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The United Nations Industrial Development Organization
Government of Ghana

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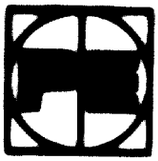
(1 of 5)

Management Assistance to the Ghana Industrial Holding Corporation (GIHOC)

Unido Contract No. 75/3
Project No. DP/GHA/74/002

Final Report

Volume 1-Text



The P-E Consulting Group

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

FINAL REPORT

VOLUME 1 TEXT

OCTOBER, 1977

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SECTION 1

SUMMARY

This report describes the programme of work undertaken for the Ghana Industrial Holding Corporation (GIHOC) by our company, The P-E Consulting Group, under contract to UNIDO.

In the summary below we have included a brief history of the project, some background to GIHOC itself and an overall description of the nature of the work and the results achieved. We have followed this with a section giving our recommendations for future action. Thereafter, in the main part of the report, the project is described in more detail under the separate areas i.e. financial, marketing, production, technical, corporate and fellowships.

The project was developed as part of ongoing assistance to GIHOC by UNIDO and the general terms for the assignment were laid down in the Project Document. This was jointly signed by the United Nations Development Programme (UNDP), UNIDO, the Government of Ghana and GIHOC in August 1974. Subsequently the contract between UNIDO and ourselves was signed in Vienna in March 1975.

The contract provided for the work to be carried out in two stages:

- Stage I (6 months): to assess the situation in GIHOC reviewing the operation of all sixteen divisions and to make detailed proposals for Stage 2.

- Stage 2 (24 months): to implement a programme of changes and improvements to management practice with particular attention to training GIHOC counterpart staff to the stage of self reliance.

The terms of reference are set out in full in Annexe I. These rightly placed great stress on the need for the programme to be action-oriented. In the contract this is further recognised by the provision of 22 man months of consulting input for Stage 1 (diagnosis) and 168 man months for Stage 2 (implementation). The separation into two stages provided the necessary review point at which all concerned agreed the detailed implementation plans for Stage 2.

In the event, the project has been completed in accordance with the planned time-scale and inputs as above. Work was started in Ghana in March 1975 and finished in September 1977.

The background to GIHOC is that it was formed in 1968, following a decree by Government of Ghana the previous year, to take over the activities of 19 state corporations in various manufacturing industries ranging from paper and glass processing to boat building. Previously these corporations were independent organisations each with its own board of directors but, within GIHOC, they became divisions operating largely independently but all reporting to GIHOC headquarters. There are now 16 such divisions operating plants at 22 locations throughout Ghana as shown on the map given as Annexe II. The scale of the operation is indicated by the facts that, overall, GIHOC has some 7,000 employees and its sales turnover for last year (1976) was Cedis (¢)80,674,000 (¢1.00 = US$0.87).

The main areas of work, carried out in close collaboration with GIHOC staff at all levels, have been:-

Financial
- Introduction of common accounts structure in all divisions
- Consolidation of group results monthly
- Provision of divisional cost analysis
- Development of individual costing routines
- Improvement of stores ledgers
- Introduction of new capital expenditure controls.

Marketing
- Conduct of individual market studies, such as:
  - bricks
  - corned beef
  - fishing boats
  - footwear
  - pharmaceutical products
- Identification of needs for further studies
- Establishment of Central Marketing Unit

Production and Technical
- Introduction of stock control routines:
  - spare parts
  - raw materials
- Introduction of planned maintenance systems
- Introduction of production control procedures
- Study of engineering capability within GIHOC
- Preparation of plans for new central workshop.

Corporate
- Examination of GIHOC objectives and roles
- Assistance with budget preparation
- Review and implementation of Head Office organisation for continuing project services.

Fellowships
- Selection of candidates
- Identification of training needs
- Identification of appropriate courses and attachments overseas
- Development of fellowship administration routines
- Monitoring progress of fellows while in UK.

The weight of the work was carried out at divisional level. Some individual divisions, in fact, have been involved in virtually all the above activities. Others needed, at this stage, only a few. A table of these activities showing the divisions where they have been carried out is shown in Annexe III. In summary the current position is as follows:-

Activities

	Completed	In Progress	Suspended	Not Applicable	Total
Financial	41	37	20	-	98
Marketing	13	5	-	-	18
Technical and Production	60	3	13	1	77
Total	114	45	33	1	193*

* Includes activities added to the programme during the project.

A completed activity represents either a new control procedure designed, introduced and run entirely by local GIHOC staff or a policy study completed, submitted and accepted by local management.

The above figures serve to indicate the scale of changes which have actually taken place within the project period. Activities in progress, though few, represent an important ongoing role for the counterparts, all five of whom have been trained to the level where, even during the project period, they have undertaken implementation tasks themselves. They will also pick up any suspended activities when it becomes possible to restart them. In this way GIHOC now has a live internal consulting resource able to tackle a new programme of activities each year. Such programmes include the monitoring of routines already established to ensure their continued correct operation and use.

The fellowship programme, integrated with the management project, has covered the creation of 29 individually designed fellowships for senior GIHOC staff. Due to restrictions of finance, fifteen of these are being held over to 1978 and provision has been made for us to make a small input in UK for monitoring progress during the next year.

In addition to the above, corporate work has involved a wide range of activities of a more general nature including attending the budget meetings of individual divisions.

Training has been a major feature of this project, not only on external fellowships. With the high proportion of work being done on detailed implementation of new procedures much of this training was done on-the-job. This took the form initially of training counterparts in studying local routines, analysing where changes were required and in putting forward proposals. Then followed training for counterparts in implementation together with on-the-job training of divisional staff at all levels. For example, in installing stock control we not only issued written procedure instructions, but also sat with clerks in the stores demonstrating the stock card entries required. Further, collective seminars were held, for example, for groups of engineers from different divisions to review and discuss developments in planned maintenance applications. External local courses were

arranged for accounts clerks to upgrade the standards of book-keeping and costing in addition to on-the-job training in new financial and costing routines. The impact of all this work on management development has been considerable and recognisable improvements in management performance have been observed.

In overall terms, the principal changes have been in the area of better information available to management on which to make decisions. This applies for example to financial data where up-to-date, more reliable, monthly figures ensure that the financial progress of each division and the group as a whole can be monitored regularly. Cost analysis shows expenditure in a form which helps management quickly localise changes in individual departments and to take remedial action. Stock control gives a new, keener edge to keeping stock levels in balance and optimising scarce resources, particularly foreign exchange. Planned maintenance ensures that plant is more systematically attended to thereby increasing its availability for production and at the same time controlling maintenance costs.

The availability of improved systems and management information has already enabled managers to make specific improvements in the operation of many of the plants. Some examples are:

- reduction of waste, by 33%, on imports of paper
- output increased by 61% on a range of products
- overall reduction of 50% in machine downtime at one plant.

Similar benefits will continue to appear as increasing use is made of the management information. These would be magnified many times if progressively increased foreign exchange allocations were available to GIHOC, as virtually all the plants operate below capacity for want of sufficient imported raw materials and spares.

In the conduct of a project of this scale, communications play a critical part. As required by the contract we have submitted the necessary progress reports at three-monthly intervals and there has been a formal project review meeting every six months. We have found these most valuable and believe that other parties have too. The atmosphere of these meetings

was always frank and constructive and allowed the work to be kept in line with changing circumstances, sometimes to the extent of making substantial changes in the programme and the resources required. This flexibility has, in our view, been invaluable to the project and was only possible with the excellent communications which existed.

Communication with GIHOC was of course more frequent and more detailed and on both formal and informal levels. We have had exceptionally good access to senior management and a close cooperative relationship which enabled problems to be solved jointly. Support at this level was always available when we were unable, as inevitably occurred in such a wide ranging project, to move forward in certain areas. Collaboration from divisional managers was, with few exceptions, excellent and the work which had been carried out was enthusiastically endorsed at a meeting of general managers towards the end of the project.

Overall we wish to record, very sincerely, our appreciation for all the support and enthusiasm for this project which has made so much progress possible. To those in UNDP, UNIDO, the Ministry of Economic Planning and GIHOC itself who have contributed to this project we offer our sincere thanks.

M.W. Hicks-Beach

K.J. Kempster

SECTION 2

RECOMMENDATIONS

In the later sections of this report there are a number of recommendations arising from our experiences in the various areas of work. In addition, at the final review meeting in Accra in September 1977, discussion about the overall project raised further points which we were asked to include in this report.

For convenience we have summarised all these recommendations under separate headings below:-

2.1 Financial

1. GIHOC should continue with the programme of training courses for accounts and cost clerks.

2. Pressure should be put on divisions to open capital work in progress records where this has not yet been done.

3. A regular review should be made of cost centre analysis sheets to ensure that the headings are still appropriate to each division's operations.

4. In Cannery Division the new accounting staff should be given several months to familiarise themselves with the division before the accounts review is started.

5. In Distilleries Division the interim costing system should be operated in parallel with the accounts for three months before considering full integration with financial accounting.

6. In Glass Manufacturing Division urgent attention should be given to opening the capital work in progress cards in view of the large volume of new plant being installed.

7. Vegetable Oil Mills Division should move towards branches becoming self accounting once the problems of recruitment of higher calibre staff at branch level have been overcome.

8. Regular progress meetings should continue to be held by the Director of Finance to ensure that satisfactory progress continues on clearing the balance of systems installations.

2.2 Marketing

1. The vacancies in the Marketing Unit for an export marketing manager/deputy head of unit and for a statistician should be filled as a matter of urgency.

2. The balance of the programme of marketing work for 1977, covering studies on pharmaceuticals and on the building industry should be tackled without delay.

2.3 Production and Technical

1. GIHOC should be provided with sufficient foreign exchange to build up and maintain adequate stocks of spare parts now that effective control of stocks and reordering is in force.

2. In Electronics Division the installation of the stock control procedures should be left until after the end of 1977 so as not to disrupt the programme arranged for the production counterpart.

3. In Glass Manufacturing Division, local staff should prepare new maintenance and spares schedules to deal with new items of plant being delivered and installed.

4. Personnel inside and outside GIHOC should be continuelly reminded that current levels of items "out of stock" and "waiting to be ordered" must not be accepted as the norm.

5. Reports by counterparts on ongoing activities should be submitted through divisional General Managers for inclusion in their querterly reports to Head Office.

6. GIHOC should continue to seek suiteble candidetes for the post of Group Chief Engineer.

2.4 Corporate

1. Performance of Ghanaian industry generally would be significantly improved by releese, early each year, of a first instelment of import licences, becked by letters of credit, to cover raw materials.

2. Marble Works Division should pey close ettention to estimating for contract work to ensure adequate margins in e wider market.

3. Meat Products Division should continue to explore oversees sources of supply offering the best value in supplies.

4. Wider use should be made of simple finencial models to test, for individual divisions, the effect of different variables on profit potentiel.

5. For the foreseeeble future the central services (financial end marketing/production) set up during the project should continue to be directed by the Director of Finance and the Deputy Managing Director (Operations) respectively.

6. The programme of work for these central services staff should be planned and monitored at regular intervals with, say, quarterly reports of progress being made to the GIHOC Executive Directors.

2.5 Fellowships

1. GIHOC should submit, without delay, the application forms and fellowship specifications for the fifteen candidates for fellowships in 1978.

2. All organisations involved in setting up and administering fellowships should bring forward their activities in relation to the fellowship starting date to avoid, in future, having to handle all departures as emergencies.

At the final review meeting in Accra in September 1977 one session was devoted to a collective review of the handling of the project overall. The object of this was to identify, for the benefit of any subsequent large projects of this type, any lessons which could be learnt. We have therefore recorded below the main recommendations which emerged from the discussions:-

1. The diagnosis work should be formally separated from design and implementation into two distinct stages, as in the project, to allow formal discussion and agreement on the nature and scope of changes to be implemented.

2. To reduce delays in obtaining counterpart staff for the project team, the earliest possible advice should be given, to the organisation receiving the assistance, on the type of individuals required.

3. Provision of transport and accommodation for consultant staff is essential to efficient operation of the team and both should be planned early and made available from the start of the project.

4. Good communications throughout the project are important to its success. As in this project, quarterly reports with review meetings at 6 monthly intervals are recommended. Consultants should hold formal meetings with the local organisation at regular intervals, say monthly, in addition to the informal ongoing contact.

5. A follow up visit to monitor progress is desirable. This should take place, say, 6 months after the end of the project period to allow the local organisation to operate on its own long enough to identify any problems in doing so.

SECTION 3

FINANCIAL

This section of the report describes the work on finance, accounting and costing undertaken during Stage II of the project. This work is discussed under the following main headings:-

1. Summary of Findings in Stage I
2. Approach to Stage II work
3. Work experience and programme development
4. Main systems changes
5. Implementation and future work programmes.

3.1 Summary of Findings in Stage I

The survey in Stage I revealed the following weaknesses in the financial department of GIHOC which required attention:

- Financial systems were weak as evidenced by the substantial number of year-end adjustments and the discrepancies which regularly arose between monthly management returns and year-end audited accounts.

- Costing systems, where they existed, were mainly used for ad-hoc pricing exercises and the costs so calculated were not regularly compared with actual results.

- Capital expenditure records were unsatisfactory and there was no regular reporting of actual capital expenditure against budgets.

- Group accounting was hampered by lack of common expenses analysis.

- The standard of clerical accounts staff was low and there was a requirement to upgrade accounts staff by more formal training.

3.2 Approach to the Work

At the end of Stage I we proposed a detailed review of the systems in each of GIHOC's divisions and the preparation of reports putting forward recommendations for revised systems for financial accounting and for cost accounting. We proposed that head office and group accounting reviews should follow divisional studies so that conclusions could be based not only on the findings of the head office reviews but also on those in the divisions.

Systems reviews were to be completed within the project period and implementation started sufficiently for counterpart and divisional staff to complete implementation of all proposals on their own. It was pointed out in the proposal that responsibility for implementation would rest largely with divisional staff. The project team were to take an active part in implementation providing guidance and assistance to the divisional management during the implementation period.

On staff training, it was proposed that a series of basic accounting courses be arranged for GIHOC accounts staff at a suitable local training institution. These courses were to last four weeks and there was expected to be at least six accounting and two costing courses per annum. Divisions were to send one clerk per division to each course thus enabling the majority of clerical staff to be trained without divisions losing too many staff at one time.

3.3 Work Experience and Programme Development

Divisional reviews were undertaken with two objectives in mind:

- to identify in detail the existing systems and the improvements required

- to provide experience for the counterparts in studying systems and preparing recommendations for change.

The methodology used in the reviews was first to interview all staff and examine their records. From the notes taken, existing systems were examined and improved systems developed. The new systems designed for each division were then discussed and agreed with Divisional Accountants in draft before a formal report was submitted to the General Manager. The scale of the programme precluded the team from providing more than regular guidance visits during implementation. It was essential therefore that Divisional Accountants clearly understood and were in agreement with the recommendations, and care was taken to have the fullest discussion with them before submitting reports to the General Managers. We were in fact able, in every report, to state clearly in the introduction that the Divisional Accountant placed on record his agreement with and willingness to implement the recommendations contained therein.

During the first reviews we found that staff were not always clear as to the systems in opeation and, certainly, divisions had no systems manuals which clearly defined the procedures.

It was therefore decided that each review should produce two documents. The first was the Volume I report originally envisaged, which commented on the existing systems and put forward the proposed design for the new systems. The second was a Volume II report which was a systems manual setting down the existing system in operation, as described to us in the course of the review, and as subsequently agreed with divisional management. The inclusion of the Volume II manuals required us to extend the time needed for divisional reviews so that full-time supervision of implementation by the team took place in early 1977 rather than during 1976. This was essential to ensure that a really firm basis was laid on which new systems could be introduced, to provide divisions with a reference record of existing systems and to ensure that bases on which Volume I recommendations had been made were fully understood and recorded. We attach, as Volume 2, Annexes IV to VII, sample copies of divisional review reports.

At head office it was originally intended only to conduct a systems review and to introduce a system of group coding to provide a better basis for producing consolidated accounts. Headquarters work was extended to include the systems manual as in divisions, and was further developed to provide for a system of consolidated books of account incorporating divisional

returns and providing consolidated reports on a monthly basis. In order to undertake this more extensive programme, additional inputs in the form of a third consultant to undertake this head office work were agreed in the review meeting in October 1976.

On training, arrangements were made for the National Training and Vocational Institute to run four week courses in Accounting and Costing.

The accounting courses were designed to give a full book-keeping training, taking students from prime entry records to final accounts. In a similar manner the costing courses were designed to take the students through all the main types of costing systems.

These courses were designed for clerks, most of whom already had practical experience and had done some theoretical accounting training already. However, it was found that there was also a need for courses for newly recruited clerks who had almost no previous training or experience and, in the second year of the project, junior training courses were introduced.

Fourteen courses have been held during 1976 and 1977 as follows:

- Senior accounts clerk courses	9
- Senior cost clerk courses	2
- Junior accounts clerk courses	2
- Junior cost clerk courses	1
	14

These courses have proved extremely beneficial to the staff and we believe they should be continued. We therefore strongly recommend that GIHOC continue with this training on a regular basis.

Finally, the proposal made specific recommendations with regard to the audit section and stated our willingness to assist as necessary. These proposals principally required Audit Department to undertake organisational changes which were not expected to require any substantial input from the project team. In the event, Audit Department have not called upon our assistance during the project.

3.4 Main Systems Changes

3.4.1 Introduction

This section describes the work done on accounting systems under the following headings:

- Financial Accounting
- Capital Expenditure Control
- Stores Accounting
- Cost Centre Analysis
- Costing Systems.

3.4.2 Financial Accounting

In order to provide a means of consolidating divisional accounts into a monthly group account, a standard format of trial balance had to be developed and introduced in all divisions. This involved altering the format of divisional general ledgers to conform to the new trial balance procedure.

At head office a new set of books was required through which divisional and head office trial balances were to be processed.

The project at headquarters was further developed to include a system for comparison and reconciliation of inter-divisional balances. This system ensured that inter-divisional imbalance is monitored on a monthly basis and steps taken, as soon as reports are received, to reconcile any accounts which are out of balance.

Introduction of these new systems of financial accounting necessitated a schedule which enabled all divisions to come on stream at the same time.

The approach adopted was first to devise and agree the group trial balance format. This was made easier by the fact that system reviews had been completed in all divisions and thus any special considerations of particular divisions could be taken into account in devising the procedure. The basic procedural

notes (Appendix A of Annexe VIII, Volume 2) were issued and all divisions were visited in order to explain the main parts of the system and to set up the implementation timetable. Thereafter the team made frequent visits to progress implementation and to assist the divisions with any problems that arose in adjusting former financial practices to bring their ledgers in line with the new trial balance procedure.

The process of implementation was begun in May 1977 and by the end of July all divisions had reorganised their ledgers and submitted trial balances in the new format for the month of April.

The following direction to divisions regarding prompt submission of trial balances has been issued:

- single site divisions are to submit returns by the fifteenth working day of the following month

- multisite divisions must submit returns by the twentieth working day of the following month.

By mid-September all divisions with the exception of head office had submitted returns up to the end of June and the following had submitted July returns:

- Brick and Tile Division
- Boatyards Division
- Distilleries Division
- Metal Industries Division
- Paints Division
- Vegetable Oil Mills Division.

The introduction of this system on a group basis has entailed substantial work by divisional staff as well as the project team. In particular, great care has had to be taken to ensure that changing over to the new system in the general ledgers was effected correctly, since this final book of account is the most critical area of any accounting system.

The advantages from this new system are substantial and may be summarised as follows:

- it provides the group with a common accounting base for consolidation and inter-divisional comparisons

- the monthly operating reports have been integrated with the trial balance and will thus, in future, be financially proven

- within the system is a sub-routine enabling inter-divisional balances to be reconciled on a monthly basis

- staff training and transfers of staff between divisions will be facilitated by use of the common trial balance system

- the standardisation of the general ledgers throughout the group will assist the work of both external and internal auditors and will speed up the production of final accounts

- the system has enabled us to develop regular group management accounting returns on a monthly basis.

For further details of the system, reference should be made to Annexe VIII, Volume 2 which contains not only the instructions for operation of the routines, but also has examples of the new trial balance format and of the group financial report forms.

3.4.3 Capital Expenditure Control

In the past GIHOC inherited a number of plants which had originally been supplied on a turnkey basis and for which no information was available as to the value of the individual items.

Efforts had been made in the past to introduce asset registers but each division had sought its own solution and many of these were found to be cumbersome in operation. We also noted that divisions were not submitting reports of their current capital programme. Finally, the preparation of asset registers and capital expenditure reports had tended to fall behind since neither were essential to completing the monthly financial accounts.

In designing the new system, a detailed description of which is attached as Volume 2, Annexe IX, we adopted the following main approach:

- we have recommended a standard system of fixed asset registers throughout GIHOC

- we recommended the use of registers in card form to give maximum flexibility of approach

- we have combined the initiation of fixed asset register cards with the capital expenditure reporting procedure. This enables management to be sure that the fixed asset registers are being kept up-to-date.

The system has called for divisions to perform two tasks namely:

- prepare the fixed asset register cards

- open capital work in progress cards from which capital expenditure reports are to be prepared and submitted.

The first task has been largely completed by all divisions and those with work still to do have been asked, at a recent general managers' meeting, to complete this by the end of September. This has not been without its difficulties due to the paucity of information regarding some of the assets but solutions have been found to enable divisions to complete the task.

The Capital Expenditure reporting procedure is still in progress since divisions have tended to concentrate on other areas of implementation and left this routine for later attention. However, Brick and Tile Division and Marble Works have completed the full programme and are submitting their capital expenditure report to Head Office with their monthly returns. Metals, Cannery, Footwear, Distilleries, Paints, Steelworks and Vegetable Oil Mills Divisions have all opened capital work in progress cards but have yet to prepare reports for head office on a regular basis before the system can be deemed complete.

The remaining divisions still require to open the current year's capital work in progress records and it is essential that management continue to put pressure on them to do this.

3.4.4 Stores Accounting

The work on stores accounting required certain divisions to set up proper stock binders which showed quantity and value for all items in the stores. These are required to be checked with the stores records for quantity and reconciled monthly with the ledgers for value. This checking procedure is essential to ensure that the asset value of inventory, as shown in the books of account, accurately reflects what is actually in the stores.

Many divisions already had this system in operation and major work was required only in five divisions. Of these Brick and Tile and Paints Division have completed the work. Marble Works have opened the binders and are bringing them up-to-date. In the remaining two, Metals have reorganised all but the raw materials stores binders which is still in progress. Electronics Division is also still outstanding since the binders cannot be opened until the new stock control procedures have also been implemented.

3.4.5 Cost Centre Analysis

During the divisional reviews we found that all divisions were reporting their financial results in the form of monthly operating statements under major expense headings, but few were providing any further breakdown of these major headings to enable management to identify which costs were exceeding budget.

It was decided, however, that the operating statement should be retained as a basic management return, the preparation of which was well established and which management were accustomed to receive. To provide the necessary supporting data a system of cost centre analysis was devised showing divisional expenditure under headings appropriate to each division and related as far as possible to the areas of responsibility of individual managers.

In order to prepare such data, divisions have had to rearrange the basic analysis of financial information. However, once completed, the cost centre analysis itself provides the basis for final postings to the general ledger and thus is fully integrated into the books. In Volume 2, Annexes IV and VI, the sample Volume I reports (Paper and Glass Divisions) demonstrate how the system works for these particular divisions. The systems installed in other divisions are largely the same and only the analysis headings are changed to suit the particular division's operational activities. This system provides therefore a common approach to expenses analysis throughout the group and which facilitates both transfers of staff and staff training.

Nine of the divisions have now completed this task and are producing these cost centre statements. In the other divisions Boatyards, Electronics and Vegetable Oil Mills have still to install the system but design work is complete. In Head Office, Meat, Paints and Footwear divisions the analysis is being done but cost sheets are not yet being prepared. In Cannery Division the review was suspended but implementation of cost centre analysis will be part of the application when work is resumed.

In the light of experience in operating the system, divisions may wish to extend the analysis beyond that already installed. We recommend that a regular review is made of all cost sheets to ensure that they are still fully informative of the divisions current activities. In particular, where divisions start new projects the cost sheets should be revised to accommodate these.

3.4.6 Costing Systems

In this area of the accounts, a division's activities must be the governing factor in the design of the system and therefore each system must to some extent be tailormade to suit each division's own needs.

However, we have been able in some instances to use a common approach for several divisions with similar costing requirements. The main areas where this has been done are firstly, in the design of process costing for Brick and Tile, Vegetable Oil Mills and Paints Divisions. In this instance although the processes are widely different the design and operation of the process cost sheets have sufficient similarity for staff from one division to understand readily the working of another. Similarly in the case of Boatyards and Marble Works Division the job costing systems and management reports have included as many similarities as possible in order to facilitate inter-divisional staff transfers and training. Finally, in both Metal Works and Pharmaceuticals Divisions standard costing is appropriate, and we have been able to demonstrate to staff from Pharmaceuticals Division how their costing system will work, when completed, by reference to that in Metals which is already almost completed.

Costing systems were the last area for implementation as it was necessary first to ensure that the new financial systems were in full operation in order to provide reliable up-to-date information for the costing process.

However, at the end of the project period four divisions namely Fibre Bag, Steelworks, Boatyards and Brick and Tile Divisions have completed implementation. Metalworks Division has completed the system on the basis of old cost data. Standard costs need to be revised to take account of recent wage increases. Glass Works Division has completed implementation up to the stage of a trial run of the proposed system before the current operations were closed down. In Footwear, Paints, Pharmaceuticals, Distilleries, Paper and Vegetable Oil Mills Divisions installation is in progress. System design has been completed for Meat, Electronics and Marble Works Divisions. For Cannery Division the modification of its existing costing systems will be part of the application when work is resumed.

Completion of costing systems will be the main area of ongoing work for the counterparts. Basic design has already been done and in the specification of these new systems the counterparts have themselves played a large role. They are therefore very conversant with what has to be done. Furthermore, sufficient implementation has already taken place for the counterparts to become familiar with the sort of fine adjustments needed for practical implementation. This has thus given them sufficent experience of the methodology of introducing change in this area for them to continue the work.

3.5 Implementation and Future Work Programme

The following paragraphs describe the work done division by division. This work arose mainly from the divisional reviews which were conducted in fourteen divisions and in head office.

3.5.1 Boatyards Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Accounting	Completed
Cost Centre Analysis	In Progress
Costing Systems	Completed

In the Boatyards Division one of the most critical factors is their ability to identify as soon as possible where individual vessels under construction are exceeding the original quotation made to customers. This is particularly so in view of the fact that most quotations include an escalation clause which can only be effectively utilised if the yard is in a position to notify customers as soon as allowable cost increments arise.

We therefore recommended a new job costing system linked with a procedure for monitoring, each month, actual expenditure to date against the original estimate on each vessel. High priority was given to implementing this system and thus, unlike other divisions, costing was given priority over cost centre analysis and has been completed before it.

It remains for the counterparts to assist the division in introducing cost centre analysis on which some work has already started. The counterparts will also ensure that the installation of capital expenditure control systems is completed.

3.5.2 Brick and Tile Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	Completed
Stores Accounting	Completed
Cost Centre Analysis	Completed
Costing	Completed

This division's financial records were found to be particularly poor and costing was virtually non existent. We have been extremely pleased with the way the Divisional Accountant and his relatively small team of four clerks have undertaken and succeeded in implementing our recommendations. The staffing level at this division is not noticeably higher than in others and indeed the Divisional Accountant is rather less qualified than many of his colleagues. Our experience in this division has been, therefore, all the more welcome in demonstrating to others that the proposals put forward are wholly practical in terms of implementation.

Due to the early completion of costing in this division it has also been possible to use it as a training ground for cost clerks from Paints and Vegetable Oil Mills Divisions for which we have proposed similar process costing systems.

3.5.3 Cannery Division

Systems	Progress
Financial Accounting	Complete
Capital Expenditure Control	In Progress
Cost Centre Analysis	Suspended
Costing	Suspended

This division's accounting review has been suspended. It was due to be completed by the senior consultant at a time when he fell seriously ill. It was decided that, rather than undertake a long review at that late stage, the project team should concentrate on implementation in other divisions. The systems review of the Cannery Division has been programmed as a special project for the systems accountant to undertake. The division has, more recently, suffered a major setback which necessitated a complete change of senior accounting staff. We recommend that the new staff be given some few months to familiarise themselves with the division and that this review does not take place until early 1978.

The new financial accounting systems have, however, been introduced so that group consolidation should not be held up. On capital expenditure control, fixed asset register cards and capital work in progress cards have been opened and all that remains is for the division to use the latter to produce the capital expenditure report.

3.5.4 Distilleries Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Accounting	Completed
Cost Centre Analysis	Completed
Costing	In Progress

This division has almost completed the capital expenditure system. Cards have been opened as far as possible and a draft capital expenditure report produced. All that now remains is for the formal capital expenditure report to be produced on a regular basis.

On the implementation of standard costing a problem has been experienceddue to the fact that the present import licence controls have left the division seriously short of raw materials and have made it difficult for realistic forward production programmes to be prepared. This, in turn, has created problems in establishment of standard cost recovery rates. It may also give riss to major variances in the costing returns which are almost totally explainable by an enforced under-utilisation of the plant. These difficultiss have been overcome by calculating standard recovery rates based on immediate past experience and by devising an interim system whereby standard costs are compared with actuals on a monthly basis but are not, as yet, integrated in the accounts. We recommend that this interim solution is allowed to operate for three months. A review should then take place of the possibility of introducing the fully integrated system. All concerned agree that this can be implemented given more settled production conditions.

3.5.5 Electronics Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Accounting	Suspended
Cost Centre Analysis	In Progress
Costing	Suspended

This division has suffered from major staff shortages in trying to implement its new financial systems. More recently it was necessary to transfer from this division to Cannery Division one key person, due to the greater need for staff at the latter division. The systems in progress will have to await the recruitment of additional staff before work can recommence and we recommend this is undertaken as soon as possible.

The suspension of implementation of costing and stores systems ie due to the suspension of the stock control procedures reported in the production section of this report. The related stores accounting and costing system were designed to link in with the proposed stock control system and require the information to be produced from that system before they can be implemented. We understand that the stock control procedures are to be implemented in the future, and when this takes place the systems accountant will need to assist the accounting section to implement the recommended related stores accounting and costing systems.

3.5.6 Fibre Bag Division

System	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Cost Centre Analysis	Completed
Costing	Completed

This division has completed the installation of all major systems with the exception of capital expenditure. The division operates an integrated process costing system with 13 process cost centres in the production section alone. The thorough revision of this system has been a major task and we are very pleased with the progress made.

On capital expenditure records the division is due to complete compilation of its fixed asset register by the end of September 1977. Thereafter the introduction of capital work in progress records and capital expenditure returns need not take more than one month.

Additional work in this division has included a special exercise on product costing to assist the division in presenting its case for a prices review to the prices and incomes board.

3.5.7 Footwear Division

Systems	Progress
Financial Accounting	Complete
Capital Expenditure Control	In Progress
Cost Centre Analysis	In Progress
Costing	In Progress

This division has in fact made rather better progress than the above schedule suggests. On capital expenditure recording they have opened fixed asset register cards for existing assets and they have also opened the capital work in progress cards. A draft capital expenditure report has already been produced and all that remains is for them to start submitting regular capital expenditure reports to Head Office. On cost centre analysis the analysis is already being done within the books in basic form. This needs to be extracted into a cost sheet for circulation to management with some further refinement of analysis headings.

On the costing side, the division has been producing a new regular internal return showing the added value earned by each line produced in the month. This has been used by the general manager to load the factory with the most profitable lines as far as possible. Further development is required to provide feedback of actual cost levels, especially on raw material, as against the standard cost raised on the system already installed and used in the added value analysis returns. This is to be undertaken by the counterparts.

3.5.8 Glass Manufacturing Division

System	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Cost Centre Analysis	Completed
Costing	Suspended

This division has recently closed down its current operations and is in the process of completely re-equipping the factory. Operation of major systems on the costing side have therefore had to be suspended pending the restart of operations when the new factory is completed. However, the systems have been designed, trial runs on the last months operations worked through and seminars held to familiarise both accounting and production staff with the systems.

On capital expenditure records the division has still to open the capital work in progress cards. This division is presented with an excellent opportunity to ensure that the fixed asset registers relating to the new plant are properly set up and we recommend most strongly that local management is pressed to install the new system and submit capital expenditure returns as soon as possible.

3.5.9 Marble Works Division

System	Progress
Financial Accounting	Completed
Capital Expenditure Control	Completed
Stores Accounting	In Progress
Cost Centre Analysis	Completed
Costing	Suspended

This division has progressed well, given the small amount of staff available to do the work, the outstanding items being the costing system and stores accounting.

This division has a multiplicity of activities in that it produces tombstones, kitchen sinks and terrazzo tiles as well as laying terrazzo floors in situ and undertaking construction work. We have recommended a job costing system similar to that used in Boatyards Division. In order to get the system under way it is necessary for original estimates to be produced in a more formal way than at present and the production management who are responsible for preparing estimates are currently working on this.

Once this task has been completed the detailed system for relating current progress to original estimates can be finalised by the counterpart and the implementation of the system completed.

On stores accounting the division has had to introduce stores binders for the first time. These have had to be written up to the year to date and reconciled with the ledger. So far the clerk has posted the stock cards up to June 1976.

3.5.10 Meat Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Cost Centre Analysis	In Progress
Costing	In Progress

This division was scheduled as the last of the divisional system reviews and has therefore had somewhat less time than the others to absorb and implement the new systems generated from their Volume I report.

However, they have fully implemented the financial accounting procedures. Fixed asset register cards are to be completed by the end of September and thus by the end of October the capital work in progress records and related capital expenditure reports should also be completed. The cost centre analysis has been prepared in draft and only requires the cost sheets to be typed and issued for the system to be complete.

Work on implementing the costing system is yet to start. The system has been designed and fully explained to divisional management. Actual implementation will take place during the forthcoming months under the guidance of the counterpart who himself played a major role in designing the system.

3.5.11 Metalworks Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Accounting	In Progress
Cost Centre Analysis	Completed
Costing	In Progress

This division has completed implementation of two main systems and work is in progress on the three remaining ones. The division has in fact virtually installed its new standard costing system and has provided thereby useful experience and training material for other divisions, notably Pharmaceuticals, where a similar system is in the process of implementation. Standard costs were worked out on old labour rates. Due to recent legislation on minimum wages these need to be revised using the new rates.

We also undertook an additional special project for this division to provide them with costing data on their proposed diversification into upholstery tacks. The resultant report is shown as Annexe X, Volume 2.

Of the remaining systems in progress, fixed asset register cards and capital work in progress cards have all been opened and it only requires the capital expenditure reports to be extracted and issued to be fully complete. On the stores accounting, binders are now in operation for all but raw material stores which should be completed within the next month.

3.5.12 Paints Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Ledgers	Completed
Cost Centre Analysis	In Progress
Costing	In Progress

This division is using a costing system similar to that currently in operation in Brick and Tile Division. The cost clerk has been sent to the Brick and Tile Division to learn the basic principles of operation and is currently opening the new process cost ledgers at Paints.

On capital expenditure control the majority of fixed asset register cards have been opened and the remainder are due to be completed by the end of September. The clerk has been shown the operation of the capital work in progress cards and these are currently being opened. This process should be completed by the end of October.

Cost centre analysis sheets have been designed and the clerk has opened the cost centre analysis books. The remaining action on this system is the completion of writing up the analysis and production of the cost centre report.

3.5.13 Paper Conversion Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Stores Accounting	In Progress
Cost Centre Analysis	Completed
Costing	In Progress

This division was one in which a large part of the proposed costing system already existed. The report has concentrated on using the established system of product costing to create standard costs and using these to relate costs back to actuals on a regular monthly basis. The system has been fully explained to the cost clerk and the counterpart has confirmed that it can be installed under his guidance within the next three months.

Work has been initiated on all other outstanding systems revision and capital expenditure recording. These also should be completed by the end of the year under the guidance of the counterpart.

3.5.14 Pharmaceuticals Division

Systems	Progrese
Financial Accounting	Completed
Capital Expenditure Control	In Progrees
Coet Centre Analysis	Completed
Costing	In Progrese

For this division we have recommended the introduction of a standard coeting system which enablee them to compare, on a regular baeie, actual cost with standard product costinge previouely used only for pricing purposes. This is particularly important in this division where there have been instances in the past of not recognising early enough increased raw material prices, and some products have therefore been sold at too low a price.

The system has been fully discussed with divisional staff and implementation agreed. Currently, revised standard costs are being prepared prior to implementation of the system.

3.5.15 Steelworks Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Cost Centre Analysis	Completed
Costing	Completed

This division already had established more advanced accounting and costing systems than others in the group. We have however introduced the necessary modifications to financial systems in order to bring them into line with the new group accounting systems. Modificationa have also had to be introduced to their existing systems of cost centre analysis and more particularly to the costing eyetem to ensure an accurate calculation of work in progress figures. On the fixed asset register and capital expenditure reporting, the division haa revised its registers and introduced the new card system. It haa yet to introduce regular capital expenditure reporting using the new system.

3.5.16 Vegetable Oil Mills Division

Systems	Progress
Financial Accounting	Completed
Capital Expenditure Control	In Progress
Cost Centre Analysis	In Progress
Costing	In Progress

This division's operations are widely spread in the country there being a copra oil mill in the far west at Esiama and two groundnut oil mills in the north at Atebubu and Tamale. The system operated is one of pure branch accounting with basic returns being sent to the divisional head office in Accra where all books of account are kept. We have recommended that the division move towards branches becoming self accounting but this will have to wait the recruitment of higher calibre staff at branch level.

Meanwhile new financial accounting systems have been installed at divisional head office. The fixed asset register cards have been opened for most items. The clerks have been instructed in the operation of the capital work in progress cards by the consultant, who demonstrated the system to them by himself opening capital work in progress cards for the Esiama plant.

The cost clerk is to be sent to the Brick and Tile Division to learn the basic concepts of the recommended process costing system. Once he has received this initial training he will open the new process cost ledgers under the guidance of the counterpart.

On cost centre analysis the proposed cost sheet has been designed and work should now begin on revising the analysis in the books so that the cost sheet can be prepared.

3.5.17 Head Office

Systems	Progress
Group Accounting	Completed
Capital Expenditure	In Progress
Stores Accounting	In Progress
Cost Centre Analysis	In Progress
Group Consolidation	Completed

The head office of GIHOC acts as the administration centre and ultimate control centre for the group. Its review therefore was undertaken only when divisional reviews had been completed to enaure that group systems were designed to be complementary to, and an extension of, the divisional systems. In the head office accounting unit we have recommended broadly the same sort of financial systems as there are in the divisions. The group trial balance system and revised general ledger have been installed. Analysis books have been opened and are being entered. These will form the basic record from which the Head Office cost centre analysis reports will be prepared.

Fixed asset register carde are now being opened, and the capital work in progress record should follow shortly.

A major area of work at Headquarters has been the setting up of the consolidation and group returns procedures. These are being done in a separate section which is headed by a chief accountant. The systems required were totally new to GIHOC and have involved opening a special analysed group ledger, into which the divisional return is entered, and from which a consolidated group report is prepared on a monthly basis. The first set of these reports had been issued by the end of the project thus bringing this major task to completion.

3.6 Conclusion

The implementation work in divisions has been a widely spread task for the project team, assisting divieional accounting staff in setting up the new routines. Annexe III, Volume 2 shows, in chart form, the overall picture of new activities being generated in 21 accounting sections of GIHOC. It may be summarised as follows:-

Activities completed	41
Activities in progress	37
Activities suspended	20
Total activities	98

To be designated complete we have insisted that a system is fully operational and that the related reports are being produced. All major systems generate a regular monthly report and thus their full completion and continued operation can be easily monitored.

We have attended discussions between the Divisional Accountants and the Director of Finance at which the Divisional Staff reaffirmed their ability to complete the programme. Regular weekly progress meetings have been set up at which the Head of Accounting Systems reports progress on the continued implementation to date.

At these meetings the Head of Accounting Systems has expressed his confidence in his ability to complete the programme and the Director of Finance has set a forward programme of work specifying priorities for completion of individual applications.

We too are confident that the Head of Accounting Systems can complete implementation, as a result of his own involvement in conducting the review programme, in design and development of the new system, and in implementation already completed.

SECTION 4

MARKETING

4.1 Introduction

In our original proposal we identified marketing, in the sense of improved promotion of current products, as being of less importance to GIHOC than, for example, improved financial management. The sales of most divisions were, and still are, controlled more by availability of raw materials and production capacity than by market demand. However, we identified individual divisions such as Brick and Tile, Cannery and Footwear where there was a lack of knowledge of the market and where a better basis was required for longer term decisions on product policy. We therefore recommended that the project include 18 months full-time marketing consultancy to create, within GIHOC, an awareness of the proper role of marketing and a small unit capable of monitoring changing circumstances and conducting any studies arising.

4.2 The Market Environment in Ghana

The Ghanaian market is regarded by most domestic manufacturers as a sellers market - i.e. one in which the producer can sell anything he can make. The concept of marketing is not generally seen to be relevant to the current economic circumstances of the country. Marketing is at at early stage of development in Ghana, and GIHOC was no exception to this general statement. This attitude derives from past protection of the home industries against foreign imports. It leads towards a lack of concern as to the quality of goods the buyer wants and to shortsightedness as to how the future demand patterns will develop.

The comfortable situation of a sheltered market outlined above will not continue forever. One day Ghanaian industry will come under increasing pressure of competition and this could occur quite suddenly, as it did to GIHOC Footwear Division in 1970/1971. Competition is most likely to come first from private enterprise in the hitherto protected home market and ultimately imports could also be freer. More immediately Governmental pressure for exports could force Ghanaian companies into the highly competitive world of international commerce. To enable GIHOC to anticipate the pressures brought about by competition the general standard of marketing in GIHOC needed to be raised.

4.3 Headquarter's Marketing Unit

We recommended therefore that a small but effective marketing unit should be set up at GIHOC headquarters to initiate the necessary improvements. The reasons for choosing this solution, rather than working directly within divisions, are varied but may be summarised as follows:

- some work relates only to headquarter's functions such as policy determination

- some work transcends any single divisional interest

- a single source of expertise is required as a nucleus from which divisional marketing may be developed.

We visualised the unit would work partly for headquarters and partly for and with the divisions. For headquarters it would primarily concentrate on work contributing to senior management's policy decisions:

- advising the Director of Development on future areas of industrial growth suitable for GIHOC investment

- helping to co-ordinate the work of the divisions where products or images overlap, so as to avoid conflict or wasted effort

- assessing the suitability of products and markets for export

- providing a bank of economic and market data to help in forecasting economic trends, as well as more detailed data on markets which are common to several divisions.

In addition, it would provide divisions with guidance and practical help in marketing. Their need for this is indicated by the fact that at the time of the initial survey most of them did not know the size of their market, how it was moving, nor what their share of it was.

The first divisional task therefore for the marketing unit was to guide divisions in assessing their share of the market and how they could increase that share profitably; alternatively, if no potential was identified for improving the market share, help would be given in investigating other and possibly more lucrative markets.

The second task was to help them to prepare for increasing competition. Divisions need to know what the consumer wants in terms of quality and also what he is prepared to pay. Marketing can help divisions gauge the questions so that they can adapt their products to what the market wants and thereby profitably increase their market share.

Help with exports is the third main task. Ghana has a desperate need for exports and there is considerable pressure from Government for firms to export at least part of their output. Indeed, Cannery Division was asked to devote its entire production to export, having in the past exported little or nothing. So marketing was required to help divisions in preparing carefully considered, selective export market plans.

The first consideration in establishing an effective marketing function within GIHOC was to create a general acceptance of its value. For this it was vital that the marketing unit won the co-operation and respect of the divisions at an early stage. It was essential to show General Managers that marketing was not just another headquarters function but could give them practical help in running their business profitably.

To this end our approach concentrated on:

- doing practical project work for and with divisions
- involving existing marketing and other staff from divisions in the projects as much as possible
- building on such constructive marketing work as had already been done in the divisions and using the evidence of completed market surveys to convince General Managers of the value of marketing.

The unit was set up from the beginning of the project with the marketing counterpart, Mr. K.M. Ananga, and subsequently he was joined by Mr. Y.C. Gaikpa working on export promotion and acting where necessary as his deputy. We believed that the marketing unit should always remain small and that by the end of Stage 2 should comprise not more than three individuals, namely:

- a senior marketing executive
- an export marketing manager
- an analyst.

In the event, this etructure has become generally accepted. Mr. Ananga continues to held the senior post but the other two posts, at the time of writing, are vacant. GIHOC are planning to fill these vacancies and we strongly urge that this is done without delay or the impact and image of marketing within GIHOC will dwindle. Much useful work has already been done but, as described below,there are still further important projects for marketing to tackle.

4.4 Work Done

The unit made a rapid start and, undei the guidance of the full-time marketing consultant, completed its first two marketing etudies during Stage 1 of the project. These were both aimed at providing a basis for immediate policy decisions, namely:

- the continuation of corned beef production at Bolgatanga and the poseibility of diversification from beef to other meats

and - the potential for expaneion of GIHOC's brick- making capacity at Kaneshie.

These relatively emall studies provided valuable experience for marketing staff as well ae giving positive useful data to management. The main conclusions were:

- that there was a large unsatisfied demand for corned beef in Ghana. Most supplies are at present imported; Meat Products Division has only a small share of the market. Indicationa were that increased production would be readily saleable even at higher prices

- that there was an adequate market to justify rehabilitation of GIHOC's Kaneshie brickworks, despite its run-down state.

Thereafter, a wider programme was agreed with senior management concentrating on developing marketing plans for the following divisions:

- Boatyards
- Footwear
- Pharmaceuticals
- Metal Industries.

The conclusions from the market studies for these divisions were as follows:-

Boatyards

There is enough demand in Ghana for wooden fishing vessels up to 70' long to maintain the division at about its present nominal capacity of 18 boats a year for the next few years. Substantial improvements will be necessary to achieve this profitably.

Footwear Division

GIHOC is the largest industrial manufacturer of footwear in Ghana, but its market share is less than 10% in terms of volume. Cheaper shoes and sandals, for a market currently dominated by wayside suppliers, offer GIHOC the most scope for increasing its market share.

Pharmaceuticals Division

The proposed expansion of Pharmaceuticals Division is well founded in terms of potential market. However, the increased sales, especially in the private sector, will bring the division up against stronger competition from other local manufacturers. There will be a need, therefore, to mount a substantial and aggressive marketing effort.

Metal Industries Division

This demonstrated that there is sufficient market demand for the scale of operation envisaged by the division. The market is capable of supporting a price structure which will enable the division to make tacks profitably. Prices to customers who presently import their supplies direct will be a little higher. However, it is felt that, given present import licence constraints, these customers would accept rather higher prices if they can secure supplies locally as this would free their import licence allocation for purchase of other imported goods.

The market for welded mesh is seen to be primarily in providing burglar proofing for low cost housing.

As an example of the reports produced from this series of studies, the one for Boatyards is given in Volume 3, Annexe I. These studies were carried out by the project team with counterpart staff taking increasingly more responsibility for the planning and overall conduct of the work. In the case of the Pharmaceuticals study most of the interviewing was done by divisional marketing staff with the central marketing team providing general direction and guidance.

With regard to export marketing a separate series of studies were undertaken. These were designed to demonstrate how to identify and then follow up opportunities for the export of GIBOC products. For this exercise, canned pineapples were chosen as a suitable product and in Volume 3, Annexe II, is the report, written by a counterpart, recording the progress made. A copy of the complementary report on the market for canned products in Europe is given in Volume 3, Annexe III.

The main findings are:

- there is scope for new entrants to the Western and Eastern European markets for canned pineapple products. In West Europe particularly the market is highly competitive and GIHOC's products do not meet required standards in four respects: consistent quality, regular deliveries, packaging and price

- success in exporting canned pineapple can only be founded on large and assured supplies of raw material.

Preliminary consideration was also given to other products which might be exported; low cost footwear and distilled products were identified as possibilities. The Export Marketing Manager, together with Distilleries Division's marketing staff made an initial visit to Upper Volta in June 1976. They received a positive response and potential customers were interested in buying Distilleries Division's products provided the price was competitive. This was followed by an order from one potential customer and a follow up visit was made in July. Unfortunately this visit proved abortive since the customer backed out at the last minute on the basis that prices were too high. It was not possible for Distilleries Division to offer any further reduction in prices, recognising that the sales revenue of spirits in the domestic market can be over twice as high as selling the same product for export, taking the 20% export bonus.

Full-time input by the marketing consultant was completed in June 1976. At that stage the above studies had been completed and the counterparts had gained sufficient experience to work on their own with only part-time inputs by ourselves.

The studies then undertaken, were as follows:-

Footwear Division

The survey of consumer preferences for adult sandals - identified as the prime target for future development of sales - was completed and the final report (analysed and edited by the marketing unit) was issued to the division in November 1976. The division accepted the report and used the conclusions in planning its future operations.

Glass Manufacturing Division

The division completed its programme of questionnaires and follow-up visits to users of hollow-ware (bottles for beer, soft drinks and spirits), which represents the bulk of its output. A divisional report was issued in February 1977. This report was then validated by the marketing unit, and discussed with the division before being issued as a final report. As a result of past shortages of supply of bottles, users' estimates of future demand for bottles - as provided to the division's marketing officer - appeared to be seriously overstated, and had to be reworked by the marketing unit in the light of likely beverage sales, bottle stocks and the rate of recycling.

Pharmaceuticals Division

Following acceptance by divisional management of the conclusions of the overall market survey completed in 1976, terms of reference were agreed with the division for a further survey of private sector demand for analgesic and anti-malarial tablets. Due to the resignation of the divisional sales manager, who was to have led the study, the study has been deferred until the division can make the necessary staff available.

Studies for more than one Division

Construction Materials Study

Preliminary terms of reference have been drawn up for this survey by the marketing unit. The purpose of the study is to assess the effect of present and projected building programmes in Ghana on the demand for construction materials supplied by 5 GIHOC divisions:-

Paints Division	Paints
Steelworks Division	Reinforcing Bar
Brick and Tile Division	Bricks
Metal Industries Division	Nails
Marble Works Division	Terrazzo and Marble Chips.

A secondary objective of the proposed study is to identify possible opportunities to make and sell other products such as flat glass, builder's hardware (e.g. locks, hinges).

4.5 Operational Budgets

The concept of preparing operational budgets for 1977 was introduced to marketing management at a seminar held in May 1976. One session was devoted to explaining to participants the background to, and information needed for, the operational budgets. At the same time participants were issued with an aide-memoire listing inputs and support data required to prepare a detailed marketing plan.

Subsequent to the seminar, the marketing consultant visited all divisions and discussed with divisional marketing sales management what could be achieved in practice as marketing inputs to the year's operation plans. The conclusion of this round of visits was that few divisions were really in a position to know the overall size of their market nor their own share of the market. Notes of the discussions were made and these were sent back to divisional management with suggestions as to what steps they should take to improve their knowledge of their markets.

4.6 Organisation and Future Programmes

As discussed in more detail in Section 6 of this report, the former marketing counterpart, Mr. K.M. Ananga, now reports directly to the Deputy Managing Director (Operations). As Head of Marketing he is now fully responsible for drawing up, obtaining approval for, and implementing each six month's programme of work to be undertaken by the Head Office Marketing Unit and the divisional marketing staff. The programmes will be discussed with and agreed by the Deputy Managing Director (Operations) so as to reflect the marketing priorities for the coming six months, as seen by the GIHOC Board. The progress achieved in completing studies against the proposed programme will be reported each month by the Head of Marketing to the Deputy Managing Director (Operations). A written progress report will, in addition, be submitted every three months.

We were present, as advisers, at the presentation by Mr. Ananga of the first such programme in March 1977 to the Deputy Managing Director (Operations) and also at the first progress meeting in May 1977. Thereafter, Mr. Ananga went to the UK for his two months fellowship in marketing subjects.

On his return he found that his deputy Mr. Y.C. Gaikpa had left GIHOC and much of the 1977 programme of work remains outstanding. We would again stress the need for filling the two vacancies in the Marketing Unit so that, in particular, the programmed work on analgesics/anti-malarials for Pharmaceuticals and the comprehensive study of construction materials can be completed in the near future. Once these have been done, the coverage of GIHOC divisions by marketing will be extensive as shown diagrammatically in Volume 3, Annexe IV.

SECTION 5

PRODUCTION AND TECHNICAL

In this section of the report we describe the production and technical work that has been carried out during the project. We show the benefits which have already been obtained and others which will arise in the future and we also give guidance on some matters which may need attention in the future.

5.1 Summary

The team, in Ghana, for this project, totalled 14 engineers and technical specialists of whom 2 were head office counterparts. They were assisted in their work by a large number of individuals and small teams at 21 of GIHOC's 22 production plants. Some of the work was done by team members being resident on site for periods varying from 2-3 weeks up to 17 months. Other activities were carried out during visits with a duration of one or more days on each occasion.

Although Stage 2 of the project started in October 1975 logistical constraints in terms of counterparts, transportation and GIHOC's documentation slowed down the rate of progress until about April 1976. Thereafter, as expected, progress was rapid and implementation continued at a high pace for the remainder of the project period.

At the review meeting in Accra in October 1976 we acceded to a joint request by UNIDO and GIHOC that the production input should be reduced in order to fund additional inputs on finance. To this end we had to agree that this would be achieved by cancelling programmes already started in Boatyards and Steelworks Divisions, which GIHOC hoped could perhaps be undertaken through bilateral financing. Further, despite a considerable input by ourselves, Electronics Division failed to implement our detailed recommendations on stock control, although they had requested they be allowed to do so and agreed both the proposals and programme.

In spite of the cancellations at Boatyards and Steelworks, the progress in other GIHOC divisions was so rapid that we were in fact able to continue making an input in the field of planned maintenance. In Periodic Report No. 1 we recorded our policy decision early in Stage 2 to involve all 22 GIHOC plants in the introduction of planned maintenance.

This was in contrast with the originally proposed work for Stage 2 where there was mention of introduction of planned maintenance at only 9 plants. In the event we are able to record that planned maintenance is now fully operational at 20 plants. The systems have been designed for the remote plants at Wenchi and Pwalugu and will be put into operation in October and December respectively. The delay with the latter is waiting for the re-opening of the plant in December to process the new season's crop.

At the start of our work on planned maintenance we encountered evidence of similar schemes which had been introduced previously and which had subsequently decayed and fallen into disuse. To minimise against this possibility in the future, we designed a standard basic system, including common documentation, which then formed the planning system in each plant. To this we added the maintenance requirements for each piece of plant and machinery and also the local administrative procedures which were required. Thus, although there is a wide variety of machinery across the different plants, they all have the same system of maintenance planning. This has the great advantage that engineers can transfer to other plants, with different processes and machinery, yet immediately operate the maintenance planning system with which they are experienced. There is of course the additional advantage, that there are now a large number of engineers throughout GIHOC with knowledge and experience of the system and this will minimise against the possibility of decay.

The purpose of planned maintenance is to keep the production and auxiliary machinery running smoothly, thus preventing the serious disruption to production which can take place when sudden unexpected breakdowns occur. In support of this it is necessary to have an adequate well-balanced stock of spare parts. To this end we have introduced spare parts stock control. After the cancellation at Steelworks our work programme for spare parts stock control comprised only 6 divisions, but in fact we have completed this control in 10 divisions and the systems are fully operational.

The introduction of spare parts stock control has been extremely complicated. It has necessitated a technical examination of each item of machinery or equipment to determine which parts should be stocked, physical counting of every single item held in stores and in some cases a complete reorganisation of the stores themselves.

Not only is it necessary to have adequate and well-balanced stocks of spare parts, it is also necessary to have the same for raw materials. Hence we planned to develop and implement raw materials stock control. With the exception of the 3 divisions mentioned earlier, we were scheduled to do raw materials stock control in 5 divisions. In fact we have completed in four; the fifth will be completed in October and has only been delayed by constraints within the division.

As with planned maintenance, both types of stock control have made use of standard documentation and a common approach modified to suit the particular operating requirements and internal organisation of each division. In conjunction with each General Manager, responsibility for the overall operation of the system, and the investment and balance of stock, has been assigned to a single officer at each plant. This is always the person responsible for consumption, irrespective of any links between, say, stores and accounting.

The value of stocks now controlled by the new stock control systems is in excess of £11,000,000, a figure which would rise appreciably if the same controls were extended to other divisions. As most of the items are imported, there is now a very real means of making the best use of foreign exchange.

Although large inputs have been made, quite rightly, in the fields of maintenance and stock control, a considerable effort has been put into other activities, in cooperation with, and often at the request of General Managers. Some typical examples of this work are:

- definition of central workshop for specialised repair, spares manufacture and training purposes; including estimate of costs and programme for building erection and equipment procurement, installation and commissioning

- specification of a range of small tools and materials urgently requiring procurement for divisional workshops

- establishment of central planning function for boat construction (BOATYARDS)

- provision of specialist technical advice on brick manufacture and kiln operation (BRICK AND TILE)

- procurement of urgently needed spare parts in Europe and air freighting these to Ghana (BRICK & TILE)

- planning new warehousing facilities (DISTILLERIES and PAINTS)

- measurement and balancing of plant capacity (DISTILLERIES)

- training and supervision of engineering personnel in the correct setting, adjustment and maintenance of production machinery (FIBRE BAG)

- specification and introduction of changes in process and quality control measurement and recording (FIBRE BAG)

- introduction of management control information (FIBRE BAG, METALS and PAPER)

- specification of work programme for technical specialist supplied under United Kingdom assistance programme (FIBRE BAG)

- provision of specialist technical advice on footwear manufacture (FOOTWEAR)

- introduction of production planning procedures aimed at meximising output with variable product mix and capacity restraints (METALS and PAINTS)

- measurement of steel can manufacturing capacity (PAINTS)

- planning re-layout of production facilities and inter-process storage (PAINTS)

- conducting in-plant supervisor training course (PAPER)

- production scheduling to remove bottleneck (PAPER)

- provision of specialist technical advice on rolling mill engineering, operation and maintenance (STEELWORKS)

- re-organisation of stores (VEGETABLE OIL MILLS).

We would like to stress that the above activities, and others not included, were only made possible by the positive contribution and participation of staff of all levels in the many plants of GIHOC.

One of the major activities undertaken by the production team has been to audit and monitor work implemented earlier in the project. In simple terms, the purpose of these visits was to check the effectiveness of the new planning and control facilities, to see the procedures are operating correctly and that action was taken where necessary. These audits also provided an opportunity to resolve any difficulties which may be arising and for giving further instruction. The results of the visits were discussed with the personnel involved and with the General Managers, if available. In the case of stock control audits, a report was always issued to the local General Manager with a copy to the Deputy Managing Director (Operations) at head office. The system of monitoring and auditing will be continued through our counterparts now that the project is ended.

Training has, of course, been another very important element of the team's programme. Much of it has been on-the-job training where a team member demonstrated the new system over a period of probably several days, then performed it jointly with the trainee, again for several days, before the next stage which consists of observing the trainee working independently. The final stage occurred when the team member resorted to part-time supervision.

In addition to the on-the-job training, seminars have been conducted at both Divisional and Corporation level. The participants here included accountants, procurement officers, stores superintendents, engineering and production personnel. Although attendance has not been compulsory, particularly for Corporation seminars, over 130 senior and middle managers have taken part.

Training by verbal means needs to be supported by written material and early in the project we made a wide circulation of notes on planned maintenance. Similarly with each application of stock control a manual of procedures was issued; seminar notes were distributed and a number of subject reports issued and distributed. Finally, a comprehensive guide to stock control in GIHOC was produced with a similar one on planned maintenance. These last two documents have been included in Volume 4 as Annexes I and II. Also in that Volume and in Volume 5 are specimens of production and technical reports submitted.

With a project of this type, many of the benefits emerge over a relatively long period of time and even then the tangible ones are not always easy to measure unless suitable yardsticks are established at an early date, as has been done for example with stock control. Nevertheless some benefits have already arisen before project completion and these are set out in the description of divisional activities which follow. Typical examples of these are:

- a bottleneck in the production of internal fitments was seriously hampering the delivery of finished cases from Paper Conversion Division; scheduling this work centre with an attendant increase in capacity raised output by 60% and has completely eliminated the backlog

- improved setting, operation and maintenance of the primary processing stages at Fibre Bag Manufacturing Division has resulted in a considerable improvement in yarn quality, which in turn is resulting in higher levels of output due to fewer yarn breakages at spinning and weaving

- the procurement of urgently needed spare parts in Europe has enabled production machinery to be kept in operation at Brick & Tile Division.

In all the 15 situations where stock control has been applied, to either raw materials or spare parts, there has been an immediate and continuing benefit in the form of savings of foreign exchange. With these controls, foreign exchange is now being spent only on the materials really required and in the quantities needed, in contrast to the former situation where it was frequently spent ill-advisedly because of the lack of real information and of effective means of control.

The introduction of planned maintenance is already beginning to improve plant performance. A good example of this is at Fibre Bag Division which has a reduction in machine downtime of 50%. Further benefits of this type are however limited in many cases by insufficient stocks of spare parts. This in turn is due to insufficient foreign exchange facilities being made available, a subject discussed later in more detail. Further improvements in output will arise through more effective use of limited resources, occasioned by the production planning introduced at Metal Industries and Paints Divisions. Similarly, waste reduction at Paper Conversion Division is a worthwhile benefit coming from improved management information. The can capacity study undertaken at Paints Division is now being extended to cover other plants with similar facilities Although the benefits of the finished study cannot be predicted it will be surprising if there is not some improvement in the utilisation of existing resources.

The benefits mentioned above are of a tangible nature, but there are those equally important which are intangible. Management development on-the-job has been an important part of the production work, and we would hope that many of the managers, and others, with whom the team have worked, will have benefited not only by gaining experience of some new techniques, but will also have had the opportunity of grasping new ideas and concepts. It is these, when sieved and blended to produce solutions appropriate to Ghana, that offer perhaps the greatest long term benefit to GIHOC.

Of course, the work which has been implemented during the project will be wasted unless there is a continuing opportunity for practice. To this end management are now continuing the auditing and monitoring of the new developments to ensure that decay does not take place. In this context, we would repeat yet again our plea that the GIHOC divisions are provided with sufficient foreign exchange firstly to build up and then maintain adequate stocks of spare parts. Without these, outputs will be lower through the inevitable stoppages or reduced rates of working. But also without these spares the engineers cannot practise planned maintenance in the proper way. Nor can engineers, production managers, stores superintendents and others practise their role in the efficient planning and management of stocks. We hope therefore that GIHOC will be given the support it needs to operate efficiently and therefore be able to avail itself fully of the benefits which should be forthcoming from the project.

Of the consultant members of the production team, Mr. D.J. Weeks left Ghana on 6th July, with Mr. S.A. Cruickshank and Mr. A.M. Marshall leaving on the 20th July and 23rd September 1977 respectively. Since that time, the work of auditing, monitoring and progressing the last completions, has been carried out by the two counterparts who are now experienced in all aspects of the production work.

A table showing the state of completion of all the production activities undertaken during the project, both scheduled and unscheduled, is given in Annexe III, Volume 2.

5.2 Boatyards Division

Activities Scheduled	Progress
Production control	Cancelled
Plant and equipment assessment	
Organisation of the production function	
Stock control of production items	

Unscheduled Activities	Progress
Planned maintenance	Complete

At the time of the review meeting in October 1976 we had been working on the first three of the scheduled activities. A number of studies had been made of methods of working and practical advice given on these matters. A central production planning section had been formed at Tema, which was actively involved in programming and progressing individual stages of build of each boat in the yard. We were about to extend the activities of this section and start work on the application of stock control to production items, when the decision was made to discontinue this part of the project.

Although not originally included in our schedule of work, we had started the introduction of planned maintenance at both Tema and Sekondi before the October review meeting. This was in accordance with our aim of implementing planned maintenance as widely as possible within GIHOC during the duration of project. We took the view that this work was not affected by the October decision and therefore continued with it.

There is not a great deal of equipment to be maintained at either of the boatyards, so that ship's mechanical equipment was included in addition to workshop machinery. The scheme has been operating successfully at Tema since the end of March. It will however need to be revised with the influx of new machinery and with an additional slipway due as part of an external aid programme. This revision work is well within the capability of the local engineer. At Sekondi, implementation was completed in July for this tiny site. The scheme is operating smoothly under the direction of a former naval engineer with previous experience of, and commitment to, planned maintenance.

5.3 Brick & Tile Division

Activities Scheduled	Progress
Planned maintenance	Completed
Plant and equipment assessment	Completed

Unscheduled Activities	Progress
Procurement of emergency spare parts	Completed

Up to October 1976, our ceramics specialist had made two visits to Ghana. During the first of these in November 1975 we made recommendations for:

- improving the kiln draught condition
- changing setting practice
- modifying production schedules
- improving kiln operation.

It was agreed that these recommendations would be implemented by divisional management, and we subsequently provided further assistance by sending, from the UK, drawings and technical cost details as required.

The second visit by the specialist consultant took place in July/ August 1976. In summary, the advice given covered the following main issues:

- identification of the need to raise the output of the brick-making plant mainly through the introduction of new methods

- recommendations to improve the quality of bricks

- review and comments on the plans for expansion of the overall plant

- recommendation for the development of hand-made bricks.

The work on planned maintenance was stopped for quite a while, with only one-third of the manual sheets completed, as the division did not have an engineer. Subsequently a young technician was appointed and although he took over the development work, progress was still slow. This was because he had to rely on the Production Manager for most of the planning information. However, the work was eventually completed and the system started operating early in August.

During the whole of the time we have been associated with this division there has been a problem of obtaining spare parts. The division made strenuous efforts to obtain suitable spares both from overseas agents and local suppliers. The partial success of these efforts undoubtedly enabled the machinery to be utilised to a greater extent than would otherwise have been possible. However, there were still some important items which were required urgently and which could not be obtained locally. These were listed by the General Manager and we were able to obtain them in the UK and Germany. They were air freighted to Ghana and put to immediate use.

5.4 Cannery Division

Scheduled Activities	Progress
Nil	-

Unscheduled Activities		Progress
Spare parts stock control		Completed
Planned maintenance	- Nsawam Plant	Completed
	- Wenchi Plant	Due October
	- Pwalugu Plant	Due December

In the initial planning of Stage 2 of the project we did not schsdule any production work to be done in this division. In the event we havs in fact undertaken the two activities named above.

Spare parts stock control was implemented in the division's main plant at Nsawam in July of last ysar. An audit was conducted in October 1976, and another in July 1977.

Ths numerical results of the audits are:-

DATE	NO. OF ITEMS	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
July 1976	421	44	10.5	38	9.0
October 1976	425	43	10.1	30	7.1
July 1977	449	24	5.3	11	2.5

The audit showed that the fall in the number of items at or below reorder level was reduced, largely due to items locally purchased in the meantime. The position on imported items remains unchanged and the placing of orders to clear these has been urged. The locally purchased items also account for the fall in the number out of stock.

Planned maintenance was completed at Nsawam in March, it was also introduced to the Wenchi factory and will become operational at the end of October. The necessary development work has also been done for the Pwalugu factory where it will become operational when the factory next opens in December.

5.5 Distilleries Division

Scheduled Activities	Progress
Stock control of spares items	Completed
Planned maintenance	Completed
Production control	Completed
Plant and equipment assessment	Completed
Organisation of the production function	Completed

Unscheduled Activities	Progress
Warehouse layout	Completed
Raw materials stock control	Completed

The spare parts stock control application was completed in March 1976. Audits were carried out in December of that year and in May 1977 which gave the following results:-

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
March 1976	197	62	31.5	62	31.5
December 1976	199	72	36.7	63	31.6
May 1977	209	63	30.1	41	19.6

Numerically the situation had improved by May due to deliveries made at the end of December and some orders placed earlier in the year. However, the May audit revealed some disappointing inadequacies in operating the scheme. In particular it was noticed that:

- no action had been taken to obtain certain parts identified as shortages in March 1976

- certain items had been ordered although they were not on stock control

- in at least one case an item was ordered which did not require this action.

The shortcomings in operating the system were the responsibility of two engineers. These deficiences have now been corrected following a frank discussion between the General Manager and the officers concerned. There is a lesson to be learned from this case and the similar example at Metal Industries Division. In both divisions the spares stock is very small and decisions on ordering take place only infrequently. Because of this, there is a danger that when a non-routine activity has to take place it is carried out in the traditional manner, rather than using the newer, more systematic approach. It demonstrates the point made earlier in 5.1, of the opportunity to practice being an essential element in the prevention of decay.

Planned maintenance was introduced in February and was operating smoothly within the constraints imposed by spare parts. However, due to shortage of imported materials there has been only limited production in the plant for several months this year and this has diluted the impact of the maintenance scheme.

The production planning, plant and equipment assessment, and work on organisation of the production function, centred on the bottling department, where we made studies to obtain the capacity and outputs for the various product lines. From these studies, we determined more realistic outputs than previously used for planning purposes. In addition to the revised output standards, standard manning arrangements for each product line have been calculated to ensure that supervisory staff allocate the appropriate staffing to the bottling lines for the maximisation of output.

To determine the outputs of the product lines, a study of the capacity balance was necessary. Bottle washing was identified as the one area of imbalance. However, a new bottle washing machine is now installed as part of a new automatic bottling line. This machine has capacity which will be used to remove the imbalance between washing and bottling processes.

The information on plant capacity has been used to modify the pre-production planning procedures. It is now possible to assess more accurately the staff required to complete the production programme, to assess the time a particular product will be bottled, to predict more accurately the requirement for blends, and to be able to plan in advance the changeover of a line from one product to another.

Modifications have been made to the management reporting system. These have included a new daily record of production indicating output, manning, start and finish times and downtime compared against the standards. A daily downtime record has been introduced in order that an analysis of the downtime of each line can be kept. A revised weekly production report has also been introduced to provide better control information. In addition, monthly analyses are prepared to check trends in production outputs and downtime. These are being used to check the revised standards and the effects on output of the planned maintenance procedures.

The first of the unscheduled activities, carried out at the request of the General Manager, was a study on the warehousing requirements for raw materials and finished goods. This identified an urgent need for increased capacity, broadly confirming the division's plans for the development of new warehousing facilities.

Two sections were identified as requiring additional space, namely, bottling materials and bonded items. The space available for the storage of bottles and cartons is presently some 15,000 sq. ft. There is one small warehouse of 2,000 sq. ft. that is designated the bonded warehouse. The calculated requirement is for some 11,000 sq. ft.

The results of the study were issued in an internal report together with a proposed layout. This showed that a new warehouse of 20,000 sq. ft. should be built on the existing site, which, together with a re-layout of the present warehousing facilities would make the best use of the available space.

In addition, the introduction of palletisation has been suggested, in order to facilitete the easier transportation of bottles within the factory.

Stock control of raw materials was completed in March and an audit carried out in June showed the following numerical results:-

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
March 1977	98	20	20.4	Nil	-
June 1977	98	20	20.4	9	9.2

At that time the situation had become more critical. The purchasing department had e list of items waiting re-ordering but wes awaiting the establishment of letters of credit before orders could be placed. Also, difficulty was being experienced in purchasing lebels from local printers because of their lack of raw materiale.

5.6 Electronics Division

Scheduled Activities	Progress
Stock control of production items	Halted
Production control	Halted

Unscheduled Activities	Progress
Planned maintenance	Completed

In January 1976 we started what should have been an extensive programme of full-time assistance for this division. We commenced with e detailed analyeis of production problems and diagnosed that firet priority should be given to the stock control of production materials. Detailed recommendations were made and accepted and we commenced implementetion. Subsequently, the Generel Manager requested that hie staff should be responsible for implementation under our overall guidance. Although we were not optimistic about thie arrangement we prepared an implementation manual, a procedures

manual and a paper setting out the rules for establishing control parameters. An implementation programme was prepared and the various completion dates agreed in June 1976.

Following that time we gave on-site training to all relevant staff, with one noticeable key absentee. We made many visits and on each occasion could detect little progress and reported to GIBOC Head Office management accordingly. At the beginning of October 1976 a review meeting was held under the chairmanship of the Managing Director. At this meeting the General Manager fully accepted the proposed scheme with one minor exception. He also promised that the original programme would be completed by 31st December 1976. Following the meeting we visited the division a number of times to monitor progress and provide guidance should it be necessary.

On these occasions we were assured that progress was up to plan though this did not accord with our own observations. Further, although we were also assured that the technical content of the manuals was well understood, there were occasions when we found it difficult to believe that this could be so.

Finally, at the beginning of February 1977 we had to report to the Managing Director that programme completion had not been achieved and the progress made was minimal. We did not believe we should continue in our attempts to introduce stock control with the division's management team. We had no confidence in their willingness to complete the development in a proper manner nor operate it diligently afterwards.

The development work required is well documented and instruction has been given to the Production Co-ordinator. Implementation will require his full-time support for a number of months. This should not be undertaken this year because of the heavy programme elsewhere in support of the rest of the project which is already in hand. It may also be necessary to rearrange some functional responsibilities in the division to ensure effective implementation. Volume 4, Annexes III, IV and V are samples of reports prepared on the work in this division.

The introduction of planned maintenance was not in our original schedule of work for this division. However, we did eventually include it although it is a small activity which became operational in June 1977.

5.7 Fibre Bag Division

Scheduled Activities	Progress
Plant and equipment assessment	Completed
Stock control of production items	Completed
Organisation of the production function	Completed
Production engineering	Completed
Stock control of spares items	Completed
Planned maintenance	Completed

Unscheduled Activities	Progress
Overhaul and resetting of machines	Completed
Planning and administration of bilateral aid programme	Completed

The plant and equipment assessment was made towards the end of 1975 by us co-opting the services of a specialist from James Mackie and Sons Limited, the company originally responsible for supplying equipment and commissioning the factory. Arising from this visit a list of plant and spare parts was specified to bring the plant into balance and enable production to be maintained. The list was subsequently modifed to take account of the imbalance created when a serious fire damaged the teasar cards and hopper feeders. The amended list now includes two hopper units of improved design and although three further hopper units would enable the mill to operate more effectively, divisional management has decided to evaluate the two new hoppers before making a final decision on the remainder in view of the high cost involved. The new hopper units, together with other items of plant and spares, should be available before the end of 1977.

With regard to stock control of production items, which in this instance refers mainly to the juts and kenaf used in the process, a detailed study was made during early 1976. The purchasing, storage and control procedures were found to be satisfactory and we considered changes to be unnecessary.

With the organisation of the production function the main emphasis was given to changes in process and quality control procedures and to machine and worker performances, these being essential factors in the management of production.

Reports were issued on the main factors affecting process and quality control, together with revised process and quality procedures. These procedures started in December 1976 and are operating throughout the factory. The various charts and graphs being maintained regularly by quality control personnel, show the effect of various changes in the process. It is significant that senior production management are taking a much greater interest in the work of the quality control department now that they can benefit from the information made available.

Revised procedures were also prepared for reporting machine and worker performances. These were implemented by the Mill Manager on his return from his fellowship in March. Progress has been excellent and all these procedures are in operation. The number of different reports is less than half of those used in the previous system and there is an improvement in the resulting management information.

As mentioned above we wrote four subject reports for this division dealing with both process and quality control as well as production performance and procedures. These have been reproduced as Annexes I to IV in Volume 5.

Plans were made and agreed with management in October 1976 to change the machine settings throughout the mill nearer to their optimum condition, thereby increasing production further. However, such changes are dependent on regular fibre slivers through carding, and with the return to hand feeding following damage to the hopper units, increases in sliver irregularities were inevitable. In the circumstances the plans were postponed and efforts diverted to other activities. More recently we discussed with senior management what action could be taken to increase production and it was agreed that some re-setting of machines within the mill could be done to increase throughput. This is a delicate operation, so it is particularly appropriate that the changes should be directed by the technical expert currently resident in the mill under the bilateral aid programme.

The production engineering activity was concerned with evaluating the types of repair and maintenance work undertaken by the division and the skills and facilities available to undertake this work. The most immediate conclusion was that although the workshop was well equipped and staff well trained, there was serious shortage of cutting tools and workshop materials. A special exercise was mounted in which the most urgent needs of this and other divisions were identified. It had been hoped to obtain these during 1976 using a part of the import licence of Steelworks Division. However, this was not implemented due to delays in obtaining pro-forma invoices. Steelworks Division has again offered their facilities for this year but the prospects are not bright in view of the general difficulty in establishing letters of credit.

In March 1976, a start was made to the application of stock control to spare parts. This was a large and slow task with all the usual complications found in this type of work, but with the added difficulty that no stocks or history of usage records were available for many of the items. By May 1977, all mechanical parts had been completed and the effort was then transferred to the much smaller number of electrical items. The work has been done by a divisional team which is undoubtedly the most experienced in GIHOC. Audits have been done from time-to-time and the results are given in the following table:-

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
July 1976	1,580	642	41	567	36
December 1976	2,381	753	32	1,133	48
May 1977	3,438	1,302	38	1,191	35

This division has large quantities of parts on order, yet still has a very serious stocking situation with 38% of all items in need of immediate re-ordering and for 35% there is no stock at all. The position has been made worse by the delay in re-ordering which has taken place because of the delay in issuing an import licence and establishing letters of credit.

Our monitoring visits on planned maintenance, which became operational some months ago, have confirmed the original impression of enthusiastic commitment by engineering personnel. Staff turnover and spare parts shortages are constraints on the effectiveness of the scheme. Nevertheless, the standard of maintenance is good as is that of machine setting. To date, planned maintenance has resulted in an overall reduction in machine downtime of 50%.

One of the unscheduled activities was the complete overhaul and resetting of machines, notably the Teaser Cards and their Auto-Hopper Units, which are such an essential part of the production facility. The need for this work was identified early in the project, and we called in specialist assistance to direct the initial efforts of the divisional engineers, and subsequently progressed this work to completion on all the Teaser Cards, and four out of the five Auto-Hopper Units. However, immediately after this work was completed, the serious fire damaged much of the same machinery, and although the Teaser Cards were repaired, the Hoppers are not repairable.

The second unscheduled activity was the planning and local administration of an aid programme for this division sponsored by the United Kingdom Government. The programme had two parts; the first being financial assistance for the purchase of essential equipment and emergency spares, the second the provision of technical assistance. Through the work being done on stock control, we were able to help specify and quantify the emergency spares. We also prepared a work programme and man specification to facilitate the selection of the technical expert. Another aspect of this activity was our co-ordinating role between the division, head office, British government departments and the equipment suppliers.

The technical expert arrived at the end of April and, in line with our original terms of reference, is concentrating his effort into training engineering personnel on the shop floor. His programme is geared to the maintenance procedures we have introduced, and he ensures that the technical tasks specified within the maintenance plan are properly carried out. Training on breakdown maintenance is done as breakdowns occur, thus ensuring that divisional engineering personnel are involved in a practical situation at every opportunity.

Fibre Bag Manufacturing Division has made excellent progress during the project period and since the appointment of a new general manager in October 1975. In spite of the many difficulties encountered during the year, the final output figure for 1976 exceeded 7,000 tons which was 28% higher than the 1975 production and the highest figure for at least eight years. Production this year is approximately 10% lower than the 1976 record figures. This is disappointing, although production is still significantly above the figures for the few years prior to 1976. There is one significant trend which has had a major influence on this year's performance. According to the Mill Manager and the Chief Engineer, 5% of the skilled production workers and 12% of the engineering personnel have already left in the first 6 months of this year. Another factor which may be limiting output is the shortage of spare parts for sewing machines. This section has now become a bottleneck, with large numbers of bales of hessian accumulating and waiting processing. Nevertheless, there is an improved level of maintenance, machine setting and operation throughout the mill. The result is a contribution to the high levels of output by a better quality of yarn and fewer machine stoppages, due to either yarn breakage or equipment failure.

5.8 Footwear Division

Scheduled Activities	Progress
Plant and equipment capacity balance	Completed
Planned maintenance	Completed
Stock control of spares items	Completed
Stock control of production items	Completion - October

The plant and equipment capacity balance was undertaken as part of a wider technical study carried out in April 1976 and reported separately at that time. The findings were that, excluding cannibalised equipment held in store, there would be sufficient machinery in the production departments to maintain existing capacity, if sole attaching machines and a rubber grinding machine were purchased. Similarly, we specified the additional machinery required to raise output in a planned and balanced manner from present budget levels of 350,000 pairs to 1,000,000 pairs per year. It was recognised that the shortage of leather and spare parts was a hindrance to the expansion, and priorities were allocated to items on spares lists in accordance with existing emergency requirements and future expansion plans. A particular problem was, and still is, the speed of the conveyors because of drive difficulties.

Progress on the introduction of planned maintenance in this division was relatively slow due to the shortage of engineers. However, it was completed in March and has worked satisfactorily since, although constrained by the serious shortage of spare parts. In the past it was possible to cannibalise from surplus machines, but this is no longer the the case. Hence the fitters are having to make parts on occasions though the materials available for this purpose are not always suitable.

The application of stock control to spare parts was completed in July. With nearly 5,000 items involved this was by far the largest stock control application. Fortunately it was completed very quickly, due to the size of team provided by the division and the very good layout existing in the stores. As mentioned above, the division has serious spares stocking problems. Out of a total of 4,915 items, there are 1,516 (31%) which need to be re-ordered and 991 (20%) that are actually out of stock. Replacement of these parts is going to be difficult, as many are no longer in current production and delivery times can extend up to 2 years.

The application of stock control to production items followed on from that on spare parts. Progress was slow as there were a large number of items, such as heels, which had been mixed and which required sorting and counting. The overall programme is being carried out by a divisional team under the part-time direction of the head office Production Co-ordinator. This work should be completed during October.

5.9 Glass Manufacturing Division

Scheduled Activities	Progress
Stock control of production items	Completed
Stock control of spare items	Completed
Planned maintenance	Completed

The stock control of production items was completed in June 1976 and audited in January 1977. The numerical results of the audit were:

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
June 1976	22	6	27.3	3	13.6
January 1977	22	4	18.2	1	4.5

The plant ceased operation at the end of June this year, to facilitate the major expansion programme. When the plant is put back into operation, the quantities of raw materials to be used will be greater than in the past and this will necessitate some adjustment of the control parameters. This is a task which can be undertaken by divisional personnel.

Spare parts stock control was implemented in February. Of the 197 items applied at this time, 20 (10%) were at or below re-order level with one item out of stock. The range of items will need to be expanded as new equipment is delivered and this can be done by divisional personnel.

The introduction of planned maintenance has been completed for all equipment which is being retained. The staff have been trained in the maintenance routines and should be capable of preparing the necessary maintenance schedules as each new item of plant is received. When all items have been installed a new maintenance programme will have to be prepared for what will virtually be a new factory. Again this task is well within the competence of the engineers in the division.

5.10 Marble Works Division

Scheduled Activities	Progress
Nil	-

Unscheduled Activities	Progress
Planned maintenance	Completed

Although no production work was scheduled for this tiny division we did in fact introduce planned maintenance to their few machines. Progress was slower than we would have liked due to the engineer having also to work on another site. However, completion was reached in September and the scheme is now fully operational.

5.11 Meat Products Division

Scheduled Activities	Progress
Nil	-

Unscheduled Activities	Progress
Planned maintenance - Tema plant	Completed
Planned maintenance - Bolgatanga Plant	Completed

Althoughno production activities were scheduled for this division, we did in fact introduce planned maintenance at both plants. This division was accorded a lower priority than some of the others with the result that Bolgatanga was not completed until July of this year followed by Tema in September.

5.12 Metal Industries Division

Scheduled Activities	Progress
Stock control of spares items	Completed
Stock control of production items	Not Applicable
Plant and equipment capacity balance	Completed
Planned maintenance	Completed

Unscheduled Activities	Progress
Procurement of wire gauges	Completed

The spare parts stock control was introduced in February 1976, and audits carried out in November 1976 and June 1977. The results of these audits are shown in the following table:-

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
February 1976	191	20	10	17	9
November 1976	191	35	18	23	12
June 1977	191	45	24	32	17

From the table it can be seen there had been a steady deterioration shown by the increasing number of items both out of stock and which had reached their re-order levels but which had not been actioned. These figures represented only the statistical evidence of a complete breakdown of the system. This was caused by the independent actions of three officers such that, for example:

- a newly appointed storekeeper had not been trained in his duties

- stock record cards had not been posted since early in 1977

- items requisitioned for purchasing had not been obtained, even those from local sources

- spare parts had been ordered from overseas supplies without any previous reference to the stock cards.

This breakdown was similar to that mentioned earlier in 5.5 Distilleries Division where, due to a low level of activity, officers had tended to revert to their previous methods of working. The situation revesled by the audit was discussed at both head office and in the division itself. The divisional officer with overall responsibility for stock control was charged with re-establishing the system and this was subsequently carried out. The report issued after implementing stock control, together with the audit report are reproduced in Volume 5 as Annexes V and VI respectively.

We examined closely the need for stock control of production items and concluded that it would be inappropriate at this stage. In a situation where demand exceeds supply and there are import licence constraints, the major requirement is for the division to bulk purchase nail wire of good quality as quickly and cheaply as possible. However, we did make a number of recommendations on variety reduction and storage of wire.

Plant capacity studies were carried out to determine the likely outputs which could be expected from the machines, taking account of actual operating speeds and losses due to breakdowns, tool changes, reloading etc.

The information from these studies was incorporated in a production planning and control scheme, the purpose of which was to:

- enable the annual capacity of the nail presses to be accurately calculated for a variety of product mixes. This in turn permits the reconciliation of productive capacity with sales forecasts and raw material availability

- enable the workload to be allocated to the various machines in the most economical way and potential over or under load situations identified at an early stage

- provide the means of determining weekly production targets and advising supervisors of them

- provide the means of recording daily and weekly outputs and comparing them with targets. The resultant efficiencies, calculated weekly, are an essential guide to management in seeking to improve manufacturing performance.

The Production Manager used the new procedures at the beginning of the year to convert the 1977 budget for nails into a production plan, which, as far as possible, reconciled the load imposed by the sales requirements with the capacity available, per period of time, in the most economical way. At the same time the reporting procedure was introduced to compare actual output with that planned.

In the event, material deliveries to this division were later than anticipated, with the result that production in the early months of the year was lower than planned. However, it was very encouraging to see, during a visit in June, that the Production Manager had used the procedure to produce a revised production programme, giving the manning requirements and monthly outputs to fulfil the budget by the end of the year. It was also noticed that the reporting information was being prepared accurately and promptly. The work on the planning of nail production is given in the report shown as Annexe VII of Volume 5.

Planned maintenance was introduced into this division some months ago and is still working well. In the middle of the year a number of operators and mechanics attended a series of part-time lectures to improve their appreciation of the subject.

A small piece of unscheduled work concerned the procurement of wire gauges. These are required to measure the diameter of incoming raw material. It was discovered that only one gauge existed, which was worn, and this tended to slow down the acceptance of material, or alternatively cause it to be accepted without checking. For a variety of reasons the division was having difficulty in obtaining replacement gauges, so we purchased them in England on their behalf.

5.13 Paints Division

Scheduled Activities	Progress
Stock control of production items	Completed
Plant and equipment capacity balance	Completed
Planned maintenance	Completed

Unscheduled Activities	Progress
Stock control of spare parts	Completed
Factory layout	Completed
Warehouse layout	Completed
Management information	Completed

The stock control of raw materials was introduced in November 1976. At that time it was noted that an out of balance stock situation existed, with excessive quantities of some items whilst some 24% of items had reached their re-order level. We would normally have carried out an audit of the stock situation and other developments, progressively over the months. However, the plant was closed for approximately three months from the beginning of April, due to a lack of certain basic ingredients. This situation, which had been forecast by management earlier in the year, could not have been prevented by the stock control application. However, if in the future, import limitations prevent the plant running throughout the year, any closure should occur with better balanced stocks than this year, giving a lower level of stock investment and possibly a greater output from the same amount of foreign exchange.

A study was done on paint production capacity and plant balance. The report showed that there was a severe shortage of milling capacity to handle pigment pastes. However, if the division took delivery of a high speed dissolver and a new PERL mill, there would be surplus capacity over its 1977 budget requirements and this was quantified. The Production Manager was trained in the revised method of capacity planning, which is to be done as an integral part of the preparation of the annual production budget. It has also to be done when re-programming such as was required following the recent prolonged shutdown. The report on this work is given in Volume 5 as Annexe VIII.

A study was also carried out on can production, from which certain constraints were identified, and capacity evaluated, with and without these constraints. The findings of this study will provide valuable basic data for a study of the total can making capacity of GIHOC scheduled for completion by the end of the year.

The planned maintenance application in this division was the first to be completed. It has always been well understood and operated satisfactorily subject to the availability of spare parts.

Spare parts stock control was not in our scheduled programme but was, in fact, introduced in April 1976, and subsequently audited in October with the following results:-

DATE	ON STOCK Control	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
April 1976	298	88	29.5	71	23.8
October 1976	347	35	10.0	25	7.2

The audit showed that with the exception of one sub-routine, the procedures were operating correctly and the stock position had improved since the implementation in April.

By agreement with the General Manager, a study was made of the layout of the factory and recommendations submitted for a revised layout which would provide the following benefits for existing production:

- reduce the distances travelled during processing
- reduce the congestion in the area for tinting and storage of various additives
- reduce the possibility of contamination of oil paints by various powders used in the manufacture of Beesham.

The new layout also takes into account two new developments. The first is the need to accommodate a high speed dissolver which has just been delivered. The second is the need to re-locate the Beesham plant to accommodate an increase in output of approximately 40%.

The recommendations on the layout were accepted and implementation commenced, though completion will take some time as it is dependent on the provision of additional warehouse space as discussed in the next paragraph.

There is a serious shortage of covered space at Paints Division and we were asked to study this problem. We made a contribution to the work being done by a team from the division by suggesting some possible warehouse strategies and making certain specific recommendations which were incorporated in an internal report.

Although not part of the original work programme, a short study was made of the suitability of the production information available to the General Manager. Some improvements were suggested and agreed by the General Manager who also undertook to implement them.

5.14 Paper Conversion Division

Scheduled Activities	Progress
Production control	Completed
Spares stock control	Completed
Planned maintenance	Completed

Unscheduled Activities	Progress
Supervisory training	Completed

The production control work was completed in February 1977. In doing this work, attention was focussed mainly on the case factory which accounts for approximately 80% of the division's turnover. A brief investigation showed that the problems of control of production were greatest in this part of the factory, largely because a number of successive processes were involved which were not in balance in terms of capacity.

Previously, production control had consisted primarily of preparing schedules of orders to be produced each week at two main processes - manufacture of the board on the corrugator and production of fitments. No schedules were prepared for the printing and stitching sections.

The work done on production control was aimed at ensuring that production is properly planned. Thus, the bottleneck section, fitment production, was identified and work for this section is now scheduled first each week. Moreover, the schedule is more realistic in that the amount of work shown on it is related to the actual capacity to produce. Schedules for other sections are now produced and derived from the fitment schedule.

At the time we were developing the planning of fitment production, twice as much work was scheduled as could be achieved. Not surprisingly there was a very large backlog of orders awaiting fitments. As a result of the action taken, production of fitments in June was at a rate of 486,600 per week, compared with 302,600 per week in February. The backlog has been eliminated, and, perhaps more importantly, we were assured it would not return.

There was no feed-back in the production control system whereby supervisors could exert any controlling influence over production. Now, at the end of each week, a report is produced for supervisors showing, in some detail, what has been achieved in comparison with what has been planned. The report is discussed with superintendents at a formal weekly production meeting.

Similarly, control over waste was limited to the collection of data. No analysis was done and no information was made available to supervisors to help them reduce the levels of waste. An analysis of records of waste showed that the total waste over a ten week period ending 28th November 1976 was 18.7%. This figure came as a surprise to most of the staff who thought it was around 10%. A weekly report was introduced showing the waste at each section in comparison with target levels so that it was possible to monitor trends and seek improvements. This seems to have been very beneficial, as for the three months ending June, the amount of waste had fallen to an average of 12.6%. Significantly of course, this represents a direct saving in foreign exchange.

Spare parte stock control was introduced in April 1976 with audite in Fabruary and May 1977. The numericel rasults of the audits were:-

DATF	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL		OUT OF STOCK	
		No.	%	No.	%
April 1976	1,075	205	19	145	13
February 1977	1,075	237	22	210	20
May 1977	1,094	185	17	186	17

Although the number of items waiting to be ordered had dropped in the period from February to May thie yeer, this reduction arose through purchasing items in Ghana. In fact the situation concerning imported spares worsened rapidly during the same period, rising from 152 to 183. Between the two audite the "out of stock" position improved due to the delivery of items obtained locally. The differences shown by the audit are not very great, but neverthelees the abeolute values are very important. There is a danger of accepting the quantitiee "out of stock" and "waiting to be ordsred" ae the norm. They are not; they are far too high and those personnel concerned with these matters both inside and outsids GIHOC should be continually reminded of the fact.

Planned maintenance is working smoothly in ths division and ie well accepted by both engineering and production management. This is a division which has had a positive enginesring outlook in the past. Nevertheless we were interested to hear from management at the end of July, that eince the introduction of planned maintenance, machine downtime has been reduced from 38 to 27 houre per shift, and expeneive weekend working by engineering personnel had been halved.

Our one unscheduled ectivity in this division was to run a one week in-plant training course for supervisors. The subjects concerned were:

- the supervisor's job
- self management
- motivation and leadership

- communication
- control and discipline
- training of operators
- production planning and control
- cost control.

The training course was attended by all production supervisors and superintendents, some maintenance supervisors, the planning officer and the production manager. All the training material was prepared specifically for the division, so that examples, discussion points and exercises were easily identifiable to the work situation of each supervisor.

5.15 Pharmaceuticals Division

Scheduled Activities	Progress
Nil	-

Unscheduled Activities	Progress
Stock control of spares items	Completed
Stock control of production items	Completed
Planned maintenance	Completed

Although we had not scheduled any activity for this division we did in fact, in agreement with local management, undertake the three shown above.

Spare parts stock control was applied to mechanical and electrical parts for machines in all production departments and also compressor and boiler equipment. A total of 1,055 items were covered in this manner, and, following the typical pattern, 648 of these (61%) were in need of re-ordering, whilst 379 (36%) were completely out of stock. A list of the items to be ordered was handed to the Procurement Manager.

Some reorganisation of the stores was undertaken in parallel with the stock control application. This was concerned with simplifying the location and identification of spares in stock, by locating all items by machine type and suitable referencing of locations.

The second unscheduled activity completed was stock control of production materials which are stored in three locations away from the production site. There were 363 different raw materials involved, of which 67 (18.5%) were in need of reordering. Of the total, 33 items (9%) were completely out of stock. As is usual the stocks were out of balance with excessive quantities of some items. We would eventually expect the stock valuation at current prices and levels of activity to change from ¢3,330,000 to ¢3,613,000, but there would be a much improved service to production.

The third activity has been the introduction of planned maintenance. We were given the impression that this was introduced in a previous UNDP Project some three to four years ago. Since that time the engineer who worked with the experts has long since left the division. During this present project therefore it became clear that planned maintenance was not in operation and the only trace was some blank plant history cards. Divisional management welcomed the possibility of the team helping them with this activity, but the start was delayed until suitable engineering staff were available after completing work on spare parts stock control. The maintenance assignment eventually started in June 1977 and, supervised by the counterpart, Mr. G. Ackah, was completed by the end of the project period.

5.16 Steelworks Division

Scheduled Activities	Progress
Stock control of spare parts	Cancelled
Stock control of production items	Cancelled
Organisation of the production function	Cancelled
Production engineering	Completed
Capacity balance	Completed
Planned maintenance	Completed

Unscheduled Activities	Progress
Nil	-

The decision made at the review meeting of October 1976 to cancel the inputs to this division affected the first three of the activities listed above. By then, work had been completed on the production engineering and capacity balance activities. Although little had been done towards the development of planned maintenance, we considered that this work should proceed and not be subject to cancellation.

The production engineering activity involved the consideration of the tools and equipment available to the divisional workshop, from which was produced the listing of requirements for procurement. The siting, equipment and possible role of this workshop was also taken into account in the planning of the central workshop.

The work on capacity balance was done as part of a wider technical study on the operation of the rolling mill. Our findings were that for the type of bar being produced the mill was in balance, though additional mills were being installed to produce bar smaller than ½" dia. Some modifications were necessary to overcome technical problems and these were specified in detail in our report at that time.

The rolling mill has for some time operated well below capacity. The major reason for this was diagnosed as the frequent breakdown of plant due to lack of proper maintenance. Planned maintenance was in existence only for auxiliary equipment such as cranes. Because of the importance of maintenance to the operation and safety of this division, planned maintenance has recently been extended throughout the factory. The technical report on rolling mill operation is shown in Volume 5 as Annexe IX.

5.17 Vegetable Oil Mills Division

Scheduled Activities	Progress
Nil	-

Unscheduled Activities	Progress
Planned maintenance - Esiama	Complete
- Tamale	Complete
- Atebubu	Complete
Stock control of spare parts	Complete

We had not originally planned to undertake any activitiee in this divieion but in the event completed thoee listed above.

The firet to be completed, in March 1977, was the introduction of planned maintenance at Esiama. Following this the development work was completed for planned maintenance at both Tamale and Atebubu. Unfortunately these two schemee could not be started ae the plents were virtually closed due to a shortage of groundnuts. However, the schemes will be put into operation when the plants re-open next year.

The need for an adequate and balanced stock of spare parte becama apparent with the introduction of planned maintenance at Esiama. Accordingly, in agreement with locel management, we introduced spare parte stock control which should have become fully operational in August but was halted due to the illneee of the local counterpart. Ae part of this work we carried out a larger than ueual reorgenisation of the stores including phyeical relocation of iteme. This produced an immediate benefit by revealing some urgently required epares which were thought to have been out of stock. Another benefit which should ariee shortly ie the more eccurate valuation of stock, through the removsl of a large number of anomalies which existed previously.

5.18 Central Workshop

At the outset of the project discussions were held on the poseibility of constructing a central workshop to undertake specialist repair work and the manufacture of interchangeable epare parts. During Stage 2 we examined in detail the need for euch a workehop, its role and the type of skille and equipment required. Our work involved visiting all 22 eitee to collect information on the requiramante of each plant and the ekille and equipment elready available to meet theee requirements.

Arising from the study we were able poeitively to identify certain types of repair work for which central reeources were more appropriate than divisional. Further, there also eeemed to be a case for undertaking eome manufacture of spare parts. We therefore prepared broad epecifications of a centrel workshop to cerry out thie work. Our report listed the quantities and types of equipment and skills required, approximate coste and a timetable for the development, inetallation and commiesioning.

The proposal to establish a central workshop was discussed at the review meeting in October 1976. At this meeting it was agreed that the UN would like to assist with funding the workshop and for this purpose a feasibility study should be undertaken by ourselves which would itself be funded jointly by UNDP and UNIDO.

The need for a feasibility study for the proposed central workshop, as agreed at the Accra review meeting in October 1976, was confirmed at the Vienna review meeting held in March 1977. The funding of this was now to be undertaken entirely by UNIDO and, subject to the formal agreement of all parties concerned, it was hoped it would be possible to confirm, during June, that P-E were to be retained to undertake the study starting in early September. Whilst in Vienna we therefore took the opportunity to clarify with UNIDO and GIHOC the outputs which were required from the study so as to avoid any misunderstanding at a later date.

Following the Vienna meeting we prepared a programme for the study to fit in with the agreed completion date of end March 1978. This programme was discussed and agreed with GIHOC during the last week in April, together with the curriculum vitae of five production engineering consultants, any one of whom might be asked to undertake the study in conjunction with the senior production consultant from the present project. Following this discussion we prepared a new proposal for undertaking the study and submitted this to Vienna.

During May we were informed by GIHOC that they had decided not to support the feasibility study after all, but would use the data from a previous feasibility study undertaken by Stevenson and Kellogg, as part of a UNIDO Project, in 1971. It was GIHOC's view that taking account of the large quantity of information available to them in the 1971 report, the proposed feasibility study was not warranted especially in view of the additional cost involved. Although disappointed at this change in direction we respect GIHOC's decision in this matter.

However, having been associated with the concept of the central workshop for over a year, and also having obtained considerable information on the likely requirements for spares we would like to take this opportunity to make clear the very great differences between a Central Workshop and that

proposed by Stevenson and Kellogg. In our view these differences are so great as to make the two schemes completely separate projects serving different objectives. In presenting this case we hope that it may be useful in the eventual planning and development of the workshop.

Essentially there are four major differences between the two concepts and these are:

- Role
- Technology
- Size
- Service to the divisions.

5.18.1 Role

The role of the workshop proposed by ourselves was to carry out:-

(i) the manufacture and repair of individual worn out or broken parts which are beyond the capability of divisional workshops

(ii) the manufacture, on a small batch basis, of small parts or tools which would otherwise have to be imported

(iii) the practical training of engineers and tradesmen in appropriate mechanical and production engineering skills

(iv) the guidance of divisional engineering staff in good engineering practice, so as to upgrade engineering knowledge and competence throughout GIHOC

(v) the provision of an engineering repair or installation service on site to divisions

(vi) subject to prior requirement of divisions, provision of similar engineering services to outside customers

(vii) the procurement, storage and distribution of all imported tools and raw materials needed by the maintenance workshops throughout GIHOC.

In contrast, the General Engineering Division emerged from the terms of reference given to Stevanson and Kellogg which said that a "General Workshops Division should be set up to cater to the overall needs of metallurgical and engineering industries as a whole in the country". The consultants modified this by recommending "the establishment of a General Engineering Division (broader production and design capability than a workshop)".

In Volume III of their project report Stevenson and Kellogg commented that "the establishment of the Foundry depends on the establishment of an Engineering Division to machine and finish the above products". They then went on to define the products to be machined in the General Engineering Division as:-

Spare parts	- 325	tons per annum*
Hand operated pumps	- 25	" " "
Valves and fittings	- 200	" " "
Brass taps, cocks, valves etc.	- 60	" " "
Industrial hand tools (Pliers, spanners etc.)	- 100	" " "
Agricultural hand tools	- 100	" " "
Components for agricultural implements	- 50	" " "
Padlocks, mortise locks, etc.	- 200	" " "
Staal hinges	- 50	" " "
Say,	1,110	tons per annum

* This figure made the assumption that GIHOC could tap the market for spare parts external to itself.

Thus it can be seen there is a fundamental difference between the two workshops. The Central Workshop proposed by ourselves was to service the needs of GIHOC's existing divisions, largely through the provision of specialist repair services and the

manufacture of spare parts. The General Engineering Division on the other hand, is a new manufacturing division supplying a variety of machined metal products to Ghana as a whole and with probably less than 10% of its output being used for the benefit of existing divisions.

5.18.2 Technology

The manufacturing technology required to produce metal products is very dependent on:

- the function which the product has to perform
- the quantities required.

The "products" to be manufactured in the proposed Central Workshop were spare parts which had to be fully interchangeable with the supplier's original equipment. That is, they must be identical in dimensional accuracy, metallurgical composition, hardness and surface finish. Further, the quantities required are very small. Although batch quantities would vary, about three quarters of the items would only require making either singly or in twos and would not be required to be made again for perhaps another two years. Thus the manufacture of spare parts for GIHOC requires a high degree of precision engineering applied to very small quantities. Success will depend on the craftmanship of highly skilled machinists using first class equipment, largely unaided by jigs and fixtures. There will be little room for any inaccuracy, as it will not be possible to test the parts in operation until they are required for service many miles away. Therefore, mistakes will be extremely costly.

Although it was proposed to make some spare parts in the General Engineering Division, the bulk of the products shown in the Stevenson and Kellogg report are not of this nature.

Rather they are, in the main, products where, for example, dimensional accuracy is much less stringent than for spare parts and the shapes required are relatively uncomplicated. The likely batch sizes for these products is not given but would probably be several hundred. Therefore the technology required for these products is one of repetitive manufacture without a very high level of precision. A few skilled machinists will be required to set the machines which make the parts, but the bulk of the labour force will be semi-skilled. Their task essentially will be to load and unload the machines, pull handles and turn wheels within pre-set limits. The exercise of skill and judgement will be small and the training required minimal. For this type of work it is not necessary to use first class machinery. Accuracy will be very dependent on the fact that machines are pre-set and use is made of jigs and special tools. Any inaccuracies, though wasteful, are not serious. The products can be tested before despatch and therefore mistakes in service avoided.

From the above it can be seen there are great differences in technology required to manufacture spare parts for GIHOC in the Central Workshop, and the listed commercial products in the Engineering Division. The type of skills and equipment necessary for the commercial products are not suitable for the manufacture of spares. On the other hand, it would be extremely wasteful to use the more highly developed skills of the craftsmen on the repetitive machining of simple components requiring little skill.

In essence therefore, spare parts for GIHOC and the proposed commercial products are technologically incompatible and require completely separate manufacturing facilities.

5.18.3 Size

There are differences in size, and therefore cost, of the two projects. This is entirely a function of their role.

Our preliminary estimats for the Central Workshop to service GIHOC was given in July 1976 as approximately ¢750,000. The General Engineering Diviaion figure was ¢1,166,400 in 1971 which may well have riaen to around ¢4,000,000 by now.

5.18.4 Service to the Divisions

For the type of production undertaken in the propoaed Central Workehop there will be the need for a planning and control system to regulate the flow of work. In practical terms, this is to ensure that parts are completsd in a sequence approximate to that in which ths orders are received by the workshop. Of course there will be the need for some flexibility to give priority in cases of emergency. For spares manufacturing these should be minimal, as the orders will be generated by the stock control eystems in the divisions as parts rssch their rs-order lsvel.

In ths proposad Gensral Engineering Division, outside customers will taks most of the output. Thersfors, commercial considerations will play an important part in determining priorities for all orders in the division. For spars parts, Stevsnson snd Kellogg acknowledged this in thsir rsports whsrs they mention the need for "fast, high quality maintenance work if GIHOC is to attract outside customers". Ths commercial pressures to maintain or increase the supply to extsrnal markets for all the products would be much grsater than the forcss operating within GIHOC to deliver aparss and repairs.

This is the classic production control situation. Management responds to the greatest preasures; the resulting low priority allocated to items for internal use ensurea that thsir delivery is extended, or forgotten. This leads to the situation whers the parts are only producsd as emergency dictatss, with the result that the divisions are not provided with the service they need.

5.18.5 Summary

There is a case for a Central Workshop to service the existing divisions with specialised repair work and a steady flow of interchangeable spare parts. In our view this service will suffer if combined with the manufacture of products requiring different and lower technologies and subjected to competitive commercial pressures.

5.19 Workshop Tools and Materials

The decision taken last year to purchase a number of tools and quantities of materials for emergency use by divisional workshops was not implemented due to delays in obtaining pro-forma invoices. These have now arrived and the Head Office Procurement Manager has once again agreed with the General Manager of Steelworks Division, that their import licence should be used for that purpose. There still remains the great difficulty of obtaining letters of credit and the strong possibility that the quoted prices are no longer applicable. We are not optimistic about the outcome of this matter.

5.20 Training

The programme of training has continued during the period. In addition to the on-the-job training during implementation, a number of seminars have been held.

In-plant seminars have been held, for example, at Footwear, Pharmaceuticals and Vegetable Oil Mill divisions. These are concerned with giving an understanding of each particular piece of development as it is completed. The participants are instructed in their own duties and responsibilities and at the same time have the opportunity of seeing how these fit into the total scheme. In this way there is a wide dissemination of knowledge at divisional level.

We have also continued the series of seminars on planned maintenance and stock control held at Corporation level. Invitations to these seminars are sent to specific individuals employed as production supervisors, engineering superintendents, stores superintendents and procurement officers.

These seminars give an appreciation of subjects to personnel who are actively involved in them. They also provide a forum for the discussion of problems which may have been encountered, and also for an exchange of views on matters for further development.

Attendance at seminars has not been compulsory, particularly those at Corporation level, so there have been some absentees. Nevertheless, all divisions have been represented and over 130 senior and middle managers have been given training by this method.

In addition to the use of seminars and other means of training, we have always felt it necessary to provide some written material on the major topics of our work. Very early in the project we produced a series of papers on the subject of planned maintenance. These were issued to general managers and divisional engineers and formed the basis for some of the appreciation seminars. A guide to planned maintenance has now been prepared which consolidates these papers and provides a guide for future reference.

With stock control we have issued copies of an operations manual, to all personnel involved, each time a new application has been completed. The purpose of these manuals has been to set out the duties, responsibilities and methods of operation. However, these manuals were not intended to provide a comprehensive guide to the subject, embracing theory and the many practical points to the introduction and operation of stock control. We have therefore provided a Guide to Stock Control in GIHOC the purpose of which is to:

- record the background situation in Ghana at the present time which constrains the procurement of adequate quantities of materials for stock, in so far that the stock control systems must take account of these constraints

- record some of the background problems which existed and how these have been overcome

- provide an understanding of the underlying principles upon which the stock control systems have been built

- record the methodology used in making the applications

- describe the audit of the operation of the system

- indicate ways by which greater control can be exerted in the future

- provide a reference to enable stock control to be applied to other divisions or other types of materials at a future date.

There has been an extensive distribution of this guide to all divisions with a number of copies retained at Head Office for distribution in the future if required. Copies of the guides are given in Volume 4, Annexes I and II.

5.21 Counterparts

As previously agreed, the two counterparts, Mr. L.A. Odotei and Mr. G.A. Ackah, now report directly to the Deputy Managing Director (Operations). Broad activity programmes have been prepared, and agreed, covering the six month period commencing July 1. Progress will be reported verbally each month with a written report each quarter. The consultants participated in the preparation of the programmes and support was maintained, as required, until the completion of the project.

5.21.1 Production Co-ordinator - Mr. L.A. Odotei

Mr. L.A. Odotei has been actively engaged in stock control applications and is also familiar with a variety of other production work undertaken by various members of the team. In establishing his programme a number of on-going commitments were taken into account as can be seen below.

Week ending 7 July - Footwear Division - Spare Parts Stock Control. Finalise list of parts to be ordered. Prepare procedure manual and report.

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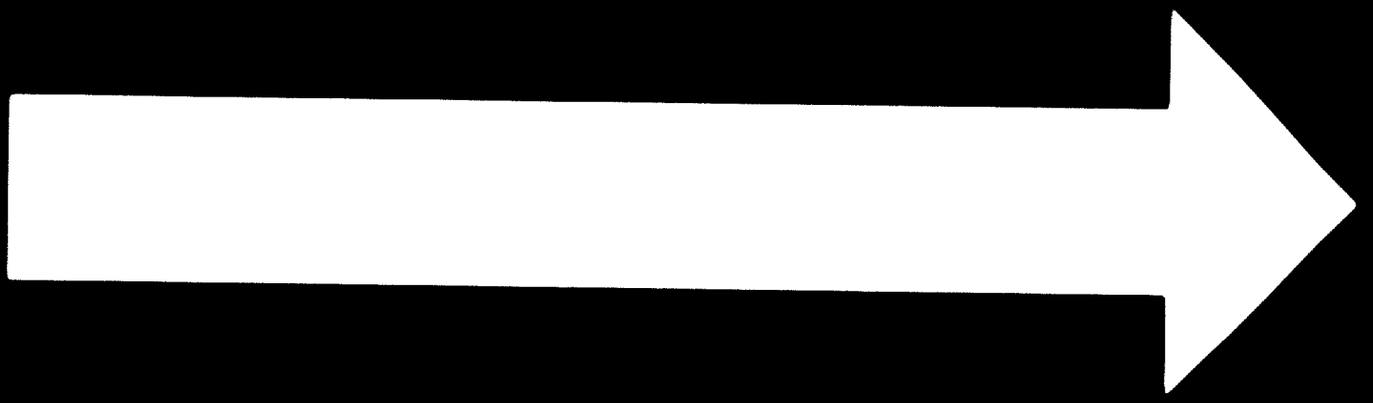

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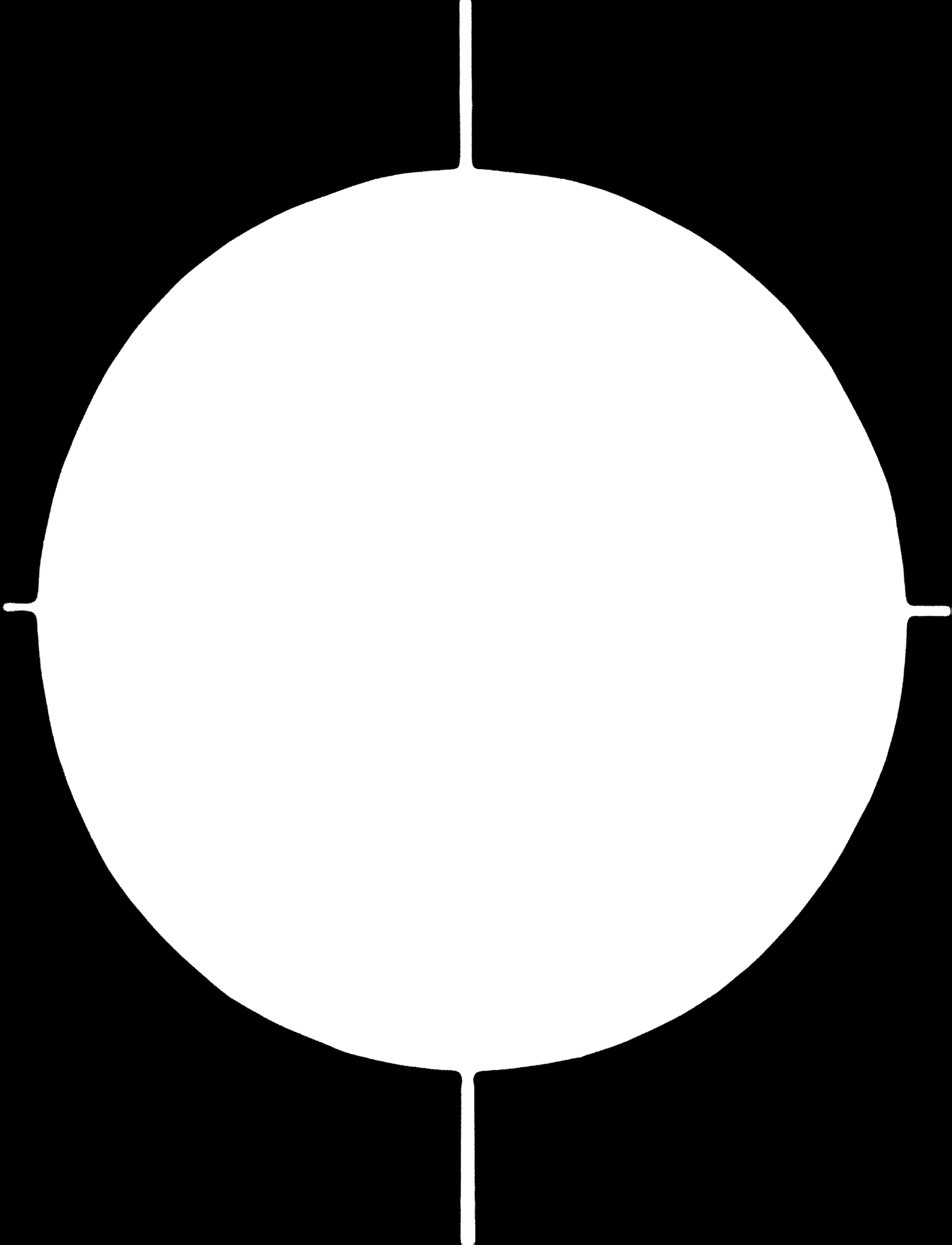
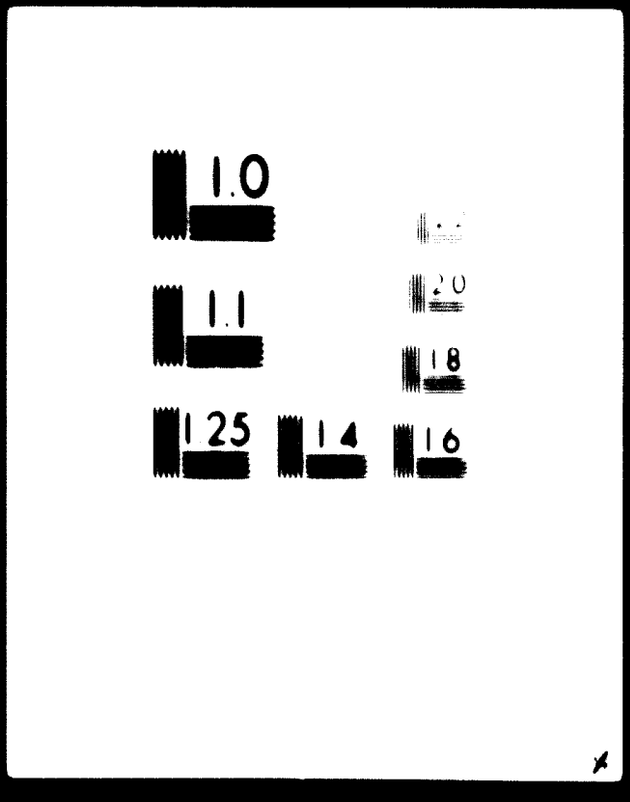




Week ending 14 July

- Paints Division - Monitor Production Programming Routines. Following the three months closure of this division it was necessary for divisional staff to prepare a new production programme using the routines developed earlier in the project. The visit by the Production Co-ordinator was to ensure that the task was undertaken correctly and provide support if necessary.

- Cannery Division - Spare Parts Stock Control-Audit operation of system.

Week ending 21 July

- Vegetable Oil Mills Division - Kaiama Spare Stock Control - Monitor the application. The development and first stage of the application were undertaken by the consultants in conjunction with the local engineering superintendent. The latter was to continue the programme scheduled for completion by August 10. The purpose of this visit then was to monitor progress and provide any necessary support.

- Glass Manufacturing Division - Raw Material and Spares Stock Control - Audit operation. Although this division had ceased manufacturing the audits were undertaken at the request of the divisional General Manager to assess the effectiveness and discuss with staff who were still on site.

Week ending 20th July - Metal Industries Division - Spares Stock Control. Audit operation. This visit was planned to check that the system had been successfully re-established following the breakdown revealed by the audit during June.

Week ending 13 August - Vegetable Oil Mills Division - Bolama Spares Stock Control - Monitor the application. This is the final visit timed to coincide with the completion of the application.

15 September -
16 November (Approx.) - Fellowship programme in United Kingdom.

In addition to the above activities which had already been scheduled, there were three other groups of activities to be completed by the end of this year and these are:-

(i) Audits and Monitoring - Audits will be carried out on all stock control operations not mentioned above. In addition, monitoring will be done of all production work.

(ii) Can Manufacturing Capacity Study - This is a new study arising out of the work done on can manufacturing capacity at Paints Division. GIHOC have a number of divisions with facilities for making cans, not all of which are fully utilised. The purpose of the study therefore is to determine the type and quantities that can be made, and submit recommendations on possibilities for improving utilisation taking account of external opportunities as well as GIHOC's own demands.

(iii) Bearings and V Belts Study - This is a new project whose purpose is to identify stocks of bearings and V belts whose use may be applicable to more than one division. The shortage of spare parts is a well recognised fact in GIHDC. Also, there is very little commonality of machinery, and, taken with the numerous countries of origin, the opportunities for having common parts are extremely remote. The exception however may well be with these two groups of items. If there is some commonality then any excess stocks can be used to meet the emergency needs of other divisions. This project derives out of an actual example during the project. During the stock control application at Metal Industries Division we had identified certain stocks of V belts. It happened that Brick and Tile Division were desperate for this type of item and we were therefore able to guide them to a ready source of supply.

We have also considered the possibility of bulk ordering of this type of item in the future should any degree of commonality exist. However, there are very real practical reasons, connected with current import difficulties, which will seriously deter the adoption of this approach.

5.21.2 Maintenance Counterpart - Mr. G.A. Ackah

Mr. Ackah who has been the counterpart on planned maintenance is also a qualified production engineer, and his agreed programme for the six months ending 31st December is:-

(i) Oversee the preparation and implementation of the remaining sites, in the planned maintenance system. The sites are:

- Brick and Tile
- Cement - Masaki
  - Pemba - in December
- Electronics
- Marble
- Meat - Tema
- Pharmaceuticals.

(ii) Monitor system already installed and operational at all other sites.

(iii) Ensure Glass Manufacturing Division prepare manual sheets on the new plant as it is installed.

(iv) Ensure that those sites where the development work has been completed, but the plants are closed for lack of raw materials, make use of the system as soon as the plants start operating again.

(v) Conduct a final seminar for all engineers in charge of planned maintenance systems to discuss the problems experienced and possible solutions.

(vi) Survey the workshop practices throughout GIHOC with a view to improving the training of engineering personnel.

(vii) Identify any surplus workshop equipment and make recommendations for its use.

One of the activities of both counterparts in the early weeks of the programme is to formalise the reporting systems which monitor what is happening in the areas of planned maintenance and stock control. This has been deliberately left until the latter part of the project to enable any practical problems arising during the operation of the systems to be accounted for. More importantly it has provided greater time to consider the proper relationships between Head Office and fairly autonomous divisions.

In the event it has been decided that the wisest course is to develop internal reports, of monthly or quarterly frequency, which can be incorporated in the general manager's quarterly reports and copies of which can be sent to Head Office. In this way it should be possible to minimise any friction which might arise if it were felt the reports were an imposition from Head Office.

5.22 Engineering Organisation

The need for a Group Chief Engineer was recognised at least a year ago, and such an appointment has been accepted in principle. The fact that this urgent requirement has not yet been fulfilled is not through any unwillingness on the part of GIHOC. Rather, there is the not uncommon problem of a state corporation finding difficulty in providing sufficiently attractive terms to recruit an engineer of sufficiently high calibre, who may well be working in private industry. Since the last report, we have submitted a position description and man specification which may perhaps help in the search for a suitable man.

5.23 Spare Parts

The team have been aware of the problem of spare parts in GIHOC for over two years now, and for the last eighteen months have been working with personnel in ten divisions to introduce spare parts stock control.

The purpose of introducing stock control was to indicate in a systematic way:

- when an item should be ordered
- how much should be ordered

with the object of:

- eliminating the disruption to production which can occur when a machine or piece of equipment fails

by:

- maintaining an adequate well balanced stock of spare parts.

The divisions do not have adequate well balanced stocks. As a result of our work we are able for the first time, to quantify the position in the divisions as shown in the following table:-

Division	On Stock Control	* To be Ordered		Out of Stock	
	No.	No.	%	No.	%
Cannery	425	44	10	30	7
Distilleries	98	20	20	9	9
Fibre	3,438	1,302	38	1,191	35
Footwear	4,915	1,516	31	991	20
Glass	197	20	10	1	0.5
Metals	191	45	24	32	17
Paint	347	35	10	25	7
Paper	1,094	185	17	186	17
Pharmaceuticals	1,055	648	61	379	36
Vegetable Oil Mills	256	89	35	77	30

THE STOCKING POSITION FOR SPARE PARTS

* These quantities may be increased if letters of credit are not extended for items on order but not yet delivered.

The above table shows that almost all divisions of GIHOC have a very serious shortage of spare parts. Yet in a number of cases they are sole suppliers of products of vital importance to either the economy or well-being of the nation. There is thus the continuing danger that the output from these vital industries will falter and be lower than the availability of raw materials would otherwise permit. A simple example can be seen at Fibre Bag Division this year, where woven material is piling up in the mill and the output of completed sacks for the cocoa crop is reduced because of the shortage of spare parts for a few sewing machines.

It is of course appreciated that the government may not be able to meet all the demands for foreign exchange which the many businesses in the country are likely to request. However, we would submit that with the work which has been completed on spare parts stock control, and raw material too, GIMOC is better placed than most other companies in being able to state its needs precisely. This means the divisions know exactly how much they will need to spend to maintain balanced levels of stock. In this way, they can in future make the best possible use of foreign exchange, and avoid some of the waste which may have occurred in the past when a heavy reliance was placed on a more subjective approach. We would hope therefore that it is now an appropriate time to demonstrate confidence in GIMOC by giving the proper level of support in terms of spare parts, in the knowledge that the industries are of strategic importance and the Corporation's requests are realistic.

On perhaps a secondary, yet nevertheless important note, we would like to refer to the morale of the very many people at all levels with whom we have worked, and who are concerned in some way with the operation or effect of stock control. During the project we encountered a degree of cynicism initially, based on the feeling that, despite the systematic approach, in the final analysis the stock would still be inadequate because of import restraints. In most cases the cynicism was replaced by optimism and enthusiasm as the development work proceeded and the officers concerned were able to appreciate the eventual usefulness of the systems. If sufficient import facilities are not now made available, it is likely that the original mood of pessimism will return, leading to the degeneration of much of the work of the project done during the last two years.

SECTION 6

CORPORATE

6.1 Group Results

The overall results achieved by GIHOC over the last five years are tabulated division by division in Volume 5, Annexe X. In total, these can be summarised as follows:-

Year	Cedis - Thousands			Profit (Loss) as % of	
	Net Capital Employed	Sales Turnover	Pre-tax Profit (Loss)	Net Capital	Sales
1972	37,905	28,062	(160)	(0.4)	(0.6)
1973	39,185	37,700	834	2.1	2.2
1974	42,677	54,403	1,621	3.8	3.0
1975	50,621	58,852	943	1.9	1.6
1976	65,039	80,674	9,914	15.2	12.2

These figures exclude Head Office transactions and are a direct total of the 16 individual divisions. Amongst these there are still divisions which have made losses throughout the period, namely Boatyards, Brick and Tile, Glass and Vegetable Oil Mills which are discussed individually below. On the other hand there are significant changes in Footwear, Marble Works and Meat Products all of which have moved from consistent loss-making to a modest profit in 1976. These, again, are discussed below in more detail. For the rest, all have continued to be profitable, taking one year with another, except that Steelworks had a heavy loss in 1975.

Overall, GIHOC has therefore moved to a much more satisfactory trading position with profits which show an adequate but not excessive return on capital. The 1976 level of profit continued into the first half of 1977 but there are now signs that the results for the rest of the year may be adversely affected by restrictions on imports which could drastically reduce output in many divisions.

6.2 Import Licence Restrictions

It is important to recognise how vulnerable GIHOC's results are to external changes. For example, at the beginning of 1977 import licences were awarded which, at ¢43.7 million in total, showed an appreciable increase in those awarded at the same time in the previous year. Having obtained such licences it was, previously, relatively straightforward to obtain letters of credit and supplies from abroad provided the licences were granted sufficiently early in the year. Now, however, delays in establishing letters of credit (requiring approval by Bank of Ghana) are seriously affecting the placing of orders in time. This is effecting all manufacturing organisations whether in the public or the private sector. As far as GIHOC is concerned, less than 30% of licences issued for 1977 had been supported by the establishment of Letters of Credit by the end of August 1977.

Each division of GIHOC submits a separate application for import licences for raw materials, spare parts, equipment and other materials. It is quite likely therefore that not only may GIHOC as a whole have poorer results in the second half of this year but the difficulties will strike some divisions more severely than others.

It would, we suggest, appreciably improve the performance of manufacturing industry generally if it were possible to release, early each year, a first instalment of import licences, backed by letters of credit, for raw materials. This would enable the ordering process to be completed and first deliveries to be received earlier in the year. The second instalments could then be given when the total availability of foreign exchange was known. This would eliminate much of the present uncertainty, make it possible to plan for more economic production and help to give a more consistent flow of finished products to the market.

6.3 Divisional Results

With regard to the performance of individual divisions we give, firstly, our comments on those still in the loss-making area and then on those which have moved from loss to profit-making.

6.3.1 Loss Making Divisions

6.3.1.1 Boatyards

The need here is to improve estimates and quotations so that they adequately cover costs currently being incurred. The new job costing system makes the necessary information on costs available and the division has started including an escalation clause in contracts. To operate this, again, requires this cost information to be kept accurately and up-to-date.

The fishing industry was depressed last year but conditions have now improved and a better demand for vessels at prices offering adequate margins is expected. With increased demand and improved margins the division could possibly break-even but this also depends on import licences for boat engines and other equipment.

6.3.1.2 Brick and Tile

The poor results of this division stem entirely from an inability to produce sufficient bricks of adequate quality. As reported elsewhere the plant is in poor condition and, although we have provided assistance recently in obtaining urgently needed speres, the prospect of sufficient improvements are poor. A complete rehabilitation of the brick making machinery is planned by GIHOC and import licences for new plant have been granted. So far, no letters of credit have been established for any part of the licence.

There are clearly many months of loss-making ahead even if the letters of credit are established immediately. Nevertheless GIHOC has to persevere with the current plant rather than shutting down because of its current commitment to Bank of Ghana for supply of bricks. There is also the longer term consideration that bricks are alternatives to cement blocks and their use thus saves valuable foreign exchange.

6.3.1.3 Glass

This plant has been shut down since June 1977 for complete rehabilitation into what will be effectively a new factory. Opening is expected at the end of 1978. Meanwhile closure removes much of the unacceptable current losses.

6.3.1.4 Vegetable Oil Mills

This division depends on local raw materials, principally ground nuts and copra. The former is a crop which varies annually according to weather and, in a poor year, imports are needed to keep up the volume of throughput and hence economic plant operation. With regard to copra, local supplies are insufficient and have a high value for other uses on the general market.

The division suffers from the time lag between increasing its prices for supplies in order to attract input and, on the other hand, obtaining awards from the Prices and Incomes Board for increases in price to the customer. Raw material costs account for about 75% of selling price so the small margins are under constant pressure. The process costing which is being installed keeps all cost changes under regular review.

6.3.2 Divisions Moving From Loss to Profit

6.3.2.1 Footwear

This division had a change of management over the last 12 months, and amongst other developments, increased use has been made of control information available. In particular, careful attention has been paid to selecting, from the added value/ profitability statement which we started in June 1976, the best products to fill the production line. This planning is a continuous short term process taking account of changing circumstances in sales orders and raw material availability.

Sales are up, conceivably due to the better information on the market derived from the studies carried out during the project. Import licences can have a significant effect on the profitability of this division particularly now that the new injection moulding machine is in use.

6.3.2.2 Marble Works

Here the gain appears to come from moving into profitable areas of contracting, including some construction work. If this continues to expand, close attention to estimating will be needed as the range of customers expands. The more traditional work e.g. marble tombstones, continues to yield good margins.

6.3.2.3 Meat Products

The turnaround in this division results from a change in policy on sources of meat. Previously, inputs depended mainly on importing cattle on the hoof from Sahelian countries north of Ghana. Now cold dressed meat is imported mainly from European surpluses which have provided an increased quantity of suitable quality meat. The future depends on import licences and the plant is still operating below capacity. Whilst the shortage of local supply persists the division should therefore continue to explore overseas sources offering the best value in supplies.

6.4 Corporate Planning and Budgeting

In the area of corporate planning and control the implementation of the financial programme has yielded for GIHOC the following improvements to its capability:

- Group management returns showing group profits, cash flow and capital structure are provided on a regular basis. These enable top management to forecast more accurately, and more frequently, group results. They are also able to set and monitor group financial objectives better.

- The revised trial balance system is ensuring that top management receive more accurate monthly reports than hitherto.

- Capital expenditure reports have been introduced which will enable top management to monitor progress on the divisions' capital programmes, for the first time on a regular basis.

- The implementation of the costing systems and cost centre analysis will provide divisional management with better information on which to base their financial projections when preparing or revising annual budgets.

The budgeting procedure frequently calls on divisional management to test the effect of fluctuations in certain major criteria on their performance. In particular, the level of import licence is currently one of the most critical factors to be established when preparing the budget.

We have therefore made a start on introducing a simple form of financial modelling that will enable divisions to test the effect on profitability of fluctuations in this type of critical factor. Perhaps the most basic and widely known financial model is the breakeven chart. This type of financial analysis, though widely understood, is little used in GEMDC and we have recommended its introduction in almost all our reports.

One of the financial consultants has set up basic models, for the Fibre Bag and Metals divisions, which are largely an extension of the breakeven chart approach. Formulae have been established whereby the division is able to select a particular factor, e.g. the level of import licence, and plot the effect on profitability of different levels of licence being allocated to the division.

The extension of this technique will be the responsibility of the Head of Management Accounting Services. He started on his fellowship in September and arrangements were made for him to be given special tuition on financial modelling during his fellowship. On his return he will be given, as part of his programme, the project of developing the use of financial models in other divisions in the group.

During the project, we gave direct assistance with the preparation of divisional budgets for the year 1977. We found that the process of integration of production, marketing and financial aspects into an annual budget was not fully developed in some divisions. To stress the importance of recognising these factors when preparing a corporate divisional budget we arranged that, for 1977, the budgets were prepared in two stages, firstly an operational one dealing solely with physical quantities and then a financial one showing the financial implication of the plan selected in the first stage. In some divisions this was a formalisation of the process usually adopted, in others the process provided a useful introduction to corporate planning. We then attended most of the individual divisional budget meetings and assisted in the budgeting process.

For each division budgets are presented for approval to the Management Committee, comprising the Deputy Managing Director (Operations), the Director of Development, the Director of Finance, the General Manager of the division and one other outside member. The separate treatment of operational and financial budgets necessitated additional meetings with consequent increase in the demands on the directors' time. It has therefore been agreed that, in future, operational and financial budgets will be presented at the same meeting but the separate stages in the budget preparation process will continue for all divisions.

6.5 Organisational Structure

In organisational matters GIMOC has had to balance carefully the position and weight of Head Office in relation to that of divisions. The wide range of products and processes in the divisions necessitates that much of the management and technical inputs should be local. On the other hand, in addition to senior line management, there is a requirement at Head Office for central services such as personnel, development, legal and group finance.

We found that GIMOC had rightly adopted a policy of avoiding over-centralisation and had developed at Head Office a suitably small and economical unit in relation to the divisions. However, the project necessitated reconsideration of the scope of central services in order to provide an ongoing service to the divisions in marketing, production, planned maintenance,

stock control, financial systems and management information generally. We therefore looked ahead to the end of the project and examined the best means of ensuring that the services and benefits to GIHOC from the project would continue thereafter.

The first stage was to review with the Managing Director the aspirations and plans of GIHOC on the broadest possible front. This included discussing, for example, whether GIHOC was likely to be seeking new areas of operation and, if so, whether this would lead to the formation of new divisions or joint companies. Similarly, the pattern of ongoing operations was examined with particular reference to the type of services which would be required in order to continue to improve performance, in individual divisions and overall.

This review established that for the next few years the priority for attention would be to improve the performance of existing operations. Although new ventures would undoubtedly arise it appeared likely that any specialist services they required (for example, market surveys) could best be provided by temporarily transferring resources from a section, or sections, involved with current operations.

The form of organisation most appropriate for provision of these services was then considered in order to establish, in broad outline, whether there was a case for bringing all types of central advisory services (finance, marketing and production) into a single department, probably under the title of Group Management Services. This would have the advantage that such a department would be headed by a senior executive who would be responsible for ensuring that his staff, including the existing counterparts, worked full-time on specific tasks to improve head office or divisional performance. Results could then be readily related to the inputs in terms of time spent on such projects.

On the other hand, not only would such an executive with sufficiently wide experience be difficult to find but, also, there is the problem of convincing divisional management that a new head office department was either desirable or justifiable. We therefore considered that, for the foreseeable future, the financial services should be with the Director of Finance and the production and marketing services with the Deputy Managing

Director (Ops). The corollary to this arrangement is that the programme of work for such central services staff must be carefully planned and needs to be monitored at regular intervals by, say, quarterly progress reports to the Executive Board. This is to ensure that full use continues to be made of the skills acquired by the present counterparts and that their role does not deteriorate into one of general duties, albeit at a senior level.

We had previously collected the job descriptions for all the executive directors and checked that the responsibilities, as described, were clearly stated and covered the type of activities which central services staff would provide. We can confirm that the above solution is consistent with the job descriptions for the Deputy Managing Director (Ops) and the Director of Finance.

The question of the future organisation of central services was also discussed with these two directors and also with the Director of Development who is Co-Manager of the current project. In all cases, the conclusions reached were similar to those described above. On a point of detail, the job description for the Director of Development includes responsibility for "research into production techniques including process planning, design of jobs and work methods, setting production standards and instituting quality control measures". It was generally agreed that this really referred to setting up such services rather than controlling them in an ongoing situation and that these functions should be under the direct control of the Deputy Managing Director (Ops).

A job summary was then prepared for each post showing the main responsibilities of the post and the channel of reporting. A paper was also prepared outlining the reasons for creating these new posts and the proposals were all approved at the GIHOC Board meeting in April 1977. The posts are as follows:

- Head of Production Services
- Head of Maintenance Engineering
- Marketing Co-ordinator
- Head of Management Accounting Services
- Head of Management Systems Services.

At the same time the Board approved the post of Group Chief Engineer which we had recommended earlier arising from our study on engineering capability within GIHOC completed in June 1976. This post is necessary not only for the development throughout GIHOC of improved standards of engineering but he would also direct the work of the specialists in production services and maintenance engineering.

The difficulty in finding s suitsble man as Group Chief Engineer was referred to earlier in this report but, apart from that, all other proposals have been implemented. The former counterparts are occupying the posts listed above and are working as members of GIHOC rather than as members of s project team. The marketing counterpart transferred in May 1977, the accountants st the end of July and the production and maintenance counterparts during August. In all cases, forward programmes have been established and approved by the Deputy Managing Director (Operations) or the Director of Finance as appropriate. Our own contribution to this process was confined to ensuring that possible useful projects were not overlooked but the ultimate choice was made in discussion between each former counterpart and the Director concerned.

For the last two months of the project period our role became a consultative one. That is, instead of directing the project team we became advisers on the creation and control of work programmes snd on any technical matters as they arose. This gave GIHOC an opportunity to get used to having central resources in the form of the specialists, as listed above, and to see that they continue to be fully and profitably employed.

SECTION 7

FELLOWSHIPS

A programme of fellowships for GIHOC staff to receive overseas training was added to the main project at the same time as the contract for consulting inputs was agreed. The fellowship funds are a separate allocation but the integration of the two projects has enabled us to advise and assist GIHOC to use the fellowship opportunities to the best advantage.

In our Stage 1 report of October 1975 we confirmed the total requirement of 108 man-months of overseas training, of which 18 were to be in respect of agro-industry training, leaving 90 for obtaining experience in manufacturing industry. At that time, it was envisaged that all this training would take place within the two year period of Stage 2 of the main project. However, early in 1976, we were advised that, because of shortage of funds, the sums available for the 1976 calendar year would be limited and would cover only about 12 man-months of fellowship.

In our Periodical Report No. 1 we identified the first priority for fellowship allocation as being divisional staff, particularly in the production area. We suggested that the selection of individuals for training should be made by members of our project team working in divisions and able to identify those members of a division who would not only benefit from the training but also be able to spread the benefits to others on their return.

The Fibre Bag Division had special needs for staff development to provide for succession at the mill manager level and also to deal with the maintenance, machine setting and quality control work forming part of our main programme. In discussion with the General Manager of the division we identified four men likely to make good use of the fellowship opportunity. We itemised the training requirements and a period of 3 months for each man was agreed as being needed, thus absorbing all the fellowship allocation for 1976. Details of the programmes were sent to UK where our project liaison staff explored the acceptability of the plans with the firms concerned and obtained details of costs and conditions for the training.

In Accra we then assisted GIMOC to prepare and submit the formal applications through UNDP to UNIDO. At the project review meeting in October 1976 it was established that funds for 1976 could not be carried over into a later year so there was barely sufficient time to meet the deadline. However, with excellent co-operation from the many authorities involved, approval was obtained in time and the four men left Ghana for UK on the 25th November, 1976.

In early January, the two consultant members of the project team responsible for the work at Fibre Bag Division were on leave in UK and visited Belfast to check that the training was progressing satisfactorily. They were also able to help to resolve difficulties which had arisen in the payment of allowances and the absence of return air tickets. When the four men had returned to their jobs we checked that full use was made of their experience.

We have described the handling of this particular fellowship programme in some detail in order to show the role which we are playing in this connection. In no way do our activities diminish any of the normal responsibilities of the many authorities involved in creating and administering a fellowship. However, with our overall experience covering Ghana and UK, we were in a unique position to help to match the training needs with firms best able to meet them, to co-ordinate the processing of each fellowship and to monitor the results of those completed during the project period.

Turning to the rest of the fellowship programme, the review meeting in Accra in October 1976 examined, and broadly agreed, the revised allocation of fellowship funds as follows:-

Calendar Year	US $
1976	13,200
1977	43,560
1978	67,760.

This created a programme which extended some 15 months beyond the end of the main project in September 1977. In order that we could continue to assist with the 1978 programme it was agreed that, out of the current consulting programme, one man-month should be set aside and used for fellowship liaison in UK in 1978. An addition of US $30,000 for the 1978 programme was subsequently agreed at the review meeting in September 1977.

For the 1977 fellowships we produced a forward programme identifying the individuals and, broadly, the type of training which we recommended each should receive. After agreement with GIHOC we developed, for each of the 10 fellowships proposed, a full fellowship specification showing the following:

- the personal history of the individual
- education
- further training
- work experience
- the recommended timing and duration of the fellowship
- the further experience now required
- the suggested combination of courses and practical work.

In collaboration with the British Council (the UK agents for UNIDO) P-E staff in UK conducted a search for organisations competent and willing to supply the training. The identification of appropriate courses and seminars presented little difficulty, but many manufacturing companies are reluctant, even for a fee, to take in trainees from outside their firm, primarily because of the disturbance which the presence of s stranger inevitably causes. However, we were able to identify suitable courses and potential sources of practical experience.

The fellowship work in Ghana was carried out by the team leader, working in close collaboration with GIHOC management, in particular the Personnel Director, the Manpower Planning Manager and the Training Officer. In the light of experience gained in processing the few fellowships in 1976, we drew up a network programme from which we provided GIHOC and UNDP with schedules for progressing further fellowship applications. By the end of February 1977 all the individual application forms for 1977 had been completed and sent to the Ministry of Economic Planning for onward submission to UNDP.

With regard to funds available for the 1977 fellowships, preliminary cost estimates indicated that the total was likely to be exceeded and methods of dealing with this were discussed with GIHOC. We agreed that these relatively short fellowships are best used for broadening the management experience of senior grades of staff and particularly for supplementing the

local training given to our counterparts. The programme was therefore balanced by deletion of 3 candidates in the more technical areas of maintenance and quality control where alternative training was likely to be more readily available. Of the remaining seven fellowships in the 1977 programme, four fellows have already completed their period in UK, two are there at time of writing (September 1977) and one has still to go.

For the 1978 programme the original allocation of US $67,760 provided for approximately 10 two-month fellowships and we started planning on that basis. During August 1977 we held meetings with the Managing Director, Deputy Managing Director and Director of Personnel at which it was agreed that the 1978 fellowships should be used mainly to develop the understanding and skills of general management. The type of training envisaged would comprise high level courses, and, apart from visits arranged as part of a course, there would be no attachments. These are becoming difficult to arrange as companies are increasingly reluctant to take in "visitors" for such short periods as 3-4 weeks.

The training pattern for the two months will therefore be a 3-4 week course in overall general management followed by other courses of 1-2 weeks selected to suit the needs of each individual. For example, a man with only production experience would be given courses in finance, accounting and marketing with emphasis on their application in manufacturing companies.

Ten candidates were selected from a short list of senior staff at or near general manager level. Five more candidates have now been nominated to take up the additional US $30,000 allocated at the final review meeting. The submission of application forms is well advanced and the specification of courses required for each individual has been completed; GIHOC will forward this information to UNIDO shortly.

We have stressed to GIHOC the importance of completing applications and training plans early. We are concerned that in spite of frequent progressing by ourselves, every departure so far in this programme has required last-minute arrangements locally. Already one fellow has failed to arrive in time and missed part of his training.

Visas, flights and foreign currency all require time to arrange after the award has been made. We urge that all the organisations involved in setting up and administering fellowships recognise this by bringing forward their activities in relation to the planned start date of the fellowship. This would reduce the amount of unnecessary work in always handling these fellowships as emergencies; it would also materially benefit the fellows and the training establishments if late arrivals and last minute changes were avoided.

We now have sufficient information with which to comment on the results being obtained from this programme. For fellowships which have been completed, the reactions of the individuals concerned and the uses to which the experience is being, and will be, put are described separately below.

Messrs. Baah, Asare, Kontoh and Essel - Fibre Bag Division

These four men went as a group to James Mackie and Sons in Belfast for a 3 month period from the end of November, 1976. The object of the visit was to supplement experience in the area of mill operation and maintenance. The leader of the group, Mr. Baah, is Assistant Mill Manager and the rest are from the engineering department in the mill.

All four returned in March to take up programmes of work in the mill which we had planned in conjunction with members of the mill management team. We were pleased to see that all benefited from the technical knowledge they had gained. It was most encouraging to see the readiness with which this experience was passed on to others, particularly by the craftsmen.

The engineering experience is being used actively in the current programme of mill rehabilitation which is supported by a British Technical Assistance project. As described in a previous section, we helped to co-ordinate these two programmes and the fellows will continue to extend their practical experience under the guidance of the UK technical expert.

On the management side Mr. Baah has clearly benefited from his fellowship and has readily taken on wider responsibilities in the running of his department.

Mr. M. Gekye-Mensah - Director of Finance

Mr. Gekye-Mensah's fellowship comprised an introductory visit to The P-E Consulting Group headquarters to discuss, in outline, modern developments in corporate finance, followed by a 10 week course at the London Business School in their Executive Programme. This is for senior executives and it provides opportunity for management development at corporate level.

On return, Mr. Gekye-Mensah expressed himself well satisfied with the content of the fellowship and was anxious to recommend it to others. Whilst the general nature of the LBS course necessarily led to some sessions being less relevant that others, the coverage of the topics important to him more than compensated for this. Mr. Gekye-Mensah and ourselves developed a plan of responsibilities within his department which enabled him to centralise the supervision of financial routines on the Financial Controller and be personally freer to handle group financial matters. The experience gained from his fellowship is thus being quickly brought into use.

Major B. Donkor - General Manager,
Fibre Bag Division

This was a short 3-week visit to James Mackie and Sons in Belfast to examine and discuss various technical aspects of mill operation and maintenance. We also arranged for Major Donkor to see a specialist in kenaf in London. A brief discussion with Major Donkor on his return confirmed that he had found the whole programme very useful.

Mr. C.K.E. Stephens - Manpower Planning Manager

This fellowship comprised a course in general management at The P-E Consulting Group and also one giving an appreciation of work study. An attachment was arranged at Rockware Ltd. for study of practical application of the course subjects particularly matters of special interest such as manpower planning, work study, training, staff appraisal systems and job evaluation. Overall, the fellowship contained somewhat more time on attachment than on courses.

Mr. Stephens has commented very favourably on the whole programme and has identified some very specific developments in the area of training and staff appraisal which he would propose for GIHOC.

We discussed the future tasks for Mr. Stephens to undertake with the Director of Personnel. One of the first requirements is the setting up of the fellowship programme for 1978 for which Mr. Stephens will be responsible. This includes appraisal of the candidates, preparation and agreement of individual fellowship specifications and processing of resultant applications.

Overall, we are well satisfied with the outcome of this group of fellowships and believe GIHOC will obtain lasting benefit from the experience their staff have gained.

The United Nations Industrial Development Organization
Government of Ghana

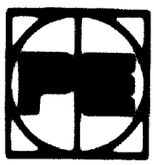
02599
(2 of 5)

Management Assistance to the Ghana Industrial Holding Corporation

Unido Contract No. 75/3
Project No. DP/GHA/74/002

Final Report

Volume 2 -Annexes
General and Financial



The P-E Consulting Group

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

VOLUME 2

ANNEXES

OCTOBER, 1977

THE P-E CONSULTING GROUP
International Consultants to Management

Park House,
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England.

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VOLUME 2

ANNEXE I

TERMS OF REFERENCE

"ASSISTANCE TO GHANA INDUSTRIAL HOLDING CORPORATION"

(GIHOC) - Phase II - DP/GHA/72/006*

26 September 1974

TERMS OF REFERENCE

1. Description of Project

This project represents a continuous programme of assistance with GIHOC. The first phase of work, which was directed primarily towards technical problems at the division/working levels, was terminated in September 1972. Related to the findings and recommendations of a UNDP Advisory Mission of 1974, the primary objectives of this project may be noted as follows:

(i) To develop action plans and an implementation schedule for a comprehensive management improvement programme in the various GIHOC Divisions and at Head Office;

(ii) To upgrade management practices and systems in selected GIHOC Divisions and at Head Office;

(iii) To develop within GIHOC an internal consultancy capability so that the management improvement programmes may be continued once the project is terminated;

(iv) To advise and assist GIHOC staff in the preparation of pre-investment feasibility studies;

(v) To provide general management counsel and advice to the Managing Director of GIHOC and the General Managers of the various GIHOC Divisions.

The work activities associated with this project can be expected to involve the following steps:

Phase I: Preparatory Activities (6 months)

a) To advise and assist in conducting a comprehensive review of each of the Divisions and Head Office with the objective of determining a management improvement programme for each of the units so considered.

b) To define, aggregate and select those management needs which justify a priority claim of technical assistance resources with the objective of optimum deployment of available resources to assist in improving GIHOC's overall profit and management performance.

c) To draw up a detailed management improvement programme and action plans with the objective of specifying

i) priority problem areas; and

ii) required management resources (both Ghana and expatriate to be so utilized), time scale for action, results expected, procedures for feedback, reporting and follow-up.

Phase II: Management Improvement Programme

Subsequent to Phase I, an action oriented management improvement programme would be finalised within the prescribed framework:

a) At the headquarters level to serve:-

i) general management policies, practices and procedures; and

ii) Head Office staff services especially in the areas of general management counselling and business strategy, corporate planning, programming, scheduling, marketing (domestic and export), profit improvement, new business development/project studies and appraisals.

b) At Division level to serve general and operational management and to specialise in technical needs especially as concerns the establishment, design and implementation of an inventory control system (e.g. raw materials, goods in process, production planning and control system, design forms and operational procedures, manuals, supervision of changeover to new systems.

c) Related to the aforementioned project objectives full consideration and coordination will be made of on-the-job management development and training activities such as

i) understudy training

ii) associate consultant training

iii) senior consultant training

* Note: When the project was activated the reference became DP/GHA/74/002.

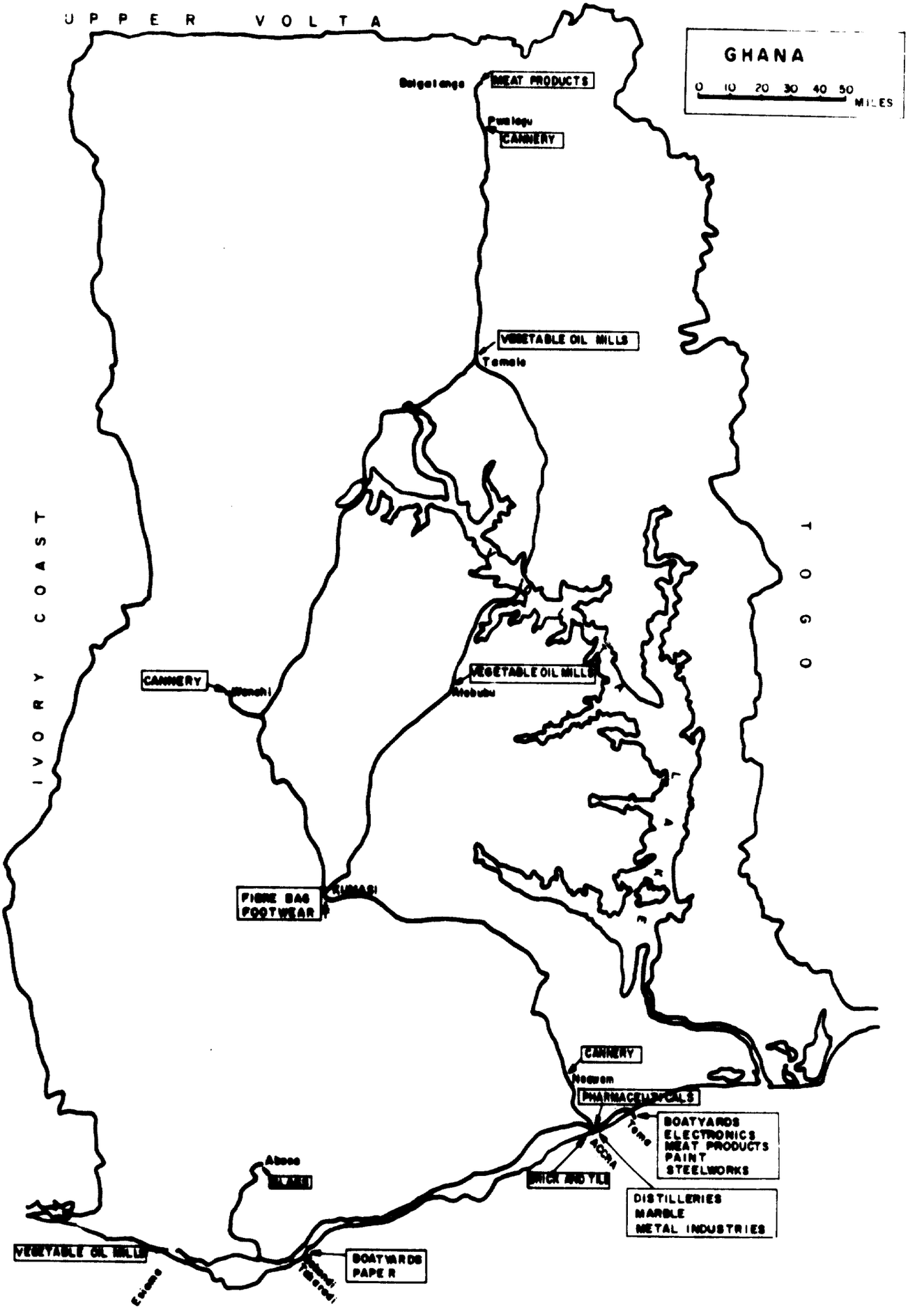
VOLUME 2

ANNEXE II

MAP SHOWING LOCATION OF GIMOC PLANTS

LOCATION OF GIHOC'S 22 PLANTS WITH ROAD LINKS

VOLUME
ANNEXE II

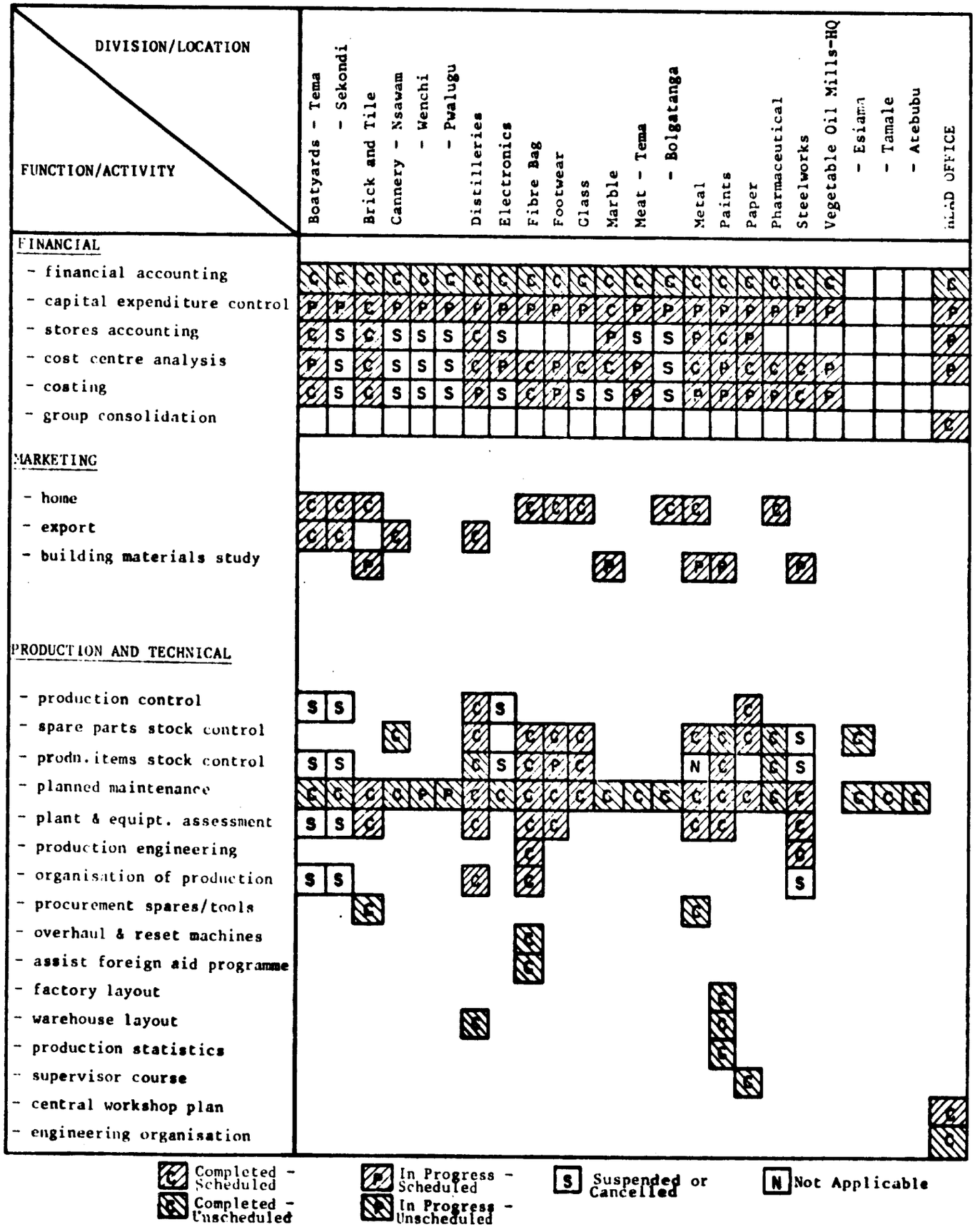


VOLUME 2

ANNEXE III

CHART SHOWING TYPES OF WORK CARRIED OUT IN DIVISIONS

TYPES OF WORK CARRIED OUT IN DIVISIONS



VOLUME 2

ANNEXE IV

FINANCIAL

SAMPLE VOLUME I REVIEW REPORT

PAPER CONVERSION DIVISION

PAPER CONVERSION DIVISION
OF GIHOC

ACCOUNTING CONSULTANCY ASSIGNMENT
VOLUME 1 : REPORT

CONTENTS

CONTENTS

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APPENDICES

PART A

INTRODUCTION

This report is the result of an accounting consultancy assignment carried out in the Paper Conversion Division of GIHOC during 1976, as part of a larger programme of management assistance commissioned by UNIDO from P-E Consulting Group Limited (P-E) under the United Nations Development Programme. Within the Divisions of GIHOC, P-E is required to implement a programme of changes and improvements to management practice, with particular attention to training GIHOC counterpart staff to the point of self-reliance. It is intended that this report will be followed up by assistance in implementation of approved recommendations and proposals. The team engaged on this assignment consisted of C.J.S. Baker and his GIHOC counterpart J.K. Micah.

Volume I of this report reviews and assesses the accounting systems in current use and sets out recommendations and proposals for their improvement and development. Volume II contains the comprehensive description of the current systems on which the content of Volume I is based.

The Chief Accountant, Mr. K. Danu, has reviewed and commented on both Volumes I and II. He wishes to put on record his agreement with their content, i.e. the description of the systems, their review and assessment and the recommendations and proposals for their improvement and development. He has expressed the desire for implementation to commence as soon as possible.

The team wishes to thank the managers and staff of the Division for their active co-operation and assistance during the assignment and look forward to working with them again in the near future.

C.J.S. Baker

J.K. Micah

October, 1976

PART B

SUMMARY OF THE REPORT

A summary of the report is given below under the headings:

- Summary of Principal Findings
- Summary of Recommendations and Proposals.

1. SUMMARY OF PRINCIPAL FINDINGS

A summary of our principal findings discussed in Part C is given below and is cross-referenced to the appropriate sections.

(i) Procurement

Transactions are subject to authorisation procedures. Suitable records are maintained and transactions supported by appropriate documentation.
(Part C, Section 2.1).

(ii) Stores

Storekeepers appear competent, conscientious and stock items are physically counted on a regular basis to verify stores records.

Storekeepers have been maintaining records which include both quantity and value of stock items and have also engaged in the pricing of issues and evaluation of stocks.

There is a lack of suitable handling and storage facilities for imported reels. There is a lack of storage space for the Case Factory and in particular in the despatch area which causes severe congestion.
(Part C, Section 2.2).

(iii) **Stores**

The operation of the current procedures is straightforward. (Part C, Section 2.3).

(iv) Financial Accounting

The financial accounting system is suitable for the needs of the Division, but requires certain amendments to the procedures to improve control and analysis.
(Part C, Section 3).

(v) **Stores Accounting**

Until recently there were no stores ledgers, stores documentation being priced by the storekeepers prior to posting to stores control accounts. Stores ledgers are currently being introduced.
(Part C, Section 4.1).

(vi) **Case and Chipboard Quotations**

The cost tables for case quotations had not been revised since August 1974 and then only by applying percentage increases to previous costs.

Subsequently, the cost tables have been revised and are applicable from June 1976. These tables are based on the latest material costs and labour rates. The output rates from each process have been estimated and related to product specifications. The data has been qualified such that costs are substantially inflated to allow for future price rises, operating practice and downtime, including that due to lack of raw materials.
(Part C, Section 4.2).

(vii) Standard Product Costing

Products with standard specifications, e.g. toilet rolls, are costed periodically, but infrequently. Costs of material content can readily be calculated. However, the absorption rates for labour cost and overheads are most suspect and appear arbitrary.
(Part C, Section 4.3).

(viii) Budget Preparation

The procedures for budget preparation are inadequate and confidence in the Division's budget is undermined due to the lack of both sufficient consultation between managers and the availability of supporting data on the Division's operations.
(Part C, Section 5.1).

(ix) Period Operating Reports

The operating reports provide to the Division's management both insufficient and inaccurate information on which to assess the Division's performance. The management accounting expertise of the Division's Accountants is not being fully utilised.
(Part C, Section 5.2).

2. SUMMARY OF RECOMMENDATIONS AND PROPOSALS

In Part D we make over 30 separate recommendations and proposals concerning the systems and procedures discussed in Part C. These are summarised below under main headings :

(i) Organisation

- segregation of Finance and Costing Sections within the Accounts Department

- introduction of a budget committee

(ii) Management Information

- introduction of period cost centre reports, contribution statement, balance sheet and capital expenditure report

- preparation of commentary to support the period operating reports

(iii) Supervision

- competent supervision to be exercised over stores and costing

- close control by accounts management over preparation of accounting reports

(iv) Training

- finance and cost clerks to take advantage of training courses

(v) Timetables

- imposition of and adherence to procedures and postings timetables

(vi) New Systems, Procedures and Documentation

- segregation of direct material records by product

- document preparation for posting prior to passing to machine room

- revision of fixed assets register

- introduction of stores ledgers to be expedited

- introduction of integrated standard costing

- introduction of periodic product costing

- use of period cost reconciliations.

(vii) Improved Data Availability and Analysis

- capacity assessment of accounting machine

- review of allotment of expense items

- revision of P & L statement to differtiate between direct and indirect costs

- derivation of standard production times

- preparation of quantities budgets

- financial analysis during budget preparation.

(viii) Verification

- recruitment of an internal auditor

- continuous stocktaking for high volume materials

- accounts management to ensure that source data used for costing and reporting is both accurate and correctly applied

- depreciation calculations to be reviewed.

PART C

COMMENTARY ON THE ACCOUNTING AND RELATED SYSTEMS

1. INTRODUCTION

To assess the efficiency and effectiveness of the accounting and related systems operated within the Paper Conversion Division, it was necessary to prepare a description of these systems. No manual of accounting and related systems was available for the Division and no one person was in a position to relate all the procedures in the systems.

A series of interviews was undertaken with not only accounting staff but staff in related departments, e.g. Sales. A comprehensive description was prepared of these systems and is Volume II of this report. This description was reviewed and commented on by the appropriate managers to confirm its accuracy. It is intended that this description will serve as a basis for the Division's Systems Manual.

In this part of the report we state our opinions on the existing accounting and related systems. A summary of these findings was given to the Division's General Manager in a letter dated 24th May 1976. Our commentary is under the following headings which are in accord with the sequence of systems descriptions in Volume II:

- Related Systems
- Financial Accounting
- Costing
- Budgetary Control.

We make our recommendations and proposals in Part D.

2. RELATED SYSTEMS

The procedures for the related systems are described in detail in Volume II, Section A, B and C.

These procedures are discussed below under the following headings:

- Procurement
- Stores
- Sales.

2.1 Procurement

The procedures carried out in the Procurement Department are described in Volume II, Section A.

All transactions are subject to authorisation procedures. Suitable records are maintained on suppliers, import licence application and utilisation, letters of credit application and utilisation and progress of orders. Transactions are supported by appropriate documentation.

2.2 Stores

The procedures operated in the stores are described in detail in Volume II, Section B.

Receipts and issues are covered by documentation and stores stock abstracts are available for all stock items except industrial finished products awaiting despatch, i.e. cases and chipboard.

The storekeepers appear competent and conscientious. However, overall responsibility for the stores and storekeeping procedures is not readily identifiable.

Stock items are physically counted on a regular basis, e.g. raw materials, work in progress and finished goods are counted each period, to verify stores records.

Storekeepers have been maintaining records, the stores stock abstracts, which include both quantity and value of stock items and have also engaged in the pricing of issues and valuation of stocks. These procedures are not recommended as these clerical duties relating to pricing and valuation are usually more efficiently and accurately undertaken by clerks in the Accounts Department. The storekeepers should

only be concerned with quantity stores records and vouchers so as to devote their time to their duties as custodians. The Consultant notified the Division's General Manager of these findings in a letter dated 24th May 1976.

Manually prepared ledgers are now in operation in the Accounts Department for raw materials and consumables. prior to being installed on the accounting machine when the capacity of the machine has been accurately assessed. The evaluation of these stores items and pricing issue vouchers has been discontinued by the storekeepers and now is carried out in the Accounts Department. Ultimately, ledgers should be introduced for all stores items.

The Division's management is fully aware of the lack of suitable handling and storage facilities for imported reels. It is understood that an order has recently been placed for a suitably equipped fork lift truck.

There is also a lack of storage space for the Case Factory and in particular in the despatch area which causes severe congestion. The provision of a larger storage area would allow production for stock and enable the batch sizes to be increased thus increasing productivity by reducing time spent on machine re-setting.

2.3 Sales

Sales procedures are described in detail in Volume II, Section C. The operation of the current procedures is straightforward and should present no problems to the staff.

It was noted that the Marketing Manager expressed a particularly responsible approach to credit control.

In view of the imposition of Customs and Excise issues of waybill and invoice pads, concern has been expressed over the lack of copies that can be retained in the Division. This can readily be remedied by printing un-numbered copies that can be inserted in the pads during preparation.

3. FINANCIAL ACCOUNTING

Financial accounting procedures are described in detail in Volume II, Sections D and E.

The nominal, personal and expenses ledger are all maintained on an electronic accounting system using magnetic stripe ledger cards.

The original documents are conventional and are comprehensive in their cover of both internal and external transactions. Control accounts are maintained and each ledger balanced every month.

All sales and purchases documentation and the payroll are subject to some form of checking by senior management.

Essentially, we believe that the financial accounting system is suitable for the needs of the Division, but requires certain amendments to the procedures to improve control and analysis.

It is in Part D that we make our recommendations and proposals for the improvement of the system. Below, we discuss the accounting procedures under the following headings:

- Machine Accounting
- Operation of the Financial Accounting Procedures
- Cost Centre Accounting
- Trial Balance and Profit and Loss Statement
- Fixed Assets.

3.1 Machine Accounting

Machine accounting within the Division offers the advantages of accuracy, speed and analysis not readily available with manual procedures. The system is operated by staff who appear both competent and conscientious.

Concern has been expressed as to the processing capacity of the system. The proposal submitted by NCR for the '400' Electronic Accounting Machine currently installed, claims that the machine can process not only the nominal, personal and expenses ledgers and payroll but also the stores ledgers. Stores ledger cards for machine processing have been prepared but contain no entries except for May 1974. The Chief Accountant has stated that the processing of the stores ledgers is both time consuming and the cards expensive. Thus the facility to mechanise the pricing and allocation of stores issues is unused.

The capacity of the system is not fully exploited because:

(i) source documents are prepared for processing, e.g. coded and pre-listed, after receipt in the machine room

(ii) processing is not carried out systematically to a period posting timetable.

Thus while the system offers fast processing speeds, it is not fully utilised due to its method of operation.

We have contacted NCR in Accra and discussed this matter with Mr. S.D. Ababio, Head of Marketing Support Division. He can find no trace of paperwork volume assessments in the NCR contract files. This lack of data may have been because the machine was considered to meet more than adequately the claims made for it in the NCR proposal.

It is understood that field staff from NCR are currently assessing the capacity of the system for the Division's requirements and reviewing the clerical procedures.

3.2 Operation of the Financial Accounting Procedures

The operation of the financial accounting procedures is straightforward and should present little problem to the level of competence of staff employed.

However, there is no accounting manual and training is passed on by word of mouth. When key staff leave it is unlikely that they will have imparted to the substitutes, if available, all details of their work. It is intended that Volume II, as amended by future developments will serve as an aid to staff training.

The volume of paperwork processed is shown in Appendix I. The volume is low given the facilities available.

As discussed in Section 2.3, the lack of invoice copies can be remedied by printing un-numbered copies for insertion in invoice pads.

As discussed in Section 3.1, documents for entry are insufficiently prepared for processing prior to being passed to the machine room. The procedures are not carried out to a timetable.

There has been no internal auditor based at the Division since May 1975.

3.3 Cost Centre Accounting

Cost centre accounting is a fundamental component of the machine accounting system and being integrated within the double-entry, is subject to the arithmetic accuracy and processing speed of the system.

However, many expenses are apportioned between the cost centres but the percentages used have not been reviewed since 1974. The cost centre analysis is not disclosed to the managers responsible for the cost centres, who, in any case, are not cost responsible. As the analysis is not used to assess cost control there is not the incentive to ensure meaningful and equitable expense allotment.

3.4 Trial Balance and Profit and Loss Statement

A trial balance is prepared for each period after completion of postings and reconciliation of control accounts. The sequence of accounts enables a balance sheet and operating statement to be readily prepared. However the trial balance, apart from the revenue and expense accounts, is not prepared on a pre-printed form which would speed preparation. It is currently prepared by the third week after the month-end.

The period profit and loss (P & L) statement is supported by schedules on wages and salaries and general expenses. Pre-printed forms are used which are in columnar format for analysis by cost centres.

However, the layout is biased towards the presentation of financial data without clear cut differentiation between direct and indirect expenses.

Within the summary headings on the P & L statement are included erroneous items. For example, within 'Direct Labour' is included storemen and drivers and within 'Factory Expenses/Overheads', which should represent only variable production expenses in the context used, is included maintenance/repairs and rental of plant and equipment and harbour expenses.

The derivation of 'Materials Consumed' is incorrect. Currently, the work in progress (WIP) accounts include only costs of direct materials. The balancing credit on each WIP account is the derived cost of production of finished goods for the period and is debited to the appropriate finished goods stock account. However, the finished goods physically counted at each period-end is valued at direct material cost AND conversion cost. Conversion cost includes direct labour, factory and general overheads. Thus the balancing credit on each finished goods account, which is regarded as the materials consumed in the cost of sales is a composite amount not exclusively direct material cost.

These procedures appear to be a relic of a previous attempt at integrated costing or at least a means by which cost of sales evaluated at 'standard' could be reconciled in memorandum with period actual costs. No manual of procedures could be traced and no attempt evidently has been made by the Division's accountants to review the effectiveness of the procedures or to complete them.

3.5 Fixed Assets

Fixed assets are given proper treatment in the ledgers. However, the fixed assets registers are not in agreement with the ledger cards.

Fixed assets are not identified to cost centres.

Depreciation calculations are suspect.

4. COSTING

Costing procedures are described in Volume II, Section G. There is no separate Costing Section within the Accounts Department and such costing as is carried out, is of a limited nature, and lacks the rigour expected of a Division well endowed with qualified accountants.

These activities are described below under the following headings:

- Stores Accounting
- Case and Box Quotations
- Standard Product Costing.

4.1 Stores Accounting

Until recently there were no stores ledgers, stores documentation being priced by the storekeeper prior to posting to stores control accounts. Stores stock abstracts recording quantities and values were maintained by storekeepers in the stores.

As discussed in Section 2.2, stores ledgers are currently being introduced. It is desirable that all production materials and finished goods stores be recorded on ledger cards processed by the accounting machine. Subsequent to the review of the Division's processing by NCR field staff it may be found uneconomic to hold non-production stock items, e.g. spare parts, on machine processed ledger cards and in this case, manually prepared ledger cards should be instituted.

4.2 Case and Box Quotations

Cases and chipboard boxes can be produced to a variety of specifications, e.g. materials and dimensions, and thus cost tables which relate cost to specification and quantity are used when preparing quotations.

However, the cost tables for case quotations had not been revised since August 1974, and then only by applying percentage increases to previous costs. The machine efficiency analysis which is the basis of the tables had not been revised since before the plant in the case factory was extended over 5 years ago. The Consultant notified these findings to the Division's General Manager in a letter dated 24th May 1976.

Subsequently, the cost tables have been revised by the Planning Officer with cost data provided by the Chief Accountant and are applicable from July 1976. These tables are based on the latest material costs and labour rates. The output rates from each process have been estimated and related to product specifications.

To allow for future price rises, current material and labour costs are inflated by at least 20%. Operating practice is allowed for by production rates based on shifts each of 6 'effective' hours, each hour containing 50 active minutes. Down time, including that due to lack of raw materials is anticipated by reducing machine rated output. Output from the corrugator is taken as 2,000 metres per hour which it is understood is 50% less than currently possible.

Factory and general overhead absorption rates on the direct labour cost have been derived by evaluating the costs reported in February, March and April of this year.

The cost tables used for case quotations should ensure profitability. As discussed above, the data has been qualified such that costs are substantially inflated. Whilst this is commercially prudent it is also in part indicative of the lack of suitable production performance statistics. The Planning Officer agreed with the Consultant that more rigorously assessed statistics are required. These can be obtained by time studies on the factory floor and by analysis of available production data.

4.3 Standard Product Costing

Products with standard specifications, e.g. toilet rolls, are costed periodically, but infrequently by the Accounts Managers. The dates on the latest cost structures made available to the Consultant were as follows:

Canisters	10 November 1975
Toilet Rolls	21 July 1975
Paper Bags	28 October 1974
Facial Tissues	1 January 1975
Paper Napkins	26 June 1975
Adding Machine Rolls	7 October 1975
Polythene Bags	None available.

Each cost structure applies absorption rates for labour cost, overheads and margin to cost component combinations based on the cost of raw material content.

Costs of material content, allowing for waste, can readily be calculated at the latest raw material unit costs. However, the absorption rates for labour cost and overheads are most suspect and appear arbitrary.

5. BUDGETARY CONTROL

The procedures for operating budgetary control are described in Volume II, Section H. They are discussed below under the headings:

- Budget Preparation
- Period Operating Reports

5.1 Budget Preparation

Responsibility for budget preparation has remained primarily with the General Manager and Chief Accountant with assistance from the Division's manager's.

Quantities budgets are prepared for sales, production and raw material consumption, but it is evident that the managers responsible for these functions have not prepared data which has been rigorously assessed or is in sufficient detail. The budget prepared for 1976 contained no supporting schedules on sales or production quantities, although these are being prepared for the 1977 budget.

The Division operates within a sellers' market and thus the only major constraint on sales is output. The major constraints on output are:

(i) the rated capacity of the Division's machines and facilities

(ii) the effective utilisation of these machines and facilities

(iii) the availability of raw materials and spare parts, dependent on,

(iv) the size of the annual import licence and its timing.

The capacities, setting and running times of the process plant have not been rigorously assessed as is discussed in Section 4.2 and thus the efficiency of production is not known in sufficient detail. The lack of data prevents optimum production programming which would be the basis of a production quantities budget.

Capacity and its effective utilisation is a constraint only if sufficient quantities of raw materials are available. Quantities budgets should be prepared at different predicted levels and timing of raw material availability in order to consider alternative optimum production programmes.

The lack of rigorously derived product cost structures, assessed with reference to the various constraints, notably the import licence value, does not enable the comparative product contributions to be used during selection of optimum product mix and volume.

As discussed in Section 3.3, the costs incurred by cost entres are not reported to the appropriate managers, who, apart from not exercising cost control, and in turn being assessed on their ability to do so, are not able to contribute to budgeting these costs.

In conclusion, it is our opinion that the procedures for budget preparation are inadequate and confidence in the Division's budget is undermined due to the lack of both sufficient consultation between managers and the availability of supporting data on the Division's operations.

5.2 Period Operating Reports

The period operating reports are prepared in terms of value by extracting data from the appropriate financial records.

The operation of the work in progress (WIP) and finished goods accounts is described in Section 3.4. In the current procedures, labour and factory overheads for the period are charged against sales revenue, instead of the common practice whereby these costs are charged to production. If these costs are not debited to the WIP accounts and thus included in the cost of production credited to the finished goods stock accounts, it is inappropriate to value the finished goods at factory cost. For example, if the quantity and thus value of finished goods decreases in a period, the P & L statement heading 'Materials Consumed' will include the conversion costs absorbed by the decrease in finished goods, thus reducing unnecessarily, the reported period contribution and profit.

The period operating statement is derived from the P & L statement. A period contribution statement has been prepared in the past but not currently. On this statement an attempt was made to allocate overheads between product groups by using a most suspect basis, that of cost centre management salaries and pensions.

No commentary is prepared to support the operating reports and provide explanation, particularly to the non-accountant, of the period results.

We consider that the period operating reports provide to the Division's management, both insufficient and inaccurate information on which to assess the Division's performance. The management accounting expertise of the Division's accountants is not being fully utilised.

PART D

RECOMMENDATIONS AND PROPOSALS

1. INTRODUCTION

The accounting and related systems operated within the Paper Conversion Division have been reviewed and assessed in Part C of this report. In consequence, we make a number of recommendations and proposals for improvement and development of these systems.

Our aim is to make such improvements to the systems and their operation that confidence in the data so produced is restored and that data is fully exploited as management information.

In the following sections our recommendations and proposals are described in the same sequence as Part C and also include a section on implementation.

2. RELATED SYSTEMS

In our review of the related systems, we commented favourably on the sales and procurement systems and thus do not proposed any changes.

2.1 Stores

In this section we make recommendations and proposals applicable to the procedures carried out in the stores.

2.1.1 Supervision

It is essential for efficient operation of the stores, that the overall supervision is vested in a responsible and competent senior manager.

2.1.2 Quantity Records

Storekeepers should maintain stock records in terms of quantities only, stock valuation and pricing will be undertaken in the Accounts Department.

The stock records in the stores and the stores ledgers in the Accounts Department should be identically segregated and sequenced to aid comparison and verification of data.

Records of direct materials should be segregated by product.

2.1.3 Verification

Stores records and stores ledgers of production materials should be agreed to physical counts each period.

Continuous stocktaking should be introduced for all high volume materials, e.g. spare parts, and records verified.

Stringent audit checks must be undertaken by an internal auditor to be recruited.

3. FINANCIAL ACCOUNTING

In our review of the financial accounting system we found that it is suitable for the needs of the Division, but requires certain amendments to the procedures to improve control and analysis.

However, there is no substitute for enlightened accounts management.

Our recommendations and proposals are discussed below under the headings:

- Accounts Department
- Machine Accounting
- Cost Centre Accounting
- Trial Balance and Profit and Loss Statement
- Fixed Assets.

3.1 Accounts Department

Below we make recommendations and proposals applicable to all the procedures carried out in the Accounts Department.

3.1.1 Organisation

It is proposed that the Accounts Department be segregated into Finance and Costing Sections, each the responsibility of an Accounts Manager.

3.1.2 Work Planning

To assist in work planning and task allocation, the work load on the clerks should be quantified in terms of the number of documents processed and records entered for each set of procedures.

Work load records should be maintained and target levels set to assess staff efficiency.

3.1.3 Training

Opportunity should be taken by the junior staff to attend the accounting courses currently being arranged with NVTI.

In addition, Volume II of this report, which provides a detailed description of the Division's systems, as amended by future developments, will serve as an aid to internal training.

3.1.4 Timetables

A procedures timetable should be introduced to assist in the timing and allocation of duties and augment a machine postings timetable.

3.1.5 Invoice Copies

Additional invoice copies can be prepared by printing un-numbered copies for insertion in the invoice pads.

3.1.6 Internal Auditor

An internal auditor should be recruited as soon as possible.

3.2 Machine Accounting

Machine accounting was reviewed in Part C, Section 3.1. Below we make recommendations and proposals.

3.2.1 Capacity Assessment

The current operating procedures and processing volume must be thoroughly reviewed by NCR field staff to ensure efficient operation and assess any surplus capacity.

3.2.2 Document Preparation

Document preparation, e.g. coding and pre-listing, must be organised to prevent down time on the machine due to lack of prepared input. Ideally as much preparation as possible should be carried out before documentation is passed to the machine room.

3.3 Cost Centre Accounting

The procedures for cost centre accounting were reviewed in Part C, Section 3.3. Our recommendations and proposals are discussed below.

3.3.1 Cost Allotment

Cost allotment of expense items currently apportioned between cost centres should be reviewed to ensure that it is equitable.

3.3.2 Product Groups

Stores issue vouchers for production materials should be identified to product groups for which the materials will be used to provide increased analysis for the proposed costing procedures.

3.3.3 Coding

Internal vouchers, e.g. stores issue vouchers, during preparation should be coded to cost centres. External vouchers, e.g. invoices for services to individual cost centres, should be coded on receipt in the Accounts Department. Expense invoices apportioned between cost centres should be processed, as now, by the chief clerk.

3.3.4 Reports

Period reports of costs allotted to cost centres, as derived from the P & L statement and its supporting schedules, should be distributed to the managers responsible for the cost centres. Actual costs will be compared with the period budget for each cost centre.

3.4 Trial Balance and Profit and Loss Statement

The procedures for preparation of the trial balance and P & L statement are reviewed in Part C, Section 3.4. Our recommendations and proposals are discussed below.

3.4.1 Pre-printed Form

The use of pre-printed forms would aid preparation of the trial balance and ensure clarity.

3.4.2 Layout

The layout of the P & L statement should be reviewed to differentiate between direct and indirect costs, the definitions of which must be clarified, and the accounts grouped on the supporting schedules to aid casting the statement totals.

3.4.3 Integration of Production Accounts

We recommend that integration of production accounts within the double-entry using standard costing procedures.

The discipline of an integrated system which operated under competent supervision, ensures timely and accurate data.

The principles of the recommended system are introduced in Section 4 and described in the Appendices.

3.5 Fixed Assets

The fixed assets records are reviewed in Part C, Section 3.5. Our recommendations and proposals are discussed below.

3.5.1 Documentation

Documentation for recording fixed assets and reporting capital expenditure is currently being reviewed for GIHOC as a whole. Standard procedures arising from this review will be implemented in due course.

3.5.2 Depreciation

All depreciation calculations must be reviewed. It is recommended that fixed assets records and depreciation should be analysed by cost centre to enable more rigorous product costing.

4. COSTING

In our review of costing, we stated that in our opinion, costing lacked the rigour expected of a Division well endowed with qualified accountants.

Our recommendations and proposals are discussed below under the headings:

- Costing Section
- Stores Accounting
- Product Costing

4.1 Costing Section

Below we make recommendations and proposals applicable to all procedures carried out in the Costing Section as proposed in Section 3.1.1.

4.1.1 Responsibilities

The Costing Section will be responsible for stores accounting and product costing.

4.1.2 Supervision

It is fundamental to the efficient and effective operation of the procedures carried out in the Costing Section that supervision is undertaken by an experienced and competent manager who fully comprehends the systems and how they can be most beneficially exploited.

4.1.3 Verification

The data recorded in the Costing Section must be subject to verification, not only as a by-product of effective supervision but by rigorous internal audit procedures.

4.1.4 Training

Opportunity should be taken by both junior and senior accounting staff to take advantage of the costing courses currently being arranged in conjunction with NVTI.

4.1.5 Timetable

The imposition of a procedure and postings timetable, an extension to that which the financial postings will be made, will ensure timely completion of routines.

4.2 Stores Accounting

The procedures for stores accounting are reviewed in Part C, Section 4.1.

4.2.1 Stores Ledgers

The introduction of stores ledgers should be expedited.

4.2.2 Titles

The stores ledger accounts for production raw materials, work in progress and finished stocks should be reviewed to aid control and analysis. The proposed accounts are listed in Appendix II.

4.3 Product Costing

The procedures for product costing are reviewed in Part C, Section 4. Our recommendations and proposals are discussed below.

4.3.1 Integrated Standard Costing

We recommend the introduction of integrated standard costing which will enable preparation of a period product group contribution statement with associated variance analysis.

The discipline of an integrated system when operated under competent supervision ensures timely and accurate data.

The principles of the recommended system are described in Appendix III.

4.3.2 Periodic Product Costing

We recommend the introduction of periodic product costing, quarterly or more frequently if appropriate, to review individual product cost structures, i.e. set and assess the accuracy of standard costs and overhead absorption. There must be close liaison between the Costing and Planning Sections.

A description of the proposed procedures is given in Appendix IV.

4.3.3 Period Cost Reconciliation

Prior to the introduction of integrated standard costing, period manufacturing costs of products for which standard costs have been set, should be reconciled in memorandum with actual costs incurred. Whilst not providing the detailed variance analysis available from a standard costing system, the suitability of current standards will be indicated.

The procedures are described in Appendix V.

4.3.4 Use of Cost Data

Product costing enables management to review product standard costs and contribution.

Accurate and analysed cost structures enable management to set realistic selling prices on uncontrolled prices and undertake negotiations with the Prices and Incomes Board in respect of controlled prices with data in which they have confidence.

5. BUDGETARY CONTROL

In our review of budgetary control we stated that in our opinion the procedures for budget preparation are inadequate and that the operating reports provide both inaccurate and insufficient information.

Our aim in making recommendations and proposals concerning budgetary control is to ensure that the Division's management is involved in budget preparation, understands the importance of budgetary control, understands the significance of the operating reports and can not only interpret management information, but can contribute to budget preparation and other planning and forecasting exercises.

Our recommendations and proposals are discussed below under the headings:

- Budget Preparation
- Period Operating Reports.

5.1 Budget Preparation

The procedures for budget preparation are reviewed in Part C, Section 5.1. Budget preparation procedures have been revised for GIHOC as a whole during 1976. Our specific recommendations and proposals are discussed below.

5.1.1 Involvement of Managers

The Division's managers must become more involved in budget preparation so that the financial budget is not prepared in isolation from operations.

Formal procedures should be instituted for budget preparation which include:

(i) the appointment of a budget committee consisting of the Division's senior managers who will consider opinions and data appropriate to the budget

(ii) the appointment of a budget officer, normally an accountant, whose role is to co-ordinate the duties of the budget committee

(iii) The adherence to an internal budget timetable, in order to achieve the target date for budget preparation set by GIHOC Head Office.

5.1.2 Quantities Budgets

Quantities budgets are fundamental to budget preparation as each area of operations will be constrained by factors which are not necessarily financial.

The following quantities budget should be prepared in detail and indicate the various combinations possible of product mix and volume:

- Sales
- Production Capacity
- Raw Materials Usage.

5.1.3 Cost Control

Opportunity should be taken during cost centre budget preparation to assess cost control exercised by managers responsible for the various cost centres.

5.1.4 Financial Analysis

During preparation of the financial budget opportunity must be taken to analyse the financial effects of variations in product mix and volume, and selling price.

This data will serve as feedback to the budget committee to show the implications of its decisions and can be used during negotiation of selling prices with the Prices and Incomes Board.

5.2 Period Operating Reports

The procedures for preparation of the period operating reports have been reviewed in Part C, Section 5.2. Our recommendations and proposals are discussed below.

5.2.1 Supervision

The preparation of the period operating reports and associated commentary must be closely supervised by the Chief Accountant.

5.2.2 Source Data

The Chief Accountant must ensure that data used for the preparation of the period operating reports is verified, both as to its arithmetic accuracy, and to the principles applied to its calculation, e.g. valuation of stores issues and stock balances and depreciation.

5.2.3 Commentary

A commentary supporting the operating reports should be explicit and rigorous in explaining variances. Ideally this commentary will be prepared by the Chief Accountant during his review of the operating statements and from his discussion with the appropriate managers prior to circulation of the reports.

5.2.4 Contribution Statement

The operating statement should be supported each period by a contribution statement as described in Appendix III.

5.2.5 Period Cost Reconciliation Report

Until the integrated standard costing system is operational, a period cost reconciliation report should be prepared as described in Appendix V.

5.2.6 Balance Sheet

A period balance sheet should be prepared as support to the operating reports.

5.2.7 Capital Expenditure Reporting

Capital expenditure reporting is currently being reviewed for GIHOC as a whole. Standard procedures resulting from the review will be implemented in due course.

5.2.8 Timetable

The operating reports should be prepared to a rigid timetable which is an extension of that to which the financial and cost accounting data is prepared.

6. IMPLEMENTATION

Implementation of approved recommendations and proposals is described below under the following headings:

- Timing
- Consulting Assistance
- Staff Requirements.

6.1 Timing

Implementation of recommendations and proposals will commence only when authorised by senior management. The majority of recommendations and proposals can readily be implemented by competent accounting management within a short time of authorisation.

6.2 Consulting Assistance

The responsibility for effective implementation is primarily that of the Chief Accountant. However, he will be entitled to seek consistance from the consulting team as it is intended that the team will be closely involved with implementation.

6.3 Staff Requirements

Given the current work load and systems, we consider the present staff members to be more than adequate, provided that there is competent supervision.

APPENDIX I

PAPERWORK VOLUMES

	October 1975	February 1976	June 1976
Sales Invoices:			
Cash	37	84	92
Credit	354	341	394
Purchase Invoices:			
Cash	22	15	14
Credit	66	96	67
Cheque Payment Vouchers	333	260	281
SIVs	445	373	435
GRNs	96	116	85

STORES ACCOUNTS

Raw Materials	- Corrugated Cases
	- Chipboard Boxes
	- Canisters
	- Polythene Bags
	- Toilet Rolls
	- Paper Bags
	- Napkins
	- Facial Tissues
	- Adding M/C Rolls
Production	- Corrugated Cases
	- Chipboard Boxes
	- Old Factory Products
Finished Goods	- Corrugated Cases
	- Chipboard Boxes
	- Canisters
	- Polythene Bags
	- Toilet Rolls
	- Paper Bags
	- Napkins
	- Facial Tissues
	- Adding M/C Rolls

Other stock accounts remain as in current practice.

INTEGRATED STANDARD COSTING

Purpose

The purpose of standard costing is to compare actual costs for a period with established standard costs of the Division's products to provide cost variance analyses for interpretation and response by management.

The standard cost of a product is the target cost based on an analytical study of its cost structure.

Integration of standard costing within the financial accounting system enables the application of a disciplined double-entry postings timetable to ensure timely and accurate preparation of cost data.

The proposed system is so designed as to enable preparation of a period product contribution statement, with associated variance analyses that can readily be agreed with the period operating statement.

Product Standard Costs

Product standard costs will be derived by evaluating the constituent elements of cost of each product at a prevailing unit standard cost, e.g. raw material cost per unit weight. Standards will be established not only for completed products but also for semi-finished products thus enabling work in progress to be readily evaluated.

The proposed elements of product standard cost are as follows:

- direct material
- direct labour
- variable production expenses.

This direct cost structure is an attempt to evaluate manufacturing at marginal cost although it is recognised that direct labour is a fixed cost.

The structure is compatible with the operating statement headings thus enabling cost of sales shown on the period contribution statement to be equal to the amount shown on the period operating statement.

On the introduction of standard costing, work in progress and finished goods will be evaluated at standard cost for balance sheet purposes. The use of this structure of standard cost for valuation is commercially prudent as well as simplifying cost account entries. However, when preparing the year-end financial accounts it will be possible if so desired, to absorb fixed overheads incurred into the valuations of work in progress and finished goods.

It is intended that the tables used for quotations will be based on standard costs.

The proposed product and product group analysis will be as is current practice, as follows:

Product Analysis		Product Groups
Corrugated Cases		Corrugated Cases
Chipboard Boxes		Chipboard Boxes
Canisters	)	
Polythene Bags	)	
Toilet Rolls	)	
Paper Bags	)	Old Factory Products
Napkins	)	
Facial Tissues	)	
Adding Machine Rolls	)	

The diagrams of the proposed systems are given on pages 6 and 7 of this Appendix and represent the flow of data on production costs; valuations of work in progress and finished goods; the calculation of variances and postings to the trading account.

Production accounts are shown for each of the product groups which are derived from the production cost centres and finished goods accounts for each product. The use of analysed journal vouchers, described subsequently, enables analysis between the cost elements. Direct material is analysed between product groups, the latter analysis avoids the major difficulty of allocation between individual products. The comparative low value of variable production expenses does not warrant further analysis. The similarity between the current work in progress accounts and the proposed direct material accounts should be noted.

The proposed variance analysis will be as follows:

- Direct Material Issue Price Variance
- Direct Material Usage Variance
- Direct Labour Efficiency Variance
- Variable Production Expense Efficiency Variance.

A guide to the interpretation of these variances is given on page 8 of this Appendix.

The system relies on the following inputs each period:

(i) cost allotments to production cost centres as derived from the cost centre expense analysis as amended to derive the materials issue price variance described below

(ii) evaluation of period-end work in progress and finished goods by product at standard cost

(iii) evaluation of finished goods transfer notes and sales invoices at standard cost.

For the period under review, the closing balances on the production and finished goods accounts for the previous period will be brought forward as opening balances. These balances represent the valuation of work in progress and finished goods at the beginning of the period.

Production cost will be debited as applicable to the production accounts. Materials will be debited to the direct materials production accounts at standard cost. Stores issue vouchers will be priced at both actual, i.e. first in first out, and at standard cost. Only the standard costs will be entered on the cost sheet analysis. The issue price variances, i.e. the differences between the totals for the period of actual and standard costs will be accumulated in a variance account and written off each period. This implies that the balance sheet valuation of raw material will be based on actual cost, although work in progress and finished goods will be valued at standard cost.

Finished goods transfer notes will be evaluated at standard, and posted between the appropriate production and finished goods accounts.

Sales invoices will be evaluated at standard cost and posted between the finished goods accounts and the trading account.

Work in progress and finished goods at the period-end will be evaluated at standard cost and credited to the appropriate production or finished goods account. Ideally, work in progress will be evaluated at standard costs based on anticipated states of completion of semi-finished products. The balance on each production account is the variance which will be debited or credited to the appropriate variance account to be subsequently written off each period.

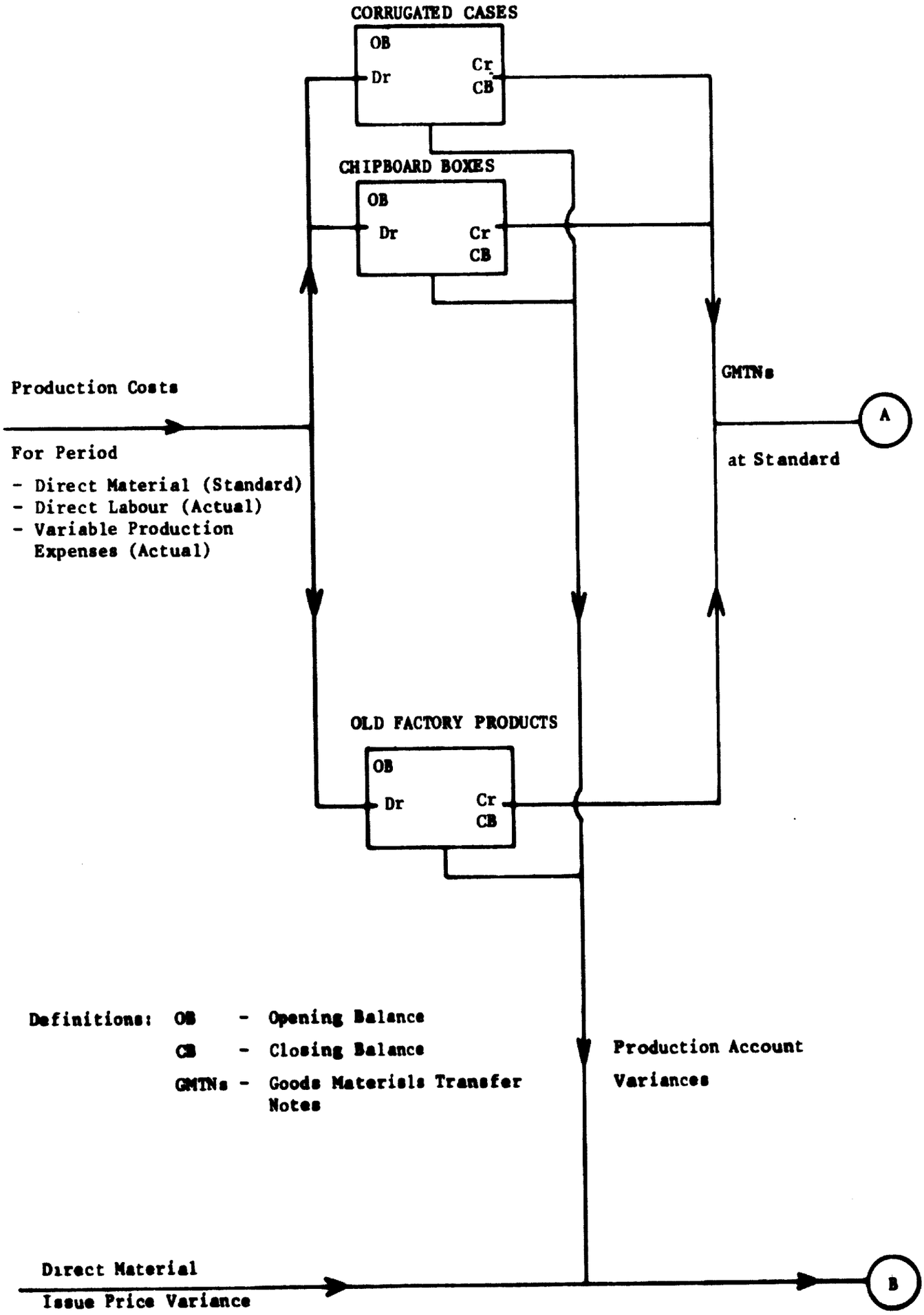
The postings to each production account will be derived on journal sheets, examples of which are shown on pages 10 and 11 of this appendix. The journals enable the postings to be analysed between the standard cost elements, i.e. labour, materials and variable production expenses, and a variance derived for each. Only the totals will be posted within the double-entry.

This analysis of variance enables preparation of a detailed period contribution statement, an example is shown on page 12. The total column contains identical entries to the period trading account within the double-entry.

Cost of sales on the period operating statement will be identical to that derived in the trading account. The direct cost headings on the operating statement will be derived by adding back the period variances to the appropriate costs and extracting the increase/decrease of work in progress and finished goods from the appropriate accounts.

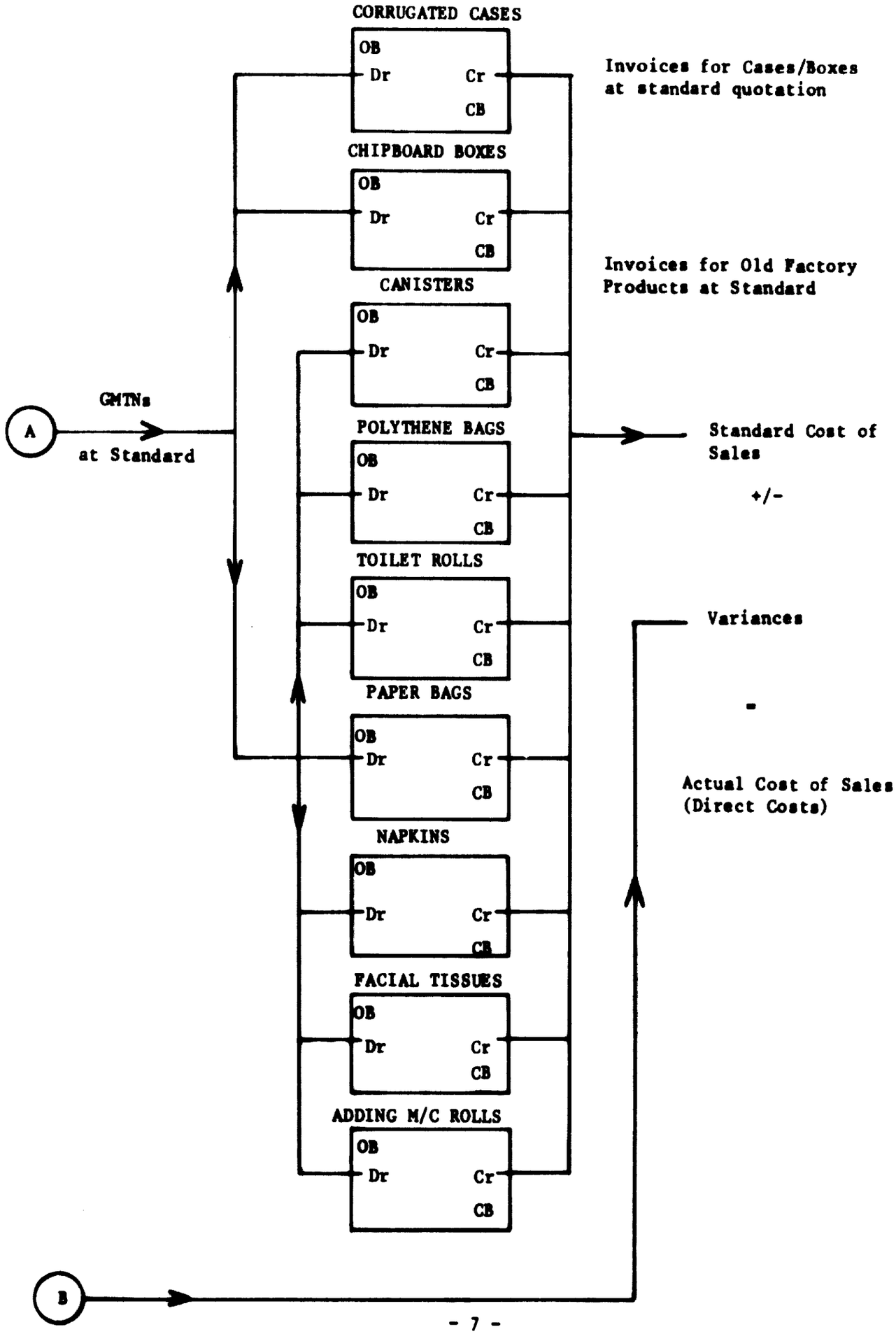
INTEGRATED STANDARD COSTING

PRODUCTION ACCOUNTS



INTEGRATED STANDARD COSTING

FINISHED GOODS



INTERPRETATION OF VARIANCES

A guide is given below to the interpretation of the following variances:

- Direct Material Issue Price Variance
- Direct Material Usage Variance
- Direct Labour Efficiency Variance
- Variable Production Expenses Efficiency Variance.

Direct Material Issue Price Variance

The direct material issue price variance is due to the actual material issue price differing from standard.

The variance reflects changes in purchase price when compared with standard. The time scale between procurement and issue to production of material may be such that this variance is inappropriate to indicate procurement efficiency, but does indicate the cost of materials currently being used in production.

Direct Material Usage Variance

The direct material usage variance is due to actual material usage differing from the allowed usage.

The allowed usage is computed by evaluating the standard direct material component of the actual production at standard cost. The actual usage is also evaluated at standard cost.

The main causes of a raw materials usage variance are as follows:

- waste or excessive scrap
- defective materials
- pilferage.

Direct Labour Efficiency Variance

The direct labour efficiency variance is due to the actual cost of labour differing from the standard cost of labour incurred in production. This variance thus includes labour rate and labour usage components. The labour rate component of the variance is caused by:

- changes in wage rates
- individual changes in specific wage rates
- use of non-standard grades of labour.

The labour usage component of the variance is caused by:

- breakdowns on machines, powercuts etc.
- changes in machine speeds
- materials not available
- changes in labour productivity
- changes in permanent labour numbers.

Variable Production Expenses Efficiency Variance

The variable production expenses (VPE) efficiency variance is due to actual expenses differing from absorbed expenses.

The absorbed expenses are computed by evaluating the standard variable production expenses component of actual production.

The main causes of a VPE efficiency variance are as follows:

- price change of expense items
- non-standard usage of expense items
- variable expenses not varying in proportion to production
- use of non-standard expense items
- non-standard use of expense items.

PRODUCTION ACCOUNT JOURNAL - OLD FACTORY PRODUCTS

PERIOD _____

	OPENING BALANCE	EXPENDITURE/ ISSUES	CLOSING BALANCE	USAGE	PRODUCTION AT STANDARD	VARIANCES
Direct Materials Canisters Polythene Bags Toilet Rolls Paper Bags Napkins Facial Tissues Adding M/C Rolls Direct Labour Variable Production Expenses						
TOTALS						

Journals:

PERIOD _____

	OPENING BALANCE	EXPENDITURE / ISSUES	CLOSING BALANCE	USAGE	PRODUCTION AT STANDARD	VARIANCES
Direct Materials Direct Labour Variable Production Expenses						
TOTALS						

Journals:

CONTRIBUTION STATEMENT

PERIOD _____

	Total	Cases	Chipboard Boxes	Old Factory Total	Canisters	Polythene Bags	Toilet Rolls	Paper Bags	Napkins	Paper Tissues	Adding Machine Rolls
Sales Revenue	£	£	£	£	£	£	£	£	£	£	£
Standard Cost of Sales											
Standard Contribution											
Variances:											
Direct Material Issue Price											
Direct Material Usage											
Direct Labour Efficiency											
VPE Efficiency											
Net Contribution											

PERIODIC PRODUCT COSTING

Purpose

The purpose of periodic product costing is to formally review the cost structures of individual products.

The reviews will be the bases for setting standard costs and thus quotation prices and will be used to assess the adequacy of those in current use. There must be close liaison between the Costing and Planning Sections.

Whilst the integrated standard costing system described in Appendix III provides feedback in the form of variance analyses, the simplifications required to enable practical application to the Division reduce the detail of cost analysis available. Similarly, the volume of paperwork that would be necessary to operate a factory batch costing system is prohibitive.

Thus it is only during periodic product costing exercises that all components of cost for an individual product can be taken into account, and even then certain simplifications are necessary to ensure a practical approach.

Cost Structure

The cost structure will consist of the same elements of prime cost described in Appendix III for product standard costs, i.e. direct material, direct labour and variable production expenses.

Having determined the unit prime cost, overhead absorption rates can be applied to determine ex-factory cost. The method and rates of absorption will be determined during implementation on a product group basis, by analysis of the relationship between product mix and volume, prime costs and overheads.

Outline of Procedures

Direct labour and variable production expenses for a period will be allotted between process outputs during the period on the basis of production times. However, we regard the recording of actual production times for period outputs as uneconomic and propose the use of standard production times. Period production will be evaluated at standard times appropriate to the product specifications and costs will be pro-rated between the products on the basis of those standard times. A key factor in the use of standard times is the assumption that they remain constant regardless of process utilisation and thus can be readily tabulated. Hence this method of cost apportionment can be applied irrespective of production mix or volume.

The standard production times will be set for each product or range of products that can be processed by each machine and will be in tabular format, to show the range of values resulting from different material grades, product weights or dimensions. Times can be obtained by studies on the factory floor and analysis of available production data.

Direct labour and variable production expenses will be allocated and rates per production hour determined for each machine process which are applied as appropriate to the table of standard times.

These rates can be amended as necessary to take into account overall production factors e.g. the availability of materials. As discussed above, this approach relies on the assumption that rated output is independent of utilisation. For example, the rates may be calculated on the assumption of 75% 'standard' machine utilisation. The rates may be increased, after due analysis, if raw material shortages are likely to cause a decrease in utilisation. It is much more convenient to change the machine/process rates than to rework the standard production times on the assumption of different machine utilisation. It is thus fundamental that calculations of standard machine times and machine/process rates are not confused and records only of derivities kept, as is the current practice.

PERIOD COST RECONCILIATION

Purpose

The purpose of period cost reconcilations will be to compare output evaluated at standard product costs with actual costs incurred. This will show whether standard product costs in general are representative of actual costs incurred. Reconciliations in memorandum should be carried out each period, prior to the introduction of integrated standard costing for those items for which standards have been set. The reconciliation of case factory costs with costed work orders should be implemented immediately.

Procedures

(i) All goods/materials transfer notes recording transfers from production to the finished goods stores and despatch area, as appropraite, will be evaluated in terms of the standard price cost, i.e. direct materials, direct labour and variable production expenses and the trend noted

(ii) If work in progress (WIP) at the beginning and end of the period under review is significant, WIP also will be evaluated at standard costs as pre-calculated for partially completed products and the trends-noted

(iii) The standard costs of production will be compared with the actual period expenditure on direct materials, direct labour and variable production expenses and variances noted

(iv) The volume of output from each production cost centre will be compared with past production rates and trends noted

(v) The labour and variable production expenses rates at each production cost centre will be recalculated for the period and compared with those recorded for previous periods and variances noted

(vi) Current overhead absorption rates will be applied to production costs and compared with actual period overheads and variances noted.

Given the approximations used, there will likely be variances to each reconciliation. However, where a large variance or a trend over successive periods is noted, this must be reported and interpreted to senior management.

VOLUME 2

ANNEXE V

FINANCIAL

SAMPLE VOLUME II REVIEW REPORT

PAPER CONVERSION DIVISION

PAPER CONVERSION DIVISION
OF GIHOC

SYSTEMS MANUAL

CONTENTS

CONTENTS PAGE

PART A

PROCUREMENT

The procedures operated in the Procurement Department are described below under the following headings:

- Overseas Purchases
- Local Purchases
- Capital Expenditure

1. OVERSEAS PURCHASES

Overseas purchases are primarily for the supply of raw materials, equipment and spare parts.

The Division's requirements for raw materials are prepared by the Procurement Manager in discussion with the Chief Accountant and the General Manager during the third quarter of each year. These requirements are based on experience of previous years.

Overseas suppliers who wish to be invited to submit quotations are requested to provide suitable samples for assessment by the Production Manager. Selected suppliers are then circulated by letter with the Division's requirements and requested to submit quotations in the form of 6 copies of a pro-forma invoice. These are evaluated on the basis of price, quality and reliability by the Procurement Manager prior to assessment by the General Manager and the Chief Accountant in discussion. Successful suppliers are notified by means of a purchase order.

Each application for a letter of credit is prepared in triplicate with one copy retained and the other two sent to the Division's bank, the Ghana Commercial Bank, Harbour Branch, with three copies of the relevant pro-forma invoices and the appropriate import licence. The award of an import licence is the prerogative of the Ministry of Industries. The Commercial and Industrial Bulletin notifies the period for application of import licences. Arrangements for the issue of import licences to the Division are made by the General Manager.

The Division's bank processes the application for a letter of credit after approval by the Bank of Ghana. On approval, the import licence will be endorsed with the amount approved. The Division's bank then requests for payment to it in cash of the required margins, the percentage of the value of each approved letter of credit as follows:

- 25% for raw materials
- 100% for machinery and spare parts

The Division's bank establishes the approved letter of credit and cables its appropriate correspondent bank to inform the supplier. A customer's advice copy is provided to the Procurement Department giving details of the letter of credit and the order is confirmed by telex to the supplier.

Records are maintained within the Procurement Department of all letters of credit awaiting establishment, established, progress on each order and of import licence utilisation.

On shipment of the goods the supplier notifies the Division by telex or letter and sends the following document copies to the Division:

- bill of lading
- 6 copies of invoice
- clean report of findings

The supplier presents the original documents to the correspondent bank in exchange for payment.

The documents are subsequently sent to the Division through the Division's bankers.

On receipt of the original shipping documents, the Division's bank notifies the Procurement Department to prepare an exchange control form A1 which must be completed prior to release of the original shipping documents and thus clearance of the goods from the port.

Prior to release, duty or import licence levy is payable at the following rate:

-	kraft paper	50%
-	tissue	20%

The bill of lading is presented to the shipping company in order to release the shipment. Payment in advance is made to the Ghana Cargo Handling Corporation (GCHC). Customs officers conduct an examination of the shipment.

The shipment is transported under the supervision of a shipping clerk from the Procurement Department by the Division's or hired transport. The GCHC issue a waybill in triplicate distributed as follows:

original	-	shipping clerk
duplicate copy) triplicate copy)	-	to be presented to port security

To cover the transfer to the Division's premises, the shipping clerk prepares an internal waybill distributed as follows:

Original	(white)	-	storekeeper
Duplicate copy	(blue)	-	driver
Triplicate copy	(yellow)	-	retained

The procedures on receipt into the stores are described in Section B.

2. LOCAL PURCHASES

Local purchases include production materials, e.g. twine and starch and spare parts.

Local purchases are initiated by means of an internal requisition (IR) prepared after ascertaining availability with the appropriate stores. The IR is prepared in triplicate, is signed by the requesting supervisor and approved by the department manager and the Chief Accountant. The copies

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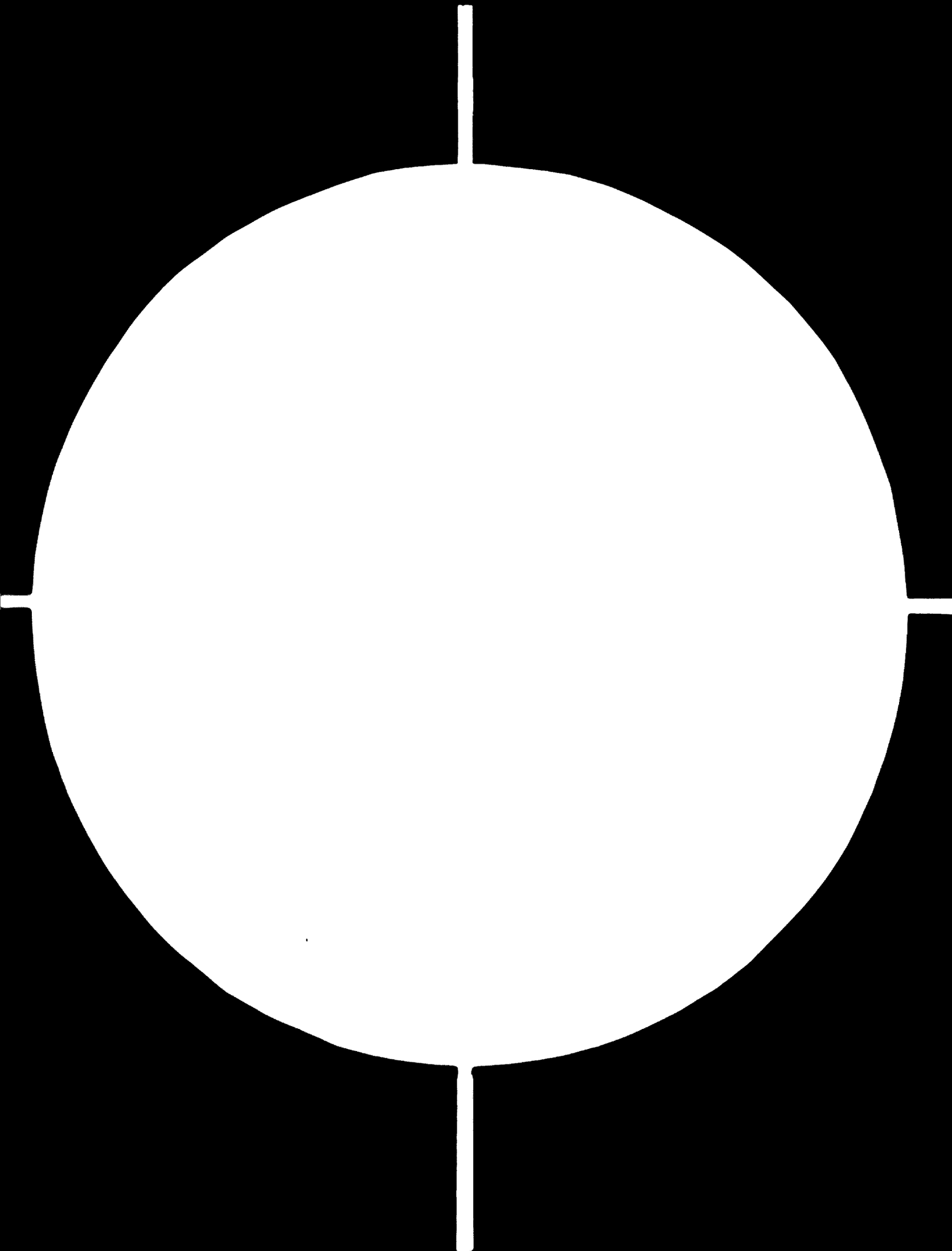

are distributed as follows:

original	-	to the Accounts Department
duplicate copy	-	to the Department Manager
triplicate copy	-	retained in the pad

Where possible, quotations or pro-forma invoices are obtained by purchasing clerks before preparation of a local purchase order (LPO). Where the item required is scarce, an open LPO is prepared.

A voucher clerk in the Accounts Department prepares the LPO to the chosen supplier in triplicate. This is approved by the Chief Accountant, Commercial or General Managers and the copies are distributed as follows:

original	(white)	-	to the supplier
duplicate copy	(blue)	-	retained in the Accounts Department
triplicate copy	(brown)	-	retained in the pad

The original copy of the IR is clipped to the triplicate copy of the LPO.

The purchasing clerk takes the original of the LPO to the supplier and collects the goods supported by a waybill, invoice and cash receipt where appropriate.

The procedures for receiving local purchase into the stores are described in Section B and for payment in Section D.

Subsequent to purchase, the duplicate copy of the LPO is attached to an Accounts Department copy of the goods received note.

3. CAPITAL EXPENDITURE

During preparation of the annual budget capital items for purchase are proposed and those agreed upon by the General Manager are submitted to Head Office for approval.

PART B

STORES

The procedures operated in the stores for the receipts and issues of goods are described below under the following headings:

- Receipt of Overseas Purchases
- Receipt of Local Purchases
- Issue from the Stores
- Receipt of Finished Goods (Case Factory)
- Despatch of Finished Goods (Case Factory)
- Receipt of Finished Goods (Old Factory)
- Transfer of Finished Goods to the Depots
- Issue and Despatch from the Depots
- Stock-taking

1. RECEIPT OF OVERSEAS PURCHASES

A shipping clerk from the Procurement Department supervises delivery of overseas purchases from the port to the Division's premises. The goods are received into the stores with a waybill (pink copy) prepared by the Ghana Cargo Handling Corporation (GCHC) and two copies (white and blue) of an internal waybill prepared by the shipping clerk at the port. The storekeeper checks the goods delivered against the waybills, signs them and gives the blue copy of the internal waybill to the driver of hired transport as support for the hire charge. The remaining copy of the internal waybill is filed in the stores and the GCHC waybill passed to the Procurement Department.

The storekeeper is provided with a copy invoice by the Procurement Department and a cost sheet by the Accounts Department to which he checks the details of the goods delivered.

The storekeeper prepares a pre-numbered goods received note (GRN) in triplicate on which are entered the following details:

- supplier
- date received
- description of goods

- quantity
- waybill number
- received by
- supplier's invoice number
- stores ledger folio

The GRN may record several deliveries from the same shipment. The GRN is distributed as follows:

original	(blue) -	to the Accounts Department
duplicate copy	(pink) -	to the Accounts Department
triplicate copy	(green) -	retained in the pad

The details and quantity of goods received are entered on the stores stock abstracts as follows:

- date
- voucher number
- details
- receipts
- balance

Major items of raw material are recorded on stores abstracts segregated by shipment.

2. RECEIPT OF LOCAL PURCHASES

A purchasing assistant supervises delivery of local purchases to the stores. The storekeeper checks the goods against the supplier's waybill/ invoice and prepares the documentation as described in Section B1. He passes the blue and pink copies of the GRN, invoice, waybill and receipt, as appropriate, to the Accounts Department.

3. ISSUE FROM THE STORES

Issue from the stores, excluding finished goods, is initiated by a factory superintendent or department manager preparing and signing a stores

issue voucher (SIV) in quadruplicate. This is submitted to the appropriate storekeeper and contains details as follows:

- from/to
- item number
- description
- gsm or ref.
- stock unit
- quantity required
- stock quantity issued
- costing details
- signatures

The issues are entered on the appropriate stores stock abstract and the SIV is distributed as follows:

original	(white) -	retained by the storekeeper
duplicate copy	(pink) -	to the Accounts Department
triplicate copy	(yellow) -	to the factory superintendent
quadruplicate copy	(blue) -	retained in the pad

Until recently, the storekeepers would price the SIVs from the cost details on the abstracts. Currently this procedure is being discontinued as stores ledgers are set up in the Accounts Department.

4. RECEIPT OF FINISHED GOODS (CASE FACTORY)

There is no separate finished goods store in the Case Factory. Finished goods are stacked on pallets in the despatch area after production is completed. Pallets are identified by tickets recording:

- general description
- work order number
- load number
- weight
- date completed
- quantity

Responsibility for finished goods, is transferred from production to despatch by means of a pre-numbered goods/materials transfer note (GMTN) prepared in quadruplicate by a production clerk and authorised by a supervisor.

The GMTN contains details which include:

- issuing dept.
- receiving dept.
- date
- quantity
- description
- job no.
- weight
- authorisation

The despatch supervisor checks the goods against the GMTN and signs the production clerk's record book denoting receipt.

The GMTN is distributed as follows:

original	(white/pink)	- retained by the despatch supervisor
duplicate copy	(blue/white)	- to the Accounts Dept.
triplicate copy	(white/pink)	"
quadruplicate copy	(white)	- retained in the pad

Details of finished goods in the despatch area are recorded in a note book.

5. DESPATCH OF FINISHED GOODS (CASE FACTORY)

An invoice and a waybill (Customs and Excise forms) are each prepared in quadruplicate by the despatch supervisor and subsequently signed by the Marketing Manager. Details of description and price are taken from the work order and details of despatch are recorded in a note book.

The waybill is distributed as follows:

original	(green) -	to the customer
duplicate copy	(orange) -	to the Accounts Department
triplicate copy	(green) -	"
quadruplicate copy	(orange) -	retained in the pad

The invoice is distributed as follows:

original	(green) -	to the Accounts Department
duplicate copy	(green) -	"
triplicate copy	(brown) -	"
quadruplicate copy	(blue) -	"

The original of the invoice is mailed to the customer after checking in the Accounts Department.

6. RECEIPT OF FINISHED GOODS (OLD FACTORY)

Finished goods manufactured in the Old Factory are transferred to the finished goods store accompanied by a pre-numbered goods/materials transfer note (GMTN) prepared in quadruplicate by a production clerk and authorised by a supervisor.

Details and quantities are recorded on stores abstracts. The GMTN is distributed as described in Section B4.

7. TRANSFER OF FINISHED GOODS TO THE DEPOTS

The transfer of finished goods from the Old Factory to the depots is initiated by preparation of an advice note by the stores supervisor on the instruction of the Marketing Manager. A GMTN is prepared as described in Section B4. and is distributed as follows:

original	(white)	- to the depot
duplicate copy	(blue)	- to the depot
triplicate copy	(white)	- to the Accounts Department
quadruplicate copy	(white)	- retained in the pad

On receipt at the depot, the goods are checked against the GMTN and the original is returned to the Old Factory and is subsequently passed to the Accounts Department.

8. ISSUE AND DESPATCH OF FINISHED GOODS FROM THE DEPOTS

An invoice and a waybill (Customs and Excise issue) are each prepared in quadruplicate by the despatch supervisor and signed by a senior depot officer. Details of description and price are taken from a price list. The quantitites issued are recorded on the appropriate store abstracts.

For cash sales, the invoice copies are stamped "Cash Paid" and a receipt given.

The invoice and waybill copies are distributed as described in Section B5 with the exception that the invoice original is passed directly to the customer.

The copies required by the Accounts Department are sent weekly from the depots.

9. STOCK-TAKING

The materials, work in progress and finished goods are physically counted each month and the stores abstracts confirmed where appropriate. The Internal Auditor makes periodic test checks.

Other stores items, e.g. spares, are counted annually.

PART C

SALES

The procedures carried out in respect of sales are described below under the headings:

- Industrial Products
- Domestic Products
- Credit Control

1. INDUSTRIAL PRODUCTS

Industrial products include corrugated cases, chipboard boxes, canisters and polythene bags. Cases and boxes are sold on the basis of quotations as described in Section G.

Canisters and polythene bags are sold at prices related to standard sizes. Prices are also dependent on customer category.

Certain customers, e.g. breweries, give large repeat orders notified by a local purchase order. New customers will go through a process of discussions, review of samples and quotation prior to a formal order.

The production schedule is agreed between the Production and Marketing Managers in discussion and a weekly schedule prepared of work orders.

On completion of production, an order is despatched from the factory as soon as transport is available as described in Section B.

2. DOMESTIC PRODUCTS

Domestic products include toilet rolls, napkins and tissues and are sold at fixed prices, depending on the customer category, from depots at Takoradi, Kumasi and Accra.

Bulk allocations of products to distributors are made by the Marketing Manager to be approved by the General Manager. Other customers can place orders at the depots and will be put on the local delivery schedule.

Goods are transferred to the depots and despatched to customers as described in Section B.

3. CREDIT CONTROL

Credit control is the responsibility of the Marketing Manager.

New customers wishing to make purchases on credit are required to name suitable referees to whom enquiry can be made. Credit limits are at the discretion of the General Manager.

On placing an order, the customer's indebtedness is reviewed. Where a customer has an overdue debt, the Marketing Manager will make a personal visit to the customer's premises. In addition, an aged debtors analysis is prepared each month from the accounting records to monitor indebtedness and aid cash collection.

Currently both credit and cash customers make deposits on placing orders to ensure priority. New customers must pay the full amount in advance. Deposits will appear as credit balances on the debtors ledger.

PART D

FINANCIAL ACCOUNTING

The procedures carried out in the Accounts Department are described below under the following headings:

- Machine Accounting
- Overseas Purchases
- Local Purchases (Credit)
- Local Purchases (Cash)
- Case Factory - Sales
- Depots - Credit Sales
- Depots - Cash Sale
- Wages and Salaries
- Accounts and Cost Centre Code
- Cost Centre Accounting
- Trial Balance and Profit and Loss Statement
- Fixed Assets Register

1. MACHINE ACCOUNTING

The nominal, personal and expenses ledgers and the payroll are all maintained on a NCR Class 400 electronic accounting system. This system comprises a programmable accounting machine which utilises magnetic stripe ledger cards. These cards are conventional visible records but with the addition of a magnetic stripe, data can be recorded on the cards and thus provide a memory which can be read and up-dated according to the programmed routines as the card is processed.

Entries are made from batched source documents, e.g. invoices, journal vouchers, receipts, debit and credit notes. The chief clerk ensures that each batch is pre-listed and is accompanied by a voucher booking summary which analyses the batch between the various account groups. He also codes the vouchers to the appropriate revenue or expense accounts and cost centres. After completion of a batch run, the proof sheet totals are verified against the pre-list. Ledger cards are in columnar format for cost centre allocation.

2. OVERSEAS PURCHASES

On receipt of the goods, the storekeeper passes the blue and pink copies of the goods received note (GRN) to the Accounts Department as described in Section B.

From details contained in the overseas purchases analyses book maintained in the Procurement Department and from examination of the copy invoices, GCHC waybills and insurance and freight documentation, the cost clerk prepares a cost sheet for each product in a shipment. Copies of the cost sheet are circulated to the General Manager, Production Manager, storekeeper, creditors section and a copy retained to which the blue copy of the GRN is attached.

The cost clerk passes to the purchases day book (PDB) clerk the pink copy of the GRN, copy invoice and appropriate GCHC waybill. The PDB clerk enters the details in the overseas PDB and passes the document set to the machine room for posting as follows:

Dr. stores accounts
Cr. foreign bills account

The document sets are filed in the machine room.

3. LOCAL PURCHASES (CREDIT)

On receipt of the goods, the storekeeper passes the blue and pink copies of the GRN invoice and waybill to the Accounts Department.

For credit purchases the PDB clerk enters details of the document set in the PDB and passes the set to the machine room for posting as follows:

Dr. stores accounts
Cr. creditors ledger

The document set is passed from the machine room to the voucher clerk who attaches the blue copy of the LPO to the set and retains it until payment

is to be made when a payment voucher is prepared in triplicate and distributed as follows:

original	-	to the cashier
duplicate copy	-	to the machine room
triplicate copy	-	retained in the pad

4. LOCAL PURCHASES (CASH)

When local purchases are made for cash the Chief Accountant is requested by a memo from the requisitioning department manager to make an advance to a purchasing clerk. Subsequently the voucher clerk prepares a cash or cheque payment voucher.

Normally up to ₵50 in cash is advanced and cheque for a larger amount. The cheque will be cashed at the appropriate bank prior to paying the supplier in cash.

The amount advanced to the purchasing clerk will be debited to his staff debtors account unless the documentation, i.e. GRN copies invoice, waybill LPO and receipt, is rendered promptly to the voucher clerk.

The voucher clerk cross checks the documentation and passes a priced GRN (pink copy) to the PDB clerk for entry in the cash purchases column of the PDB. The document set is then passed to the cashier who makes the appropriate entries.

An alternative procedure is that the goods are brought to the Division and then paid for on the same day. After cross checking the documents and entry by the PDB clerk, the voucher clerk prepares a payment voucher which is passed, after authorisation, together with the purchase documentation to the cashier for payment to be made.

5. CASE FACTORY - SALES

The waybill and invoice are both prepared and distributed by the despatch supervisor as described in Section B5. The copies for the Accounts Department are passed periodically to the sales day book (SDB) clerk in

batches and are listed serially in a note book on receipt and signed for by the SDB clerk. They are sorted into serial number order to ensure that the sequence is intact and prices and calculations are checked.

The original of the invoice is despatched to the customer. The duplicate copy of the invoice and the waybill copies are passed to the statistics clerk who despatches them, together with a summary, each month to the Customs and Excise. The triplicate copy of the invoice is passed to the machine room for posting.

On the quadruplicate copy of the invoice is entered the cost details taken from a copy of the work order which include:

- materials
- conversion cost
- margin
- sales tax
- excise duty

These details are entered together with the invoice price in the SDB which is analysed between corrugating and chipboard sections and the Accra, Takoradi and Kumasi Depots. The invoice quadruplicate copy is then filed in serial number sequence.

The SDB is balanced weekly and monthly and journals prepared for posting sales tax, excise duty, freight, carriage and net revenue.

All sales are on a credit basis although in practice sales are largely pre-paid.

6. DEPOTS - CREDIT SALES

The procedures for credit sales at the depots are similar to those at the Case Factory with the exception that the documents are checked by a senior officer and the copies for the Accounts Department are sent periodically. The customers' copies of the invoices are despatched from the depots.

The Marketing Manager, who is based at Takoradi, reviews the documents prior to passing them to the SDB clerk. Cost details are entered on the quadruplicate copy of the invoice from a product cost table.

7. DEPOTS - CASH SALES

The procedures for cash sales at the depots are similar to those described above with the exception that a cash receipt in triplicate is prepared to cover the receipt of cash and the invoice is stamped to denote a cash sale.

The waybill and invoice copies are sent to the Accounts Department as described above but accompanied by receipt copies and a paying-in slip to cover the deposit of cash at the local bank.

The invoices are recorded in the SDB as cash sales.

8. WAGES AND SALARIES

Wages and salaries are paid monthly for the period up to the 15th of each month. The junior staff payroll including casuals, is prepared in the Wages and Salaries Section. The senior staff payroll is prepared by an Accounts Manager.

The Personnel Department notify the Section of engagements, holiday periods, dismissal, retirement and sundry personnel details.

All junior staff are required to clock in and out on arrival and departure respectively. The timekeeper submits the individual clock cards to the Section for processing and provides details of working days, absenteeism and overtime. This data is recorded on individual salary advice forms on which are also recorded non-statutory deductions, e.g. staff loan repayments. These forms are used as input for preparation of the payroll and payslips on the accounting machine. Statutory deductions are automatically calculated by programmed routines.

Wages and salaries are normally paid in cash. A denomination analysis

by department is prepared for cash required. A cheque is drawn for the exact amount. The pay packets each contain a payslip and are prepared by the accounts clerks working in pairs. The packets are distributed by the accounts clerks to employees in the presence of the appropriate supervisors. On receipt of his pay packet, the employee signs or thumbprints the payroll. Unclaimed pay packets are retained by the cashier.

At the month-end journals are prepared to post the payroll totals and the following control accounts are reconciled:

- unpaid wages
- staff debtors
- payments in advance
- wages
- salaries

Social security contributions are compiled and paid monthly to the Social Security Fund. Employees' income tax is also compiled and paid over monthly to the Central Revenue Department.

9. ACCOUNTS AND COST CENTRE CODE

Ledger accounts are numbered sequentially and grouped under the following headings:

A.	Assets and Depreciation	1 - 30
B.	Security	31 - 34
C.	Merchandise Stocks	35 - 47
D.	Debtors	48 - 54
E.	Cash	55 - 65
F.	Capital	66 - 70
G.	Reserves and Provisions	71 - 76
H.	Loans	77 - 79
K.	Creditors	80 - 84
L.	Pre-payments and Accrued Liabilities	85 -
M.	Profit and Loss Account	
N.	Finished Goods	
P.	Income Surplus/Deficit	

Cost centres in current use are listed below:

CR.1	Corrugating
CH.2	Chipboard
PL.3	Polythene
OF.4	Old Factory
HQ.8	Headquarters Administration
MT.9	Maintenance
CA.10	Canteen
PW.11	Power
SD.14	Sales and Distribution

10. COST CENTRE ACCOUNTING

Cost centre accounting is within the double entry. Each earnings and expenditure ledger card is analysed between cost centres. The appropriate program tape fitted to the accounting machine equips it with the routines that enable postings to be allocated as each entry is made.

All posting vouchers for earnings and expenditure are coded to the appropriate account and cost centre by the chief clerk. The majority of items can be allotted directly to a cost centre. Listed over page are the items currently apportioned and the percentages used.

	DIRECT FACTORY					ADMINISTRATION SERVICES					SALES AND DISTRIBUTION
	CRI	CH2	PL3	CF4	TOTAL	HQ8	MT9	CA10	PW11	TOTAL	SD14
40 Management and Supervisory Salaries and Pensions	40%	3%	3%	12%	58%	42%	Actual				
57 Drivers - Wages and Pensions	40%	5%	5%	15%	70%	5%	5%			10%	20%
58 Overtime - Drivers	40%	5%	5%	15%	70%	5%	5%			10%	20%
70 Electricity and Power	55%	5%	10%	15%	85%	5%	5%	5%		15%	
73 Motor Vehicle Repairs	40%	5%	5%	15%	70%	5%	5%			10%	20%
74 Motor Vehicle Other Expenses	40%	5%	5%	15%	70%	5%	5%			10%	20%
78 Telephones	15%	2%	2%	5%	24%	37%	13%	2%		52%	24%
80 Local Rates	40%	4%	13%	25%	82%	5%	5%	5%		15%	3%
81 Ground Rent	80%				80%						20%
82 Building Rent	20.4%	0.9%	1.3%	5.0%	27.6%	37.0%	8.5%	1.8%		47.3%	25.1%
83 Building Depreciation	70%	1%	2%	15%	88%	4%	2%	5%	1%	12%	
84 Plant and Equipment Depreciation	65%	2%	12%	15%	94%	2%			4%	6%	
85 Motor Vehicle Depreciation	90%	5%	5%	15%	65%	5%	5%	5%		15%	20%
93 Workmens Depreciation	38%	3.5%	5.0%	15%	61.5%	16.0%	13.0%	3.5%		32.5%	6%
94 Insurance - Fire	56%	6%	16%	20%	98%						2%

11. TRIAL BALANCE AND PROFIT AND LOSS STATEMENT

A trial balance is prepared for each period-end and is summarised under the following headings:

- Assets and Depreciation
- Marketable Securities
- Raw Materials Stocks
- Work in Progress Stocks
- Non-trade Stocks
- Finished Goods Stocks
- Receivables and Payables
- Cash and Bank Accounts
- Provisions
- Loans and Capital
- Pre-payments
- Accruals
- Income Surplus/Deficit
- Golden Chance Raffle
- Suspense
- Revenue Control
- Expenses Control

Total accounts for raw materials, work in progress and finished goods accounts are maintained within the double-entry. Stores ledger records are currently available only for certain raw materials. The raw materials control accounts are as follows:

- Corrugating and Chipboard
- Polythene and Tins
- Old Factory

The period total of stores issue vouchers are debited as appropriate to the following work in progress (WIP) accounts:

- Corrugating
- Chipboard
- Polythene
- Tin containers
- Toilet Rolls)
- Paper Napkins) Old Factory
- Paper Bags and Wrappers)

No other costs, e.g. direct labour and variable production expenses are currenly included in the WIP accounts. WIP is physically counted at each period-end and evaluated at raw material cost. The balancing credit on each WIP account is the derived cost of production of finished goods for the period and is debited to the appropriate finished goods stock account as follows:

- Corrugating
- Chipboard
- Polythene
- Tin Containers
- Old Factory

Finished goods are physically counted at each period-end and evaluated at material and conversion cost derived either from the work orders for industrial products or standards for Old Factory products. The balancing credit on each finished goods stock account is regarded as the cost of materials consumed in sales for the period and is posted to 'Materials Consumed' in the profit and loss (P & L) statement.

The P & L statement is pre-printed and in columner format corresponding to the revenue and expense ledger cards. It is supported by schedules listing expenses for the period analysed between cost centres. The period totals on the schedules are entered against the appropriate heading on the P & L statement which also has a column for cumulatives.

"Direct Labour' includes the following accounts:

51	Salaries and Pensions	- Storemen/Storekeepers
52	"	- Factory Operators
53	"	- Dermatology Laboratory
54	"	- Casuals
55	Overtime	- Others
56	"	- Laboratories
57	Salaries and Pensions	- Drivers
58	Overtime	- "
61	Ex Gratia Payment	
67	Night Shift Allowance	

'Factory Expenses/Overheads' includes the following accounts:

70	Electricity and Power
71	Fuel, Oil and Lubricants
72	Consumable Materials e.g. starch, glue, twine, ink stitching wire and gummed tape
87	Maintenance/Repairs, Plant and Equipment
88	Plant and Equipment Rental
102	Harbour Expenses

The P & L statement is summarised in a contribution analysis which also shows overheads alloted between the production cost centres.

12. FIXED ASSETS REGISTER

Purchases of fixed assets during the year are posted without details to asset ledger cards analysed between various asset categories, e.g. factory plant and machinery and motor vehicles. The postings are cross-referenced to vouchers from which the details of the purchases can be obtained.

A fixed assets register is available to record particulars of assets in columnar format analysed between:

- Loose Tools
- Canteen Equipment

- Fixtures and Fittings
- Plant and Machinery
- Motor Vehicles

Depreciation is calculated using pre-determined rates specified by GIHOC Head Office.

PART E

CASH

The procedures used for recording cash, cheques and letters of credit are described below under the following headings:

- Bank Accounts
- Cash Books
- Receipts
- Payments
- Letters of Credit

1. BANK ACCOUNTS

Bank accounts are maintained as follows:

Letters of Credit	- Ghana Commercial Bank, Harbour Branch
Main Account	- " " " Liberation Road
Accra transactions	- " " " Liberty House
Kunasi transactions	- " " " Kejetia Branch
Treasury Bills	- Standard Bank of Ghana, Harbour Branch

2. CASH BOOKS

Cash books are maintained at Takoradi for each of the locations, i.e. Accra, Kunasi and Takoradi. These books record receipts, payments and transfers between accounts. They are balanced daily, weekly and monthly.

A single petty cash book is maintained on imprest and the floats supplied from Takoradi as follows:

Takoradi	- ₵500
Accra	- ₵150
Kumasi	- ₵100

3. RECEIPTS

Receipts are prepared in triplicate at all locations as follows:

Original	(white)	- to the customer
Duplicate copy	(green)	- to the Accounts Department
Triplicate copy	(yellow)	- retained

Cash and cheques received at the Kumasi and Accra Depots are banked locally. A copy of the paying-in slip is sent to the Accounts Department to support invoice and receipt copies.

4. PAYMENTS

Payments are supported by the preparation of payment vouchers as described in Section D and can be drawn on any of the locations. Cheque payments are accompanied by remittance advices.

5. LETTERS OF CREDIT

The procedure for application for letters of credit is described in Section A.1.

On payment of the required margin to the bank the accounting entries are as follows:

Cr.	Main Account	E57
Dr.	L of C No.2 Account	E57/2

When the goods are received, the foreign exchange cost is treated as follows:

Cr. Foreign Bills Payable Account C42
Dr. Raw Materials Accounts

The margin is transferred:

Cr. L of C No.2 Account
Dr. Foreign Bills Payable Account C42

When the balance is paid the entries are as follows:

Cr. Main Account E57
Dr. Foreign Bills Payable Account C42

PART F

STORES ACCOUNTING

The procedures for store accounting are described below under the following headings:

- Receipts and Issues
- Stores Ledgers
- Pricing

1. RECEIPTS AND ISSUES

The procedures and documentation for receipts and issues are described in Section B. In the stores, quantities are recorded on stores abstracts. Until recently, unit prices were recorded on all stores abstracts and the storekeepers were responsible for pricing of all issues documentation. Currently, this procedure applies to all items other than raw materials and consumables.

2. STORES LEDGERS

Until recently there were no stores ledgers and stores documentation, priced by the storekeepers, was posted in total to stores control accounts. Currently, manually prepared ledgers are in operation for raw materials and consumables prior to being installed on the accounting machine. Pricing of these stores issue vouchers is carried out within the Accounts Department. Ultimately all stores accounting may be processed by machine.

3. PRICING

Issues and receipts are priced as follows:

Overseas purchases	-	cost sheet
Local purchases	-	invoice
Issues	-	first in first out
Work in progress	-	standard raw material cost
Finished goods	-	materials and conversion at standard or at quotation cost.

Conversion cost is defined as direct labour, factory and general overheads.

PART G

COSTING

The procedures for costing are described below under the following headings:

- General Procedures
- Cases and Boxes
- Canisters
- Toilet Rolls
- Paper Bags
- Paper Napkins
- Facial Tissues
- Adding Machine Rolls
- Use of Costing Data

1. GENERAL PROCEDURES

Products offered to a variety of specifications, e.g. cases and chipboard boxes, are priced during quotation. Raw material quantities are evaluated in detail for each order and priced at 'standard' costs. The labour cost is evaluated using tables of costs related to product specification and quantity ordered. Overhead absorption rates are applied to the labour cost.

Products having standard specifications, e.g. toilet rolls, are costed periodically. Raw material content is assessed in detail and evaluated and other expenses are absorbed at various percentages of cost component combinations.

2. CASES AND BOXES

Costing of an order is undertaken during preparation of a quotation.

Raw material content is determined on the basis of the quantity, dimensions and material specification and is evaluated at 'standard' material costs.

Labour cost is the direct and supervisory labour content in setting and running the required processes. This cost is evaluated using tables of costs related to product dimensions and quantity ordered.

Factory and general overheads are absorbed as percentages of direct labour cost, i.e. currently proposed at 107% and 295% respectively.

A margin is applied as a percentage of total production cost, currently proposed at 17.5%.

3. CANISTERS

Canisters are manufactured at a standard diameter with various axial heights available.

Materials cost is based on batches of 1000 canisters. Material usage is estimated by the Production Manager. The components are costed at the prevailing unit prices and consist of the following:

- tin plate
- aluminium foil
- straw board
- glue

An allowance of 51% waste is made in costing tin plate usage.

Material costs, excluding that of tin plate, are prorated when costing canisters of various heights.

Other expenses are absorbed as shown below:

materials cost
+ conversion cost (25% materials cost)
= production cost
+ overheads (20% production cost)
+ packing material (transfer price)
= factory cost
+ margin (20% factory cost)
= net price
+ sales tax (11½% net price)
+ freight reserve
= ex-factory price

There is not currently a controlled price.

4. TOILET ROLLS

Materials cost is based on cartons of 50 and 100 rolls with roll weights of 160,180 or 240 gms. The components costed are listed below:

- tissue
- tube
- ink
- wrapper
- wrapper
- glue

All other expenses are absorbed as shown below:

+ conversion cost (% materials cost)
= production cost
+ overheads (% production cost)
+ packing material (transfer price)
= factory cost
+ margin (% factory cost)

= net price
+ excise duty (7.5% net price)
+ sales tax (7.5% (net price + excise duty))
+ freight reserve (estimate)
= ex-factory price

The price of toilet rolls is controlled and the percentages used for absorbing expenses are chosen so as to arrive at the controlled price.

5. PAPER BAGS

Materials cost is based on a batch of 1000 bags produced in 40 or 60 gram kraft paper. Paper and glue content per batch are costed at the prevailing unit prices and an allowance of 3% is made for waste.

The current bag sizes include the following:

	Inches
60gm	3½ x 6
	6 x 9
	8 x 13
	9 x 12
	10½ x 14
	13 x 17
	15½ x 22
40gm	3½ x 6
	6 x 9
	9 x 12
	10½ x 14
	13 x 17

Other expenses are absorbed as shown below:

materials cost (excluding packaging)
+ conversion cost (17½% materials cost)
= production cost
+ overheads (15% production cost)
= factory cost (excluding packaging)

+ margin (15% production cost)
= net price
+ excise duty (7½% net price)
+ sales tax (7½% (net price + excise duty))
+ packing material (transfer price)
+ freight reserve (estimate)
= ex-factory price

There is not currently a controlled price.

6. PAPER NAPKINS

Materials cost is based on batches of 100 packets of napkins.

Paper and ink content are costed at the prevailing unit prices.

Other expenses are absorbed as shown below:

materials cost
+ conversion cost (25% materials cost)
= production cost
+ overheads (16% production cost)
+ packing material (transfer price)
= factory cost
+ margin (20% factory cost)
= net price
+ sales tax (11½% net price)
+ freight reserve
= ex-factory price

There is not currently a controlled price.

7. FACIAL TISSUES

Materials cost is based on batches of 50 boxes per carton of 150 x 3 ply or 100 x 2 ply tissues.

Tissue costs are derived from weight evaluated at the prevailing unit cost.

Other expenses are absorbed at the rates shown below:

materials cost
+ conversion cost (25% materials cost)
= production cost
+ overheads (16% production cost)
+ packing material (imported and transfer price)
= factory cost
+ margin (17% factory cost)
= net price
+ sales tax (11½% net price)
+ freight reserve
= ex-factory price

There is not currently a controlled price.

8. ADDING MACHINE ROLLS

Materials cost is derived from weight of a roll evaluated at the prevailing unit costs. Rolls consist of the following:

- newsprint
- core

An allowance of 10% of the cost derived above is made for waste.

All other expenses are absorbed as shown below:

materials cost
+ conversion cost (82% materials cost)
+ overheads (92% materials cost)
+ packing material (transfer price)
= factory cost
+ margin (35% factory cost)
= net price
+ sales tax (11½% net price)
+ freight reserve (estimate)
+ ex-factory price

There is not currently a controlled price.

9. USE OF COSTING DATA

Costing data is primarily used for setting selling prices and for valuation of stocks of finished goods at factory cost, i.e. direct materials, labour and factory and general overheads.

PART H

BUDGETARY CONTROL

The procedures for operating budgetary control are described below under the headings:

- Budget Preparation
- Operating Reports

1. BUDGET PREPARATION

Responsibility for preparation of the budget rests primarily with the General Manager and the Chief Accountant with assistance from the Division's managers.

The sales quantities budget, prepared by the Marketing Manager, is based on analysis of past performance. The production quantities budget, prepared by the Production Manager, is based on past output achieved. Subsequently, the Division's requirement for raw materials is prepared by the Procurement Manager.

2. OPERATING REPORT

The Chief Accountant supervises the preparation of the following period reports for distribution to the Division's senior management and to Head Office.

Form		Title
HQ.1	-	Operating Statement
HQ.5	-	Debtors, creditors and stocks
HQ.8	-	Monthly Cash Forecast and Statement
HQ.6	-	Debtors analysis

The balance sheet (form HQ.2) can readily be prepared for each period.

Data for preparation of the forms is picked from the financial records, in particular from the profit and loss (P & L) statement described in Section D.11.

The P & L statement is periodically summarised in a contribution analysis which shows the operating statement headings split between the following production cost centres:

- Corrugating
- Chipboard
- Polythene/Tins
- Old Factory

The analysis also shows overheads apportioned between these production cost centres on the basis of management salaries and pensions as follows:

- Corrugating 70%
- Chipboard 5%
- Polythene/Tins 5%
- Old Factory 20%

VOLUME 2
ANNEXE VI

FINANCIAL

SAMPLE VOLUME I REVIEW REPORT

GLASS MANUFACTURING DIVISION

GLASS MANUFACTURING DIVISION
OF GIHOC

VOLUME I : REPORT

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APPENDICES

PART A

INTRODUCTION

This report is the result of an accounting consultancy assignment carried out in the Glass Manufacturing Division of GIHOC from April to June 1976, as part of a larger programme of management assistance commissioned by UNIDO from P-E Consulting Group Limited (P-E) under the United Nations Development Programme. Within the Divisions of GIHOC, P-E is required to implement a programme of changes and improvements to management practice, with particular attention to training GIHOC counterpart staff to the point of self-reliance. It is intended that this report will be followed up by assistance in implementation of approved recommendations and proposals. The team engaged on this assignment consisted of C.J.S. Baker and his GIHOC counterpart J.K. Micah.

Volume I of this report reviews and assesses the accounting and related systems in current use and sets out recommendations and proposals for their improvement and development. Volume II, which is intended to serve as a systems manual, contains a comprehensive description of the current systems on which the content of this volume is based.

The Divisional Accountant, Mr. E. Ashie-Orllenson, has reviewed and commented on both Volumes I and II. He wishes to put on record his agreement with their content, i.e. the description of the systems, their review and assessment and the recommendations and proposals for their improvement and development. He has expressed his desire for implementation to commence as soon as possible.

The team wishes to thank the managers and staff of the Division for their active co-operation and assistance during the assignment and look forward to working with them again in the near future.

C.J.S. Baker

J.K. Micah

November 1976

PART B

SUMMARY OF THE REPORT

A summary of the report is given below under the headings:

- Summary of Principal Findings
- Summary of Recommendations and Proposals.

1. Summary of Principal Findings

A summary of the principal findings discussed in Part C is given below and is cross-referenced to the appropriate sections.

(i) Procurement

All transactions are authorised and adequate records are kept of such transactions.

Amounts received by the commercial clerks against IOU's and cheque suspense vouchers are not accounted for promptly. (Part C, Section 2.1).

(ii) Stores

All receipts and issues are covered by some form of documentation.

The format of the receiving sheet requires revision.

Bin cards are not maintained for bulk raw materials. Procedures for recording cullet are not rigidly followed. Control over goods transfer notes is lax.

Period stocktaking is not properly supervised and, for certain stocks, is on a sample basis which is not systematically applied. (Part C, Section 2.2).

(iii) Sales

The sales procedures are simple and straightforward to operate.

Security over documentation is weak.

No formal procedures exist to review the granting of credit for breakages after despatch.
(Part C, Section 2.3)

(iv) Financial Accounting

The financial accounting system appears adequate for the needs of the Division but there is a need for changes and improvements to ensure efficient operation.
(Part C, Section 3).

(v) Stores Accounting

There are appropriate records and documentation for current stores accounting purposes. However, supervision over staff is lax and the procedures are not effectively controlled to ensure accuracy.
(Part C, Section 4.1)

(vi) Product Costing

Product costing operated within the Division is totally inadequate.
(Part C, Section 4.2).

(vii) Budget Preparation

The procedures for budget preparation are inadequate and confidence in the Division's budget is undermined due to the lack of both sufficient consultation between managers and the availability of supporting data on the Division's operations.
(Part C, Section 5.1).

(viii) Period Operating Reports

The period operating reports provide to the Division's management insufficient information on which to assess the Division's performance.
(Part C, Section 5.2).

2. SUMMARY OF RECOMMENDATIONS AND PROPOSALS

In Part D we make over 40 separate recommendations and proposals concerning the systems and procedures discussed in Part C. These are summarised below under main headings.

(i) Organisation

- introduction of a budget committee
- appointment of a committee to deal with customers' claims for breakages after despatch

(ii) Management Information

- introduction of period cost centre reports, contribution statement, balance sheet and capital expenditure report
- preparation of commentary to support the period operating reports

(iii) Supervision

- competent supervision to be exercised over stores accounting and costing
- close control by accounts management over preparation of accounting reports

(iv) Training

- storekeepers and accounts clerks to take advantage of training courses

(v) Timetables

- imposition of and adherence to procedures and postings timetables

(vi) New Systems, Procedures and Documentation

- confirmation orders to be pre-numbered and copies passed to the Accounts Department
- daily reports instituted on IOU's and cheque suspense vouchers
- replacement of current stores receipts documentation by standard format GRN's
- bin cards and ledger cards opened for bulk materials
- introduction of cost centre codes and voucher coding prior to posting
- expansion of cost centres to include production processes
- revision of fixed assets register
- introduction of integrated process costing subsequently developed to use standard costs
- introduction of periodic product costing to formally review product cost structures

(vii) Improved Data Availability and Analysis

- cullet from all sources to be quantified
- cullet which cannot be reused must be identified as scrap
- expenses differentiated between direct and indirect and consistently used in costing, period reporting and budget preparation
- preparation of quantities budgets
- financial analysis during budget preparation

(viii) Verification

- quantities recorded on stores ledger cards to be regularly agreed with the bin cards and audit checks instituted

- continuous stock-taking introduced for the technical stores
- weight of bulk materials to be estimated each period, e.g. by empirical formulee
- depreciation calculations to be reviewed
- accounts management to ensure that source data used for costing and reporting is both accurate and correctly applied.

PART C

COMMENTARY ON THE ACCOUNTING AND RELATED SYSTEMS

1. INTRODUCTION

To assess the efficiency and effectiveness of the accounting and related systems operated within the Glass Manufacturing Division it was necessary to prepare a description of these systems. No manual of accounting was available for the Division and no one person was in a position to relate all the procedures in the systems.

A series of interviews was undertaken with not only accounting staff but staff in related departments e.g. Commercial and Sales.

A comprehensive description was prepared of these systems and is Volume II of this report. The description was reviewed and commented on by the appropriate managers to confirm its accuracy. It is intended that this description will serve as a bases for the Division's Systems Manual.

In this part of the report we state our opinions on the existing accounting and related systems. Our commentary is under the following headings which accord with the sequence of systems descriptions in Volume II:

- Related Systems
- Financial Accounting
- Costing
- Budgetary Control

We make our recommendations in Part D.

2. RELATED SYSTEMS

The procedures for the related systems are described in detail in Volume II, Section A, B and C.

These procedures are discussed below under the following headings:

- Procurement
- Stores
- Sales

2.1 Procurement

The procedures carried out in the Procurement Section of the Commercial Department are described in detail in Volume II, Section A.

The procedures operated are straightforward and within the competence of the commercial staff.

All transactions are authorised and adequate records are kept of such transactions.

Adequate supervision is exercised over the preparation of documentation for overseas purchases. Confirmation orders are prepared in respect of all chosen overseas suppliers. However, such orders are not pre-numbered and the Accounts Department is not given a copy of the order to enable the Divisional Accountant to prepare against the financial implications of the order. Further, the security and custody of the confirmation orders is inadequate.

No local purchase orders are prepared for cash purchases. Cheques for cash purchases are frequently issued in the name of the purchaser who cashes the cheque prior to payment. Amounts received by the commercial clerks against IOU's and cheque suspense vouchers for cash purchases are not accounted for promptly. As at 9th April 1976, outstanding IOU's amounted to ¢967 out of which ¢485 had been outstanding since 19th December 1975, and unsettled cheque suspense vouchers amounted to ¢20,534.85, some of which had been outstanding since November 1975. Management's control of cash purchases, hence, is inadequate.

2.2 Stores

The procedures for the receipts are issues of stores are described in detail in Volume II, Section B.

All receipts and issues are covered by some form of documentation. Prior to entry on the bin cards, goods received are recorded on a receiving sheet (RS), the Division's equivalent of a goods received note. However, the format of the RS duplicates in part the waybill but excludes suitable headings to record data on both overseas and local purchases. The RS should be replaced by a standard format goods received note.

Bin cards are maintained for all items except bulk raw materials, i.e. sand, shells and cullet. Although likely to be approximate, the introduction of bin cards for these bulk materials would inject discipline into control over them.

Procedures are available for recording cullet but are not rigidly followed due to lack of competent supervision. Cullet obtained from furnace drainage is not weighed and that obtained from the subsequent processes is weighed and recorded incompetently.

The goods transfer notes are not pre-numbered and supervision over their preparation and distribution is lax. The forwarding storekeeper does not acknowledge by signature the goods received from production.

Monthly stock-taking is not properly supervised and, for certain stocks, is on a sample basis which is not systematically applied. No periodic audit checks are undertaken of the stores ledger cards. Entries on bin cards are not initialled by the storekeeper, thus in cases of error it is difficult to locate responsibility.

2.3 Sales

The procedures adopted in respect of sales are described in detail in Volume II, Section C.

The sales procedures are simple and straightforward to operate.

Adequate records and statistics are maintained and strict supervision is exercised over the staff. However, security over the sales documentation is week. In particular, the loading premit is loose-leaved and not pre-numbered.

In addition, no formal procedures exist to review the granting of credit for breakages after despatch.

3. FINANCIAL ACCOUNTING

Financial accounting procedures are described in detail in Volume II, Sections D and E.

The books maintained for the Division's financial accounting system are those for a conventional manual double-entry system with separate day books, personal and a general ledger supported by subsidiary ledgers.

The original documents are likewise conventional and are comprehensive in their cover of both internal and external transactions. Control accounts are kept for all the ledgers and each ledger is balanced every month.

All sales and purchases documentation and wages and salaries are subject to some form of checking and authorisation by senior management.

However, though the financial accounting system appears adequate for the needs of the Division, we believe there is still need for the changes and improvements to ensure efficient operation. In Part D, we make recommendations and proposals for the improvement of the accounting procedures which are discussed below under the following headings:

- Operation of the Financial Accounting Procedures
- Accounts and Cost Centre Code
- Books of Account and the Trial Balance
- Wages and Salaries Preparation
- Fixed Assets

3.1 Operation of the Financial Accounting Procedures

The operation of the financial accounting procedures is straightforward and within the level of competence of the staff employed. However, there is no accounting manual and training is passed on by word of mouth. When key staff leave it is unlikely that they will have imparted to their substitute, if available, all details of their work. It is intended that Volume II, as amended by future developments will serve as an aid to staff training.

The volume of paperwork processed is shown in Appendix I. The volume of the majority of the vouchers is low in relation to the staff available. There is no postings timetable to discipline posting and to ensure completion of the month-end balancing earlier than the current two to three weeks after the month-end.

3.2 Accounts and Cost Centre Code

The code is incomplete as there is no cost centre code.

Vouchers are not coded prior to posting and this significantly reduces the speed of processing.

3.3 Books of Account and the Trial Balance

A single manufacturing account and separate finished goods accounts for pressed and hollow glass are included in the general ledger and thus cost of sales can be calculated within the double-entry. However, these procedures are unsatisfactory as they are based on unsubstantiated assumptions due to lack of adequate production data notably:

(i) the unit cost of glass for a period is the same in both hollow and pressed glass processes

(ii) the value of furnace work in process, i.e. molten glass, is constant and there is no other work in process.

It is unreasonable to assume the same unit cost of glass from furnaces of different specifications. The process cost of finished products will not be dependent only on the weight of glass in each product. Work in process is constant only when the production is truly continuous.

Finished goods are currently valued at unit selling prices as these are lower than unit production costs.

In Part D, we recommend a process costing system which will enable more equitable accounting of production.

Cost centre accounting is integrated within the double-entry. Vouchers are posted to expense headings in the expenses ledger and in parallel also analysed to cost centres in analysis books from which the departmental cost analysis (DCA) is prepared. From the DCA is derived a journal clearing the expenses ledger to the operating statement headings in the general ledger. However, the lack of voucher coding delays cost centre allotment in the analysis books. The cost centre analysis is not disclosed to the managers responsible for the cost centres, who, in any case, are not cost responsible. As the analysis is not used to assess cost control, there is not the incentive to ensure meaningful and equitable expense allotment.

The sequence of accounts aids preparation of the operating statement but not the balance sheet. It is inconvenient during preparation of the trial balance that the sales revenue accounts are not included within the general ledger. The trial balance is not prepared on a pre-printed form which would speed preparation and aid clarity.

3.4 Wages and Salaries Preparation

The Division's Burroughs accounting machine was used for payroll preparation but has been out of action since January 1975. Thus the payroll (700 employees) is currently prepared manually which imposes a large volume of clerical processing with attendant risk of error.

The security over payroll records is lax. Supervision of staff is lax. There is inadequate checking of payroll calculations.

The format of the personal earnings record card is inappropriate and requires revision to replace inactive columns, e.g. bonus, by columns for the various allowances.

Pay slips are not issued with pay packets.

Employees records and statements for social security contributions are not kept up to date.

3.5 FIXED ASSETS

Fixed assets registers, with the exception of that for motor vehicles, are non-existent.

With the exception of motor vehicles, there is no identification tag denoting ownership on any of the Division's property.

Depreciation calculations are most suspect.

4. COSTING

Within the Costing Section there are two main activities carried out which are discussed below under the headings:

- Stores Accounting
- Product Costing

4.1 Stores Accounting

The procedures for stores accounting are described in Volume II, Sections F and G.

Stores accounting for raw materials and finished goods is within the double-entry. Work in process at the end of each period is a constant since it is assumed to consist of a fixed quantity of molten glass in the furnaces evaluated at a standard cost.

Stores ledger cards recording physical quantities and values are kept in a cardex in the Costing Section. There are no cards for sand, shells or cullet. Entries by the stores ledger clerks are made from receiving sheets and stores issues vouchers. The clerks operating the procedures appear sufficiently competent and conscientious given their level of attainment. However such entries are inadequately supervised and not checked to ensure accuracy.

No month-end reconciliation takes place between the quantity balances on the bin cards and those on the stores ledger cards.

All issues of raw materials and stores are costed and alloted to cost centres in the raw materials analysis book and the departmental issues analysis book respectively. Again, this analysis and costing is inadequately supervised and not checked to ensure accuracy.

In conclusion, we consider that there are appropriate records and documentation for current stores accounting purposes. However, supervision over staff is lax and the procedures are not effectively controlled to ensure accuracy.

4.2 Product Costing

The procedures for product costing are described in Volume II, Section H.

Production cost statements are prepared infrequently in memorandum. These are the basis of product costing. Production costs and overheads for the period are related to output weight to derive the period cost per tonne of good formed glass. Product unit costs are determined by evaluating the product weight at this period cost per tonne.

There is limited differentiation between pressed and hollow glass production and individual process or product costs are not considered. In addition, as discussed in the previous section, raw materials issue data can be suspect.

This approach to costing is ineufficiently rigorous and ie unable to provide either the accuracy or the detail normally required by management for cost control or pricing purposes.

To cost products effectively, a costing system must be able to evaluate production in sufficient detail so that all major cost factors are accounted for and related to the individual products. The glass industry is one of those industries where the largest component of process cost is 'variable production expenses'. The equitable treatment of this component is fundamental to arrive at realistic product costs.

Thus, we consider that product costing operated within the Division is totally inadequate and in Part D we propose the introduction of formal costing procedures.

5. BUDGETARY CONTROL

The procedures for operating budgetary control are described in Volume II, Section I. They are diecussed below under the headings:

- Budget Preparation
- Period Operating Reports

5.1 Budget Preparation

Responsibility for budget preparation has remained primarily with the Divisional Accountant who receivee very limited assistance from the Division's managers.

Quantities budgets are prepared by the Divisional Accountant. This situation reflects adversely on the competence of the appropriate managers.

The Division operates within a seller's market and thus the only major constraint on sales is output. It is understood that output from the Division's plant has never achieved more than 50% of theoretical capacity and thus profitable operation with the current plant and facilitiee is unlikely at current selling prices. However, effective budgetary control based on accurate product costing can assist management in reducing losses.

The major constraints on output are:

(i) the capacity of the Division's plant and facilities
(ii) the effective utilisation of this plant and facilities
(iii) the availability of raw materials and spare parts partially dependent on,
(iv) the size of the annual import licence and its timing

Statistics on plant capacity and utilisation are not readily available although data can be obtained by management with little effort. This lack of data prevents production programming which would be the baeis of a production quantities budget.

The lack of rigorously derived product cost structures prevents comparison of product contributions and thus eelection of optimum product mix and volume.

The differentiation between fixed and variable production expenses used in budget preparation cannot be substantiated and is not in agreement with the definitions used in the period operating statements.

As discussed in Section 3.3 the costs incurred by cost centres are not reported on to the appropriate managers, who apart from not exercising cost control, and in turn being assessed on their ability to do so, are not able to contribute to budgeting these costs.

In conclusion, it is our opinion that the procedures for budget preparation are inadequate and confidence in the Division's budget is undermined due to the lack of both sufficient consultation between managers and the availability of supporting data on the Division's operations.

5.2 Period Operating Reports

The period operating reports are all prepared in terms of value by extracting data from the appropriate financial records. Reports on cost centre expenditure are not prepared.

The operation of the manufacturing and finished goods accounts is discussed in Section 3.3 in which we state that the procedures are unsatisfactory. In Part D proposals for the introduction of process costing are made which will provide more detailed information than currently available from the production cost report, and in particular provide a period contribution statement.

Accounting ratios are calculated each period but no commentary is prepared to support the operating reports and provide explanation, particularly to the non-accountant, of the period results.

We consider that the period operating reports provide to the Division's management insufficient information on which to assess the Division's performance.

PART D

RECOMMENDATIONS AND PROPOSALS

1. INTRODUCTION

The accounting and related systems operated within the Glass Manufacturing Division have been reviewed and assessed in Part C of this report. In consequence, we make a number of recommendations and proposals for improvement and development of these systems.

Our objective is to make such improvements to the systems as will enable them to operate more efficiently, produce more accurate and adequate data and are consistent with the proposed rehabilitation of plant and facilities.

In the following sections, our recommendations and proposals are described in the same sequence as in Part C.

2. RELATED SYSTEMS

In our review of the related systems, we commented on a number of aspects of these systems, some of which adversely affected the operation of the accounting systems.

Our recommendations and proposals are discussed below under the headings:

- Procurement
- Stores
- Sales

2.1 Procurement

In this section we make recommendations and proposals applicable to the procedures carried out in the Procurement Section of the Commercial Department.

2.1.1 Confirmation Orders

It is recommended that confirmation orders be pre-numbered and that copies of confirmation orders should be passed to the Accounts Department to enable the Divisional Accountant to prepare against the financial implications of the order, e.g. by cash flow forecasting.

2.1.2 Cash Purchases

A local purchase order duly marked 'Cash Purchase' should be prepared in respect of each cash purchase.

In addition, a determined effort should be made by the Division's management to obtain credit facilities from suppliers of recurrent items. Such a move will reduce the unnecessarily high incidence of cash purchasing.

The practice should cease, except in abnormal circumstances, whereby cheques for cash purchases are drawn in the name of the commercial clerk making the purchase. Such cheques should be drawn in the name of the supplier on production of a proforma invoice by the procurement clerk.

2.1.3 Settlement of IOU's and Cheque Suspense Vouchers

It is recommended that the Divisional Accountant ensures that all monies advanced against IOU's or cheque suspense vouchers are settled promptly.

Daily reports on the position of IOU's and cheque suspense vouchers should be prepared by the Accounts Manager on pre-printed forms for the attention of the General Manager.

2.2 Stores

In this section we make recommendations and proposals applicable to the procedures carried out in the stores.

2.2.1 Documentation

It is proposed that a goods received note of standard format as shown in Appendix II be introduced to replace the receiving sheet currently used.

Bin cards should be introduced for all items to include sand, shells and cullet. Estimates must be made of the current quantities for entry as the opening balances on the cards.

The goods transfer note should be pre-numbered and strict supervision exercised over its preparation by the shift masters.

Each entry on the bin cards must be initialled by the appropriate storekeeper to facilitate the location of responsibility in case of errors or fraud.

2.2.2 Training

Opportunities should be explored for storekeepers and other associated with the stores to attend short courses on storekeeping.

2.2.3 Verification

Quantities recorded on the stores ledger cards should be regularly agreed with the bin cards.

It is recommended that the internal auditor undertakes surprise audit checks of bin cards and stores ledger cards.

2.2.4 Cullet

Cullet from all sources must be quantified, e.g. by weighing or by calculation before being stored and appropriate documentation completed. Cullet which cannot be reused must be identified as scrap.

2.2.5 Stock-taking

It is proposed that continuous stock-taking procedures be introduced in the technical stores.

Procedures should be instituted to enable weight of bulk materials which are stored in piles, hoppers or bins, e.g. sand shells and cullet to be competently estimated each period. Empirical formulae can be used to relate dimensions with weight.

2.3 Sales

In this section we make recommendation and proposals applicable to procedures carried out in the Sales Department.

2.3.1 Documentation

The custody and security over sales documents should be strengthened. In particular, the loading permit should be pre-numbered.

2.3.2 Refunds for Breakages

It is proposed that a standing committee comprising the Internal Auditor, the Production Manager and the Sales Manager be appointed to deal with matters relating to customers' claims for breakages of goods after despatch.

The committee, under the chairmanship of the Internal Auditor will conduct inspection of the breakages, assess their value and make recommendations to the General Manager for approval.

Where the amount involved is more than $2,000, it is recommended that the approval is sought from the Head Office before credit is granted.

3. FINANCIAL ACCOUNTING

In our review of the financial accounting system we found that the system is adequate for the needs of the Division, but there is need for changes and improvements to enable the system to operate more efficiently.

Our recommendations and proposals are discussed below under the headings:

- Finance Section
- Accounts and Cost Centre Code
- Books of Account and the Trial Balance
- Wages and Salaries Preparation
- Fixed Assets

3.1 Finance Section

We make recommendations and proposals below which are applicable to all procedures carried out in the Finance Section.

3.1.1 Training

Opportunity should be taken by the junior staff to attend the accounting courses currently being arranged in conjunction with NVTI.

It is intended that Volume II of this report, which contains a detailed description of the Division's accounting systems and procedures, will serve as an accounting manual which will be used in conjunction with job descriptions for staff training.

3.1.2 Timetable

It is recommended that a procedures and postings timetable be introduced and enforced to inject discipline and increase productivity.

3.1.3 Steff Supervision

The Accounts Manager should exercise strict supervision over the accounts staff and maintain discipline.

3.1.4 Accounting Machine

Repair or replacement of the accounting machine should be expedited.

Opportunities should be explored to machanise financial accounts, e.g. the creditors and debtors ledgers.

3.2 Accounts and Cost Centre Code

The accounts code is reviewed in Part C, Section 3.2. Our recommendations and proposals are discussed below.

3.2.1 Cost Centre Codes

It is recommended that the cost centre be expanded to identify production processes and a code introduced as shown in Appendix III.

The layout of the cost centre analysis sheets should be revised to include these cost centres as shown in Appendix IV. Expenses must be differentiated between direct or indirect and used consistently in costing, period reporting and budget preparation.

3.2.2 Voucher Coding

Vouchers should be coded to expense and cost centre prior to posting.

3.3 Books of Account and the Trial Balance

The procedures for preparation of the books of account and the trial balance are reviewed in Part C, Section 3.3. Our recommendations and proposals are discussed below.

3.3.1 Integration of Process Accounts

We recommend the integration of process accounts with the financial accounts. This will enable the calculation of costs of production and sales within the double-entry.

The discipline of an integrated system, when operated under competent supervision, ensures timely and accurate data.

The principles of the recommended system are introduced in Section 4 and described in the appendices.

3.3.2 Trial Balance

The sequence of accounts and thus the layout of the trial balance should be revised to aid balance sheet preparation.

The use of pre-printed forms would speed preparation of the trial balance and ensure clarity.

3.4 Wages and Salaries Preparation

The procedures for wages and salaries preparation are reviewed in Part C, Section 3.4. Our recommendations and proposals are discussed below.

3.4.1 Custody of Records

Strict control must be exercised over the location of and access to payroll records.

3.4.2 Supervision

Strict supervision must be exercised by a senior accounts clerk over preparation of the payroll and rigorous checks instituted.

3.4.3 Documentation

It is recommended that the format of the personal earnings records be redesigned to include columns for discomfort allowance, deep night allowance and tool allowance. This will facilitate preparation and minimise the incidence of computational errors.

Employees' records and statements for social security contributions should be brought up to date.

3.4.4 Pay Slips

Employees must be given pay slips recording their gross pay and deductions.

3.5 Fixed Assets

The lack of fixed assets records is discussed in Part C, Section 3.5. Our recommendations and proposals are discussed below.

3.5.1 Documentation

Documentation for recording fixed assets and reporting capital expenditure is currently being reviewed for GIHOC as a whole. Standard procedures arising from this review will be implemented in due course.

3.5.2 Depreciation

All depreciation calculations must be reviewed.

4. COSTING

In our review of costing in Part C, we found that the costing systems and procedures are inadequate for the needs of the Division and that there is a lack of supervision and verification.

Our recommendations and proposals are discussed below under the following headings:

- Costing Section
- Stores Accounting
- Product Costing

4.1 Costing Section

Below we make recommendations and proposals applicable to all procedures carried out by the Costing Section.

4.1.1 Organisation

The Costing Section should be organised under an Accounts Manager.

The section will be responsible for stores accounting but product costing would, for the meantime, be undertaken by the Accounts Manager.

4.1.2 Training

Opportunity should be taken by the cost clerks to attend costing courses being arranged in conjunction with NVTI.

4.1.3 Timetable

The imposition of a procedures and postings timetable, an extension to that which the trial balance is prepared, will ensure timely completion of the costing routines.

4.2 Stores Accounting

The procedures for stores accounting are reviewed in Part C, Section 4.1.

4.2.1 Supervision

Entries on the stores ledger cards and the costing, coding and posting of stores issues documentation should be closely supervised.

4.2.2 Reconciliation

Balances on the bin cards should be extracted and reconciled with the stores ledger card balances for production materials at the end of each month and for all items periodically to ensure accuracy and that document cut-off is observed.

4.2.3 Sand, Shells and Cullet

Stores ledger cards should be opened for sand, shells and cullet. All receipts and issues should be documented.

4.2.4 Batch Issues

Batches will be included in work in process only when transferred to the furnaces. When evaluating stocks, materials remaining in the batch house will be added back to unissued materials.

4.2.5 Screen Printing

Prior to screen printing, the appropriate output from the annealing 10 hours is stored. Ledger cards must be instituted for these items.

4.3 Product Costing

The procedures for product costing are reviewed in Part C, Section 4.2. Our recommendations and proposals are discussed below.

4.3.1 Integrated Process Costing

We recommend the introduction of integrated process costing which will enable costs to be alloted to production processes such that output from each process can be costed within the double-entry.

The discipline of an integrated system when operated under competent supervision, ensures timely and accurate data.

The principles of the recommended system are described in Appendix V.

4.3.2 Integrated Process Standard Costing

When the rehabilitation programme has been completed and more consistent production is possible, we recommend that process costing should operate with standard costs. Process cost variance analyses will then be available for interpretation and response by management.

The proposed system described in Appendix VI is so designed as to enable preparation of a period product group contribution statement with associated variance analyses, that can readily be agreed with the period operating statement.

4.3.3 Periodic Product Costing

Periodic product costing refers to a formal comprehensive review of the Division's product cost structures particularly during the introduction of standard costs, selling price reviews and annual budget preparation.

A review of product process costs requires special attention to the bases of direct cost allotment between products and will be necessary on introduction and subsequent review of standard process costs.

Product overhead absorption rates must be reviewed to ensure that selling prices are based on equitable ex-factory cost calculations. The bases of overhead absorption will be determined during implementation by analysis of product mix and volume, process costs and overheads.

5. BUDGETARY CONTROL

In our review of budgetary control we stated that in our opinion the procedures for budget preparation, in particular, are inadequate and that the operating reports provide insufficient information.

Our aim in making recommendations and proposals concerning budgetary control is to ensure that the Division's management is involved in budget preparation, understands the importance of budgetary control, understands the significance of the operating statements and can not only interpret management information but can contribute to budget preparation and other planning and forecasting exercises.

Our recommendations and proposals are discussed below under the headings:

- Budget Preparation
- Period Operating Reports

5.1 Budget Preparation

The procedures for budget preparation are reviewed in Part C, Section 5.1. Budget preparation procedures have been revised for GIHOC as a whole during 1976. Our specific recommendations and proposals are discussed below.

5.1.1 Involvement of Managers

The Division's managers must become more involved in budget preparation so that the financial budget is not prepared in isolation from operations.

Formal procedures should be instituted for budget preparation which include:

(i) the appointment of a budget committee consisting of the Division's senior managers who will consider opinions and data appropriate to the budget

(ii) the appointment of a budget officer, normally an accountant, whose role is to co-ordinate the duties of the budget committee

(iii) the adherence to an internal budget timetable in order to achieve the target data for budget preparation set by GIHOC Head Office.

5.1.2 Quantities Budgets

Quantities budgets are fundamental to budget preparation. They should be prepared in detail for sales, production and raw materials requirements and indicate various combinations of product mix and volume.

The effects of the non-availability of imported raw materials should be anticipated.

5.1.3 Cost Control

Cost centre expenditure should be budgeted and opportunity taken during cost centre budget preparation to assess cost control exercised by the cost centre managers or senior management where appropriate.

5.1.4 Financial Analysis

During master budget preparation opportunity must be taken to analyse the financial effects of variations in product mix and volume and selling price. Unit product standard costs should be reviewed and revised if necessary.

This data will serve as feedback to the budget committee to show the implications of its decisions and also serve as additional information during negotiation of selling prices with the Prices and Incomes Board.

5.2 Period Operating Reports

The procedures for preparation of the period operating reports have been reviewed in Part C, Section 5.2. Our recommendations and proposals are discussed below.

5.2.1 Supervision

The preparation of the period operating reports and associated commentary must be closely supervised by the Divisional Accountant.

5.2.2 Source Data

The Divisional Accountant must ensure that data used for the preparation of the period operating reports is verified both as to its arithmetic accuracy and to the principles applied to its calculation, e.g. valuation of stores issues and stock balances and depreciation.

5.2.3 Commentary

A commentary should be prepared as support for the operating reports and be explicit and rigorous in explaining variances. Ideally this commentary will be prepared by the Divisional Accountant during his review of the results of the period and from his discussions with the appropriate managers.

5.2.4 Contribution Statement

The operating reports should be supported by a contribution statement as described in Appendices V and VI.

5.2.5 Cost Centre Reports

Period reports of costs alloted to cost centres, comparing actual costs with budget, should be distributed to managers responsible for the cost centres.

5.2.6 Balance Sheet

A period balance sheet should be prepared as support to the operating reports.

5.2.7 Capital Expenditure Reporting

As discussed in Section 3.5.1 capital expenditure reporting is currently being reviewed for GIHOC as a whole. Standard procedures resulting from the review will be implemented in due course.

5.2.8 Timetable

The operating reports should be prepared to a rigid timetable, an extension to that which the financial and process costing data is prepared.

6. IMPLEMENTATION

Implementation of approved recommendations and proposals is described below under the following headings:

- Timing
- Consulting Assistance
- Staff Requirements

6.1 Timing

Implementation of recommendations and proposals will commence only when authorised by senior management. The majority of recommendations and proposals can readily be implemented by competent accounting management within a short time of authorisation.

6.2 Consulting Assistance

The responsibility for effective implementation is primarily that of the Divisional Accountant. However, he will be entitled to seek assistance from the consulting team as it is intended that the team will be closely involved with implementation.

6.3 Staff Requirements

Given the current work load and systems, we consider the present staff members to be more than adequate, provided that there is competent supervision.

APPENDIX I

PAPERWORK VOLUMES

		JUNE '75	OCTOBER '75	FEBRUARY '76	JUNE '76
Sales Invoices	: Cash	34	40	11	7
	: Credit	38	30	31	37
Payments Vouchers	: Cash	125	163	131	150
	: Cheques	134	135	120	126
Stores Issues Vouchers		392	376	444	471
Goods Transfer Notes		90	80	82	95
Purchase Invoices	: Cash	35	41	32	37
	: Credit	127	133	78	89
Waybills		75	69	71	81

From ..... TO .....STORES DATE

FOR STORES USE			DESCRIPTION	WAYBILL NO.	UNIT/ PACKAGE	FOR STORES USE		FOR ACCOUNTS USE	
CODE	OPENING STOCK	ORDER NO.				QUANTITY RECEIVED	STOCK BALANCE	UNIT PRICE	VALUE

Carrier's Name: .....

Invoice Nos: .....

Received by: .....

Remarks: .....

.....

GOODS RECEIVED NOTE

APPENDIX II

COST CENTRE CODES

Batch House		BH
Hollow Glass A		HG-A
"	Melting Furnace	HG-A-MG
"	Forming	HG-A-F
"	Annealing Lehr	WG-A-AL
Hollow Glass B		HG-B
"	Melting Furnace	HG-B-MF
"	Forming	HG-B-F
"	Annealing Lehr	HG-B-AL
Pressed Glass		PG
"	Melting Furnace	PG-MF
"	Forming	PG-F
"	Annealing Lehr	PG-AL
Screen Printing		SCP
Sand and Shell Preparation		S & S
Inspection		INS
Packing		PCK
Warehouse		WRH
Electricians Shop		ELC
Machine Shop - Mould Manufacture		MAC-MM
Machine Shop - Plant Maintenance		MAC-PM
Power House		POW
Laboratory		LAB
Water Treatment		WAT
Carpentry		CPT
Administration		ADM
Selling and Distribution		S & D
Garage & Transport		G & T
Dispensary		DPY
Canteen		CNT
Club/Shop/Band		CLB

Notes: i) This list is not exhaustive

ii) Process cost centres will be adapted to identify rehabilitated and additional plant

PERIOD:

	TOTAL	HG-A TOTAL	HG-A-MF	HG-A-F	HG-A-AL	HG-B TOTAL	MG-B-MF	HG-B-F	HG-B-AL	PG TOTAL	PG-MF	PG-F	PG-AL	SCP
Direct Material														
Direct Labour														
Variable Process Expenses														
TOTAL DIRECT COSTS														

COST CENTRE ANALYSIS

CLB					
CNT					
DPY					
G & T					
S & D					
ADM					
CPT					
WAT					
LAB					
POW					
MAC-PM					
MAC-MM					
ELC					
WRH					
PCK					
INS					
S & S					
BH					
SCP					
PG					
HG-B					
HG-A					
TOTAL					
Direct Materials Direct Labour Variable Process Expenses	TOTAL DIRECT COSTS	Indirect Materials Indirect Labour Indirect Expenses	TOTAL INDIRECT COSTS	Allotment of Service Costs G & T DPY CNT CLB	TOTAL COSTS

INTEGRATED PROCESS COSTING

Purpose

The purpose of process costing is to enable costs to be alloted to production processes such that output from each can be costed.

Integration of process costing within the double-entry enables the application of a disciplined double-entry postings timetable to ensure timely and accurate preparation of cost data.

The proposed system readily enables the preparation of a period contribution statement.

Cost Structures

The cost elements accounted for in the proposed system are as follows:

- direct materials
- direct labour
- variable process expenses

This prime cost structure is an attempt to evaluate production at marginal cost whilst including all direct process costs. The use of process marginal costs snsures consistent evaluation of work in process and finished goods. If fixed costs were to be absorbed in process costing, wide fluctuations in process unit costs would be caused by the lack of consistent production volume and mix.

It is recognised that direct labour is a fixed cost but inclusion enables the cost structure to be compatible with the operating statement hsadings:

The cost elements will include the following direct expense components:

direct materials	- all materials, chemicals and cullet issued to process cost centres

direct labour	- gross salaries, SSF, overtime and deep night and discomfort allowances for factory operatives alloted between process cost centres
variable process expenses	- electricity, power, fuel oil and lubricants alloted between process cost centres

When preparing the year-end financial accounts it will be possible, if so desired, to absorb fixed overheads incurred into the valuations of work in process and finished goods.

Description of the System

Process costing is a simulation in financial terms of the production processes shown on page 5 of this appendix. The current three process lines are represented, Hollow Glass Lines A and B and Pressed Glass and each process is identified using the code proposed in Appendix III. The system can readily be adapted to cover additional processes. Packing costs will be excluded to avoid complication due to the current operating practices.

Accurate process costing relies on the availability of production data on the quantity and description of input and output at each process. This data will be provided for each period by the Production Manager in the format shown on pages 6 and 8 as described on pages 9 and 10. The data will be confirmed in the Costing Section, where possible, by reference to stores accounting records.

The accuracy of the production data will depend on:

(i) competent supervision
(ii) accurate recording of cullet
(iii) accurate product identification and quantifying
(iv) accurate products unit weights

The process data will be evaluated in financial terms on process cost sheets, examples are shown on pages 11 to 14 of this appendix. There will be separate cost sheets for each process in each line. Period process costs,

both direct costs incurred and costs already accumulated against WIP inputs are totalled and apportioned over process 'outputs'. Thus direct costs are accumulated against WIP transferred along the process lines until completed. Format of the cost sheets complies with accepted process costing practice. Quantities will be extracted from the period process reconciliations. Period costs will be derived from the appropriate cost centre analysis. Process cost sheet computations are described in detail on pages 15 and 16 of this appendix.

For evaluation of process outputs, the use of equivalent weights may be found desirable. Period costs of output will be derived by prorating period costs on the basis of output weights. However, the direct labour and variable process expense components apportioned to certain outputs, E.G. WIP carried forward, may be overstated by using weight as a basis of apportionment. In this situation, the weight of WIP used in the apportionment calculation will be reduced by a standard percentage or percentages to calculate on equivalent weight appropriate to the direct labour or variable process expense content. The decision on whether to incorporate equivalent weights will be made during implementation.

The process costing system described in this appendix uses cumulative average costing. The use of standard costs in process costing is described in Appendix VI.

In accounting for losses it is proposed that normal and abnormal losses will be differentiated. Process losses are to be expected during production. Those that can be accurately predicted e.g. by a fixed percentage of the appropriate process quantities, are considered normal, the balance of losses being regarded as abnormal. Abnormal process loss is that loss caused by unexpected or abnormal conditions, e.g. sub-standard materials, or machine breakdowns. All losses under this category must be thoroughly investigated, and, where necessary, steps should be taken to try to prevent any recurrence. However, it is understood that losses due to evaporation in the melting furnaces can always be accurately predicted and thus no provision is made for evaporation abnormal losses. Results for the first half of 1976 show that 63% of raw material input to the hollow glass furnaces was lost as cullet or evaporation and that performance fluctuates from month to month. Thus, not only are the losses of significance but also consist of normal and abnormal components as defined above.

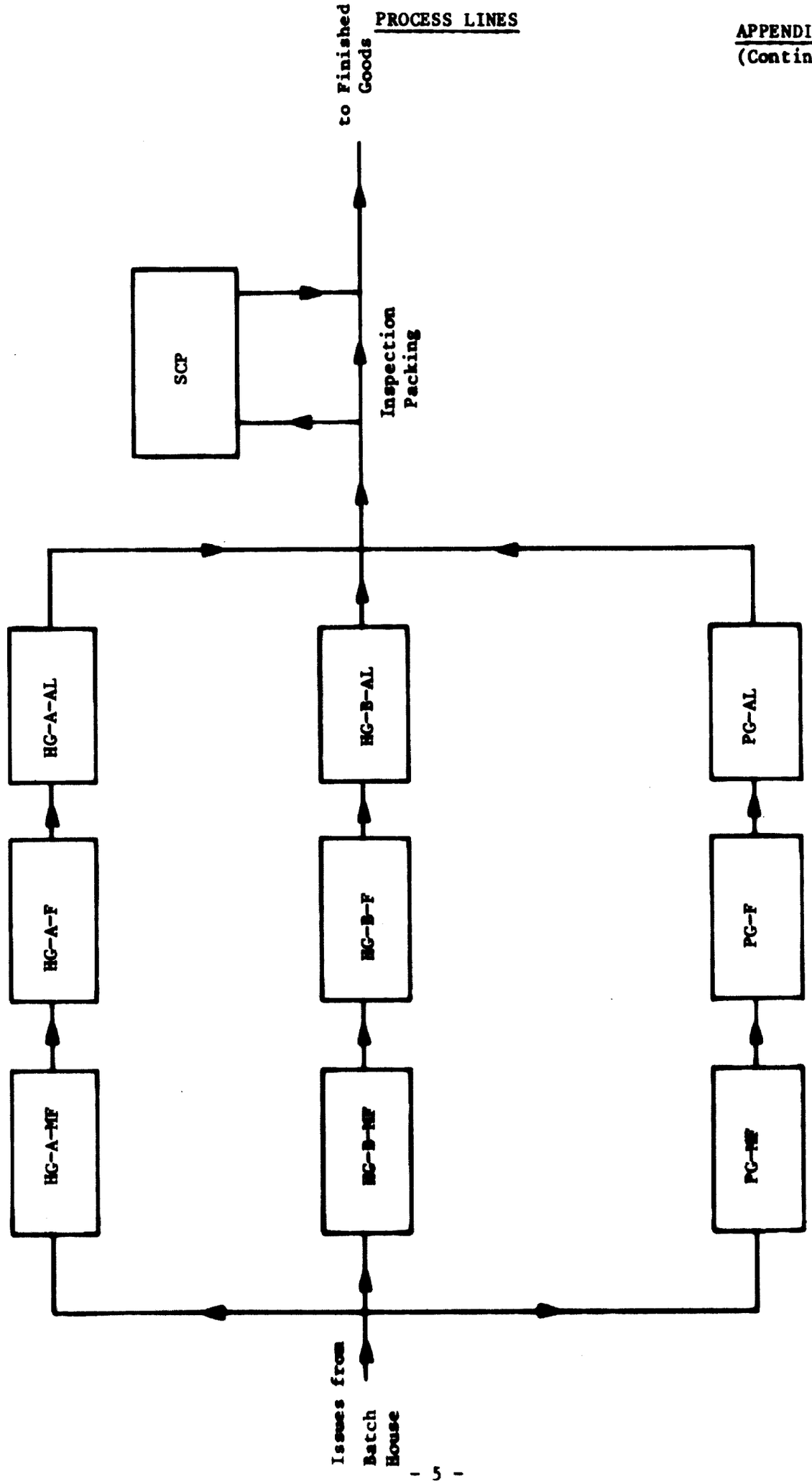
The conventional accounting treatment of normal and abnormal losses differ. The cost of normal loss is absorbed in the process cost of WIP and good output. Abnormal loss is written off and thus is not included within WIP or finished goods valuations or in the cost of sales. This treatment prevents unit process costs fluctuating each period depending on the magnitude of the abnormal losses. It is proposed that abnormal losses (or gains) will be posted out of the process costing system each month to an abnormal Losses Account, and subsequently written off. Cullet abnormal loss will include only direct labour and variable process expense components as the cullet can still be re-used and is valued at direct material cost.

Within the double entry there will be separate process line accounts as shown on page 17. Thus the process cost sheets are equivalent to journal vouchers for postings of direct costs from the cost centre analysis to the process line accounts and from the process line accounts to finished goods accounts. Space is allowed on each cost sheet to record the appropriate journal postings.

Currently, product costs, as calculated using prevailing procedures, are greater than selling prices. Thus it is prudent to value finished goods at selling price. However, finished goods should be valued at unit process cost where that is lower than the selling price.

Finished goods ledger cards must be maintained for each product, process costs accumulated and the average product process cost re-calculated each period. The period process cost of sales will be calculated for each product and a contribution statement prepared as shown on page 18.

PROCESS LINES



BATCH HOUSE RECONCILIATION

Line	Sand	Soda Ash	Calcium Carb.	Feldspar	Dolomite	Barium Carb.	Sodium Nitrate	Sodium Sulphate	ABA Sand	Sodium Bic
	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Kg
1. Balance b/f - batched										
2. - not batched										
3. From stores										
4 Inputs										
5. Balance c/f - batched										
6. - not batched										
7. To Melting Furnaces: HC-A										
8. HC-B										
9. PC										
10. Losses										
11. Outputs										

Note: Materials shown are not exhaustive and must be agreed to those in current use.

PROCESS RECONCILIATIONS

		PROCESS LINES		
		MG-A	MG-B	PG
		Kg	Kg	Kg
Melting Furnaces (MF)				
Line				
1	WIP b/f			
2	From Batch House (BH)			
3	Inputs			
4	WIP c/f			
5	Evaporation - Normal Loss			
6	Cullet - Normal Loss			
7	Cullet - Abnormal Loss			
8	To Forming (F)			
9	Outputs			
Forming (F)				
Line				
1	From Melting Furnaces (MF)			
2	Cullet - Normal Loss			
3	Cullet - Abnormal Loss			
4	To Annealing Lehrs (AL)			
5	Outputs			

PROCESS RECONCILIATIONS

		PROCESS LINES		
		HG-A	HG-B	PG
		Kg	Kg	Kg
Annealing Lehrs (AL)				
Line				
1	From Forming (F)			
2	Cullet - Normal Loss			
3	Cullet - Abnormal Loss			
4	To Finished Goods			
5	For Screen Printing (SCP)			
6	Outputs			
Screen Printing (SCP)				
Line				
1	From stocks			
2	Cullet - Normal Loss			
3	Cullet - Abnormal Loss			
4	To Finished Goods			
5	Outputs			

PROCESS DATA

BATCH HOUSE (BH)

Line		
1	Balance b/f - batched	As at previous period-end
2	- not batched	As at previous period-end
3	From stores	SIVs for period
4	Inputs	Column totals, lines 1, 2 and 3
5	Balance c/f - batched - not batched	Physical count or estimate
7 to 9	To Melting Furnaces	Issue documentation for period
10	Losses	Balancing figures
11	Outputs	Equals line 4

MELTING FURNACES (MF)

Line		
1	WIP b/f	As at previous period end
2	From Batch House	Weighed in Batch House
3	Inputs	Column totals, lines 1 and 2
4	WIP c/f	Estimates based on depth of glass
5	Evaporation - Normal Loss	Standard percentage of materials issued
6	Cullet - Normal Loss	Standard percentage
7	Cullet - Abnormal Loss	All cullet derived less normal loss
8	To Forming (F)	Derived below
9	Outputs	Equals line 3

Forming (F)

Line		
1	From Melting Furnaces (MF)	Balancing figures
2	Cullet - Normal Loss	Standard percentage
3	Cullet - Abnormal Loss	All cullet counted/weighed less normal loss
4	To Annealing Lehrs	Derived below
5	Outputs	Column totals, lines 2, 3 and 4

Annealing Lehrs (AL)

Line

1	From Forming (F)	Balancing figures by product
2	Cullet - Normal Loss	Standard percentage
3	Cullet - Abnormal Loss	All cullet counted/weighed, identified by product, less normal loss
4	To Finished Goods (FG))	Counted, identified by product.
5	For Screen Printing (SCP))	Evaluated at standard weight
6	Outputs	Column totals, lines 2, 3, 4 and 5

Screen Printing (SCP)

Note: A buffer stock exists between the annealing lehrs and screen printing

Line

1	From stocks	Counted, identified by product evaluated at standard weight
2	Cullet - Normal Loss	Standard percentage
3	Cullet - Abnormal Loss	All cullet counted/weighed, identified by product, less normal loss
4	To Finished Goods (FG)	Counted, identified by product, evaluated at standard weight
5	Outputs	Column totals, lines 2, 3 and 4

PROCESS COST SHEET

HOLLOW GLASS LINE A

HG-A-MF

Line		1	2	3	4	5
		Wt.	Total	DM	DL	VPE
		Kg	Kg	Kg	Kg	Kg
1	WIP b/f					
2	Direct Costs					
3	Evap. - Normal Loss					
4	Net Inputs					
5	Average Unit Costs					
6	WIP c/f					
7	Cullet - Normal Loss					
8	Cullet -Abnormal Loss					
9	To HG-A-F					
10	Net Outputs					

Journals.

Note

(i) Definitions:

DM - direct materials

DL - direct labour

VPE - variable process expenses

(ii) Period Batch House costs, i.e. direct labour and expenses are pro-rated between the process lines by weight issued.

PROCESS COST SHEET

HOLLOW GLASS - LINE A

HG-A-F

Line		1 Wt. Kg.	2 Total ¢	3 DM ¢	4 DL ¢	5 VPE ¢
1	From HG-A-MF					
2	Direct Costs					
3	Inputs					
4	Average Unit Costs					
5	Cullet - Normal Loss					
6	Cullet - Abnormal Loss					
7	To HD-A-AL					
8	Outputs					

Journals:

Note: Transfers between processes subsequent to Forming are analysed by product.

PROCESS COST SHEET

HOLLOW GLASS - LINE A

HG-A-AL

Line		1 Wt. Kg.	2 Total ¢	3 DM ¢	4 DL ¢	5 VPE ¢
1	For HG-A-F					
2	Direct Costs					
3	Inputs					
4	Average Unit Costs					
5	Cullet - Normal Loss					
6	Cullet - Abnormal Loss					
7	To Finished Goods (FG)					
8	For Screen Printing (SCP)					
9	Outputs					

Journals:

PROCESS COST SHEET

SCREEN PRINTING (SCP)

Line		1 Wt. Kg	2 Total £	3 DM £	4 DL £	5 VPE £
1	From HG-A Stocks					
	From HG-B Stocks					
	From PG Stocks					
2	Direct Costs					
3	Inputs					
4	Average Unit Costs					
5	Cullet - Normal Loss					
6	Cullet - Abnormal Loss					
7	Finished Goods (FG)					
8	Outputs					

Journals:

Note:

(i) The format above assumes screen printing plant capable of processing all products

(ii) Direct costs are apportioned between products on the basis of operating times

PROCESS COST SHEET COMPUTATIONS

MELTING FURNACES (MF)

Line		
1	WIP b/f	Valuation of work in process brought forward from previous period
2	Direct Costs	Period costs of materials issued, direct labour and variable process expenses from cost centre analysis
3	Evaporation - Normal Loss	Nil Value
4	Net Inputs	Column Totals, lines 1, 2 and 3
5	Average Unit Costs	Input cost totals per unit weight
6	WIP c/f	Period costs prorated by weight
7	Cullet - Normal Loss	Materials cost prorated by weight
8	Cullet - Abnormal Loss	As for WIP
9	To Forming (F)	Period costs prorated by weight
10	Net Outputs	Column totals, lines 6 to 10, equals line 4

FORMING (F)

Line		
1	From Melting Furnaces (MF)	Period cost calculated as above
2	Direct Costs	Period costs from cost centre analysis
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input costs totals per unit weight
5	Cullet - Normal Loss	Materials cost prorated by weight
6	Cullet - Abnormal Loss	As for output to AL
7	To Annealing Lehrs (AL)	Period cost prorated by weight, apportioned between products by standard process times
8	Outputs	Column totals, lines 5 to 7, equals line 3

ANNEALING LEHRS (AL)

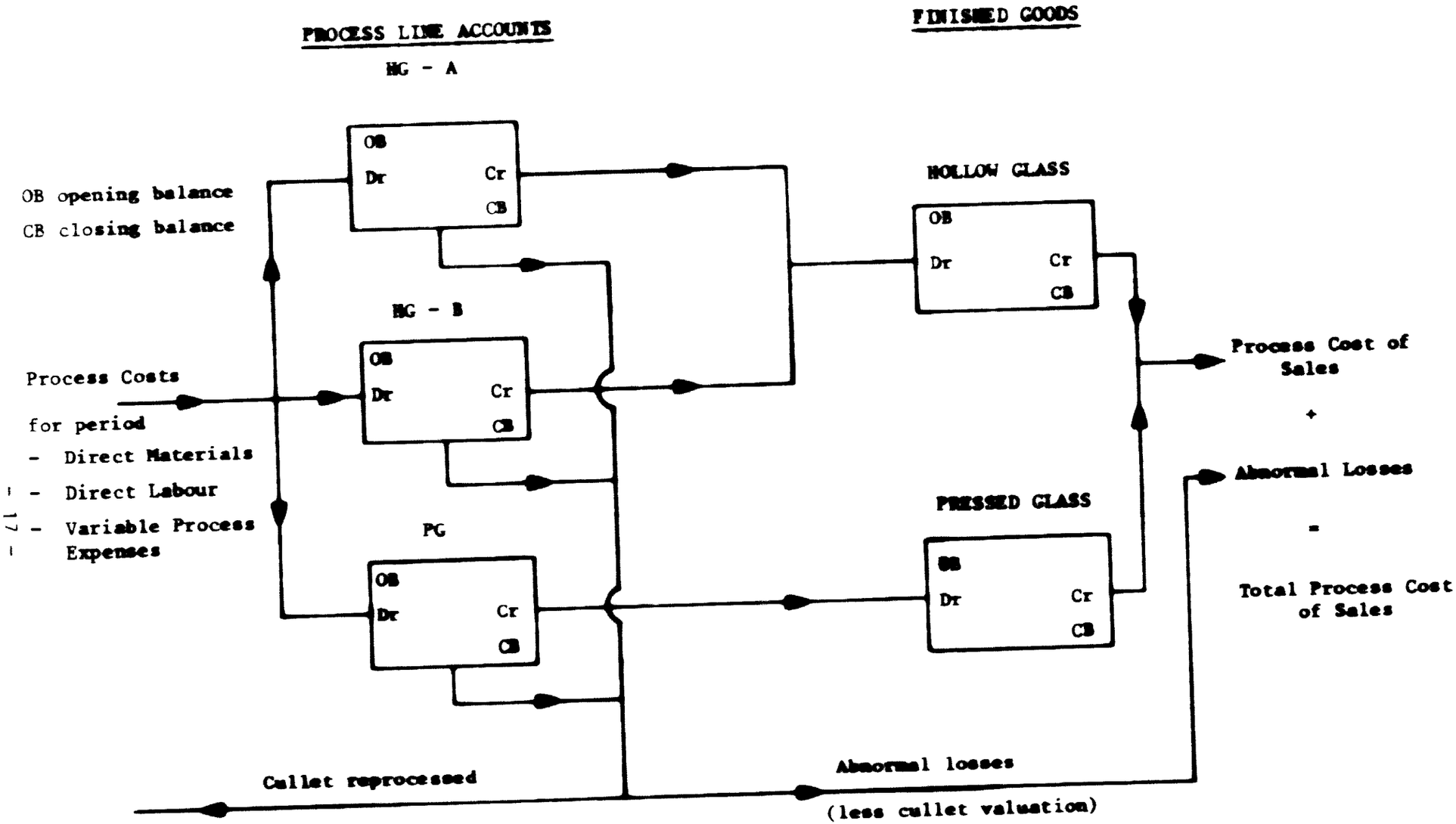
Line		
1	From Forming (F)	Period cost calculated as above
2	Direct Costs	Period costs from cost centre analysis
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input cost totals per unit weight
5	Cullet - Normal Loss	Materials cost prorated by weight

Line		
6	Cullet - Abnormal Loss	As for output to FG/SCP
7	To Finished Goods (FG)	) Period costs prorated by number/
8	For Screen Printing (SCP)	) weight
9	Outputs	Column totals, lines 5 to 8, equals line 3

SCREEN PRINTING (SCP)

Line		
1	From Stocks	Average cost from ledger cards
2	Direct Costs	Period costs from cost centre analysis apportioned between process lines
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input cost totals per unit weight/product
5	Cullet - Normal Loss	Materials cost prorated by number/weight
6	Cullet - Abnormal Loss	As for output to FG
7	To Finished Goods (FG)	Period costs prorated by number/weight apportioned between products by standard process times
8	Outputs	Column totals, 5 to 7, equals line 3

INTEGRATED PROCESS COSTING



APPENDIX V
(Continued)

CONTRIBUTION STATEMENT

	TOTAL	HOLLOW GLASS - LINE A				HOLLOW GLASS - LINE B				PRESSED GLASS			
		TOTAL				TOTAL				TOTAL			
	£	£	£	£	£	£	£	£	£	£	£	£	£
Sales													
Process Cost of Sales													
Process Contribution													
Abnormal Losses:													
Melting Furnaces													
Forming													
Annealing Lehre													
Screen Printing													
Net Contribution													

INTEGRATED PROCESS STANDARD COSTING

Purpose

The purpose of a standard costing system is to compare actual costs for a period with establishsd standard costs of the Division's products to provide cost variance analysss at each process for interpretation and response by management. The standard cost of a product is the target cost based on an analytical study of its cost structure.

This system is a development of the system described in Appendix V which will together with appropriate process data, provide the necessary analysis of cost structure to snable standards to be set in terms of both quantity and value.

Integration of the standard costing within the financial accounting systsm enables the application of a disciplined double-entry postings timetable to ensure timely and accurate preparation of cost data.

The proposed systsm is so designed as to enable preparation of a period product contribution statement with associatsd variance analyses that can be readily agresd with the period operating statement.

Product Standard Coats

Product standard costs will be derived by svaluating the constituent elements of cost of each product at a prevailing unit standard cost, e.g. direct material cost per unit weight. Standards will be sstablished for output from each process and work in process whers appropriate.

the proposed elsments of costs are the same as for the system dsscribed in Appendix V, that is:

- direct materials
- direct labour
- variable process sxpenses.

The structure is compatible with the operating statement headings thus enabling cost of sales shown on the period contribution statement to be squal to the amount shown in the operating statement.

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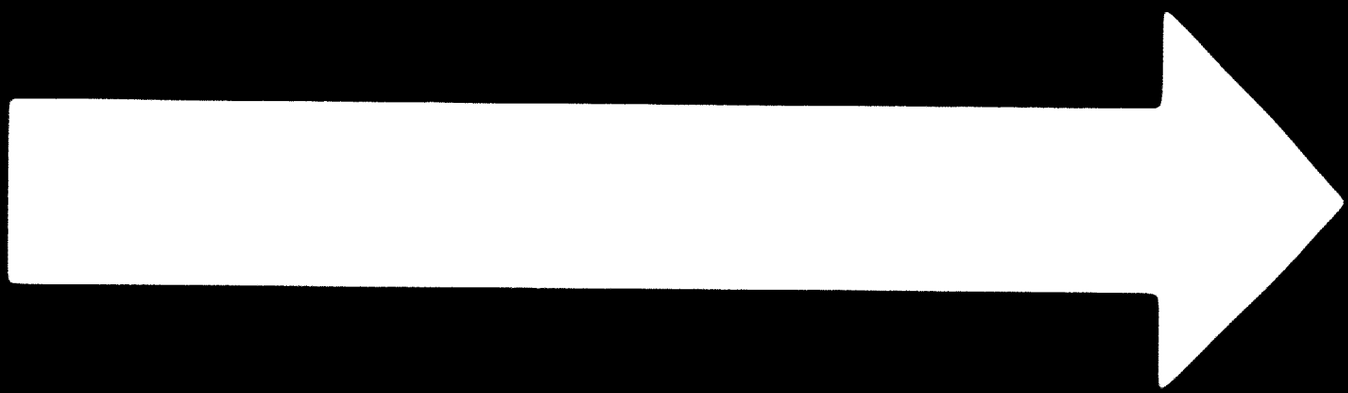

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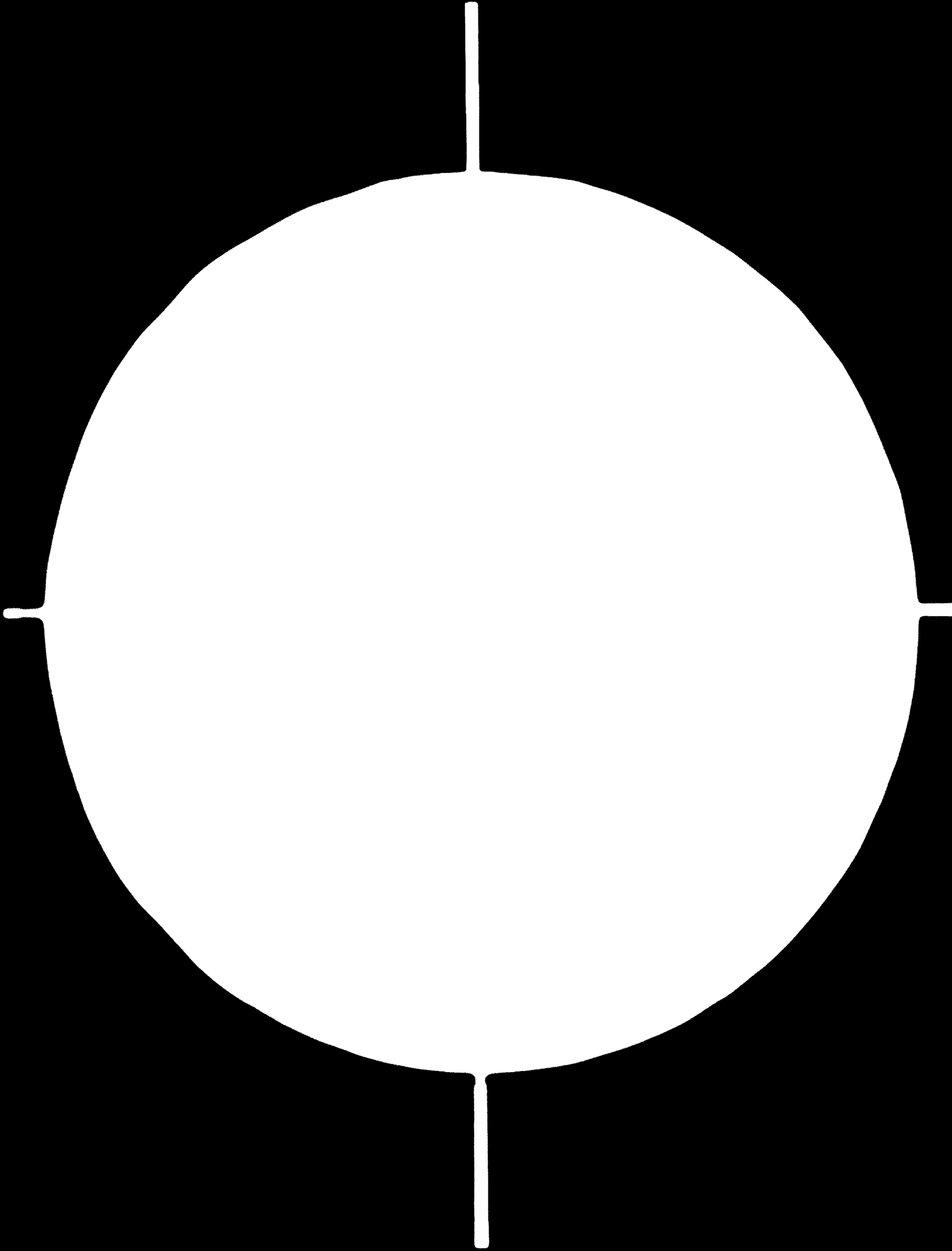

On the introduction of standard costing, work in process and finished goods will be evaluated at standard cost. However, when preparing the year-end financial accounts it will be possible, if so desired, to absorb fixed overheads incurred into the valuations of work in process and finished goods.

Description of the System

The process reconciliations will be carried out each period as described in Appendix V.

The process standard cost sheets will be similar to those described in Appendix V with lines for the variances included. An example of the format is shown on page 5 of this appendix. The standard cost computations are described on pages 6 and 7. The cost sheets will remain as media for journal postings and in addition provide the means for variance calculation.

The process line accounts and finished goods accounts will remain unchanged from those proposed in Appendix V. Period variances will be recorded in process variance accounts prior to being written off. The variance accounts will replace the accounts for abnormal losses proposed in Appendix V.

The setting of standard costs will take into account the following:

(i) materials issued to the melting furnaces will be costed at standard material issue prices per unit weight

(ii) evaporation - normal loss will be a fixed percentage of materials issued to a melting furnace and the standard material issue price of this loss will be absorbed in a standard net material cost per unit weight

(iii) the appropriate standard net material cost will be used to evaluate melting furnace WIP and transfers to subsequent processes

(iv) the direct material components of the losses due to evaporation or as cullet will be evaluated at standard materiel issue prices. Thus cullet, which is assumed will be reprocessed, will be valued at the same standard material issue prices per unit weight of the appropriate formula as unprocessed materials issued to the melting furnaces

(v) cullet - Normal Loss will be costed at standard material issue prices only. Abnormal losses will be costed at standards which include direct material issue prices, direct labour and variable process expense components

(vi) equivelent weight percentages thought desirable in the system described in Appendix V will be incorporated into the appropriate standards

(vii) standards will initially be based on those unit costs derived in the system described in Appendix V.

The selection of variances for analysis is based on the following consideretions:

(i) evaporation and cullet normal losses will be fixed percentages and will not be considered as variances. Neither losses will absorb direct labour or veriable process expense components

(ii) efficiency variances will be derived as balances on each process account and represent direct costs not absorbed into WIP, losses or transfers

(iii) the efficiency variance for direct material will represent a batch mix variance and also the direct material cost of evaporation normal loss not absorbed in the standerd material cost of 'good' output due to non-standard yield

(A batch mix variance represents the quantity differences, evaluated at standard costs between the materials mix used in forming ware and the standard mix assumed for costing that ware. This variance would be calculated for the gob from each furnace. However this variance can only be isolated if the actual gob mix can be accurately determined. If so, the process reconciliation for the melting furnances shown in Appendix V, page 7 should be extended so as to show the material mix for each heading.)

(iv) the costs alloted to cullet abnormal losses, i.e. direct material, direct labour and variable process expenses will be considered as significant data for specific reporting to senior management

(v) as variances will be calculated on the process cost sheets these documents can act as reporting media or as support to a period report.

As noted above, it will be desirable that the total direct cost of abnormal losses be reported to senior management and the cost sheets can act as support to a period report. However, it is assumed that all cullet will be stored for reuse and the direct material cost component will not be 'lost' and thus treated as a variance will be posted to the Cullet Stock Account. This splitting of the cullet cost leaves the direct labour and variable process expense components to be treated as variances and subsequently written off. Cullet which is not suitable for reuse must be identified and written off.

The presentation of the period variances in the contribution statement is shown on page 8 of the appendix.

To derive direct material issue price variances for a process line, batch house documentation for issues to the melting furnaces will be priced at both actual i.e. first in, first out, and at standard. The standard cost of issues will be entered in the cost centre analysis and subsequently posted to the process accounts and the issue price variances, i.e. the differences between the period totals of actual and standard costs, accumulated in appropriate variance accounts.

The process variances, net of the direct material component of cullet will be accumulated by direct cost component against each process. Direct labour and variable process expense variances will include both loss and efficiency variances which can be shown separately if so desired.

PROCESS STANDARD COST SHEET

HOLLOW GLASS-LINE A

HG-A-MF

		1	2	3	4	5
		Wt.	Total	DM	DL	VPE
		Kg	¢	¢	¢	¢
1	WIP b/f					
2	Direct Costs					
3	Evaporation - Normal Loss					
4	Net Inputs					
5	Average Unit Costs					
6	WIP c/f					
7	Cullet - Normal Loss					
8	Cullet - Abnormal Loss					
9	To Forming					
10	Variances (DM, DL and VPE)					
11	Net Outputs					

Journals:

PROCESS STANDARD COST COMPUTATIONS

MELTING FURNACES (MF)

Line		
1	WIP b/f	Valuation of work in process brought forward from previous period
2	Direct Costs: - Materials Issued	Actual quantities at standard material issue prices from cost centre analysis
	- Direct Labour - Variable Process Expenses)	Period costs from cost centre analysis
3	Evaporation - Normal Loss	Nil value
4	Net Inputs	Column totals, lines 1, 2 and 3
5	Average Unit Costs	Input cost totals per unit weight
6	WIP c/f	Actual quantity at standard WIP
7	Cullet - Normal Loss	Standard weight at standard material issue price
8	Cullet - Abnormal Loss	Weight at standard cost
9	To Forming (F)	Actual quantity at standard output cost
10	Variances (DM, DL and VPE)	Balances of DM, DL and VPE costs
11	Net Outputs	Column totals, lines 6 to 11, equals line 4

FORMING (F)

Line		
1	From Melting Furnaces (MF)	Calculated as above
2	Direct Costs	Period costs from cost centre analysis
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input cost totals per unit weight
5	Cullet - Normal Loss	Standard weight at standard material issue prices
6	Cullet - Abnormal Loss	Weight at standard cost
7	To Annealing Lehrs (AL)	Actual quantity at standard output cost
8	Variances (DL and VPE)	Balances of DL and VPE costs
9	Outputs	Column totals, lines 5 to 8, equals line 3

ANNEALING LEHRS (AL)

Line		
1	From Forming (F)	Calculated as above
2	Direct Costs	Period costs from cost centre analysis
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input cost totals per unit weight
5	Cullet - Normal Loss	Standard quantity at standard material issue price
6	Cullet - Abnormal Loss	Weight at standard cost
7	To Finished Goods (FG)	Actual quantities at standard output cost
8	For Screen Printing (SCP)	
9	Variances (DL and VPE)	Balances of DL and VPE costs
10	Outputs	Column totals, lines 5 to 9, equals line 3

SCREEN PRINTING (SCP)

Line		
1	From stocks	Actual quantities at standard cost
2	Direct Costs	Period costs from cost centre analysis
3	Inputs	Column totals, lines 1 and 2
4	Average Unit Costs	Input cost totals per unit weight/product
5	Cullet - Normal Loss	Standard weight at standard material issue price
6	Cullet - Abnormal Loss	Weight at standard costs
7	To finished Goods (FG)	Actual quantities at standard output cost
8	Variances (DL and VPE)	Balances of DL and VPE costs
9	Outputs	Column totals, lines 5 to 8, equals line 3

CONTRIBUTION STATEMENT

PROCESS STANDARD COSTING

	TOTAL	HOLLOW GLASS-LINE A				HOLLOW GLASS-LINE B				PRESSED GLASS				
		TOTAL				TOTAL				TOTAL				
Sales	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Standard Cost of Sales														
Standard Contribution														
Issue Price Variances														
Efficiency Variances														
Melting Furnace DM														
DL														
VPE														
Forming DL														
VPE														
Annealing Lehrs DL														
VPE														
Screen Printing DL														
VPE														
Net Contribution														

VOLUME 2
ANNEXE VII

FINANCIAL

SAMPLE VOLUME II REVIEW REPORT

GLASS MANUFACTURING DIVISION

GLASS MANUFACTURING DIVISION OF GIHOC

SYSTEMS MANUAL

CONTENTS

CONTENTS

PART A

PROCUREMENT

The procedures operated in the Procurement Department are described below under the following headings:

- Overseas Purchases
- Local Purchases

1. OVERSEAS PURCHASES

Overseas purchases are primarily for the supply of chemicals, machinery and spare parts.

The Division's requirements in respect of chemicals and spare parts are prepared by the Commercial Manager from the Division's annual budget which is usually available in October of each year.

Overseas suppliers are then circulated with the Division's requirements and invited to submit quotations by means of pro-forma invoices.

The Commercial Manager subsequently analyses the pro-forma invoices by price, delivery time and mode of packing and recommends a supplier to the L/C application committee which comprises the following:-

- General Manager - Chairman
- Plant Manager
- Divisional Accountant

The L/C application committee chooses the suppliers on the basis of the Commerical Manager's analysis and recommendations. The General Manager then authorises letters of credit to be established for the suppliers. Each application for a letter of credit is prepared in duplicate with one copy retained and the other sent to the Division's bank, the Ghana Commerical Bank, together with two copies of the relevent pro-forma invoices and the appropriate import licence.

The award of an import licence is the prerogative of the Ministry of Industries. The Commercial and Industrial Bulletin notifies the period for application of import licences. Arrangements for the issue of import licence to the Division are made by the Head Office working in conjunction with the General Manager.

The Division's bank processes the application after approval by the Bank of Ghana. On approval, the import licence is endorsed with the amount approved. The Divisions's bank then requests for payment to it in cash of the required margins - the percentage of the value of each approved letter of credit as follows:

25% for raw materials
80% for spares and machinery.

The Divisions's bank establishes the approved letter of credit and cables its appropriate correspondent bank to inform the supplier. The bank provides a customer's advice copy to the Commericial Department which confirms the order to the supplier by the preparation of a confirmation order in quadruplicate distributed as follows:

original) to the supplier
duplicate copy)
triplicate copy - to the H/O Procurement Officer
quadruplicate copy - retained in the pad.

The Commerical Manager subsequently follows the confirmation order with a letter requesting advance copies of the documents below:

- bill of lading
- attested invoices
- certificate of clean report of findings.

Records are maintained within the Commerical Department of all letters of credit awaiting establishment, established, progress on each order and of import licence utilisation.

On shipment of the goods, the supplier advises the Division by telex. The Commercial Manager then goes to the Division's banker with a completed exchange form A1 to be exchanged for the original copies of the following documents:

- bill of lading
- attested invoices
- certificate of clean report of findings
- manufacturer's invoice.

On arrival of the goods, the Shipping Section of the Commercial Department clears the goods from the Takoradi Port and an internal waybill is prepared in quadruplicate and distributed as follows:

original	)	to the storekeeper
duplicate copy	)	
triplicate copy	-	passed to the transporter
quadruplicate copy	-	retained

The goods are transported to the Division's stores by hired trucks or by rail. On receipt of the goods, the storekeeper checks them against the internal waybill and prepares a receiving sheet to cover them.

The Division's insurers are notified of any shortage or damage detected by the Shipping Section in each consignment cleared.

2. LOCAL PURCHASES

Local purchases are initiated by a departmental manager submitting a requisition to the Commercial Department. The Commercial Manager forwards the purchase requisition to the General Manager for approval.

Where possible, three quotations are obtained on pro-forma invoices by a commercial clerk. The Commercial Manager selects a supplier and authorises a local purchase order (LPO) to be prepared in triplicate.

The LPO is submitted with the purchase requisition to the Divisional Accountant and the General Manager for approval.

The top copy of the LPO is taken to the chosen supplier by a commercial clerk who collects the goods supported by a waybill, invoice or receipt. The duplicate copy of the LPO is passed to the stores and the last copy of the LPO is retained in the Commercial Department.

When local purchases are made for cash, no LPO is prepared. The Divisional Accountant authorises the cashier to advance cash against an IOU for the purchase where the amount involved does not exceed ₵50. Where the amount exceeds ₵50 the cashier advances a cheque against a cheque suspense voucher for the purchase. The cash and cheques are accounted for with supporting receipts after purchase.

The goods are checked against the supplier's waybill, invoice or receipt by the storekeeper who receives the items into stock and issues a receiving sheet to cover them.

PART B

STORES

The procedures operated in the stores for the receipts and issues of goods are described below under the following headings:

- Receipt of Overseas Purchases
- Receipt of Sand and Shells
- Receipt of Local Purchases
- Receipt of Finished Goods
- Issue of Sand and Shells
- Issue of General Stores
- Issue from the Chemical Stores
- Issue and Despatch of Finished Goods - Credit Sales
- Issue and Despatch of Finished Goods - Cash Sales
- Stock-taking

1. RECEIPT OF OVERSEAS PURCHASES

Staff from the Shipping Section of the Commercial Department supervise the delivery of overseas purchases - chemicals, spares and machinery to the factory premises.

The goods are received with internal waybills prepared by the Shipping Section, a supplier's packing list and a copy invoice.

The storekeeper checks the goods against the accompanying documents, signs the waybill and prepares a pre-numbered receiving sheet (RS) in triplicate which contains the following details:

- consignor
- delivery slips
- waybill no. and date
- quantity
- description of goods
- allocation

The storekeeper makes entries on the back of the invoice/waybill, as appropriate, against the headings which he stamps as follows:

- date of receipt
- LPO no.
- quantity
- quality specification
- particulars of person checking

He then attaches the original of the RS to and the distribution is as follows:

original	-	to the Accounts Department
duplicate copy	-	to the Procurement Section
triplicate copy	-	retained in the stores.

The details and quantity of goods received are then entered on the bin card by the storekeeper as follows:

- date of receipt
- order no.
- description
- quantity received
- balance.

2. RECEIPT OF SAND AND SHELLS

The Divisions's junior glass technologist supervises the delivery of sand and shells to the factory premises.

The sand and shells are weighed on delivery at the weighbridge in the presence of a security officer and the technologist prepares a toll bridge card to record the delivery. Receipts are recorded in an analysis book and a daily raw material receipts form is prepared in duplicate. The original is passed to the Accounts Department and the duplicate retained.

3. RECEIPT OF LOCAL PURCHASES

A commercial clerk supervises the delivery of local purchases to the stores.

The goods are received together with an invoice, waybill, duplicate copy of LPO and receipt where appropriate.

The storekeeper and a security officer check the goods against the document set and the storekeeper signs the supplier's waybill which is usually submitted in duplicate. The storekeeper then returns the original copy of the signed waybills to the delivery driver, stamps the back of the invoice and prepares a receiving sheet as described in Section B.1.

The original copy of the RS is pinned to the invoice and the distribution and entry on the bin card is as described in Section B.1 with the addition that the storekeeper's and Commercial clerk's copies of the LPO are attached to the documents sent to the Accounts Department.

4. RECEIPT OF FINISHED GOODS

Finished goods transferred from the Packing Section to the finished goods store are accompanied by a goods transfer note (GTN) prepared by the shift master in quadruplicate and distributed as follows:

original	-	to the General Manager
duplicate copy	-	to the Divisional Accountant (Costing Section)
triplicate copy	-	to the Production Manager
quadruplicate copy	-	to the Sales Manager (forwarding/stores)

The GTN is subsequently used in the Costing Section to verify the production analyses.

The storekeeper checks the quantities transferred against the GTN and prepares a daily stock movements sheet (DSMS) in quadruplicate which contains the following details:

- date
- description of goods
- opening stock
- production
- sales
- breakages
- closing stock

The distribution of the DSMS is as follows:

original	-	to the General Manager
duplicate copy	-	to the Sales Manager
triplicate copy	-	to the Accounts Department

The DSMS is used by the Costing Section to make entries in the cardex.

5. ISSUE OF SAND AND SHELLS

Issue of sand and shells is recorded on a daily raw materials consumption return prepared in duplicate, the original is passed to the Accounts Department, the duplicate copy retained.

6. ISSUE OF GENERAL STORES

General stores include the following:

- machinery spares
- motor accessories
- electrical accessories
- medical supplies
- stationery
- petrol, oil and lubricants
- large tools
- miscellaneous items.

Issue is initiated by the preparation of a pre-numbered stores issue voucher (SIV) in triplicate which is to be approved by a departmental manager. The SIV contains the following details:

- departmental requisition
- department to be charged
- quantity required
- description
- date of requisition
- quantity supplied
- stock balance.

The storekeeper receives the SIV not detached from its pad, checks on the availability of the items requested and supplies accordingly. He then makes relevant entries on the SIV, signs it and distributes the set as follows:

original	-	to the Accounts Department
duplicate copy	-	retained by the storekeeper
triplicate copy	-	to the requesting department.

The issues are entered on the relevant bin card as follows:

- date of issue
- issued to
- SIV No.
- quantity issued
- balance.

7. ISSUE FROM THE CHEMICAL STORES

Chemicals used include the following:

- soda ash
- albite
- barium carbonate

- sodium sulphate
- borax
- dolomite
- sodium biocromate.

The procedures for the issue of chemicals are the same as those described in Section B.5.

8. ISSUE AND DESPATCH OF FINISHED GOODS - CREDIT SALES

The finished goods storekeeper receives a loading permit from the Sales Department signed by the Sales Manager and approved by the General Manager. The availability of the items to be issued is checked and the storekeeper prepares a loading analysis sheet in duplicate as the customer's truck is being loaded.

Using the loading analysis sheet, the storekeeper then prepares waybills in four copies to cover the issue. The waybill contains the following details:

- name and address of customer
- identification of driver and transport
- quantity and description of goods
- time and date of despatch.

It is signed by the despatcher, the Sales Manager, the General Manager and the receiver and is distributed as follows:

original	(green)	-	to the customer
duplicate copy	(orange)	-	to Customs and Excise
triplicate copy	(green)	-	to Customs and Excise
quadruplicate copy	(orange)	-	to the sales clerk

The storekeeper prepares a loading analysis (LA) and subsequently enters the issues on the daily stock movement sheet.

A sales clerk is located in the stores and prepares invoices from the loading analyses.

9. ISSUES AND DESPATCH OF FINISHED GOODS - CASH SALES

The procedures adopted for the issue and despatch of finished goods in respect of cash sales are the same as those described in Section 8 with the exception that the storekeeper receives a cash sales invoice in triplicate together with a cashier's receipt from the sales clerk before the goods are issued.

10. STOCK-TAKING

Finished goods and chemical stores are physically counted each period. General stores are counted annually.

Raw materials, e.g. sand, shells and cullet are not physically counted.

PART C

SALES

The procedures adopted in respect of sales are described below under the following headings:

- Credit Sales
- Cash Sales
- Credit Control

1. CREDIT SALES

Credit sales are initiated by the receipt of a customer's order by the Sales Department. The Sales Manager authorises the sales clerk to prepare a loading permit (LP) in respect of the customer's order in duplicate for the approval of the General Manager.

The loading permit contains the following details:

- date
- name of company
- LPO no.
- no. of cartons/crates
- description
- driver's name
- vehicle no.
- licence no.

The top copy of the LP is sent to the finished goods storekeeper who issues the goods and prepares a loading analysis (LA) for the Sales Department. The duplicate copy of the LP is retained in the Sales Department.

Using the LA, the sales clerk prepares an invoice in seven copies for checking and signature by the Divisional Accountant prior to distribution as follows:

original	(green)	-	to the customer
2nd copy	(green)	-	to Customs and Excise
3rd copy	(brown)	-	to Customs and Excise
4th copy	(blue)	-	to the Accounts Department
5th copy	(white)	-	retained on the customer's file.
6th copy	(white)	-	retained for sales records
7th copy	(white)	-	retained in the pad.

2. CASH SALES

Cash sales are mainly in respect of pressed glass items, e.g. flower vases, ash trays and soup bowls.

A sale is initiated by the customer or his agent who goes to the Sales Manager for a memo authorising the sale.

The sales clerk prepares a pre-numbered cash sales invoice (CSI) in triplicate which contains the following details:

- date of sale
- description of goods
- quantity
- unit price
- total cost.

The customer makes payment to the cashier and submits the receipt to the sales clerk who quotes the receipt number on the CSI and supplies the goods.

The CSI is then distributed as follows:

original	(green)	-	to the customer
duplicate copy	(white)	-	to gate security
triplicate copy	(yellow)	-	retained in the pad.

3. CREDIT CONTROL

Customers wishing to purchase on a credit basis with the Division are required to submit a formal application on a pre-printed form addressed to the General Manager.

Confidential reports are subsequently sought from the customer's bankers and other business houses which are currently trading with the customer and affording him credit.

Where the reports are favourable, the General Manager approves the application stating the credit limit.

The Divisional Accountant and the Sales Manager are notified of the customer's credit limit by copies of the General Manager's letter of approval to the customer.

The Sales Manager together with the Divisional Accountant monitor the customer's transactions with the Division to ensure that his debts are settled promptly and that his credit limit is not exceeded.

PART D

FINANCIAL ACCOUNTING

The procedures carried out in the Accounts Department in respect of financial accounting are described below under the following headings:

- Overseas Purchases
- Local Purchase: (Credit)
- Local Purchases (Cash)
- Credit Sales
- Expenses Ledger
- Departmental Cost Analysis
- General Ledger and Preparation of the Trial Balance
- Wages and Salaries
- Fixed Assets.

1. OVERSEAS PURCHASES

The overseas purchases (OP) clerk in the Finance Section receives a cost statement from the Costing Section for each shipment. The OP clerk compiles daily the details of all cost statements in a memorandum import analysis book which is analysed by expenditure headings related to costs of importation and is closed off at the month-end for postings into general ledger and the expenses ledger.

2. LOCAL PURCHASES (CREDIT)

Prior to purchase, the LPO is approved by both the General Manager and the Divisional Accountant.

After purchase, the purchases day book (PDB) clerk receives from the Costing Section a document set comprising the following:

- supplier's invoice
- receiving sheet
- waybill

The PDB clerk checks the accuracy of the calculations, compares the documents and makes appropriate entries in the purchases day book.

The PDB clerk closes off the PDB monthly and the total is entered in the creditors control account in the general ledger. The PDB entries are posted to the creditors ledger daily when convenient by the PDB clerk. The relevant cash book entries are posted at the month-end. The creditors ledger is closed off monthly, and any adjustments made by authorised journal vouchers. The creditors ledger is agreed with the creditors control account prior to preparation of the trial balance.

3. LOCAL PURCHASES (CASH)

The Commercial Department prepares an IOU or cheque suspense voucher for the approval of the Divisional Accountant and the General Manager prior to the release of cash or a cheque by the cashier.

After purchase, a commercial clerk submits the supplier's receipt together with the receiving sheet for the goods to the cashier for entry in the columnar analysed cash book. The cash book entries are posted monthly to the appropriate ledgers.

4. CREDIT SALES

The sales day book (SDB) clerk in the Finance Section receives three copies of the invoice from the Sales Department. He verifies the accuracy of the calculations and using the blue copy he makes entries in the sales day book.

The sales day book is posted daily when possible to the debtors ledger by the SDB clerk, the total of the entries being posted monthly to the debtors control account in the general ledger. The relevant cash book entries to the debtors ledger are posted at the month-end. The debtors ledger and control account are agreed prior to the preparation of the trial balance.

The debtors schedule is prepared monthly together with an aged analysis after the control account has been reconciled.

Customers' statements are prepared in four copies soon after the month-end.

Distribution is as follows:

original	-	to the customer
duplicate copy	-	to the Sales Manager
triplicate copy	-	to the General Manager
quadruplicate copy	-	retained in the Accounts Department.

The remaining two copies of the invoices (the green and brown copies) are forwarded to Customs and Excise accompanied by a summary prepared by an accounts clerk.

5. EXPENSES LEDGER

The expenses ledger records all operational expenses and revenues and is analysed by expense headings to which the cash book expenses analysis headings correspond. It is kept by the general ledger clerk who makes postings at the month-end from the following books:

- cash books
- payroll summary
- stores issues analysis book
- journal
- purchases day book.

The ledger is closed off at month-end and the expense totals agreed with the corresponding totals in the departmental cost analysis sheet prior to transfer of these expense totals to the general ledger.

6. DEPARTMENTAL COST ANALYSIS

The Division operates an integrated cost centre accounting system. Costs are accumulated on a departmental cost analysis (DCA) sheet and allocated between the following production and service cost centres:

- Batch House
- Hollow Glass
- Pressed Glass
- Screen Printing
- Sand and Shells
- Electrical
- Machine Shop
- Garage and Transport
- Power House
- Laboratory
- Water Treatment
- Carpentry
- Dispensary
- Canteen
- Administration
- Selling and Distribution
- Club

The DCA clerk analyses, by cost centre, the cashier's payment voucher file and the stores issues analysis book in a memorandum analysis book (MAB). At the month-end, the MAB totals are agreed with the expense account totals in the expenses ledger and then entered on the DCA sheet.

The DCA clerk prepares an operating cost summary which further analyses the DCA cost centre totals between the following operating statement headings:

- direct production expenses
- factory overhead
- administrative overhead

- selling and distribution expenses
- sand and shells
- club house expenses
- El Dorados

Finance charges are included under administrative overhead. Depreciation is not included in cost centre accounting.

The bases of the allocations are as follows:

- expenses incurred at the sand and shell cost centre are treated as material purchases and charged to the raw materials account

- expenses relating to raw materials consumption, fuel and electricity consumption, and the labour expenses of batch house, pressed glass, hollow glass and screen printing cost centres are charged to direct production expenses

- all expenses incurred at the machine shop, carpentry, transport and electrical workshops as well as all overhead expenses of batch house, pressed glass, hollow glass and screen printing are charged to factory overhead

- all expenses incurred at the canteen, dispensary and administration cost centre etc. are charged to administrative overheads

Using the operating cost analysis summary, the general ledger clerk passes a journal voucher crediting the appropriate expense accounts in the expenses ledger and debiting the manufacturing account and the appropriate operating statement accounts in the general ledger thus clearing the expense ledger account with the exception of the sales revenue.

7. GENERAL LEDGER AND PREPARATION OF THE TRIAL BALANCE

The general ledger records assets and liabilities and includes control accounts for trade debtors, staff debtors and creditors.

A manufacturing account and finished goods stocks accounts for both pressed and hollow glass are included in the general ledger and are within the double-entry.

For each period, production expenses, i.e. direct labour, direct material, variable and fixed production expenses including depreciation, are posted from the appropriate expense ledger accounts to the debit of the manufacturing account. This account represents all processes for both hollow and pressed glass. Work in process (WIP) is assumed to be a constant quantity of molten glass retained in the furnaces evaluated at a standard value. No formed glass in subsequent processes is included in WIP. Thus the cost of output for the period, the balancing credit on the manufacturing account, is the same amount as the total of production expenses debited.

The cost of output is posted to the debit of the finished goods stocks accounts apportioned between pressed and hollow glass on the basis of output weight as reported in the production summaries. The finished goods stocks at the end of each period are derived from the production summaries and evaluated at invoice price and are debited and credited to the finished goods stocks account as appropriate. The cost of sales is the balancing credit on each finished goods stock account.

Accounts for the operating statement headings are included in the general ledger to which the appropriate expense ledger accounts are posted each period. Thus, with the exception of the sales revenue, all the expense ledger accounts are cleared to the general ledger each period.

The trial balance is prepared in balance sheet format and verified by the Accounts Manager prior to preparation of the operating statement.

8. WAGES AND SALARIES

Wages and salaries are paid monthly. The junior staff payroll is prepared by the wages and salaries clerk and the senior staff payroll is prepared by the Accounts Manager.

The wages and salaries clerk receive copies of all engagement, promotion, suspension and dismissal letters from the Personnel Department.

Junior staff are required to clock in and out on arrival and departure respectively. Time keepers use the clock cards to prepare employees' time sheets grouped by department. The time sheet details are summarised in night/discomfort/and absenteeism returns which are usually available to the Wages Section by the 15th of every month.

Overtime is authorised by departmental managers with the approval of the General Manager and details are submitted on pre-printed forms for verification by the time keepers and the Personnel Manager.

Basic pay, overtime, other allowances and deductions, e.g. income tax and employee social security contributions, are recorded on the earnings record cards. From these cards, the wages and salaries clerk assisted by 2 other clerks, calculates and prepares the payroll.

The payroll is then submitted to the Accounts Manager for checking and signature and then passed over to an internal auditor who pre-vouches all entries on the payroll prior to payment.

Wages and salaries are normally paid in cash. The wages and salaries clerk prepares a denomination analysis by department of cash required. A cheque is drawn for the exact amount and signed by both the Divisional Accountant and the General Manager.

The cashier accompanied by the Accounts Manager, security officer and armed policemen goes to the bank to cash the cheque.

The pay packets, with distribution details, are prepared and the cash counted and enveloped by the accounts clerks working in pairs.

The supervisors collect the pay packets of their respective sections. On receipt of his pay packet, the employee signs or thumb prints the payroll. Unclaimed paypackets are retained by the cashier. At the month-end, total salaries and wages payments are analysed for posting into the expenses ledger.

9. FIXED ASSETS

Purchases of fixed assets during the year are posted without details to the general ledger accounts which are analysed between various categories, e.g. plant and machinery and motor vehicles. The postings are cross-referenced to the vouchers from which details of the purchase can be obtained. The particulars of recent fixed asset purchases are entered in an assets register analysed as follows:

- description of asset
- date of purchase
- purchase price
- expected normal life
- expected scrap value
- other associated costs
- location
- depreciation rate
- annual/monthly depreciation charge
- accumulated depreciation.

Depreciation is calculated using predetermined rates provided by GIHOC Head Office.

PART E

CASH

The procedures adopted for the recording of cash, cheques and letters of credit are described below under the following headings:

- Tarkwa Accounts - No. 1 and No. 2
- Takoradi Account
- Accra Account
- Petty Cash

1. TARKWA ACCOUNTS - No. 1 and No. 2.

The Division operates two accounts - No.1 and No.2 at Tarkwa, Ghana Commercial Bank and Barclays Bank respectively. These accounts are used for all receipts and payments excluding payments for letters of credit.

The Division maintains separate analysed cash books for receipts and payments. The cash books are balanced daily, weekly and monthly.

Receipts in duplicate are prepared for all cash and cheques received. These amounts are paid daily into the Division's account with either the Ghana Commercial Bank or Barclays Bank using a paying-in slip prepared in duplicate. Receipts are subsequently entered in detail in the analysed receipt cash book at the close of each day.

Suppliers' invoices to be paid are presented daily by an accounts clerk for authorisation by the Divisional Accountant. The clerk prepares a pre-numbered payment voucher and a cheque (where the amount involved exceeds ₵50.00) in respect of each invoice. The payment vouchers are prepared in duplicate and contain the following details:

- date of payment
- name and address of payee
- particulars of payments
- accounts code
- amount of payment

The payment vouchers, not yet detached from their pad, together with the appropriate invoices and cheques are checked by the Accounts Manager and taken to the Divisional Accountant and General Manager for signature and approval respectively. All of the documents are returned to the cashier who detaches the signed cheques for payment to the respective payees. The cashier subsequently stamps the invoice pad, attaches the original and duplicate copies of the PV with the relevant invoice and makes entries in the payment cash book prior to filing the document set in voucher sequence number. The remaining copy of the PV is retained in the pad.

Cash and cheques passed to commerical clerks for local purchases must be authorised by the Divisional Accountant and approved by the General Manager. For cash and cheque advances, either an IOU or cheque suspense voucher will be signed and the amount accounted for after the purchase has been made.

2. TAKORADI ACCOUNT

The Division's Takoradi account is operated at the Ghana Commercial Bank and is used for payments to the customs department and the Ghana Cargo Handling Corporation in respect of customs duties and handling charges on Divisions's imports. The procedures adopted for payments from this account are the same as those described in Section E.1 above.

3. ACCRA ACCOUNT

The Division's Accra account, which is operated at the Ghana Commercial Bank, is used mainly for payments for letters of credit.

The procedures adopted for payments are the same as those described in Section E.1.

4. PETTY CASH

The Division maintains petty cash on an imprest of $1,000 recorded in a petty cash book which is analysed by expense headings.

All payments up to $50.00 are made by petty cash.

Cash is counted each morning by the Divisional Accountant or his assistant and a cash count statement prepared and submitted to the General Manager.

The petty cash book is checked and balanced daily by the Accounts Manager. It is closed off at the month-end for posting into the expenses ledger.

PART F

ACCOUNTING FOR RECEIPTS AND ISSUES BY STORES

Accounting for receipts and issues by stores is described below under the following headings:

- Receipts of Sand and Local Raw Materials
- Receipts of Overseas Purchases
- Receipts of Local Purchases
- Receipts and Issues of Cullet
- Issues of Raw Materials
- Internal Issues
- Receipts of Finished Goods
- Issues of Finished Goods

1. RECEIPTS OF SAND AND LOCAL RAW MATERIALS

Within the laboratory, an analysis is maintained in the local raw materials receipts book (LRMRB) of all receipts of sand and local materials, e.g. limestone and feldspar.

The LRMRB is analysed by raw material type and it records the following details in respect of each truck load delivered:

- date of delivery
- particulars of vehicle
- weight of material delivered
- type of material
- supplier

The details are transmitted to the Costing Section by means of daily raw material receipt forms prepared by the glass technologist.

The quantities received are reconciled to the suppliers' invoices before payment. Under the supervision of the Accounts Manager, costs associated with total deliveries over a period, usually six months, are accumulated on a cost sheet as follows:

- royalties paid to land owners
- transport charges paid to contractors
- medical and sundry expenses
- labour costs
- miscellaneous expenses

These costs are picked from the appropriate ledgers and are related to the deliveries for the period unit costs per tonne.

2. RECEIPTS OF OVERSEAS PURCHASES

For each shipment, the senior cost clerk prepares a cost sheet in quadruplicate recording costs incurred as follows:

- bill amount
- bank charges on letters of credit
- marine insurance
- import duty
- delivery expenses
- handling charges
- transport charges

The costs are picked from the cost report prepared by the Shipping Section supported by the import entry forms and invoice. The cost sheet is distributed as follows:

original	-	to the PDB clerk
duplicate copy	-	to the storekeeper
triplicate copy	-	to the Commercial Manager
quadruplicate copy	-	retained

The total and unit costs derived are entered on the receiving sheet passed to the stores ledger clerk for entry on the cardex.

3. RECEIPTS OF LOCAL PURCHASES

For each receipt of local purchases, the storekeeper picks the cost from the accompanying invoice or receipt and enters it on the receiving sheet which is passed on to the stores ledger clerk for entry.

4. RECEIPTS AND ISSUES OF CULLET

Cullet excluding drainage during machine breakdowns is weighed prior to dumping at the batch house. The weight is recorded in a note book and summarised weekly for the Production Manager. Cullet obtained from drainage is dumped at the batch house without weighing.

Issues of cullet to prodcution are recorded on the raw materials analysis return which is submitted to the Costing Section daily. The cost clerk compiles the weekly issues in the raw materials analysis book which is closed off at the month-end. He prepares a monthly summary of the cullet issues evaluated at basic raw material cost.

5. ISSUES OF RAW MATERIALS

Issues of raw materials, e.g. sand, shells and chemicals are notified to the Costing Section by means of daily raw materials consumption returns prepared by the batch house superintendent.

The daily issues to production are compiled weekly in the raw material analysis book (RMAB) by a cost clerk. The RMAB is closed off at the end of each month, the quantities totalled and evaluated at unit cost on first in first out (FIFO) basis. The general ledger clerk subsequently collects the RMAB for postings into the appropriate ledgers.

In addition, stores issue vouchers (SIVs) are prepared for chemicals and are passed to the stores ledger clerk for entry.

6. INTERNAL ISSUES

Issues from the stores are notified to the Costing Section by means of SIVs as described in Section B. Each SIV contains details of the cost centre to be charged. The cost clerk enters the SIVs directly into the appropriate store ledger cards and costs them on a FIFO basis prior to posting them in the departmental issues analysis book (DIAB).

The DIAB, which is analysed by expense headings and by cost centres, is closed off at the month-end for posting into the expenses ledger and recording on the departmental cost analysis sheet.

7. RECEIPTS OF FINISHED GOODS

All receipts of finished goods are entered by a cost clerk in the analysis book for cost of goods produced (ABCP) from the goods transfer notes (GTN) which are received daily from the packing section.

The ABCP is analysed by product type and contains details of date of receipt and quantity received.

The ABCP is closed off at the end of each month and a summary prepared of the output received from hollow and pressed glass respectively. The receipts are evaluated by apportionment by weight of the actual production cost as derived from the manufacturing account in the general ledger.

8. ISSUES OF FINISHED GOODS

Issues of finished goods are entered in the analysis book for cost of sales (ABCS) from the loading sheets which are received daily from the stores and forwarding section. The ABCS is analysed by product group and contains the following details:

- date of issue
- invoice no.
- quantity issued.

The ABCS is closed off at the end of each month and a summary is prepared if the issues evaluated at invoice prices.

PART 8

STORES LEDGERS

Stores ledgers are maintained in the Costing Section in a cardex for all stores items except sand, shells and cullet.

The procedures used for the stores ledger are described below under the following headings:

- Entries
- Verification
- Valuation

1. ENTRIES

The main sources for entries to the ledger cards are the receiving sheets and the stores issue vouchers described in detail in Section 8 and F.

2. VERIFICATION

The cost clerk in charge of the cardex confirms that the bin cards in the stores agree with the stores ledger cards by reference to the closing balance indicated on the stores issue voucher and by periodic checks.

Physical stock-taking is carried out occasionally on a sampling basis for spare parts and general stores, and monthly for finished goods.

3. VALUATION

All stores, except finished goods, are evaluated on a first in first out basis.

Finished goods are evaluated at selling prices.

PART H

PRODUCT COSTING

The procedures for product costing are described below under the following headings:

- Unit Cost of Glass
- Unit Cost of Products
- Use of Cost data

1. UNIT COST OF GLASS

The cost per tonne of glass produced is calculated at the end of each month by the Accounts Manager. The total costs relating to output of glass are compiled each period in a production cost statement as follows:

	Data Source
Total material input (tonnes)) Total output (tonnes))	- Production report prepared by Ag. Production Manager.
Material consumption	- Raw material consumption analysis book
Direct labour cost	- wages and salaries analysis book
Production overheads) Administrative and other expenses)	- Departmental cost analysis

The total production cost so derived is related to the total output of glass to arrive at the cost per tonne. No differentiation is made between hollow and pressed glass. The production costs include operating expenses of all processes.

2. UNIT COST OF PRODUCTS

Periodically the cost per tonne of glass is converted to item unit cost on the basis of standard product weights.

3. USE OF COST DATA

Cost data is used primarily for pricing purposes.

PART I

BUDGETARY CONTROL

The procedures for operating budgetary control are described below under the headings:

- Budget Preparation
- Period Operating Reports

1. BUDGET PREPARATION

Responsibility for preparing the Division's annual budget rests primarily with the Divisional Accountant with very limited assistance from the departmental managers.

The budget preparation commences with the assessment of the expected production quantities in tonnes by the Divisional Accountant.

Other budgets are subsequently prepared by the Divisional Accountant when the production budget has been completed.

The master budget which embraces all the departmental budgets is discussed with the General Manager prior to submission to the Head Office for approval.

The documents included in the Division's annual budget file submitted to the Head Office are as follows:

Form	Title
O.P.1.1	- Budget Operating Statement
O.P.1.2	- Phased Budget Operating Statement - Monthly Analysis
O.P.1.2 (b)	- Phased Budget Operating Statement - Cumulative Analysis
A.S.2.1	- Budget Balance Sheet - Fixed Assets Schedule - Source and Application of Funds Statement

A.S.2.2	- Cash Forecast
A.S.2.4	- Capital Expenditure
A.S.2.5	- Capital Asset Disposal
SAL 3.1	- Budget Sales Summary - Sales Value
SAL 3.1 (b)	- Budget Sales Summary - Sales Quantities
SAL 3.2	- Phased Budget - Sales Statement - Values
SAL 3.2	- Phased Budget - Sales Statement - Pieces
SAL 3.3	- Budget Selling Prices
MAT 4.1	- Raw Materials Budget
MAT 4.2	- Budget Product Consumption of Main Raw Materials
FIX 7.1	- Production Expenses
FIX 7.2	- Administration Expenses
FIX 7.3	- Selling, Distribution & Advertising
FIX 7.6	- Staff Housing
W.1	- Wages and Salaries - Senior Staff
W.1 (b)	- Wages and Salaries - Junior Staff

The implementation of the Division's annual budget is the joint responsibility of the Divisional Accountant and the General Manager.

2. PERIOD OPERATING REPORTS

The Divisional Accountant supervises the preparation of the following reports each month for distribution to the Division's senior management and to Head Office:

- Operating Statement - HQ 1
- Debtors/Creditors/Stock - HQ 5
- Monthly Cash Forecast - HQ 8
- Accounting Ratios
- Production Cost Report
- Departmental Wages/Salary Analysis
- Raw Materials Stock Position.

The balance sheet (form HQ. 2) can readily be prepared for each period.

Data for preparation of the forms is picked from the financial records.

VOLUME 2

ANNEXE VIII

FINANCIAL

HEAD OFFICE CONSOLIDATION PROCEDURES

GIHOC HEAD OFFICE

CONSOLIDATION PROCEDURES

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CONTENTS

APPENDICES (Continued)

PART A

INTRODUCTION

This report is the result of an accounting consultancy assignment carried out in the Head Office of GIHOC, during the period from March to July 1977, as part of a larger programme of management assistance commissioned by UNIDO from P-E Consulting Group Ltd (P-E) under the United Nations Development Programme. Within the Divisions Head Office of GIHOC, P-E is required to implement a programme of changes and improvements to management practice.

This report is concerned principally with the Head Office role of financial co-ordinator of the various divisions within GIHOC. In particular it deals with the problems of collation of meaningful financial information at the centre and the control of transactions between Head Office and the divisions and between the divisions themselves.

In general, the recommendations contained within this report have already been implemented at the time of writing and it is intended that the report and its appendices should be regarded as a manual for those required to operate the systems in future.

The Director of Finance, Mr. M. Gyekye-Mensah, the Chief Accountant, Mr. J. Ayeh, and the Consolidations Accountant, Mr. P. Aduhene, have all reviewed and commented on the contents of this report. They wish to put on records their endorsement of the recommendations and proposals made for the improvement and development of the central financial monitoring system.

The consultant wishes to thank the afore-mentioned officers and their staff, together with the financial managers of the various divisions of GIHOC, for their active co-operation and assistance during this assignment.

V.J. TUFFIELD

UNDP

AUGUST 1977

PART B

BACKGROUND, OBJECTIVES AND APPROACH

1. BACKGROUND

In the stage I survey report it was stated that there was a need for reviewing the monitoring of divisional results by headquarters. This was primarily seen as a problem of improving the accuracy, scope and consistency of divisional financial reports which were intended to be brought together and processed by means of revised procedures at the centre. In particular it was suggested that a standard group system should be introduced.

During stage II of the project GIHOC management expressed increasing concern over the problem of producing audited group accounts within a reasonable time after the year end. The following table demonstrates the delays that have been experienced in the past.

Year Ended	Date of Audit Report
31.12.68	15.12.70
31.12.69	25.2.72
31.12.70	29.10.73
31.12.71	10.1.74
31.12.72	15.11.74
31.12.73	1.5.75
31.12.74	12.2.76

(Note: The accounts for the year ended 31.12.75 had not been received in their consolidated form at the time of writing this report and those for year ended 31.12.76 were in the process of audit)

Thus it can be seen that, although there has been some improvement in recent years, the basic situation is far from satisfactory.

The necessity for improving this situation is demonstrated by the fact that the Government will not sanction bonus payments to GIHOC Staff on the strength of management accounts alone. Also, a more rapid publication of consolidated accounts will strengthen the organisations corporate image, not only with the general public but also with the various ministries and other official bodies with whom it has dealings.

2. OBJECTIVES

Given the situation as outlined, the prime objectives of this assignment was to explore ways and means of speeding up the consolidation process and thereafter to report and implement a series of recommended changes in procedures.

Initially, this was regarded from the view point of annual financial consolidations for audit purposes. However, as the investigation progressed it soon became apparent that there was a need for this information to be available at more frequent intervals. This is necessary in order that central management has the opportunity of monitoring, on an on-going basis, the capital structure and liquidity of the Corporation as a whole.

Consequently, it can be seen that the initial terms of reference were developed and expanded as the assignment proceeded.

In addition, an examination of the consolidated accounts of past years showed that there was severe accounting problems involved in inter-divisional trading and indeed between the Head Office itself and the various divisions. There was therefore a need to develop a means of monitoring the various current accounts and to systemise communications about internal transactions.

3. APPROACH

The consultant commenced the assignment by holding a series of discussions with the Director of Finance, the Chief Accountant and the Consolidations Accountant, in order to determine the nature of the problems and to find out what attempts had been made to overcome them.

After this, the basic concepts of the recommendations were discussed and, following broad agreement, interviews were sought with the State Enterprises Audit Corporation. This purpose of interviews were firstly to obtain their views on the problems encountered in the past, secondly to establish their concurrence with the basic principles involved in the proposals, and thirdly to discuss in detail the accounting conventions to be used.

As a result of these discussions an internal memorandum, in the form of an instruction manual, was drawn up concerning the procedures required to improve the reporting of financial information to Head Office on a monthly basis. This memorandum was then delivered personally by the consultant to the divisional accountants of all the divisions, with the exceptions of two in outlying areas, where the introductions were made by a colleague consultant. The purpose of these visits was to introduce the new systems and explain the reason why the change was necessary.

PART C

FINDINGS

This part of the report describes the findings of the investigation. The commentary is organised in the following manner:

- annual financial consolidation
- monthly management information
- inter-divisional accounting

1. ANNUAL FINANCIAL CONSOLIDATION

As already stated, the problem here is that there is an inordinate delay in the production and therefore publication of the annual accounts for the Corporation as a whole. The reasons for this divide into two main areas:

- audit problems
- accounting problems

1.1 Audit Problems

Although GIHOC is unlike a conventional group of companies, in that the operating divisions are not separate corporate entities, the problems of audit and production of consolidated accounts remain the same. There are in fact a few 'subsidiary companies', although not in the conventional accounting sense since there are no investments in terms of shares, and there are also some investments in associated companies. However, the accounts of these subsidiary and associated companies are not included in the consolidation.

In theory, as GIHOC is a single legal entity, the external auditors should be presented with one set of draft accounts for the whole Corporation for review. However, each operating division is an autonomous accounting centre and in the past head-quarters has been unable to produce a unified set of accounts.

Therefore, the external auditors have had to set about their task by treating each division and head office as separate trading bodies and review the accounts for each. Thus there are currently seventeen seperate audits of draft accounts to be processed before the whole can be pieced together. In the absence of a clearly defined audit trial from the centre outwards to the divisions, this is the only manner in which the auditors can fulfill their statutory obligation to satisfy themselves as to the state of affairs of the Corporation.

Also the external auditors expressed the view that the Internal Audit Department, as it is currently staffed and structured, is not sufficiently independent for them to be able to rely to any large extent on the internal audit. As has been stated elsewhere, this view is shared by the Consultants to this project.

It should also be borne in mind that in Ghana there are considerable logistical problems in auditing a widespread organisation such as GIHOC, with branches in remote regions.

However, bearing in mind all these constraints on the external auditors, it nevertheless must be said that not a great deal of effort has been put into the planning of the annual audit. In particular it appears, that their usual practice is for them to await the production of a certain division's draft accounts before commencing that divisions audit. Consequently, a backlog of work builds up as more and more divisions finish their final accounts and the external auditors' limited resources are unable to cope with them all in a short space of time. This problem could be reduced if the auditors adopt the recommendation put forward later in this report.

1.2 Accounting Problems

Speedy production of consolidated results depends upon efficient preparation of individual sets of draft accounts for the divisions and headquarters. However, prompt production of accounts is not sufficient in itself, the accounts also need to be accurate and consistent. Observations made during the assignment show that the draft accounts submitted to the head office are currently far from accurate or consistent

Trial balances are submitted to headquarters each month by all divisions and the Head Office Accounts Department. In the past each one of these has been different both in content and in format. It was originally intended that, as the result of discussions between GIHOC management and the external auditors before the commencement of this assignment, these trial balances should form the basis of a central consolidated ledger containing an on-going of all assets, liabilities and revenue transactions. However, due to the wide divergence of presentation between the division, this exercise entailed a considerable amount of time-consuming work before any entries could be passed through the books. Also there were considerable problems of definition as similar accounts would have different titles in different divisions and it was not always easy for someone at the centre to decide into which groups or classifications they should fall. A further problem arose due to the monthly trial balances being submitted on a cumulative basis. This meant that for the records to be cumulative also, the monthly movements had to be extracted by comparing each trial balance with that of the previous month and the differences analysed and posted.

This system ultimately proved to be too cumbersome and at the time of commencement of the assignment the decision had already been taken to abandon the monthly cumulative records. Instead an attempt was to be made to produce a consolidated set of accounts based on the trial balances at the end of December 1976. This avoided the problem of deducting monthly movements but not that of analysing the accounts into a common series of account headings.

This work continued the course of the investigation but further problems were encountered when the draft accounts prepared by the divisions started to arrive. These were found to disclose completely different sets of figures in almost every respect in almost every division. This entailed a further exercise concerned with establishing the areas of difference and passing through a series of journal entries in the consolidation books to adjust the figures to agree with the draft accounts.

The net of this is that, for the first time, a draft set of consolidated accounts has been produced for the external auditors to

review once they have finished their work in the divisions. However this has been achieved at the expense of a considerable amount of time and energy put in by the consolidations team.

In summary, therefore, the accounting problems can be stated as follows:

(a) The presentation and content of the trial balances is inconsistent and therefore difficult to consolidate;

(b) the preparation of the trial balances is such that the contents do not provide an accurate record of the financial position of the divisions; and

(c) the process of consolidating the trial balances is not worthwhile unless the procedures are improved at divisional level.

2. MONTHLY MANAGEMENT INFORMATION

The existing accounting returns submitted each month to headquarters consist of an operating statement, a statement showing movements in trade debtors, trade creditors, raw materials stock, finished goods stock and work-progress, and a cash flow forecast. Balance sheets are produced at six monthly intervals only.

The problem arising from this situation is that there is no means of checking the figures since the accounts are not financially proven through the dicipline of producing monthly balance sheets. This must cast serious doubts on the validity of the information produced.

An examination of the monthly trial balances showed that, in most cases, the figures on the operating statements bore no relationship to the figures in the books of account. Most divisions were preparing their operating statements from memorandum records which contained numerous adjustments to the financial figures and in some instances it was discovered that the operating returns were being completed prior to the books having been balanced.

Also in many divisions the stock accounts were not 'live', i.e. they did not records movements in the stocks in the books of account. Thus it was not possible to verify the cost of materials consumed from the trial balance.

This problem had already been commented on in the divisional accounting reviews and the recommendations put forward, particularly those relating to integrated costing systems and cost centre analysis, were designed to correct the situation.

Apart from the question of the validity of the information submitted, the other major problem is the deficiency of adequate information on which to base a view of the Corporation as a whole. Although the monthly operating statements provide a means by which central management can monitor the progress of individual divisions there is no opportunity of examining such things as corporate liquidity, the flow of funds, the changes in the overall investment in stocks, the level of debtors throughout the organisation, and the progress of capital investment programmes. Without this information there can be a tendency to concentrate on the weakest divisions whilst perhaps overlooking the fact that the Corporation as a whole may be achieving far better results. Management does not have the means to regularly review and update its group development plans and financial policies in the light of changing circumstances.

3. INTER-DIVISIONAL ACCOUNTING

The magnitude of the problems in this area can quite easily be seen from a casual examination of the audited consolidated accounts. In any consolidation, whether of companies or divisions, the amount of indebtedness between the constituent parts should cancel out. In GIHOC this does not happen. There is always an unreconciled difference in the annual accounts.

To illustrate the point, the balances at the end of each year are listed below:

YEAR ENDED	DIFFERENCES
	£
31.12.68	937,039
31.12.69	(3,013,442)
21.12.70	(559,868)
31.12.71	2,890,647
31.12.72	3,306,569
31.12.73	3,170,436
31.12.74	867,403
31.12.75	NOT AVAILABLE
31.12.76	3,639,601

(Note: Figures in brackets indicate a credit balance)

The reason for this imbalance is that there are no regular standard procedures in operation for reconciling the balances between divisions or between the divisions and Head Office. In particular there has been no issue of standard accounting practice on the problems of cut-off at the year end.

The content of this net balance is not known but it is conceivable that this could represent expenditure which has not been properly accounted for through the revenue account over the years. If this is the case it would mean that the current assets of the Corporation are substantially overstated. The significance of this can be put into perspective when one considers that the balance at the end of 1976, per the unaudited draft accounts, represents over 25% of the total accumulated surplus to date.

PART D

RECOMMENDATIONS AND PROPOSALS

This section of the report outlines a series of recommendations and proposals designed to alleviate the problems described in Part C.

The overall objectives are:

- to improve the flow of information to headquarters
- to improve the content and validity of such information
- to speed up the consolidation process
- to produce the annual accounts sooner after the year end
- to provide additional management information on monthly basis.

1. BASIC PROPOSALS

The means of achieving these ends is through standardisation. The principal recommendations are as follows:

(a) All divisions and Head Office should re-arrange their general ledgers so that the accounts follow a pre-determined sequence.

(b) A common coding system should be adopted.

(c) The presentation of the monthly trial balances should follow a common format.

(d) Operating statements should be extracted directly from the trial balances.

The details of these proposals are contained within APPENDIX A to this report and it is not, therefore, necessary to reiterate them here.

However, the salient features are noted below:

- the accounts have been arranged in a logical sequence to conform with the consolidated balance sheet headings

- the accounts required to be reported have been reduced to the minimum necessary for central information purposes

- the coding system is based on a simple alphanumeric code

- comprehensive guidance has been given on the interpretation of the account headings

- the format of the trial balance has been designed to show monthly movements as well as the cumulative position

- the trial balance has been sectionalised to facilitate collation at Head Office

- divisional accountants are required to report on unusual movements monthly so as to forestall queries from the centre and therefore prevent delays in collation

- interim divisional balance sheets can readily be extracted from the trial balances.

2. AUDIT

The recommendations covering audit procedures fall into two spheres:

- internal audit
- external audit

2.1 Internal Audit

It is not within the compass of this report to comment generally on the functions of the Internal Audit Department. However certain aspects of them impinge on the problems; with which this report is concerned.

The internal auditors have a big role to play in improving the accuracy of the information produced. In order to achieve this it is recommended that they should regularly, though not necessarily monthly, conduct balance sheet audits at divisional level. This means that they should concern themselves with verifying the figures reported on the trial balance as well as detailed vouching of source data.

It is important however that the submission of the trial balances is not delayed pending audit. Any errors found can be adjusted in the ensuing month.

Comment has already been made on the independence of the internal auditors. Until such time as the external auditors feel that they can safely rely to any large extent on the work of the internal audit department, there will continue to be duplication of verification work at considerable cost to the Corporation. Competent internal audit will reduce the work of the external auditors and thereby speed up the publication of annual accounts.

It is therefore recommended that urgent priority should be given to the restructuring of the internal audit department in order to restore their independence.

Also the internal auditors should adhere rigidly to the existing audit programmes, which are considered adequate, and not involve themselves in other areas of management. Management audit should take second priority to financial audit.

2.2 External Audit

It is not within the competence of the consultants to dictate to the State Enterprises Audit Corporation how they should organise their business. However, it is considered that it is in GIHOC's best interests that a dialogue between top management and the senior officers of the external auditors should be commenced with the objective of exploring ways and means of reducing the audit lag.

In particular it is suggested that GIHOC impress on the auditors the need for interim audits. There is no reason why much of the detailed vouching work cannot be completed before draft accounts are produced. If this were carried out, the final audit would be a comparatively short exercise in checking year-end cut-off procedures and verifying the existence of assets and liabilities.

It is important, however, that the divisional accounting staff are aware that this will take place and that they will be expected to co-operate. Although a detailed time-table of visits should be drawn up by the external auditors in conjunction with GIHOC's financial staff at Head Office, the precise timing of specific visits to divisions should not be communicated in advance unless there are unavoidable logistical problems such as accommodation.

In general, the work of both the Internal and External Auditors should be considerably facilitated by the adoption of the prepared standardised general ledgers and the related coding system.

3. DIVISIONAL ACCOUNTING

Many of the problems of accuracy currently arising in the divisions should be solved by the adoption of the recommendations contained within the individual divisional reviews. In particular the proposed integrated costing system should overcome the present difficulties with stocks, work-in-progress and materials consumption, and an area which gives rise to considerable differences at the year end.

In addition the integrated cost centre analyses, which are currently being introduced throughout GIHOC, are designed to automatically produce summary figures for operating statement purposes. The analysed data will be posted to control accounts with operating statement headings and these also conform with the requirements of the standard trial balance format.

Divisions are now also required to pass entries through the books monthly for current depreciation, Head Office contributions and internal finance charges instead of waiting for the year end.

All of these factors should combine to reduce the discrepancies between the trial balance and the draft accounts at the end of the financial year.

There remains the question of accruals and repayments and divisions should be vigorously encouraged to bring into their accounts each month, by means of journal entries, as much as possible of known or estimated liabilities. This can be monitored by the consolidations team in that enquiries can be made if there is no movement on the accruals or prepayments accounts from month to month.

4. CENTRAL PROCESSING

It is not felt necessary to change the consolidated books of account themselves except in so far as it is necessary to re-arrange the ledger accounts to conform with the trial balances. The posting procedures will also remain the same. However, the whole process should be considerably speeded up since all the information has been pre-analysed on to the trial balance form. Also, since the trial balances show monthly movements, the process is simply one of checking and transfer of each division's figures into a summary book prior to posting to the ledger every month.

Apart from simplifying the posting process, the purpose of showing monthly movements is to enable the consolidations team to recognise any accounting problems as they arise and initiate corrective action rather than waiting for the year-end draft accounts. It is intended that the time saved in processing shall be utilised in thoroughly checking the information received.

The Consolidations Accountant will be expected to liaise with the Divisonal Accountant in order to resolve errors and omissions. The responsibility for investigating discrepancies therefore rests with the Consolidations Accountant. In the unlikely event that investigation shows that errors are resulting from a weakness in the operation of a particular division's system, then the Head of Accounting System should be called in to advise on the solution to the problems.

The consolidation procedures and checking processes are described in more detail in APPENDIX B.

5. MANAGEMENT INFORMATION

The existing management returns have been retained on the grounds that everyone is familiar with their style and content. However, a number of proposals are made to supplement the information provided.

At divisional level recommendations have already been put forward in the individual accounting reports whereby the divisions are required to produce monthly balance sheets, product contribution statements and capital expenditure reports. The first of these will be considerably facilitated by the introduction of the standardised trial balance format.

In addition to these new divisional returns it is proposed that the following statements should be drawn up at headquarters every month:

- Consolidated Balance Sheet
- Consolidated Operating Statement
- Consolidated Source and Application of Funds Statement

With these documents management will be in a position to assess:

- overall profitability
- changes in the capital structure
- progress of capital investment plans

- changes in the level of debtors and creditors
- the level of investment in inventories
- the movement of liquid funds.

The last of these items will be explained by the sources and application of funds statement. It has been recommended in the report on the Head Office Accounts Department that a similar monthly statement be drawn up to reflect the movements for headquarters itself. Consequently. a simple comparison of the two statements will enable management to assess the relative liquidity of Head Office with that of the divisions and corrective action can be taken if necessary.

The format of the recommended statements is shown in APPENDIX C, together with instructions on completion of the source and application of funds statement.

6. INTER-DIVISIONAL ACCOUNTING

Here there are two basic problems which require attention.

Firstly, there is a considerable backlog of reconciliation work required both between Head Office and the divisions and between the divisions themselves.

Secondly there is a need to improve the accounting, procedures at Headquarters.

In so far as it affects Head Office the first point has already been mentioned in the report on the Head Office Accounts Department. By far the greatest part of the imbalance arises between Head Office and the divisions. For the most part this dates back to the times when Head Office was organising the letters of credit for all divisions. Fortunately this practice has now stopped. However there are still a considerable number of balances in the Head Office overseas creditors accounts which presumably relate to the importation of goods on behalf of the operating divisions. It is therefore most important that these balances are cleared before any attempt is made to reconcile the divisional balances.

On the second point it is recommended that a directive should be sent from Head Office to all divisions and the Head Office Accounts Department specifying the routines which should be carried out each month. These should include the following:

- all debit and credit notes must contain an indication of the current account to be debited or credited.

- each month statements must be despatched within one week of the trial balance having been agreed to all other divisions with whom an account is maintained, irrespective of whether or not there has been any movement during the month (a copy of this statement should also be sent to Head Office),

- a member of the staff in each accounts department should be allocated the task of reconciling current movements each month with the statements received from other divisions or Head Office.

If these simple instructions are carried out divisional accountants will have the opportunity of questioning allocations as they arise and the current imbalance will not worsen.

The task of sorting out the existing balances should be given to an accountant based at Head Office. Once the overseas creditors accounts have been cleared at Head Office, this man will then have the job of visiting the various divisions in order to establish the amount of each balance which cannot be reconciled or for which documentary evidence no longer exists.

As a result of these visits he should prepare a paper for the Board reporting on the situation so that policy decisions may be taken as to how the residue can be written off.

There is also a need for setting up a system of monitoring progress on divisional reconciliations on a monthly basis. Since the accountant concerned is likely to be away from the office a great deal on divisional visits, it is recommended that he should be allocated an assistant to maintain routine records and files.

The assistant would prepare two schedules of balances which would be extracted from the trial balances each month. The first of these would be in columnar form with the divisions along one side and the five Head Office accounts along the other.

For each of the five types of account there would be two columns in which would be entered the balance per the division's books and that shown in Head Office books. This would give an immediate indication of the problem areas for investigation.

The second schedule would be in a matrix form with the divisions (not Head Office) along both sides. One particular division's balances with other divisions would then be entered down the page in its own column and totalled. Once this has been done for all divisions, the columns can then be added across for each division to give a total of the accounts as held by the other divisions. A comparison of totals at the bottom with those down the side would give a clear indication of those divisions having most difficulty in agreeing their accounts.

However, as each division may have up to three accounts with any other division, once one has been selected for investigation, a more detailed schedule should be prepared showing details of all accounts as per their own books as compared with the other divisions records. It should be borne in mind that a purchases account in one division's book should contra with the sales account in another division.

The assistant would also undertake the task of chasing those divisions who had not submitted copy statements. Once received these statements would be checked against each other and missing items can be noted so that the accountant in charge can follow them up on divisional visits.

In view of the amount of travelling involved in this work it is recommended that serious consideration be given to the question of providing a permanent means of transport. This could be shared with other members of the consolidation team.

APPENDIX A

[redacted] INTER OFFICE MEMO

From: Copy to:

To: Date:

[redacted] OF GENERAL LEDGERS AND TRIAL BALANCES

INTRODUCTION

As part of our investigations into Head Office accounting routines, we have been considering the procedures required for more effective consolidation of the accounts of the various operating divisions. The aim is to attain a progressive improvement in the flow of financial information to Head Office and in the longer term to achieve speedier production of year-end audited accounts for the Corporation as a whole.

As a first step towards these ends, it is proposed that all divisions should, as soon as possible, adopt a common system of general ledger coding and trial balance presentation. This will enable the Head Office Finance Department to collate the financial information speedily and efficiently and in due course to extract more meaningful management information.

Other advantages arising from the introduction of our recommendations are as follows:

(a) The use of a common ledger coding system will facilitate the work of the auditors - both internal and external.

(b) The uniform coding will help accounting staff transferring between divisions to settle in to their new environment.

(c) The reduction in the number of ledger accounts required and the greater use of control accounts should produce improvements in the accuracy of postings.

(d) The inclusion in the trial balance of control accounts for the major headings contained within the Operating Statements will enable the latter to be broadly verified and reconciled with the trial balances.

RECOMMENDATIONS

Our recommendations are discussed below under the following headings:

(a) Standard coding
(b) Trial Balance format and procedures
(c) Year-end draft accounts
(d) Implementation Programme

(a) Standard Coding

It is proposed that all divisions and Head Office should adopt a common system for their general ledgers. The recommended codes are set out in Appendix AI.

It will be seen that these comprise eight major account groupings each with a letter code as follows:

A. Inter-Divisional Accounts
B. Fixed Assets
C. Investments
D. Current Assets
E. Current Liabilities
F. Long Term Liabilities
G. Capital and Reserves
H. Revenue Accounts

Each major group has been sub-divided into those accounts which are required for Head Office purposes, and as such comprise the minimum information required. At the same time, to avoid unnecessary and time-consuming analysis or collation of numerous balances in order to arrive at those figures, the specified accounts should also be regarded as the maximum amount of detail required.

Further analysis can be furnished to Head Office on request.

Detailed notes and comments on particular accounts within each group are shown in Appendix AII.

Since, in many instances, the coded accounts are summaries of numerous individual balances, it will be necessary for divisions to further sub-divide the accounts and introduce their own sub-code routines for internal use only. The codes in Appendix AI relate to only those accounts which are required to be reported to Head Office.

(b) Trial Balance format and procedures

The format of the monthly trial balance to be submitted is shown in Appendix AII. A temporary supply of forms is being issued to all divisions and once the procedures have been operating for a few months printed forms should be made available.

It will be noted that each trial balance consists of;

- the opening balances for the month
- the movements on accounts for the month
- the closing balances at the end of the month

The object of this is to enable the Head Office consolidation team to post each months movements into a cumulative summary ledger. Also Head Office staff will be better able to recognise any accounting problems as they arise and initiate corrective action without having to wait for the year-end draft accounts.

In order to prevent numerous queries arising from Head Office and the consequent delays due to communication problems, it is recommended that each month all divisions should attached to their trial balances a report explaining any significant adjustments made in the current month in respect of any previous period.

Furthermore, when the year accounts of a divisions have been audited, the necessary accounting adjustments should be posted as a separate exercise

and a revised trial balance submitted showing the adjustments in the centre column as current month's movements. This will enable the Head Office consolidation team to adjust their summary ledger and reconcile the opening balances at the beginning of the year with the subsequent audited accounts.

(c) Year-end draft accounts

Ultimately the level of monthly accounting to trial balance should reach a stage where there will be no need for a separate exercise to be undertaken to produce draft accounts. However, it is recognised that this is a longer term objective, and in the immediate future, with the constraints imposed by the availability of suitably qualified or experienced accounting personnel, it is not feasible to achieve this aim. Consequently, it will be necessary for draft accounts to be prepared at the year end for each division when a detailed trading account will be required by the external auditors.

(d) Implementation of Coding System and Trial Balance Reporting

Implementation is phased in four stages and although no specific time-table is planned for each individual stage, Divisional Accountants should complete all four stages in time to produce the June trial balance in the new coding order.

The four phases are as follows:

(i) Phase I

Each Divisional Accountant should take his list of accounts as per his existing trial balance and code each account to conform with the recommended standard coding in Appendix AI.

He should then list in the sequence shown in Appendix AI, all the new account headings applicable to his division and show against each one the titles of the existing accounts to be included. This list should be sent to Mr Aduhene, the Consolidations Accountant, at Head Office.

Every effort should be made to prepare these lists as soon as possible and send them to Head Office by the quickest possible means.

Head Office will check the account allocations and ensure that a uniform approach is adopted by all divisions.

(ii) Phase II

Once Head Office has had an opportunity of checking the revised grouping of accounts, the Divisional Accountant will be given clearance to continue with Phase II of the implementation programme.

Upon receiving the clearance, the divisional accounts department should complete the posting cycle currently in progress and balance the books as normally. New ledgers and/or ledger cards should then be opened for all accounts in the order required under the standard coding system. The balances on the old ledgers or ledger cards should then be transferred on to the new ledgers or cards which should then be totalled and balanced again to ensure no errors have arisen.

In order to avoid delays the trial balance for the month in question may be submitted in the old format prior to opening the new books.

(iii) Phase III

As soon as the new ledgers are opened the posting cycle can begin using the new codes. At the end of that month (no later than June) a trial balance can be submitted in the new format using the third column only.

(iv) Phase IV

When the postings for the subsequent months have been completed, the system will be fully operational, the trial balance being submitted showing current month's movements as well as opening and closing balances.

Also at this time the first commentary on major adjustments relating to previous periods should be attached to the trial balance.

Conclusion

The UNDP/GIHOC accounting team will be pleased to help deal with any problems arising in particular divisions. If such difficulties do arise they may be referred either to Mr. V.J. Tuffield (UNDP) at Head Office or to one of the visiting consultants as convenient.

K.J. HEMPSTER
(TEAM LEADER)

V.J. TUFFIELD
(CONSULTANT ACCOUNTANT)

STANDARD CODING FOR GENERAL LEDGERS

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
A	Internal-Divisional Accounts	
	Head Office Accounts:-	
	Letters of Credit	A1
	Loans	A2
	Deposits	A3
	Contribution	A4
	Miscellaneous	A5
	Divisional Accounts:-	
	Miscellaneous	
	Sales to Division	
	Purchases from Division	
	Boatyards	A10 - A12
	Brick & Tiles	A15 - A17
	Cannery	A20 - A22
	Distilleries	A25 - A27
	Electronics	A30 - A32
	Fibre Bag	A35 - A37
	Footwear	A40 - A42
	Glass Manufacturing	A45 - A47
	Marble Works	A50 - A52
	Meat Products	A55 - A57
	Metals Industries	A60 - A62
	Paints	A65 - A67
	Paper Conversion	A70 - A72
	Pharmaceuticals	A75 - A77
	Steelworks	A80 - A82
	Vegetable Oil Mills	A85 - A87

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
B	**Fixed Assets**	
	Land and Buildings	B10
	Plant and Machinery	B20
	Furniture and Fittings	B30
	Equipment	B40
	Motor Vehicles	B50
	Lease Tools	B60
	Goodwill	B70
	Development Expenditure:-	
	Capital Assets	B80
	Deferred Expenses	B90
	Depreciation:-	
	Land and Buildings	B110
	Plant and Machinery	B120
	Furniture and Fittings	B130
	Equipment	B140
	Motor Vehicles	B150
	Lease Tools	B160
	Current Year Depreciation	B200

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
C	Investments	
	Subsidiary Companies	
	Cost of Shares	C1
	Current Accounts	C2
	Associated Companies	
	Cost of Shares	C3
	Current Accounts	C4
	Trade Investments	
	Cost of Shares	C5
	Current Accounts	C6
	Government Stocks	C7
	Other Securities	C8
	Sinking Fund	C9

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
0	Current Assets	
	Stocks and Work-in-progress:-	
	Raw Materials Stocks	01
	Work in Progress	02
	Finished Goods Stocks	03
	Non-trade Stocks	04
	Stocks in Bonded Warehouses	05
	Goods in Transit	06
	Trade Debtors	07
	Sundry Debtors	08
	Staff Debtors	09
	Bad Debt Provisions:-	
	Pre-GIHDC	010
	Post-GIHDC	011
	Prepayments and Sundry Deposits	012
	Prepaid Income Tax	013
	Cash at Bank	014
	Cash in Hand	015

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
E	Current Liabilities	
	Trade Creditors	E1
	Sundry Creditors	E2
	Accruals	E3
	Deposits received from customers	E4
	Staff Welfare Fund	E5
	Letters of Creditors Payable	E6
	Bank Overdraft and Short-Term Loans	E7
	Corporate Income Tax	E8
F	Long Term Liabilities	
	Government Loans	F1
	Bank Loans	F2
G	Capital and Reserves	
	Stated Capital	G1
	Government Grants	G2
	Income Surplus/Deficit	G3

GROUP CODE	ACCOUNTS REQUIRED FOR HEAD OFFICE USE	SUB CODE
M	Revenue Accounts:-	
	Sales:	
	Cash	M1
	Credit	M2
	Export	M3
	Variable Cost of Sales	M4
	Fixed Cost of Production	M5
	Administration Expenses	M6
	Selling and Distribution Expenses	M7
	Finance Charges:	
	Internal (GIHDC)	M8
	External (Non-GIHDC)	M9
	Head Office Contribution	M10
	Other Income	M11
	Depreciation	M12

NOTES ON STANDARD CODING SYSTEM

1. GROUP A: Inter-divisional Accounts

This is an area which has caused many problems in the past due to failure of accounting staff to communicate adequately with each other. It has therefore been decided to highlight this area by removing such accounts from sundry creditors or debtors and grouping them as a separate category in order that progress on reconciliation can be more easily monitored.

Ideally, of course, all such accounts should cancel out on consolidation.

(i) Accounts with Head Office

It will be noted that five difference accounts have been allowed between a division and Head Office. This is the maximum number of accounts permitted. Any transaction which does not fall naturally in to one of the first four accounts should be passed through account A5 - Miscellaneous In pactice, it is unlikely that any one division will have all five accounts in operation at one time, since a division would scarcely have a loan from Head Office and a deposit with Head Office concurrently.

(ii) Accounts with other Divisions

Three accounts have been allowed for transactions with another division. However, 'Sales to Division' and 'Purchases from Division' accounts are only permitted when such sales form a regular feature of inter-divisional trading e.g. Paper Conversion Division manufactures packaging materials for Distilleries Division. Irregular transactions should be passed through the Miscellaneous Account.

Consequently, not every division will have three accounts with every other division - some may have none at all. However, where accounts are maintained between divisions, the coding shown in Appendix A-I must be used.

In each case the first code number of divisional group represents the miscellaneous account.

Example

In the example quoted above Paper Conversion will probably have the following accounts:-

Distilleries - Miscellaneous account	A05
Distilleries - Sales Account	A06
and Distilleries will have	
Paper Conversion - Miscellaneous	A70
Paper Conversion - Purchases Account	A71

(iii) The one exception to the standard coding arises in the treatment of current accounts in the Head Office books. Since Head Office will have up to five accounts with each division, it follows that their requirements cannot be encompassed in the standard coding proposed. Consequently, a separate coding sheet will be issued for Head Office use only.

2. Group 8. Fixed Assets

In the fixed asset coding each sub-code is a multiple of ten. This is to allow for each class of asset to be further divided with the sub-code representing the total account for the class.

Example

Freehold Land	81
Leasehold Land	82
Office Buildings	83
Factory Buildings	84
Bungalows	85
Cottages	86
Workshops	87
Clinics	88
Land & Buildings - total Account	800

Only the total account need be reported to Head Office in the monthly trial balance

(i) [redacted]

It is impossible to define exactly which assets will fall into each particular class for every division and, consequently, each divisional accountant must use his initiative based upon past experience The aim should be that all items included within a sub-group should, as far as possible, have a similar depreciation rate

As a guide, there below are some examples of typical sub-divisions which may be found within a division

Land and Buildings	as per the example shown above
Plant and Machinery	all major items used in the production process sub-division probably not necessary although in some instances differentiation is made between office and site plant
Furniture and Fittings	Office Furniture and Fittings Factory Furniture and Fittings Bungalow Furniture and Fittings
Equipment	Office machines Canteen equipment Sports equipment Workshop equipment
Motor Vehicles	Motor Cars Motor Cycles Trucks and Vans Buses Farm Vehicles Cranes Fork lift Trucks

Loose tools	- Sundry tools
	- Farm tools and implements
	- Khaldi
	- Dies

It is stressed that the above examples are in no way supposed to be exhaustive and are included merely for purpose of illustration.

(ii) Development Expenditure

Development expenditure usually arises on specified major capital projects and can be conveniently split as shown in the coding lists

Capital Assets	Expenditure should be allocated to this account only if it is directly related to the construction, installation or acquisition of a physical asset, which will be transferred to one or other of the aforementioned fixed asset accounts on completion Normally depreciation provisions should not commence until completion
Deferred Expenses	These are expenses incurred in relation to a project but ancillary to the physical asset themselves e.g. project feasibility study costs, trial running costs, etc These costs should not be transferred to an asset account on completion, but should be written off over a number of years on a basis agreeable to the auditors and in line with companies policy

The above definitions should be taken as guidelines only as each development project will need to be treated on its merits

(iii) Depreciation

The depreciation accounts have been included within the Fixed Assets group so that the total of the group will correspond to the net book values of the assets for consolidation purposes.

It will be noted that a separate account has been included for current year depreciation. This is to avoid complex allocations on a monthly basis. The depreciation accounts corresponding to the fixed asset accounts will therefore contain only the accumulated depreciation at the beginning of the year, less any adjustments for disposal arising during the year. At the end of the year the current year depreciation account should be accurately recalculated and re-allocated to the various asset depreciation accounts.

It is suggested that each division should draw up a schedule of basic monthly depreciation charges based initially on the assets shown in the draft account as at the end of 19XX. These global amounts, however, can then be adjusted during the year to take account of any major additions. The journal entry per month is then required debiting the revenue section of the ledger and crediting account 8XXX. As stated above, at the end of the year a more precise calculation can be made and account 8XXX could be cleared by transfer to the asset depreciation accounts, any adjustments being written off to the Revenue Account in the usual way.

In the first instance it may be necessary to set up depreciation provisions dating back to the beginning of the year, if they have not already been included in the financial records.

(iv) Asset Acquisitions and Disposals

It is most desirable that the Head Office consolidation team be informed of any movements in fixed assets as they arise. In particular, advance knowledge of this kind could eliminate some of the delays now experienced in consolidating the end-year draft accounts.

Consequently, divisions should include in their monthly commentary attached to the trial balance, a list of assets acquired during the month and their respective costs. With regard to disposals of assets the following information should be shown

original cost)
accumulated depreciation) where known
sales proceeds)
profit or loss on sale (where known)

The profit or loss on sale should be transferred to the other income account in the revenue section of the ledger

3 [illegible] Investments

This section is solely the concern of the Head Office accounts department, since most of the Corporation's investments are held through Head Office

However, some divisions do have short term investments, particularly in Government stocks and the like, and in such cases all transactions should be noted in the monthly trial balance report

4 [illegible] Current Assets

In the main, these items are self-explanatory. However, a few comments are detailed below for your guidance

(i) [illegible]

These items have been separated into four categories shown in order to comply with the disclosure provisions of the Companies Code 1963

In practice, many divisions will wish to further sub-divide one or all of these categories so that they have separate figures for different products. However, it is necessary to report to Head Office the four sub totals only

(ii) [illegible] in Transit

Provision has been made within the costing system for the use of Goods in Transit account. This applies to all divisions involved in the importation of raw materials or other goods.

A standard accounting procedure is described in Appendix A-IV.

(iii) Trade [illegible]

This should be the total of the sales ledger control account.

(iv) Sundry [illegible]

This is the total of all sundry debit balances not included elsewhere. It will also include the balances on any cash bargain accounts (see Appendix A-IV).

(v) Staff [illegible]

A control account, supported by a subsidiary personal ledger, should be maintained for each of the following as appropriate:

Car Loans
Other Cycle Loans
Other Long-term Loans
Salary Advances
Staff Purchases

Only the total of the control accounts is required to be included in the trial balance.

It should be noted that salary advances should be repaid within the month they are given by deduction from next salary cheque. Outstanding balances should only arise on item account in exceptional circumstances and should always be minor. Other long term loans should not exceed twelve months.

(vi) Bad Debt Provisions

Although there will be credit balances, they have been included in current assets because it is normal accounting practice to offset the provisions against debtors and the aim is to arrive at a group total representing current assets as they would appear.

(vii) Prepayments and Sundry Deposits

Prepayments should be adjusted monthly by means of journal entries, provided that this does not unduly delay the production of the trial balance.

(viii) Cash at Bank

Those divisions which use control accounts for their various bank accounts, should include here only those accounts which they would normally expect to be in debit. In such cases, where an account is temporarily overdrawn at the end of a particular month, attention should be drawn to this in the monthly trial balance report, so that the consolidation team can make the appropriate transfer to current liabilities.

Where no control accounts are used, the division is required to enter the total only of its bank accounts in debit or in the trial balance under this code.

4 GROUP 2 Current Liabilities

Again, this group is self-explanatory, but a few comments are detailed below.

(i) Trade Creditors

This is represented by the purchase ledger control account balance.

(ii) [redacted]

This comprises

Sales Tax
Excise Duty
Commissioner of Income Tax - PAYE
Administrator of Social Security
VAT
Credit Union
Other sundry credit balances not included elsewhere

(iii) Accruals

Accruals should be made for such costs as electricity, water, telephone and other expenses. Wherever possible, these should be adjusted monthly by means of journal entries so that the revenue accounts reflect the true costs to the division.

(iv) [redacted]

Monies received from customers in advance of goods being supplied must be included in current liabilities and should not be offset against trade debtors. When the goods have been supplied the balances should be transferred to clear the debts outstanding in the sales ledger accounts.

If these transactions are numerous it may well be preferable to use a control account with a subsidiary personal ledger.

(v) [redacted]

This account has been shown separately as there is a statutory requirement to set aside a percentage of profits for the welfare of staff

(vi) Letters of Credit Payable

Please refer to Appendix A-IV on the subject of standard accounting practice for the treatment of imported goods

(vii) Bank Overdrafts and Short Term Loans

Similar considerations apply as in Section 6 (viii) of this appendix. Those divisions who use control accounts for bank and cash will need to include here those accounts which are temporarily in debit at the end of any particular month.

Where no control accounts are used, a single total for all overdrafts should be entered on the trial balance under this code.

8 [illegible] Long Term Liabilities

The only problem likely to arise here is one of definition.

A long term loan is one which is fixed to amount with definite repayment terms, which may either be spread over a period of years or repayable in full after an elapsed period of time, provided that such loan is not due to be extinguished within twelve months or less. Once this latter point is reached the loan no longer represents a long-term liability but should be included in current liabilities.

9 [illegible] Capital and Reserves

(i) Government Grants

Government grants are subsidies which are not expected to be repaid.

(ii) Income Surplus/Deficit

This will consist of the profit or loss brought forward from the previous year as adjusted by amendments following the audit of the previous year's accounts.

8 [redacted]

The revenue accounts in the ledger should provide as far as possible, the results in the form required for the monthly operating statements. Expenditure is therefore accumulated by class rather than by individual expense headings.

At the moment, most divisions are reporting expenditure in their trial balances under expense headings and [redacted] calculations and apportionments are evidently done in order to arrive at the figures in the operating statements.

In order to incorporate the operating statement groupings of expenditure in the trial balance, it will therefore be necessary for these [redacted] adjustments to be incorporated in the financial records, whether by means of journal entries or by appropriate analysis of the prime records prior to posting.

Eventually, most of this information will be produced by the cost centre analysis being introduced in the divisions under the [redacted] programme. The [redacted] accounting team will be pleased to advise on particular problems arising during the transition period.

(i) [redacted]

These have been divided into the headings used on the operating statement and should require no alterations to current systems.

(ii) [redacted]

This is a total account comprising the following elements of direct cost:

Labour
Raw materials used
Increase/decrease in work-in-progress

Variable production expenses
Increase/decrease in finished goods stock

It will be noted that this account contains materials consumed and not purchases as is currently reported in the trial balances of some divisions. This factor, together with the inclusion of movements in work-in-progress and finished goods stock, requires that the stock accounts reported in Group B must be adjusted monthly.

(iii) Fixed Costs of Production, Administration, Overheads and Sales and Distribution as Incurred

Where these items are not already represented by a ledger account in their own right, new control accounts need to be established under these three headings.

(iv) Finance Charges

A distinction is made here between those costs which are generated internally within [redacted], e.g. interest on loans from Head Office, and charges levied by outside bodies such as banks.

The former category should cancel out on consolidation.

(v) Other Income

This will include
rents receivable
dividends received
interest received
profit on sale of assets
divisional contributions received (Head Office only)
any other source of income not related to normal trading
currency earnings

[redacted]

[redacted]	[redacted]	[redacted]				[redacted]			

[redacted] ACCOUNTING PRACTICE FOR THE TREATMENT OF IMPORTED GOODS

During the course of the review of the accounting system employed within the [redacted], it has become apparent that there is no common approach to the problem of accounting for the importation of raw materials and the like. In particular, it has been noticed that in some divisions there is a failure to recognise that imported goods become the property of [redacted] as soon as they have been loaded on to the ship for conveyance.

The reason for this failure is often that the accounts department is unaware of the existence of the goods until they have arrived in Ghana and the shipping documents have been forwarded by the bank. The solution to this problem is for the Divisional Accountant to impress upon the purchasing officer that it is essential that advance shipping documents are requested from the suppliers at the time of ordering the goods. At the very least, notification of date of shipment should be sent by telex.

Assuming that these procedures are carried out, the accounting entries should be as follows:

1. Debit Cash Margins Account
   Credit Bank Account
   with the margin paid on the letter of credit account once the letter has been established. It is necessary to use a Cash Margins Account since this represents a debtor to the business until such time as goods are shipped.

2. Debit Goods in Transit Account
   Credit Letter of Credit Payable Account
   with the total cost of the goods as soon as shipment is advised. At the same time
   Debit Letter of Credit Payable Account
   Credit Cash Margins Account,
   with the margin paid, thereby clearing the Cash Margins Account and reducing the Letter of Credit Payable Account to the balance due.

3. Debit - Letters of Credit Payable Account
Credit - Bank Account
with the balance outstanding when paid to the bank on release of shipping documents

4. Debit - Stock Account
Credit - Goods-in-Transit Account
with the cost of goods on receipt into the divisional stores

[redacted]

(1) There will of course be other related costs incurred such as customs duty, insurance premiums, inland freight charges, etc., but these have been omitted in the above explanation so as not to distract from the simplicity of the basic accounting requirements. These ancillary expenses should be added to the costs of goods

(2) A separate Letter of Credit account should be opened for each transaction

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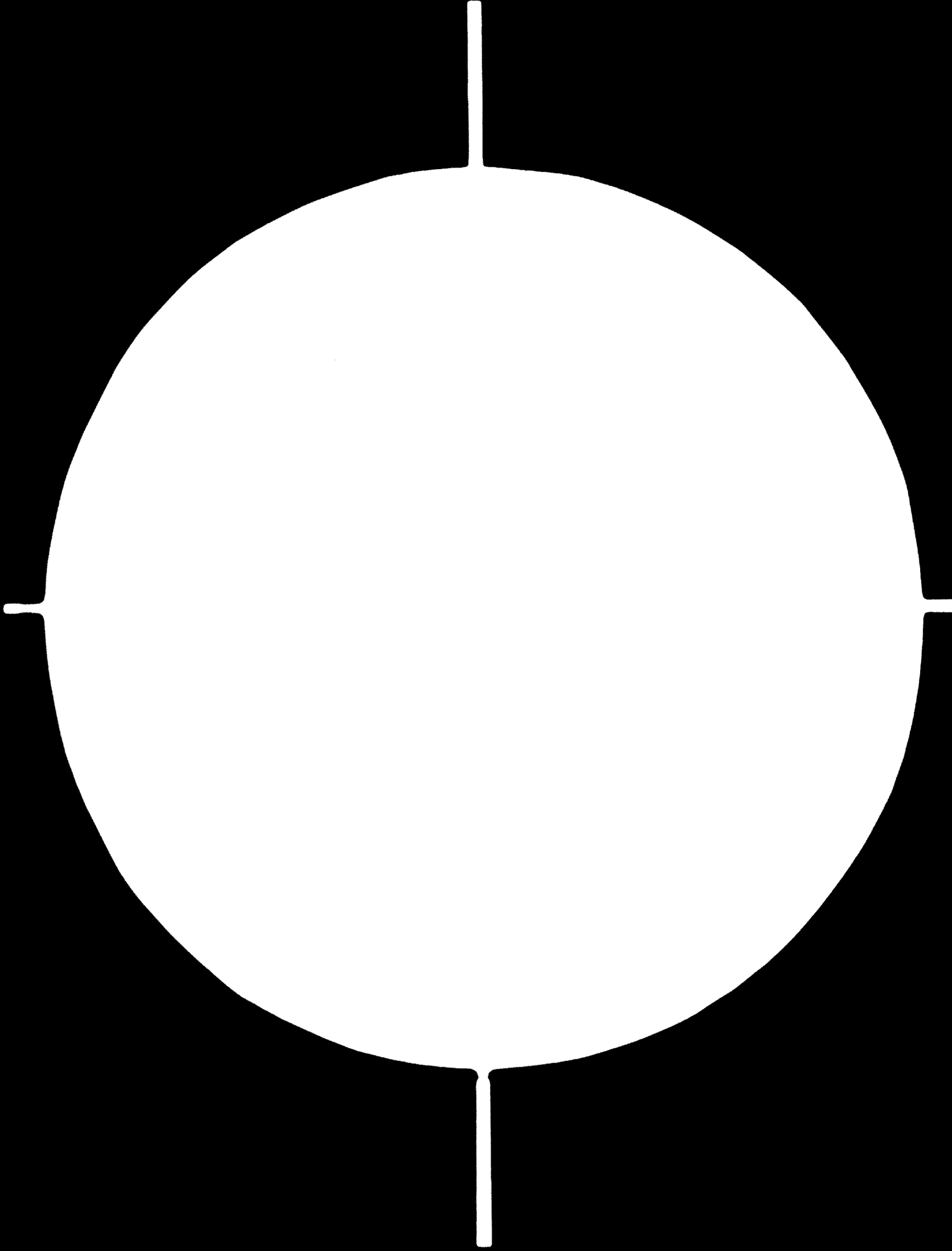

THE CONSOLIDATION PROCESS

The central consolidation process requires the use of three books of account only:-

- a trial balance summary book
- a ledger and
- a journal

The accounting procedures involved can be regarded in two sections:-

- monthly procedures and
- annual procedures

1. MONTHLY PROCEDURES

These consit of the following operations:-

(a) registration
(b) checking
(c) clearance of queries
(d) posting
(e) extraction of reports
(f) commentary.

(a) Registration

It is important that all incoming trial balances are entered into a register and the dates of receipt should be noted. Not only is this useful for keeping a check on the progress of the consolidation, but it will also enable the Consolidations Accountant to report to the Chief Accountant on those divisions which are persistently in arrears.

(b) Checking

This is probably the most important process of all. Unless this is done thoroughly the results of the exercise will be meaningless.

Listed below is a check-list of questions which should be answered in respect of each divisional trial balance every month:

1. Is the trial balance arithmetically correct?
2. Do the current month's opening balances agree with the closing balances of the previous month?
3. Have any figures been missed in the typing process?
4. Do the section totals (schedules A-H) agree with the summary?
5. If there have been movements in the fixed assets, have details been provided?
6. Do the fixed asset additions agree with the capital expenditure report? (see schedule B)
7. If assets have been disposed of, have they been taken out at cost with the appropriate adjustment to accumulated depreciation and has the profit or loss on sale been transferred to other income in the revenue accounts? (check schedule B and schedule H account H11)
8. Has depreciation been provided for the current month?
9. If there have been movement in the investments, have details been provided?
10. Do the movements on stocks, work-in-progress, trade debtors and trade creditors (schedules D and E conform with the statements attached to the operating statement? (H.Q.5)
11. Do the changes in finished goods stocks and raw materials (schedule D) correspond with the figures on the operating statement (H.Q.1)
12. Is there any movement on the pre-payments and sundry deposits account? (account D 12)
13. Does the cash at bank (schedule D or E) agree with the cash flow statement? (H.Q.8)
14. Is there any movement on the accruals account? (account E 12)
15. If there are any movements on the income surplus/deficit account has an explanation been provided? (account G 3)
16. Do the revenue account figures (schedule H) tie up with the operating statement? (H.Q.1)

17. If the division has a loan from Head Office, have any internal finance charges been put through the accounts?
18. If there is a deposit with Head Office, does it appear that credit has been taken for interest receivable? (check account A.3)
19. Do the interest charges look reasonable in relation to the loan?
20. Has provision been made for the contribution to Head Office? (check accounts A4 and H10)
21. Does the calculation of the contribution provision look correct?
22. Does the balance sheet agree with the trial balance?
23. Does the current year depreciation provision look realistic when compared with the previous year?
24. Have any bank accounts moved from debit into overdraft or vice-versa? (check accounts D14, D15 and E7)
25. Have any extra accounts been inserted?
26. Have any balances been static where movement would be expected?
27. Have there been any disproportionate movements on any accounts without adequate explanation having been given?

(c) Clearance of Queries

A fairly simple form can be drawn up with the numbers of the above questions along the top and the divisions down the side. The answers to the questions can then be indicated by a tick or cross for each division.

From this can be extracted an Error/Query Report for each division. This should be prepared in duplicate. The first copy would be given to the Consolidations Accountant so that he can decide how best to arrange clearance of the problems. The second copy should be sent to the appropriate Divisional Accountant, even if the queries are small and can be cleared by telephone, so that he is aware of the sort of mistakes that can cause problems in consolidation.

It is important that a sense of proportion is maintained when dealing with queries. Although accuracy is desirable, an error of even a few thousand cedis will not significantly affect the overall position in the consolidated balance sheet.

(d) Posting

Once each trial balance has been checked and the significant problems have been resolved, the figures for the current month's movements can be transferred into the posting summary book.

This will be sectionalised in the same manner as the trial balance itself with columns across the page for the individual accounts within each section.

Once all the divisional trial balances have been entered into the posting summary book the columns should be totalled and cross-cast. The final check is then to ensure that the sections balance prior to posting to the consolidations ledger.

The total of each section should then be posted to a control account within the ledger and the individual analysis totals can be pusted to separate accounts arranged in accordance with the trial balance coding. Once the postings have been made and the cumulative totals have been adjusted, each section can be balanced back to the control accounts. The use of control accounts will facilitate the tracing of posting errors.

(e) Extraction of Reports

The figures required for completion of the consolidated balance sheet (as illustrated in APPENDIX C) can be extracted from the ledger. In some cases, e.g. fixed assets, the figures will be taken from the control account and in others, e.g. current assets, the individual account totals will be required.

In the case of the consolidated operating statement the monthly figures are required and these may be extracted from the revenue section of the summary book. The group net profit before tax should then be verified against the total of the individual operating statements.

Although it will not appear in any book, a provision for taxation can be calculated on the consolidated results, taking into account any known exemptions, and can then be entered on the consolidated operating statement to give a net profit after tax.

The source and application of funds statement is explained in detail in APPENDIX C.

(f) Commentary

The Consolidations Accountant should prepare a monthly commentary to accompany the reports to the Board. This would draw attention to any pertinent facts and explain any major movements in the month. Occasionally it may be necessary to omit a divisions's figures if their submission has been unduly delayed and this must be noted in the commentary. In addition attention can be drawn to those divisions who are persistently late in submission of their reports.

2. ANNUAL PROCEDURES

At the end of the year management accounts can be produced in the normal way from the December trial balances. These figures would then be transferred to a new ledger to form the opening balances for the ensuing year. However when the draft accounts arrive from a division a comparison should be made with the trial balance and a schedule of differences drawn up. The normal practice would be for these adjustments to be put through the divisional books in the following year and therefore it is essential that the consolidation team is aware of when they have been included. Thus the books of the ensuing year will be automatically adjusted, but it will be necessary to put through a series of journal entries in the books for the year in question, in order that the draft consolidated balance sheet for audit purposes conforms with the individual accounts of the divisions.

At the same time, careful enquiry should be made into the reasons for the adjustments as this will indicate the reliability of the trial balances used for management information purposes. It should be expected that some adjustment will take place due to such things as year-end reconciliation of the stock records with the physical count and inclusion of additional creditors picked up after the December trial balance has been completed. However, large discrepancies may indicate faults in the accounting system employed and it may be necessary to advise the Head of Accounting Systems accordingly.

GHANA INDUSTRIAL HOLDING CORPORATION

CONSOLIDATED BALANCE SHEET

AS AT.....19...

Current Month Last Year			Current Month		Last Month	
₵'000			₵'000		₵'000	
	x	Fixed Assets less depreciation	x		x	
	x	Development	x		x	
x	x	Deferred Expenditure	x		x	
x	x	Investments	x	x	x	x
x		Net Working Capital per schedule		x		x
x		Deduct: Long-term Liabilities		x		x
x				x		x
x		NET ASSETS		x		x
		Represented by:-				
x		Stated Capital		x		x
x	x	Government Grants		x		x
	x	Accumulated Surplus	x		x	
	x	Current Year Profit/Loss	x		x	
		Deduct: Difference on Inter-divisional Accounts	x	x	x	x
x		CAPITAL EMPLOYED		x		x

GHANA INDUSTRIAL HOLDING CORPORATION

SCHEDULE OF WORKING CAPITAL

.....19...

Current Month Last Year			Current Month		Last Month	
₵'000			₵'000		₵'000	
		CURRENT ASSETS				
	x	Raw Materials	x		x	
	x	Work-in-Progress	x		x	
	x	Finished Goods	x		x	
	x	Non-trade Stocks	x		x	
	x	Bonded Stocks	x		x	
	x	Goods in Transit	x		x	
	x	TOTAL STOCKS AND W-I-P	x		x	
	x	Trade Debtors	x		x	
	x	Sundry Debtors	x		x	
	x	Staff Debtors	x		x	
	x	Prepayments & Sundry Deposits	x		x	
	x	Prepaid Income Tax	x		x	
	x	Cash at Bank	x		x	
x	x	Cash in Hand	x	x	x	x
		CURRENT LIABILITIES				
	x	Trade Creditors	x		x	
	x	Sundry Creditors	x		x	
	x	Accruals	x		x	
	x	Deposits Received	x		x	
	x	Staff Welfare Fund	x		x	
	x	Letters of Credit Payable	x		x	
	x	Bank Overdrafts & Short-term Loans	x		x	
x	x	Corporate Income Tax	x	x	x	x
x		NET CURRENT ASSETS		x		x

GHANA INDUSTRIAL HOLDING CORPORATION

CONSOLIDATED OPERATING STATEMENT FOR THE PERIOD

ENDED.....19...

Current Month Last Year			Current Month		Cum. Year to date	
₵'000			₵'000		₵'000	
		Sales:-				
	x	Cash	x		x	
	x	Credit	x		x	
x	x	Export	x	x	x	x
x		Variable Cost of Sales		x		x
x				x		x
		GROSS CONTRIBUTION				
		Less: Overheads				
	x	Fixed Costs of Production	x		x	
	x	Adminstration Expenses	x		x	
	x	Selling & Distribution Expenses	x		x	
x	x	Finance Charges (External)	x	x	x	x
x				x		x
x		Other Income		x		x
x				x		x
x		Less: Depreciation		x		x
		NET PROFIT BEFORE TAX				
x		Provision for Taxation		x		x
x		NET PROFIT AFTER TAX		x		x

GHANA INDUSTRIAL HOLDING CORPORATION

CONSOLIDATED SOURCE AND APPLICATION OF FUNDS STATEMENT

.....19...

Current Month Last Year			Current Month		Cum Year to date	
₵'000			₵'000		₵'000	
		SOURCE OF FUNDS				
x		Net Op. Profits before Tax		x		x
x		Add Depreciation		x		x
x	x	Inc./(Dec) in previous year profit	x	x	x	x
x	x	(Inc.)/Dec. in inter-div. imbalance	x	x	x	x
x				x		x
		FUNDS GENERATED FROM OPERATIONS				
		FUNDS FROM OTHER SOURCES				
	x		x		x	
	x		x		x	
x	x		x	x	x	x
		APPLICATION OF FUNDS				
	x	Net Inc/(Dec.) in Stocks	x		x	
	x	Net Inc/(Dec.) in Debtors	x		x	
	x	Net (Inc.)/Dec. in Creditors	x		x	
	x	Inc/(Dec.) in Working Capital	x		x	
	x	Purchases less Sales of Fixed Assets	x		x	
	x	Development Expenditure	x		x	
	x	Net Tax Paid	x		x	
	x	Repayments of Capital/Loans	x		x	
		Other Items:-				
	x		x		x	
	x		x		x	
x	x		x	x	x	x
x		NET INFLOW/(OUTFLOW) OF FUNDS		x		x
		MOVEMENT IN NET LIQUID FUNDS				
x		Inc/(Dec) in bank balances and cash		x		x
x		(Inc)/Dec. in bank overdrafts		x		x

GHANA INDUSTRIAL HOLDING CORPORATION

SOURCE OF FUNDS STATEMENT

.....19...

Current Month Last Year			Current Month		Cum. Year to date	
₵'000			₵'000		₵'000	
x		Operating Profits		x		x
		add:				
x		Adjustment for Depreciation		x		x
x				x		x
	x	Increase in Previous Year Profit	x		x	
x	x	Decrease in Inter-Div. Imbalance	x	x	x	x
x		FUNDS GENERATED FROM OPERATIONS		x		x
		FUNDS FROM OTHER SOURCES				
x		Capital Introduced		x		x
x		Loans Received		x		x
	x	Decrease in Stocks	x		x	
	x	Decrease in Debtors	x		x	
x	x	Increase in Creditors	x	x	x	x
x		Sales of Assets		x		x
x		Decrease in Investments		x		x
		Other Items:-				
x				x		x
x				x		x
x				x		x
				x		x
x						
x		TOTAL INFLOW OF FUNDS		x		x

GHANA INDUSTRIAL HOLDING CORPORATION

APPLICATION OF FUNDS STATEMENT

.....19...

Current Month Last Year			Current Month		Cum. Year to date	
₵'000			₵'000		₵'000	
x		Operating Losses		x		x
		Less:				
x				x		x
x		Adjustment for Depreciation		x		x
	x	Decrease in previous year profit	x		x	
x	x	Increase in Inter-Div. Imbalance	x	x	x	x
x		FUNDS LOST THROUGH OPERATIONS		x		x
		OTHER APPLICATIONS				
	x	Increase in Stocks	x		x	
	x	Increase in Debtors	x		x	
x	x	Decrease in Creditors	x	x	x	x
x		Purchases of Assets		x		x
x		Development Expenditure		x		x
x		Increase in Investments		x		x
x		Net Tax Paid		x		x
x		Capital Repaid		x		x
x		Loans Repaid		x		x
		Other:-				
x				x		x
x				x		x
x				x		x
x				x		x
x				x		x
		TOTAL OUTFLOW OF FUNDS		x		x

ITEM/SOURCE OF INFORMATION

ITEM	SOURCES OF INFORMATION
Net Operating Profits or Losses before tax	Section H of posting summary book
Depreciation	Account B 200
Change in Previous Year Profit	Account G 3
Inter-Divisional Imbalance	Net movement on all Accounts
Capital Introduced/Repaid	Increase or decrease on account G I
Increase/Decrease in Investment	Increase or decrease in Section C
Purchase of Assets	Debits to Accounts B10 - B70
Development Expenditure	Accounts B 80 and B 90
Sales of Assets	Credits to accounts B10 - B60 less debits to accounts B110 - B160
Decrease/Increase in Stocks and W-I-P	Movement on accounts D1 - D6
Decrease/Increase in Debtors	Movements on accounts D7 - D12
Decrease/Increase in Creditors	Movements on Accounts E1 - E6
Net Tax Paid	Net reduction in account E8 less account D13 (Note: Current year tax provisions are ignored as the funds statement starts with pre-taxed profits.)
Increase/Decrease in Bank balance and Cash	Movements on accounts D14 and D15
Increase/Decrease in bank overdrafts	Movements on account D14 and E7

NOTES ON COMPLETION OF FUNDS

STATEMENTS

The recommended source and application of Funds Statement consists of three separate reports:

- Source of Funds Statement
- Application of Funds Statement
- Consolidated Source and Application of Funds Statement

The object of splitting the statement is to demonstrate that movements will take place in opposite directions in different divisions. For example some divisions will increase their investment in stocks and work-in-progress whilst others will reduce their holdings. In this case the increase in stocks will be reported on the Application of Funds statment, whilst the decreases would appear on the Source of Funds Statement and the net difference between the two would be entered on the Consolidated Source and Application of Funds Statement.

The information required for completion of the forms can be obtained from the posting summary book. Care should be taken to separate opposing movements within accounts, so that they can be entered as sources, or applications appropriately.

The attached table indicates the source of the information for completion of the major items on the funds statements.

VOLUME 2
ANNEXE IX

FINANCIAL

CAPITAL EXPENDITURE AND REPORTING

PROCEDURES

CAPITAL EXPENDITURE AND REPORTING PROCEDURES

CONTENTS

APPENDICES

CAPITAL EXPENDITURE RECORDING AND REPORTING

We attach hereto two new forms which we would like all Divisions to keep. The first is for the recording of fixed assets and is a loose leaf fixed asset register card. The second is a recommended monthly capital expenditure progress report, designed to accompany the monthly operating statements.

We are recommending two group wide systems for the following reasons:

- Fixed asset register cards are designed to complement in accounting departments the plant register cards already introduced on a group basis

- Operating statements are on a common format for all Divisions and capital expenditure reports should in our view also be

- The two forms are designed to be used together in that the capital work in progress section of the fixed asset register card forms the basic record from which the capital expenditure progress report is prepared.

The purpose of this memo is to describe in greater detail how these new records will be used in Divisions.

1. THE FIXED ASSET REGISTER CARD

1.1 The attached card (Appendix I) has been designed as a result of our review programme which has now covered almost all Divisions. It has the following main characteristics:

- It is designed to complement the plant history cards or equivalent capital stock records (i.e. change parts stores cards) already being introduced in the engineering and production projects. Thus a card must be prepared that matches each and every one of the engineering/production records. Care must be taken to ensure that certain details common to both are indeed so

- The card is designed to provide as comprehensive a record as possible of the asset's financial history

- By incorporating the budget record into the fixed asset register card. Divisions can and should open the card as soon as an item is approved, record its progress against budget and, once installed, enter the fixed asset register by merely transferring the total cost on the card to the appropriate section and the card itself into the appropriate batch

- The register is designed to be in card form to enable the different classifications of fixed assets to be batched together and further split between capital work in progress, fixed assets in use, and where appropriate, idle plant.

1.2 Whilst some Divisions do have asset registers which incorporate many of the features above, none incorporate the budget record and thus enable the items of capital expenditure to be recorded as soon as possible on one complete history card.

1.3 The cards will be held in files as follows:

- There will be three main files covering the following main ledger accounts:

  File 1 Capital Work in Progress
  File 2 Fixed Asset Register (Active)
  File 3 Fixed Asset Register (Idle)

- Within the above three main files will be sub-files covering asset classification as per the balance sheet e.g.
  - land and building
  - plant and machinery
  - office equipment
  - canteen equipment etc. etc.

1.4 Each of the above main and sub-files will have a control card which should be reconciled monthly with the general ledger accounts which will be analysed on the same basis.

1.5 The following paragraphs describe the entries to be made in the various sections and boxes on the card and how they will be used.

1.5.1 Cards will be opened for each item on the capital budget as soon as the budget is approved. (Cards should of course be opened for all existing assets). 'Asset Classification', the first entry, will be in accordance with the headings in the general ledger.

1.5.2 The first line, the section on description record will be entered as follows:

- 'Asset Type/Description' must be the same as that used on the plant history card. The Accounts Department should liaise with the Engineering Department to ensure that this is so

- The name of the maker as well as supplier should be entered, (they are not always the same). The country of origin of the "Maker" should also be shown

- 'Inventory/Plant No.' must be the same as that shown on the plant history card. This may not be allocated by the Engineering Department until the items are received and may therefore have to be left blank. It should however be filled in as soon as possible

- 'Makers Number' must also agree with the plant history card. This is very often shown on the invoice but it must be checked with the actual number on the machine when it arrives

- The last three boxes are self explanatory. The asset life should be that indicated by the depreciation rate. However this should be checked and should it be found that the item is likely to have to be replaced earlier than the depreciation rate indicates, then application to Head Office should be made for a special rate to be used.

1.5.3 The second section, capital work in progress record, will be entered as soon as the card is opened as follows:

- 'Budget Year' will be the year in which expenditure on acquiring the asset will start to take place

- 'Budget Invoice Price' will be as per the supplier's invoice or contract document for local purchases. For imported items, only the L/C cost will be entered in this box, all ancillary charges including local L/C levy and duty will be entered under other charges

- 'Budget other charges' will include the estimate of all ancillary costs

- The remaining three boxes are self explanatory

1.5.4 The second part of the capital work in progress record is used to record in detail the budgeted expenditure and the actual expenditure as it comes through. The budget figures can be entered in accordance with the agreed capital expenditure budget. As the expenditure is incurred it will be entered on the card and each month the cards will be listed to form the capital expenditure report. The control card will carry the totals of all capital work in progress and should agree with the equivalent ledger account in the general ledger.

1.5.5 Once an asset has been installed and is operational the total actual from the capital work in progress section will be transferred to the fixed asset annual record section. The card will be removed from the capital work in progress file and inserted in the appropriate fixed asset register file. Each asset register file will have a control card which should be balanced with the ledger accounts. Depreciation will only be entered on the cards annually. The monthly charge will be posted to the ledger and the annual entry on the fixed asset register cards should be balanced with the annual total as per the general ledger.

1.5.6 Side 2 of the card provides space for additions and disposals details. There will normally be only one line but additional space has been provided for possible extensions to buildings and additions and disposals of change parts. It should be noted that change parts will be kept on the asset register by part number and where a number of the same part are kept they will be recorded on the same card.

1.5.7 Corporation tax valuation should be maintained for each item and will be used to calculate tax allowance on asset acquisitions, annual allowances and balancing charges and allowances on disposal.

1.5.8 The sections for fixed asset and stock replacement reserve will be used to record the reserves so raised on fully depreciated plant still in use. Such asset records should be kept in a separate file having a separate control card and corresponding ledger account. This will enable the fixed asset and stock replacement reserve to be calculated and posted in the ledger on a monthly basis and on the card annaually in the same way as depreciation. It is recommended that the amount of provision made should be the same as the depreciation rate used for the asset.

1.5.9 Finally there is a record of the locations. The entries are self explanatory and space has been allowed for changes in location. Within the individual asset register files it may be useful to group items by location and thus facilitate making out the annual inventory check lists.

2. CAPITAL EXPENDITURE RECORDING

2.1 Attached as Appendix II is the proposed capital expenditure report form to be used in conjunction with the asset register cards. Completion of the asset register cards is not however essential in introducing this report which can be utilised without them.

2.2 As stated above, the budget section of the fixed asset register card will form the original record from which the majority of the capital expenditure report will be prepared. It is important to note that the first three columns will contain the entire capital budget authorised by the Board regardless of whether any progress has taken place in the month. This is essential to enable management to review the capital budget in its entirety at regular intervals and make any necessary adjustments in the light of the total commitment rather than current work in progress.

2.3 The form should be completed as follows:

2.3.1 On authorisation by the Board of the forward capital programme, cards will be made out for each item and placed in the budget file of fixed asset register cards. A senior member of the divisional accounts staff must personally check that all cards for both proposed and current capital expenditure have been made out.

2.3.2 In order to aid monthly reporting, the agreed budget plan may be run off on preprinted forms which have the first three columns and budget columns filled in. This would mean that the fixed asset clerk would only have to fill in the actuals for each month as they occur.

2.3.3 Each month the fixed asset clerk will go through the budget file section of the fixed asset register, once it has been balanced with the capital work in progress account. From there he will extract the actuals to date for each item and enter them on the semi-completed form.

2.3.4 He will then pass the draft report to a senior member of the accounts staff, either the d visional accountant or accounts manager who will ascertain from the appropriate managers responsible for each project the following:

- the percentage completion. This should reflect the actual work done and thus indicate as early as possible if the project is going to overrun budget

- the latest target completion date should also be stated and the earliest indication sought of any likely slippage on the programme.

2.3.5 The report once completed should be examined by management and a covering commentary prepared on any variance from the original programme. These should be submitted to Head Office together with operating statements.

3. SPECIAL PROJECTS

3.1 It may be decided that major capital programmes should be reported and recorded separately. This decision will usually be indicated to the division at the time of approving the project. The cards and report form can be used for this purpose as follows:

- once the project has been agreed, capital work in progress cards will be opened as usual. However they would be placed in a separate project file

- in the same way a separate capital expenditure report form may be prepared listing the buildings and equipment to be bought and the monthly progress monitored as usual.

3.2 With major capital programmes there may be ancillary administrative and development expenses as well as design costs. These will normally be capitalised and apportioned to the assets acquired only if they are incurred for the purpose of acquisition and installation of particular assets. A further area of capital development costs may be incurred in project feasibility studies and in trial running of new plant. These are not normally added to asset values but should be treated as a separate asset account, normally called development expenses, and written off on a basis agreeable to the auditors and in line with corporation policy.

3.3 For the purpose of fixed asset register recording and budget reporting, the specific charges will be added to the individual asset register cards. Development expenses should be recorded on separate cards and if these are substantial it may be necessary to start cards for separate cost centres. This will only occur on major projects, which because of their size and relatively infrequency should in any event be treated on their merits.

GIHOC

FIXED ASSET REGISTER CARD

APPENDIX I
Side 1

DIVISION: ASSET CLASSIFICATION: LEDGER A/C No.

TYPE/ DESCRIPTION		MAKER SUPPLIER		INVENTORY NO.	MAKERS NO.	NEW S/HAND	DEPRECIATION %	LIFE ..... YEARS

CAPITAL WORK IN PROGRESS RECORD

BUDGET YEAR	BUDGET INVOICE COST	BUDGET OTHER COSTS	BUDGET TOTAL COSTS	BUDGET START DATE	BUDGET FINISH DATE

DATE	BUDGET MONTH ¢	ACTUAL MONTH ¢	BUDGET CUM ¢	ACTUAL CUM ¢	DATE	BUDGET MONTH ¢	ACTUAL MONTH ¢	BUDGET CUM ¢	ACTUAL ¢

FIXED ASSET ANNUAL RECORD

DATE	ADDITIONS	DISPOSALS	COST TO DATE	ANNUAL DEPRECIATION	DISPOSALS DEPRECIATION	CUMULATIVE DEPRECIATION	NETT BOOK VALUE	NOTES

GIHOC

FIXED ASSET REGISTER CARD

APPENDIX I
Side 2

ADDITIONS

DATE	DESCRIPTION	VALUE	DATE	DESCRIPTION	VALUE

DISPOSALS

DATE	DESCRIPTION	BOOK VALUE	SALE VALUE	DATE	DESCRIPTION	BOOK VALUE	SALE VALUE

TAXATION VALUE

DATE	ADDITIONS/ DISPOSALS	ORIGINAL COST / ALLOWANCE					
		%	INVESTMENT	%	INITIAL	%	ANNUAL

WRITTEN DOWN VALUE

FIXED ASSET AND STOCK REPLACEMENT RESERVE

DATE	BROUGHT F	ANNUAL PROV	CUMMULATIVE

LOCATION

Date	Description

CAPITAL EXPENDITURE REPORT

TO BE PREPARED MONTHLY

DIVISION:

MONTH:

YEAR:

OUTSTANDING CAPITAL BUDGET			MONTHLY PROGRESS		CUMULATIVE PROGRESS				DATE TARGET COMPLETION		REMARKS
Item Description	Date Approved	Amount £	Actual Exp. £	Budget Exp. £	Exp £	to Date £	Budget to Date £		Original	Latest	
These three columns show total budget approved for the year including items brought forward from previous years			The months progress only			Year to dates progress include previous years brought forward in brackets above current year's figures. The figure is the completion			Latest estimated completion date against original budget		

VOLUME 2
ANNEXE X

FINANCIAL

COST APPRAISAL

[redacted] - UPHOLSTERY TACKS

METAL INDUSTRIES DIVISION
OF GIHOC

COST APPRAISAL OF DIVERSIFICATION STUDY NO.1
UPHOLSTERY TACKS

CONTENTS

APPENDICES

PART A

INTRODUCTION

The purpose of this report is to appraise on behalf of the Division, the cost of diversification into the manufacture of upholstery tacks.

This cost appraisal is based upon the conclusions drawn in Diversification Study No. 1 - Upholstery Tacks and on operating costs of the Division derived from the 1976 Budget.

In Part C, the costs are analysed and minimum selling prices calculated.

In Part D, the bases for cost computations are described and supported by the appropriate working papers in the appendices.

C.J.S. Baker
April, 1976.

PART B

SUMMARY OF FINDINGS

The revenue cost structure for an annual production of 9 tonnes of upholstery tacks by the proposed equipment at 1976 prices is shown below:

	£ 000	%
Direct Labour	4.7	24.6
Raw Materials	5.7	29.8
Variable Production Expenses	1.7	8.9
	12.1	63.3
Fixed Production Expenses	0.4	2.1
General Overhead	1.8	9.4
Finance Charges	1.9	10.0
Depreciation	2.9	15.2
	19.1	100%

	£
Unit Cost per kg.	2.12
+ Sales Tax	0.24
+ Head Office Contribution	0.04
	£2.40

Thus the minimum selling price of tacks to yield a net profit at that level of production must be greater than:

£ 2.40 per kg.

£ 1.09 per lb.

PART C

COST COMPUTATIONS

The cost computations used for appraisal are described below under the following headings:

- Marginal Costs
- Additional Revenue Expenditure
- Cost Statement

1. Marginal Costs

Marginal costs are defined as the variable costs of production which in the case of the Division are raw material costs and variable production expenses. It is these expenses that can be assumed to vary in proportion to output and thus these costs per unit of production remain the same at different levels of output.

The difference between the unit selling price and the unit marginal cost is termed the contribution as this amount contributes to recovering the fixed overheads. In the case of the Division all costs other than raw materials and variable production expenses can be assumed to be fixed. Thus as production of units increases the component of unit cost reduces that is necessary to recover fixed costs.

In this appraisal, the purpose of calculating the marginal cost of the proposed product is to determine in the absence of a controlled price set by the Price and Incomes Board, what the minimum unit selling price must be that will yield a contribution.

The marginal cost of budgeted production of tacks is compared with that of the nail press as a whole in the table below:

	Nail Press	Tacks
	£ 000	£ 000
Raw Materials	1782.5	5.7
Variable Production Expenses	38.4	1.7
	1820.9	7.4
Budgeted Production	2671 tonnes	9 tonnes
Marginal Cost	£0.68 per kg	£0.82 per kg
	£0.31 per lb	£0.37 per lb

The marginal cost of a tack is greater than that of the average nail due to increased production expenses because of power required for heat treatment. Raw material costs per unit weight are assumed to be similar.

The implication of this analysis are as follows:

(i) At the proposed level of production of tacks, i.e. 9 tonnes, each additional kilogram of production costs £0.82

(ii) The minimum unit selling price of tacks that will yield a contribution to the fixed expenses, i.e. labour and general overheads, must be greater than:

	£
Marginal Cost	0.82
+ Sales Tax - 11½%	0.09
+ Head Office Cont. 2%	0.02
	£0.93 per kg.
	£0.42 per lb

2. Additional Revenue Expenditure

As described in D, we do not consider that additional labour, fixed production or general overhead expenses as defined in the 1976 Budget need be increased on diversification. However, additional

revenue expenditure will be incurred solely in respect of tack production. This expenditure is regarded as a fixed cost. This implies that the contribution derived from the sale of tacks must be at least sufficient to recover these costs.

Additional revenue expenditure in the production of tacks is incurred in the form of:

(i) interest charged on the finance for fixed and working capital, i.e. machinery and raw materials

(ii) depreciation on the machinery.

This expenditure is regarded as non-variable.

The total additional revenue expenditure required per annum at the budgeted output of 9 tonnes is shown below:

	£ 000
Marginal Cost	7.4
Finance Charge	1.9
Depreciation	2.1
	11.4

Budgeted Production	9 tonnes
Unit Cost	£1.27 per kg.
	£0.58 per lb.

This analysis demonstrates that before yielding a contribution sufficient to recover any of the budgeted fixed costs the minimum selling price of tacks, i.e. to breakeven must be greater than:

Unit Cost	£1.27
+ Sales Tax 11½%	0.15
+ H/O Contribution 2%	0.03
Selling Price	£1.45 per kg.
	£0.66 per lb.

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The total additional revenue expenditure required per annum at the budgeted output of 9 tonnes is shown below:

	£ 000
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	11.4
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This analysis demonstrates that before yielding a contribution sufficient to recover any of the budgeted fixed costs the minimum selling price of tacks, i.e. to breakeven must be greater than:

Unit Cost	£1.27
+ Sales Tax 11½%	0.15
+ H/O Contribution 2%	0.03
Selling Price	£1.45 per kg.
	£0.66 per lb.

3. Cost Statement

As discussed above, we do not consider that the budgeted fixed costs need be increased on diversification. However, in addition to the fixed costs solely incurred in respect of tack production, a proportion of the budgeted fixed costs charged against the nail press will be legitimate expenses of tack production. Thus tack production should be priced on a more appropriate cost analysis. The absorption of expenses in tack production also implies that the cost of nail production decreases.

The table below compares the costs of nail and tack production.

	Nail Press		Tack Machine		Revised Total Costs
	£000	%	£000	%	£000
Direct Labour	245.4	9.8	4.7	24.6	250.1
Raw Material	1782.5	71.5	5.7	29.8	1788.2
Variable Production Expenses	38.4	1.5	1.7	8.9	40.1
	2066.3	82.8	12.1	63.3	2078.4
Fixed Production Expenses	21.5	0.9	0.4	2.1	21.9
General Overhead	304.2	12.2	1.8	9.4	306.0
Finance Charges	38.0	1.5	1.9	10.0	39.9
Depreciation	65.5	2.6	2.9	15.2	68.4
TOTAL COSTS	2495.5	100%	19.1	100%	2514.6
Output tonnes	2671		9.0		
Unit Cost per kg.	£0.93		£2.12		
per lb.	£0.42		£0.96		

It will be noted above that raw material costs for tack production at the proposed level of output are a much lower percentage of total costs than for nail production. This is due to the effect of:

(i) power consumption of heat treatment
(ii) finance charges
(iii) depreciation

An indication of the effect of decrease and increase of tack production is given in the table below:

	Annual Tack Production Tonnes		
	4.5	9.0	13.5
	£000	£000	£000
Marginal Cost	3.7	7.4	11.1
Fixed Costs	11.7	11.7	11.7
	15.4	19.1	22.8
Unit Cost per kg.	£3.42	£2.12	£1.69
per lb.	£1.56	£0.96	£0.77

Thus the minimum selling price at the above levels of production to yield a net profit must be greater than:

Unit cost per kg.	£3.42	£2.12	£1.69
+ Sales Tax 11½%	0.39	0.24	0.19
+ H/O Contribution 2%	0.07	0.04	0.03
Selling Price per kg.	£3.88	£2.40	£1.91
per lb.	£1.76	£1.09	£0.87

PART D

BASES OF COMPUTATION

The major sources of data are as follows:

(i) Diversification Study No. 1 - Upholstery Tacks
(ii) the Division's 1976 Budget

The Division's 1976 Budget does not enable operating costs, apart from raw material costs, to be allocated or apportioned between the different types of production undertaken. The Budget is summarised in Appendix I. Hence, as an approximation suitable for this cost appraisal all budget operating costs, other than allocated raw material costs, are assumed to be incurred in nail manufacture.

Costs to be incurred in tack manufacture fall into two different areas:

(i) costs incurred in addition to costs of current production, e.g. fixed and working capital, power, finance and depreciation.

(ii) costs re-allocated where no overall increase in costs is anticipated e.g. labour, fixed production expenses and general overheads.

Tack production details are given in Appendix II.

The bases for allotment of costs are discussed below under the following headings:

- Direct labour
- Raw materials
- Variable production expenses
- Fixed production expenses
- General overheads
- Finance charges
- Depreciation

1. Direct Labour

The direct labour cost in the 1976 Budget is £250.1 thousand. The analysis of this figure between the production areas is not available. However, the nail press which is budgeted to produce 86% of turnover has been allocated approximately 50% of direct labour. Thus it is likely that no additional labour would be recruited to produce tacks.

The bases for allotment of direct labour cost are as follows:

(i) All direct labour costs are allocated to nail and tack production

(ii) Direct labour costs are apportioned between nail and tack production

The computation of productive machine hours is shown in Appendix III. Budgeted production has been converted to machine hours at estimated machine outputs. Assuming constant two shift working on all 26 nail presses and availability of raw materials, this indicates a nail press utilisation averaging 67.5%.

The utilisation of a new but similar machine should at least be equal to 67.5%. In Appendix IV is shown the computation of output of the tack machine assuming one shift operation.

The computations in Appendices III and IV are summarised below:

	Nail Press	Tack Machine
Utilisation	67.5	67.5
Productive Hours	64.620	1,242
	98.11%	1.89%

Thus the budgeted direct labour cost is apportioned as follows:

Budget	Nail Press	Tack Machine
£000	£000	£000
250.1	245.4	4.7

between the nail press and the tack machine on the basis of productive hours.

Budget	Nail Press	Tack Machine
£000	£000	£000
21.9	21.5	0.4

5. General Overheads

No additional general overheads are considered necessary in respect of tack production. The budget expenses are apportioned between the nail press and tack machine on the basis of prime cost plus production overheads.

	Total	Nail Press	Tack Machine
	£000	£000	£000
Prime Cost plus PE	2,100.3	2,087.8	12.5
General Overheads	306.0	304.2	1.8

6. Finance Charges

Additional finance charges are anticipated as interest charges on increased fixed and working capital as follows:

Cost of Wafios BT15	£21,380
Raw material - ½ annual consumption	2,842
	24,222
Interest at 8% per annum	£ 1,938

7. Depreciation

Additional depreciation will be incurred in respect of the tack machine as follows:

£21,380 @ 10% straightline = £2,138 per annum

Depreciation on assets other than plant and machinery is apportioned on the basis of the number of machines, i.e. 26 nail presses plus 1 tack machine.

Thus the allocation of depreciation is as follows:

	Nail Press	Tack Machine
	$000	$000
Plant and Machinery	44.0	2.1
Other	21.5	0.8
	65.5	2.9

ANALYSIS OF 1976 BUDGET

	Steel Wire Nails Roofing Nails	All Other Products	Total
	$000	$000	$000
Sales	2,821.2	453.2	3,274.4
Direct Labour	N/A	N/A	250.1
Raw Materials	1,782.5	203.8	1,986.3
Variable Production Expenses	N/A	N/A	38.4
	"	"	2,274.8
Gross Margin	"	"	999.6
Fixed Production Expenses	"	"	21.9
General Overheads	"	"	306.0
Finance Charges	"	"	38.0
N/O Contribution	"	"	65.5
Total Overheads	"	"	431.4
Profit	"	"	568.2
Depreciation	"	"	66.3
Profit After Depreciation	"	"	501.9

Notes

(i) Social Security Contribution included within Variable Production Expenses in the Budget has been added back to Direct Labour

(ii) Raw materials for nails are assumed to include packing materials

(iii) With the exception of raw materials, for the purpose of analysis all costs are allocated to nail production

MACHINE DETAILS

Mafios BT15

(i) Machine Performance - 16,500 tacks per hr.
(continuous operation) - 7.25 kg per hr.
- 6.9 hrs. per shook 50 kg.

(ii) Machine Cost

- FOB Germany	DM	45,000
Exchange rate 2.21	£	20,362
- Freight/Insurance @ 5% FOB	£	1,018
- Duty etc.		Nil
	£	21,380

(iii) Raw Material Cost
- as for steel wire in 1976 budget 580 per tonne

Heat Treatment

(i) Process Output - as for tack machine

(ii) Equipment Cost - £ 1,000

(iii) Operating Cost - estimated equivalent electric power rating 10 kw/hr.
- at 5p per kw/hr. £ 0.50 per hr.

NAIL PRESS UTILISATION

Nail Size	Budgeted Output Cases 50 kg.	Machine Hrs Per Case	Machine Hrs for Output
½ x 18	455	8	3,640
¾ x 17	450	6	2,700
⅞ x 16	300	6	1,800
1 x 15	4,550	3	13,650
1 x 14	1,340	3	4,020
1½ x 14	2,200	3	4,400
1½ x 13	1,750	2	3,500
2 x 12	5,550	1	5,550
2 x 11	5,550	1	5,550
2½ x 10	4,300	1	4,300
3 x 9	1,300	1	1,300
3 x 8	6,600	½	3,300
3½ x 7	400	½	200
4 x 7	2,150	½	1,075
4 x 6	10,800	½	5,400
5 x 5	1,610	½	805
6 x 4	1,380	½	690
QN.2½ x 10	2,740	1	2,740
	53,425		64,620

Available Hours

Assume. (i) 2 shift working
(ii) 8 hour shifts
(iii) 230 working days
(iv) 26 nail presses

95,680

Average Machine Utilisation 67.5%

TACK MACHINE OUTPUT

Machine Performance - 7.25 kg. per hr.
- 6.9 hrs. per shook 50 kg.

Available Hours per Annum

Assume (i) 1 shift working
(ii) 8 hr. shift
(iii) 230 working days - 1,840 hrs.

Average Machine Utilisation

Assume similar to nail press i.e. 67.5%

67.5% x 1,840 - 1,242 hrs.

Annual Production

0.00725 x 1,242 - 9 tonnes

180 shooks 50 kg.

The United Nations Industrial Development Organization
Government of Ghana

02599
(3 of 5)

Management Assistance to the Ghana Industrial Holding Corporation

Unido Contract No. 75/3
Project No. DP/GHA/74/002

Final Report

Volume 3 -Annexes
Marketing

The P-E Consulting Group

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

FINAL REPORT

VOLUME 3

ANNEXES

MARKETING

OCTOBER, 1977

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THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

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FINAL REPORT

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BOATYARDS DIVISION

MARKET SURVEY

BOATYARDS DIVISION
OF GIHOC

MARKET SURVEY

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APPENDICES

BOATYARDS DIVISION
OF GIHOC

MARKET SURVEY

1. INTRODUCTION AND OBJECTIVES

In August 1975 it was agreed with the Managing Director of GIHOC that the central marketing team should conduct a survey of the market for small wooden vessels in West Africa and Europe and thereby provide an essential contribution to decisions on the future operations of the Boatyards Division. The survey was conducted in two parts. This report deals with the West African study; the European study is the subject of a separate report.

In late September the terms of the survey were agreed with the General Manager and the Commercial Manager of the Boatyards Division. The central marketing team has conducted the survey, from October to December 1975, with the Division providing statistics of GIHOC sales, and giving guidance on specific study areas. We should like to thank the General Manager and Commercial Manager very much for their co-operation and guidance.

The report is arranged as follows:

Section 2 : Summary of Findings and Conclusions

Section 3 : Approach to Survey

Section 4 : Findings

Section 5 : Factors Affecting Realisation and Potential Demand

Section 6 : Implications and Prospects for GIHOC.

2. SUMMARY OF FINDINGS AND CONCLUSIONS

Consumer Demand

2.1 Fish consumption in Ghana is over 20 kilograms per head per year, a high level by West African standards. There is an estimated potential demand of nearly 30 kilograms per head.

Fish Supplies

2.2 Ghana's fish catch has increased from 68 thousand tonnes in 1966 to about 200 thousand tonnes in 1973 and now accounts for 91% of consumption. Total supplies still fall short of demand by 100 thousnd tonnes.

2.3 Canoe fishing provides the largest part of fish catches at about 60%. Distant water vessels have a 30% share. Inshore motor vessels have the remaining 10%.

2.4 Total inshore catches by motor vessels have fluctuated between 30,000 tonnes and 15,000 tonnes, largely as a result of very variable catches of sardinella, and are currently depressed.

2.5 The future of the industry depends on being able to fish for species other than the seasonal sardinella, or on finding new stocks of sardinella. Most of the inshore fishing fleet is equipped for purse-seine fishing alone.

2.6 Poor catches have made existing operators unable to invest in newer equipment, but have not prevented newcomers investing in bigger vessels and different fishing methods. An immediate priority is the conversion of purse-seine vessels to dual purpose trawlers which enables operators to fish all the year round and therefore operate more profitably.

Vessel Trends

2.7 There is a gathering trend to large multi-purpose vessels for inshore fishing and the preferred sizes are now between 49' and 70'. The larger vessels have a longer range, a high fish storage capacity and more space for modern fishing equipment enabling them to fish the more remote fishing grounds profitably. Most current orders are apparently coming from newcomers to the fishing business.

Replacement Market

2.8 Nearly half of the Takoradi motor vessels are over 15 years old in contrast to the Tema fleet where three quarters are under 10 years old; but the desirability of replacing ageing boats at Takoradi is likely to be prevented by the unprofitability of existing operations.

Dominance of Canoes

2.9 Canoes are still more important numerically and as catchers of fish than larger motor vessels. Although they could be regarded as outmoded, there is no likelihood in the short run that the larger vessels will supplant them, particularly since most have now been fitted with outboard engines.

Boat Building Materials

2.10 The maximum economic size of a wooden vessel is about 70'. Equally, the minimum economic size of steel vessel is about 80'. The local availability of wood, existence of wood-working skills, and the high foreign exchange cost of imported steel make it most unlikely that steel will be a serious competitor to wood in this size range.

Competitors

2.11 The Yartel Boatyard at Elmina is the only significant internal competitor to GIHOC. Future expansion and competition from Yartel is likely to be limited, partly because of financial difficulties and partly because its production may well remain confined to the smaller (30' - 40') end of the size range.

Finance

2.12 The availability of finance for customers is fundamental to future demand for GIHOC vessels. Poor fish catches and rising capital and running costs are exerting financial pressure on most purse-seine operators. The result has been defaults on loans and a consequent reduction of loan facilities.

The African Development Bank's 1976 forecasts show a willingness to continue financing the fishing section, its lending priorities being for conversion of purse-seiners and construction of 70' vessels.

Government Policy

2.13 The Government intends to take steps aimed at raising fish supplies from 200,000 tonnes to match the estimated consumer demand of 300,000 tonnes, but specific plans are as yet unpublished.

Repairs and Conversions

2.14 There are three main areas of opportunity for GIHOC apart from new construction. These are conversion of purse-seiners to trawling, emergency rapairs, and routine maintenance.

We estimate that annual sales from repairs and maintenance could ultimately amount to ¢500,000 - much of which will be for parts and materials. Fulfilment of these high sales levels will depend on a more secure supply of spare parts, and on the successful education of operators on the costs and benefits of regular preventive maintenance.

Short Term Order Book

2.15 GIHOC currently has 33 prospective orders and outstanding quotations amounting to a potential sales value of ¢4 million. Even if only 33% of these became firm orders it would still represent nearly a year's work.

Conclusions

2.16 There is a continuing demand for GIHOC-built vessels and for GIHOC's repair and maintenance services which should enable the yards to operate at near their present nominal capacity for several years.

In the short term this demand is based on:

- newcomers and a small number of well established operators wishing to purchase vessels in the 49' - 70' feet size range equipped for dual purpose trawling and with modern accessories
- operators who are not doing well with traditional fishing techniques who are willing and able to convert to dual purpose trawling
- execution of a backlog of outstanding repairs.

Longer term demand is based on:

- following up the trend to 49' - 70' vessels
- converting smaller vessels
- building small numbers of dual purpose 35/45' vessels
- establishment of a regular preventive maintenance service to the Ghana inshore fishing fleet
- exports to other West African countries
- replacement of secondary passengers/cargo transportation launches on the Volta Lake, and development of boats for fishing the deeper waters.

Fulfilment of these opportunities depends on:

- much more regular supplies of vessel machinery, especially engines, and of spare parts
- acceleration of vessel production
- reduction in production costs
- improvement of repair and maintenance facilities.

3. APPROACH TO THE STUDY

The market for small vessels is well documented. Statistics on the wider aspects of fishing developments in West Africa were obtained from FAO. The Ministry of Agriculture, Fisheries Department and Fisheries Research Unit supplied fisheries data on Ghana. Data on the financing of operators was provided by Agricultural Development Bank. GIHDC Boatyards Division supplied GIHDC sales, financial/costs, and repairs data.

In order to evaluate the above statistics, the Team conducted a comprehensive interview programme. This included the main manufacturing competition, a sample of operators of inshore and deep-sea fishing vessels and the leading commercial banks. The Volta Lake development programme was covered by visits to the Volta River Authority at Akosombo and Accra.

A list of key respondents is shown in Appendix B-1.

4. FINDINGS

4.1 Introduction

The fishing industry in Ghana is predominantly marine, with Lake Volta supplying only 20% of domestic fish catches. 62% of the sea fishing is inshore, that is, it is carried out by vessels operating up to 50 miles from the coast on the continental shelf. The two GIHOC Boatyards at Sekondi and Tema were set up to supply this part of the industry and in the short term the main potential for GIHOC remains with inshore fishing vessels. It is therefore the demand for them which this report examines. There is also a longer term but much smaller potential for transport and fishing vessels on Lake Volta and this is separately described.

This section outlines our main findings under the following headings:

- Consumer demand for fish
- Fish stocks
- Fish catches and trends in fishing techniques
- Trends in vessel production
- Repairs, maintenance and conversions
- Other factors
- Economic size of Ghana inshore fleet
- Potential demand for GIHOC: new vessels, rsplacements and repairs.

The report necessarily uses a number of technical terms and these are defined in Appendix B-II.

4.2 Consumer Demand for Fish

There is a substantial, but currently undersatisfied consumer demand for fish in Ghana. The Ministry of Agriculture estimates that consumer demand now amounts to about 300,000 tonnes representing a consumption rate of about 30 kilograms per person per year. Average annual supplies fall about 100,000 tonnes short of demand, and the Government wishes to close this demand/supply gap.

The ability of the inshore fishing fleet, comprising both canoes and 30' - 70' motor vessels, to fill a significant part of this gap depends primarily on continuing availability of inshore fish stocks and will necessitate a dramatic improvement in fish catches. Understanding of these two factors is fundamental to any estimate of the future demand for GIHOC built vessels. They are discussed in the following sections.

4.3 Fish Stocks

A continuing high density of inshore fish stocks is essential to the future prosperity of the fishing industry. If these vanish, or seriously diminish, there can be no profitable fishing industry, and therefore demand for GIHOC's products will fade.

FAO experts admit that the estimation and forecasting of fish stocks is hazardous and that past attempts have often been wrong. Collapses in the fish catch, most recently in Ghana, but also in other parts of the world (see section 4.4) show that a recession can be both sudden and severe. Purse-seine fishing in Ghana has been very unprofitable over the past three years, mainly because pelagic fish stocks (i.e. those in the upper waters) have gone. Those involved with the fishing industry, including Government, the Agricultural Development Bank, and operators themselves wish to restore the industry's prosperity by a conversion of boats to enable them also to trawl for demersal fish. Stocks of these fish are thought to be 'good', but we must await an FAO survey (planned for 1976) for a more thorough assessment.

Demand for GIHOC vessels is closely tied to the inshore fishing industry's prosperity. There is a need for GIHOC constantly to watch for shifts in inshore fish stocks as indicated by the trend of landings, so as to anticipate a likely change in demand for its products.

4.4 Fish Catches

Tables 1 and 2 show fish catch trends, first in the West African region, and second by the Ghana fishing fleet.

4.4.1 West African Nominal Catch

Table 1 shows the annual fish catch of the main West African countries with coastal fisheries. More detail is given in Appendix B-III.

Table 1: Principal Fish Catches by West African Countries

'000 tonnes

Country	1966	1970	1971	1972	1973
Benin (Dahomey)	18.8	31.5	32.9	32.9	32.9
Ghana	68.2	171.5	216.4	281.2	195.5
Ivory Coast	61.6	57.9	62.6	72.4	51.0
Liberia	15.8	23.0	23.0	23.0	23.0
Nigeria	110.0	542.9	592.7	645.6	664.8
Senegal	141.5	189.2	239.8	268.1	323.8
Sierra Leone	32.2	30.6	30.6	51.0	51.3
Togo	7.0	8.9	10.6	10.6	10.9
Others	140.9	151.4	150.4	150.2	148.8
TOTAL	596.0	1198.8	1359.0	1535.0	1502.0

Source: Extract from FAO Year Book of Fishery Statistics 1973.

The total West African catch between the years 1966 and 1973 expanded from 600,000 tonnes to 1.5 million tonnes, an annual average rate of 14%. This is the highest growth rate of any world fishing region. Of the total West African catch, the combined share of Nigeria, Senegal and Ghana is 79%. Fish catches in these countries trebled between 1966 and 1973. Ghana's fish catch has increased at a slightly lower rate, from 68 thousand tonnes in 1966 to 195 thousand tonnes in 1973. The Ghana fishing industry is therefore one of the largest in West Africa.

4.4.2 Ghana Fish Supplies

Table 2 shows the volume of fish supplies to Ghana between 1967 and 1974, by source. More detail is given in Appendix B-IV.

Table 2: Ghana Fish Supplies by Source, 1967-74

'000 tonnes

Source of Fish	1967	1970	1971	1972	1973	1974
Canoe fishing	40	90	113	154	73	109
Inshore vessels	24	20	19	30	17	16
Distant water	28	47	44	65	65	55
Imports and other	13	17	21	1	1	6
TOTAL	105	174	197	250	156	186

Source: Fisheres Department Annual Report

Note: The sharp increase in fish catch by canoes from 1970 onwards reflects the provision of more detailed statistics on canoe fish catches.

The above table shows that:

- canoe fishing still holds the largest share of fish catches, at about 60% in volume

- distant water vessels (e.g. State Fishing Corporation, Ocean Fisheries, Mankoadze) have a volume share of about 30%

- the share of inshore motor fishing vessels fluctuates between about 8% and 12%.

The above figures suggest that the Ghana fishing fleet, although developing over the last decade from a traditional canoe fleet to a mixed traditional-modern fleet is still dominated by motorised and non-motorised canoes. The canoes partly operate in the same inshore waters as the 30'-70' vessels. We believe that this feature will continue for many years to come. The main trend in further modernisation of the canoe fleet will be in motorisation of canoes rather than in any extensive replacement of canoes by motor fishing vessels.

4.4.3 Catches by Inshore Vessels

Total catches by inshore vessels in recent years have declined substantially, as shown in Table 2, but during this period the distribution of inshore catches by fishing method has altered very significantly, as shown by Table 3 below.

Table 3: Inshore Fish Catches by Method, 1971-74

Category	1971 Tonnes	1972 Tonnes	1973 Tonnes	1974 Tonnes
Trawl	7,024	10,805	11,457	12,680
Purse-seine	8,420	12,878	3,199	1,857
Ring/ali and other	2,606	6,399	1,972	1,263
TOTAL	19,050	30,082	16,648	15,800

Source: Fisheries Department Annual Report

Historically purse-seine fish catches have been subject to grant fluctuations and since 1972 have declined from nearly 13,000 tonnes to below 2,000 tonnes. Ring-ali fishing, which is a similar method to purse-seine, has experienced a decline in catches from 6,400 tonnes in 1972 to under 1,300 tonnes in 1974. During the same period trawling has increased its share of the total fish catch from 11,000 to nearly 13,000 tonnes.

Purse-seine fishing is the technique for which most GIHOC built wooden vessels are designed. Yet by 1974 it only accounted for 12% of inshore fish catches. Conversely, trawling, which in 1974 produced 80% of inshore catches, is mostly done by a small number of 100' long steel vessels. These are mostly operated by Kaleawor Fisheries.

The implications for GIHOC of this change in the successful methods of catching fish are discussed in the following section.

4.4.4 Trends in Fishing Techniques

The Ghana inshore fishing fleet was built up on the basis of 30' - 40' vessels operating up to 50 miles offshore on the continental shelf. The most productive areas were the 100 miles between Winneba and Axim and the 50 miles from Ada to Afleo. The fishing pattern is determined by the annual migration of the sardinella aurita. The main season for catching this species usually lasts for three months of the year, from July to October.

The fishing method used was purse-seine, which involves the drawing of a net through the upper waters. Because of the proximity of the fishing grounds to the Tema and Takoradi bases, and because purse-seining does not demand much power, most vessels were fitted with 50 hp engines (much smaller than needed for trawling).

In the late 1960s purse-seining was lucrative. In the peak season of 1967, 27% of domestic catches were of sardinella aurita. 1972 was also an excellent year, when 20,000 tonnes were caught by vessels using purse-seining and similar techniques.

Since 1972, the picture has dramatically changed. In 1973 and 1974 the sardinella catch by purse-seine declined to well under 2,000 tonnes. Such drastic declines are not peculiar to West Africa as indicated by Table 4 below which shows other world fishing grounds where a similar collapse has occurred in recent years.

Table 4: Current and Maximum Catches of Fish

Fishing Ground	Current Catch '000 tonnes	Maximum Catch '000 tonnes
Hokkaido-Sakhalin Herring (Japan)	0	800
Atlanto-Scandian Herring (N. Atlantic)	21	1,723
Downs Herring (N. Sea)	0	98
Pacific Sardine (W. Coast USA)	0	791
Japanese Sardine	21	1,590
S. African Sardine	82	452
TOTAL	124	4,454

Source: Journal of Physical, Human and Regional Geosciences

Some FAO experts regard these collapses as due to ecological factors, and it is known that they can last many years. Other experts believe that they may be the result of overfishing and that strong and continued conservation measures by Government over at least 5 years are essential to any recovery.

The collapse of the sardinella supply has badly affected the profits of most operators, who are typically one or two man enterprises owning a single purse-seine vessel. Only a very few, such as Soli, Matanawi and Olemd operate two vessels or more. Catches have dwindled often to as little as 10 crates per boat per trip, compared with a capacity of 300 crates. The collapse has emphasised the disadvantages of concentrating on purse-seine fishing. They are:

- even in a good year, sardinella is a highly seasonal catch. Vessels are likely to be underutilised during most of the year

- the purse-seine engine is too weak for other fishing techniques, such as trawling. The vessel therefore cannot use these other techniques to obtain good catches when sardinella is not available.

- the purse-seine net is expensive, at a capital cost of $40,000

- since the vessel was designed for short fishing trips, there is no refrigeration on board, nor is there radio or sonar equipment

- the crew required is at least 4 more than for trawling.

The collapse in fish catches, added to increases in fuel prices, spare parts shortages and foreign exchange scarcity, has meant that existing operators are in no position to invest further in fishing of any sort. The operators themselves, as well as the Fisheries Department, GIMOC Boatyards Division and the Agricultural Development Bank, see the first priority as being conversion from purse-seining to dual purpose trawling. Dual purpose trawling involves equipping each purse-seine vessel to operate a trawl net. The advantages which this method has over purse-seining are:

- it should enable operators to fish profitably all the year round, since stocks of bottom feeding fish are believed still to be good

- the more powerful engine should enable vessels to work a wider area of fishing grounds

- the trawl net at ¢5,000 costs about one eight of the purse-seine

- fewer crew are needed than for purse-seining.

There is plentiful evidence of the determination with which the fishing industry is attacking the task of conversion. The Agricultural Development Bank which provides about 80% of operators' finance has budgeted over ¢100,000 to help convert 20 vessels in the 27' - 45' size range. GIHOC itself recognises that purse-seining is a dying method and now insist on building only dual purpose vessels. The Government professes that it will encourage conversion of some 100 purse-seine boats over a (probably) 5 year period. All are aware that conversion is the key to restoring the inshore fishing industry's prosperity.

4.5 The Ghana Fishing Fleet

4.5.1 Fleet Size

Table 5 shows how the size and composition of the Ghana fishing fleet has varied since 1970.

Table 5: Number of Ghana Fishing Vessels by Size

Type of Vessel	1970	1971	1972	1973	1974	Change 1970/74
a) Fishing Vessels (general)						
Up to 32'	201	220	168	204	144	-57
33' - 60'	131	119	95	128	100	-31
61'-100'	25	27	21	29	36	+11
100'+	32	34	27	22	35	+ 3
TOTAL	389	380	311	383	315	
b) Specialised Tuna boats						
61' - 100'	3	-	6	5	3	
100'+	76	52	49	29	30	-46
(a) + (b) Total vessels operating	468	432	366	417	348	
c) Vessels registered but non-operating	83	72	192	1	119	
(a) + (b) + (c) d) Total Ghana Vessels	551	504	558	417	467	-84
e) Canoes						
Non-motorised	1825	1194	1130	1070	1070	
Motorised	6903	7534	7598	7168	7168	
TOTAL CANOES	8728	8728	8728	8238	8238	-490

Source: Fisheries Department Annual Report

In 1970 there were 389 general purpose fishing vessels in Ghana, of which 332 (85%) were 60 feet or under in length, and 201 (52%) were 32 feet or under. By 1974, of 315 vessels 244 (77%) were under 60 feet in length and 144 (44%) were under 32 feet. The total reduction over the 4 year period of some 75 vessels relates to old smaller sizes vessels not

replaced and to vessels not operating for one reason or another (e.g. awaiting repairs or chartered to another West African country). The start of a trend is evident, which is only now gathering impetus, away from vessels under 32 foot, and towards the 49 foot, 60 foot and 70 foot vessels.

In the same period the total number of canoes has only reduced by 500, from 8,700 to 8,200, whereas the number of non-motorised canoes has nearly halved from 1,800 to 1,100. Motorised canoes have slightly increased in number and at 7,168 now amount to over 85% of the total. These figures show that since 1970 the modernisation of the Ghana fishing fleet by re-equipment of canoes has made some small progress. There is, however, little to show that traditional canoe fishing is being ousted for large scale inshore fishing from motor vessels despite moves by fishing co-operatives, notably the Ghana Co-operative Fisheries Association, in this direction.

4.5.2 Age and Size of Inshore Fishing Fleet

Tables 6, 7 and 8 below analyse the vessels the GIHOC yards have built since 1952 by size and age. Table 6 includes the 30 vessels built since 1971 by the Yartel yard at Elmina. The aim of these analyses is to show size trends in the 30' - 70' range and to identify a potential replacement market for GIHOC.

Table 6 below analyses the age and size of vessels for the combined fleet.

Table 6: Vessel Registrations by Size and Age (Sekondi, Elmina and Tema)

	Period of Registration					
Length	1951-55	1956-60	1961-65	1966-70	1971-73	Total
30'+	33	103	33	66	52	287
40'+	-	9	33	99	5	146
50'+	-	-	-	5	9	14
60'+	-	6	4	9)	4	23
70'	-	-	-	-)		
TOTAL	33	118	70	179	70	470

Source: Fisheries Department Register

32% of the fleet is over 15 years old.

The start of a trend to the 50' - 70' sizes is emerging, but is much more apparent from an analysis of vessels under construction and quoted than from past registrations (See Table 9).

The following tables analyse the Takoradi/Sekondi and Tema registered vessels separately since the yards have been operating for different periods and have somewhat different production capabilities.

These tables account for 440 of the current fleet of 470 vessels. The remaining 30 vessels have been built in the last 5 years by Yertel et Elmina and are to the 30' - 45' range.

Table 7: Numbers of Sekondi Built Vessels by Years of Registration

	Period of Registration					
Length	1951-55	1956-60	1961-65	1966-70	1971-75	Total
30'+	32	105	31	65	20	253
40'+	-	10	8	52	5	75
50'+	-	-	-	-	-	-
60'+	-	2	10	-	-	12
70'+	-	-	-	-	-	-
TOTAL	32	117	49	117	25	340

Source: Fisheries Department Register

The above table shows that Sekondi has concentrated on vessels of under 40'. 45% of the fleet of 340 are more than 15 years old, and might be expected to be nearing the end of their reliable life. However high capital costs have discuaded most owners of these older vessels from replacement, and instead there is a preference for rehabilitation or piecemeal repair.

No identifiable replacement market has therefore yet emerged, and is unlikely to do so until operating profitability improves.

Table 8: Numbers of Tema-built Vessels by Years of Registration

Length	Period of Registration 1962-65	1966-70	1971-75	Total
30'+	-	-	-	-
40'+	26	48	3	77
50'+	-	6	10	16
60'+	-	5	1	6
70'+	-	-	1	1
TOTAL	26	59	15	100

Source: Fisheries Department Register

Most vessels built at Tema have been over 40 foot in size. Since 1966 the trend towards the larger sizes has gathered pace. Of the 26 vessels built before 1965 all were of 40' average length. Indeed, 77 vessels are still in this category. In contrast, of the 15 built since 1971, 12 were 50 foot or more.

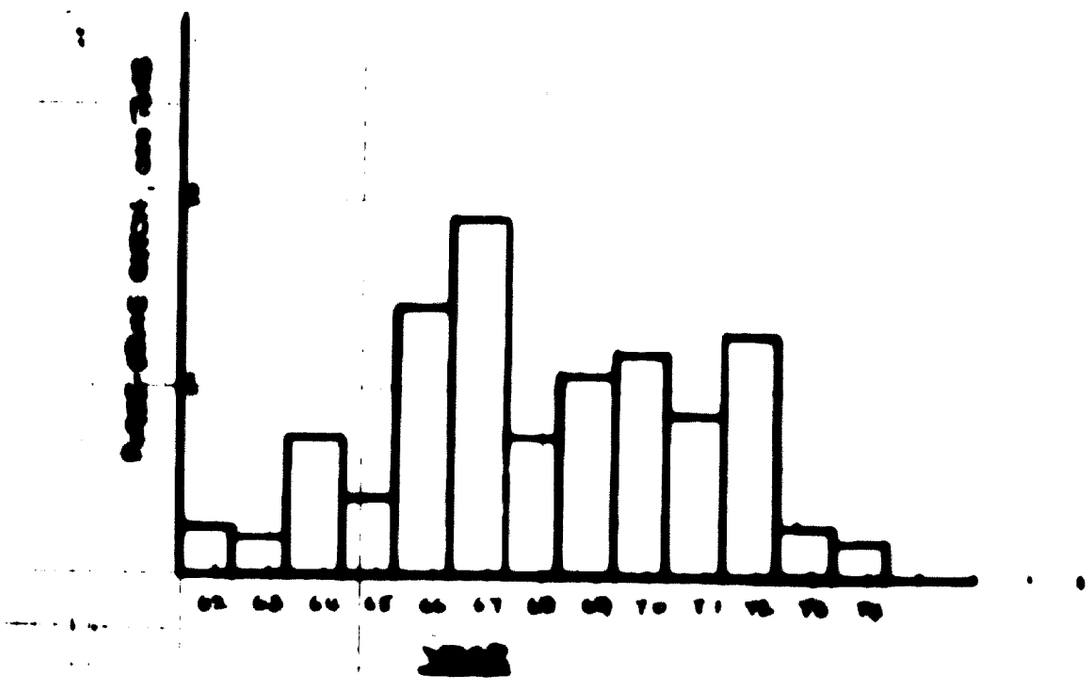
The Tema fleet is relatively young with 74 vessels under 10 years old and all vessels under 15 years old. This suggests that replacement of well-maintained vessels offers scope for work in the medium rather than the short-term.

13 out of 15 vessels registered in the years 1971-75 were between 40' and 50' in length. However, 15 out of 35 outstanding quotations (see Table 9) are for vessels 60' or more in length. Of those under 60' at least 9 are river launches or planked beach canoes, and hence in a different vessel category. The advantages of a larger vessel up to the economical ceiling of around 70 foot, are:

- increased fish storage
- greater range
- more space for accessories such as freezing equipment
- more engine power, creating more flexibility in operating and fishing techniques
- operating economies of scale.

There is a strong correlation between trends in vessels registered (assumed new vessel completions) and in fish catches. 59% (see Table 8) of the Tema fleet were registered between 1966 and 1970, as were 34% (see Table 7) of the Sekondi fleet. This pattern coincides with a period when purse-seine fish catches were particularly good, as shown in Figure 1 below.

Figure 1:



This suggests that an operator is encouraged and able to invest in fishing when times are good; and is unlikely to do so when they are hard. This is an important factor in assessing the demand for GRP vessels, particularly in the light of recent lean times for purse-seine fishing.

4.5.3 Future Prospects

Table 9 confirms the gathering trend of buyers towards vessels at the top end of the 30' - 70' range.

Table 9: Pattern of Demand for Wooden Vessels, 1971 Onwards

Length	Vessels Registered 1971-75 Number	Vessels Quoted for 31.10.75 Number
30'	-	1
40'	3	9
50'	10	10
60'	1	1
70'+	1	14

Source: GIBDC Statistics

4.0 Repairs, Maintenance and Conversions

This section considers repairs and maintenance, and the associated subject of conversions to dual purpose trawling, from the following aspects:

- current GIBDC revenue and future scope
- repair costs trends.

4.0.1 Current GIBDC Revenue and Future Scope

GIBDC earns a substantial part of its revenue from repairs and maintenance. Repair revenue for the last 3 years has been:

1973 $120,000
1974 $[illegible]
1975 $216,000

However these figures conceal certain problems. There is and has been for some time a considerable backlog of repair work. An estimated 50 of the 200 Tema based fishing vessels are idle in the harbour, awaiting repair. There is thus considerable scope for GIBDC to increase its repair turnover, but to do this it will have to:

- improve its procurement of spare parts
- modernise the slipways and workshop facilities
- improve its yard management.

A more steady source of income could be by undertaking regular preventive maintenance for operators and thereby avoiding some of the more serious breakdowns which result in vessels being out of operation for long periods.

4.6.2 Repair Cost Trends

Costs of repairs have risen by well over 100% since 1971. Comparative costs, mainly labour, for 1971 and 1975, are shown below:

Category	1971	1975
Hull repairs	¢300	¢600
Engines and machines	¢800	¢2,000
TOTAL	¢1,100	¢2,600

Source: GIHOC Statistics

The only way to mitigate these increases and to convince operators of the benefits of maintenance, is by providing more efficient repair facilities, which ensure that the vessel is out of service for as short a period as possible.

In Section 4.9.2 we assess GIHOC's sales potential from repairs, maintenance and conversions.

4.7 Other Factors

Three other factors are relevant to the potential demand for GIHOC's products. They are:

- Government direction and incentive
- Extension of territorial waters
- [illegible] arrangements.

4.7.1 Government Policies

In August 1975, the Commissioner for Agriculture announced a Government programme aimed at achieving self-sufficiency in fish supply. The immediate target is to increase fish catches from all sources, from 200,000 tonnes to 300,000 tonnes (see paragraph 4.2). Appendix B-V contains an outline of the programme set by the Fisheries Department to achieve this. In pursuit of this objective the intention is:

- to provide technical services to support the fishing industry
- to determine specifications for fishing vessels in general
- to set up a standardisation programme for marine engines and accessories
- to enforce a mesh size policy to ensure that only mature fish are landed
- to zone fishing areas and to establish administrative units for each zone
- to provide harbours and landing stages for the fishing fleet
- to evolve an effective communication network for the fishing fleet
- to give financial support to co-operatives and associations
- to increase the size of the fishing fleet
- to establish technical support facilities, including base workshops, maintenance workshops and mobile repair services
- to encourage dual purpose fishing vessels.

It is too early to assess the extent to which this programme will be translated into action which will foster the demand for GINDC's products. A working party has been set up under the Director of Fisheries to formulate more specific plans.

For the moment, it can be said that the programme reflects a desire by Government to develop the Ghana fishing industry, so as to satisfy the demand for fish from indigenous resources. Some of the steps contemplated to achieve this objective, such as encouragement of dual purpose vessels, increase in fishing fleet, technical support, standardisation of engines and spare parts, and support for fishing co-operatives should all be beneficial to GINDC.

4.7.2 Extension of Territorial Waters

The recent UN Conference on the Law of the Sea at Caracas and Geneva have shown evidence of increasing pressure for coastal states to extend their territorial zone up to 200 miles beyond their coasts. This should encourage Ghanaian exploitation of its own continental shelf. It is likely that the Government will support this by grants for buying larger boats, and encouragement of boat owners to modernise or replace their boats.

4.7.3 ECOWAS

The establishment of ECOWAS is still at an early stage. It is therefore not yet possible to anticipate the setting up of such provisions as reciprocal fishing rights, joint fishing ventures on an international scale, or joint fishing market arrangements. These are developments for the longer term. None the less, they point to the expansion of fishing in the West Africa region and to potential export opportunities for GIHOC. An initial assessment of export prospects is contained in Appendix B-VI.

We plan to survey the Nigerian market for GIHOC vessels as part of the West African export market study, to be conducted in 1976.

4.8 Economic Size of Ghana Inshore Fleet

Section 4 so far has described the main factors which bear on the potential demand for GIHOC vessels. In this connection it is useful to consider the economic size of the Ghana fishing fleet. If the fleet is already too big to be profitable, replacement or expansion on a commercial scale is unlikely and continuing demand for GIHOC vessels will be negligible.

There are several difficulties in producing an accurate assessment of the fleet's economic size. The Government does not control the size of the fleet. Fishing is conducted by small enterpreneurs, who buy boats on their own initiative. A nucleus of only 50 successful operators could provide GIHOC with an ongoing demand for, say 5 to 10 vessels per year, and it would not matter to GIHOC if the other 400 made no money at all. Furthermore, although the Government plans to increase annual fish supplies from 300,000 tonnes to 300,000 tonnes, we do not know what share of this larger figure is expected of the inshore fleet. An expected increase of fish catches from 15,000 tonnes to say 80,000 tonnes by the inshore fleet

could have implications for the fleet size, but we do not certainly know whether inshore fish stocks could sustain such an expansion. Any assessment must therefore be to some degree speculative. In Appendix B-VII we have calculated the 'economic' fleet size for two extreme conditions in recent years:

(i) 1972: a good year for fish catches, which caused low selling prices and a squeeze on margins

(ii) 1974: a poor fishing year, which along with inflated running costs, caused a sharp rise in selling prices.

Table 10 summarises the results of these calculations.

Table 10; Comparison of Actual and Estimated Economic Fleet Size

Year	Actual Size (Vessels)	'Economic' Size (Vessels)	$\frac{\text{'Economic'}}{\text{Actual}}$ %
1972	263	234	89%
1974	244	86	35%

The table shows that in a good fishing year such as 1972 89% of operators are reasonably profitable. In a poor year, such as 1974, only a fleet 35% of the actual size would be regarded as profitable.

These conclusions are based on a number of assumptions, and in particular on the need for boat operators to cover all costs including depreciation. Although they could and do continue to operate on a marginal cost basis during a bad year such as 1974, such a level of profitability would not permit them either to buy new vessels or to carry out major rehabilitation of existing vessels. Nor would there be any encouragement for outsiders with money to invest in the fishing industry at such a time.

We conclude therefore that there is no immediate prospect for GIBSC to supply vessels for purse-seine fishing; and that the economic fleet size using only this fishing method is probably well below the actual number of boats available.

Consideration of alternative fishing methods presents a somewhat different picture. Statistics of trawler catches show annual tonnages ranging from 11,000 to 12,500 tonnes. The number of registered trawlers of over 80' is 7. Thus the annual average catch in recent years for these longer boats has been about 1,500 tonnes. The average capacity of a 49'/70' boat is about half that of these larger boats. Thus, assuming 150 trips a year, this indicates an annual catch per boat of 750 tonnes. A fleet of 100 dual purpose vessels should therefore in theory be adequate to produce much of the increased inshore catch required by the Government's programme, ignoring any contribution from unconverted vessels.

The published statistics show canoes, which normally fish within a few miles of the shore, as accounting for 5 times the catch of the inshore motor vessels which range up to 50 miles out. Unless therefore the density of fish stocks decreases drastically as the continental shelf gradually deepens there would appear to be every likelihood of adequate stocks to support a substantial increase from the inshore fleet.

However the availability of fish stocks does not of itself mean that they can be economically fished. This depends on such factors as the rockiness of the sea bed and the accessibility of the fishing ground from the harbours, which is a function of the range and equipment of boats in each location.

The implications of this assessment are that in the next 5 years there should be adequate room for 100 dual purpose vessels to operate profitably inshore, and consequently GIBOC should be able to assume 20 - 30 conversions or new contracts for such vessels each year during the period.

4.9 Potential Demand for GIBOC's Products

The preceding sections have outlined the different factors which bear upon potential demand for GIBOC's products. This section summarises this market potential, both in the immediate and the longer term.

4.9.1 New Vessels

There is a clear indication of potential demand for GIBOC vessels, and of the sources of that demand, from the following schedule of quotations made since July 1975.

Table 11: Outstanding Quotations - Tema and Sekondi Yards

Category	Vessel Type	Size	No.	Sales Value (from quotation) Vessel Type (₵)	Total (₵)
Seagoing	Fishing	70'	14	2,800,000	
	"	49'	7	1,008,000	
	"	45'	1	140,000	
	"	40'	1	118,000	
					4,066,000
Other	Beach Canoe	40'	3	9,000	
	Yacht	35'	1	36,000	
	River Canoe	45'	1	8,000	
	River Launch	45'	1	15,000	
	"	55'	1	105,000	
	"	33'	1	40,000	
	"	40'	1	59,000	
	Lake Barge	45'	3	15,000	
					287,000
TOTAL	Sales Value, Outstanding Quotations				₵4,353,000

Source: GIHOC Sales Records

GIHOC's schedule of prospective orders has a potential sales value of over ₵4 million. Well over 90% of this represents sales of fishing vessels. The share of other vessel categories is only 7%, mainly because of the low unit value of most river or lake vessels. The table confirms our view that the main market potential both in numbers and value lies in sea fishing vessels rather than in other types.

It is improbable that all of the above quotations will become firm orders. GIHOC themselves expect a conversion rate of quotations into orders of about one third. Moreover, a substantial proportion of the cost relates to purchased material and components, so the contribution to GIHOC's labour and overheads may be no more than 30% of sales values. Even so, a potential turnover of well over ₵1 million can be secured for GIHOC from these quotations, and it should be possible to digest this workload within 12/18 months.

Two other points should be noted. First, of the 23 enquiries for fishing vessels, 21 are from potential newcomers to the fishing business wishing to purchase vessels, usually of the largest economic size, equipped with dual purpose trawl gear and other modern accessories like radio, refrigeration, and echo sounder. They are in a different category from the traditional operator struggling with the purse-seine vessel, and have clearly not been deterred by his recent lack of success.

Second, the Volta Lake and River is beginning to emerge as a potential area of demand. In the short term we do not expect much business from this source, but in the longer term there is potential for replacing much of the existing secondary transport fleet of 130 launches. Appendix B-VIII discusses this market in more detail.

Assessment of demand beyond two years ahead is much more speculative. It is difficult to assess buying intentions until a would-be owner makes an enquiry. Nevertheless, several indicators of the climate in the fishing industry can assist GIHOC in forecasting trends and in anticipating shifts in demand patterns so as to adapt product policy and marketing effort. Most of these factors have already been outlined in this section and the remainder are considered in Section 5. They are:

- consumer demand for fish
- stocks of marine (deep-sea and inshore) fish
- fish catches and fishing techniques
- vessel sizes and age composition
- operators' profitability
- availability of finance to the fishing industry from the commercial banks particularly the Agricultural Development Bank
- GIHOC's own output performance
- effects of competition from other manufacturers, and in the longer term from other materials.

Taking all of these into account it seems that in the immediate future a demand of about 10 boats a year in the 40' - 70' range is likely, and this should be enough to give a reasonable base load to the Tema yard.

Indications of orders in the smaller sizes between 35' and 45' are less promising if we only consider the outstanding quotations. However, it should be noted that Yartel at Elmina has consistently been making up to six dual purpose boats a year in this size range, and we do not therefore believe that demand for the smaller sized boats is at an end.

Yartel's success is doubtless in part due to the difficulties GIHOC have had in producing on time and at the quoted price, but improvement in GIHOC's performance should enable them to tap this market, which is as likely to consist of new entrants to motorised fishing as of owners replacing obsolete vessels.

4.9.2 Repairs, Maintenance and Conversions

In the next five years there are three main areas of sales opportunity for GIHOC resulting from:

- conversion of existing purse-seine vessels to dual purpose trawlers
- emergency repairs
- routine maintenance to the inshore fishing fleet, on a twice or thrice yearly basis.

In addition there is a short term opportunity to catch up on the backlog of 50 boats currently needing repairs of various sorts. We calculate below the potential sales revenue from each source or repair work.

(i) Conversion to Dual Purpose Trawlers

Number of Vessels	100
Labour costs:	
Engine installation	¢4,000
Accessories	¢2,000
Total Revenue	¢600,000

The calculation assumes that only 100 of the fleet will be converted to dual purpose trawlers. Revenue for GIHOC comprises labour costs for installation of engine and accessories, at ¢4,000 and ¢2,000 respectively.

(ii) Emergency Maintenance to Fleet

Number of Vessels	30
Maintenance frequency	1
Labour costs:	
Engines and machinery	$2,000
Total Revenue	$60,000

The calculation assumes that 30 vessels will need 1 emergency repair per year at a labour cost of $2,000.

(iii) Routine Maintenance to Fleet

Number of Vessels to be maintained	200
Annual maintenance frequency	3
Cost of routine hull overhaul	$600
Total Revenue	$360,000

The calculation assumes that 200 vessels will undergo preventive maintenance 3 times a year at a hull overhaul cost of $600. It excludes installation charges or minor maintenance work.

(iv) [illegible] 90

Number of Vessels	90
Labour: Hull	[illegible]
Engines and machinery	[illegible]
Total Revenue	[illegible]

The calculation assumes that although 70% of the vessels currently idle need engine or machinery repairs, the vessels have been idle for so long (often 3 years) that a hull overhaul is also needed.

These four sources of repair work would give the following potential revenue to GIHOC:

Emergency maintenance	$60,000	On-going
Conversions	$600,000	Once-off
Outstanding repair work	$130,000	Once-off
Routine maintenance	$360,000	On-going.

If conversions are done over a 5 year period they would provide an annual revenue of $120,000 over this period, and emergency repairs a further $60,000 in addition to any contribution from the backlog of outstanding repairs.

In the short term therefore there should be a continuing repair and conversion turnover of up to $250,000. The contribution of routine maintenance is more problematic. It could amount to a substantial figure, but depends on educating boat owners as to its value.

We conclude that repairs and maintenance work could contribute a substantial proportion of annual revenue. Achievement of the sales levels quoted above will depend on:

- more regular supply of spare parts
- provision of a separate repair slipway
- provision of a speedy and economic repair service to operators, so that the vessel is out of action for the minimum time
- education of operators into the cost/benefits of preventive maintenance.

The prospects for building new vessels and for doing repairs and maintenance work reflect a potential demand for GIHOC's products of about $1¼ million in the first year.

Beyond this period assessment is more speculative. We consider there will be a continuing, if limited, demand for the smaller dual purpose vessels and the limits to this will be set by the area of fishing grounds accessible from the fishing ports. Such new boats will be in direct competition with any of the existing fleet which are converted. The larger

boats in the 49' - 70' range are still in the position of being able to work relatively unexploited fishing grounds by virtue of their longer range. So for the next few years we see the greatest scope for expansion in this sector but it is not yet possible to assess how many boats of this size the coast could ultimately support. In the longer term therefore GIHOC should certainly be looking to export possibilities in other West African countries.

However potential demand and actual sales are two different matters. Realisation of the potential depends on a number of factors mentioned in Section 5 which follows and GIHOC can control some of these.

5. FACTORS AFFECTING GIHOC'S ABILITY TO REALISE POTENTIAL DEMAND

Four main factors are likely to influence the ability of GIHOC to realise the potential demand stated in Section 4. They are:

- production resources
- finance for the fishing industry
- competition, from materials and other manufacturers
- reputation.

5.1 Resources

The annual production capacity of the two GIHOC yards is claimed to be:

- Tema, 12 vessels of 45'/70'
- Sekondi, 6 vessels of 35'/49'.

In practice various problems, mostly connected with the procurement of engines and machinery from abroad have seriously affected actual output, as indicated in Table 12.

Table 12: Number of Completions of Major Boats

Year	Tema (35'+)	Sekondi (30'+)
1971	4	n.a.
1972	5	4
1973	14	6
1974	3	9
Annual Average	6.5	6.3

Even allowing for the higher average size of boats made at Tema, that yard's output has been disappointing in relation to its claimed capacity.

At Tema and to a lesser extent at Sekondi the yard layout and in particular the shortage of slipways and cradles is a constraint both on production of new vessels and the repair of existing ones. Vessels have to wait up to 3 months for repairs at Tema, although this is not necessarily only due to slipway difficulties. Delays in construction of the particular boat on the cradle have interfered with the effective operation of the whole yard.

At Sekondi the location of the yard precludes launching of the larger boats except at spring tides.

If GIHOC is to have any hope of achieving the sales potential outlined in Section 4, practices must be developed and resources provided which will consistently reduce the time needed to complete and launch a vessel.

5.2 Finance for Operators

This fundamental subject is discussed under two headings:

- capital costs
- running costs

5.2.1 Capital Costs

Most fishing operators are from one of the following three categories:

- co-operatives
- limited liability companies
- partnerships.

The capital investment in a fishing vessel has always been too large for most individuals. Lack of finance has been and is a major constraint on the expansion of the fishing industry. Moreover, capital costs are rising. In 1971 capital costs of a 45' vessel were about $40,000. By 1975 they had increased to $100,000. Part of the increase in capital cost has been due to increasing sophistication of the engines and the fishing, navigation and communication equipment. Labour costs of installation have at least doubled over the past five years. Add to this the long time between order and delivery with consequent increases in material prices, and the operator can be under financial pressure before his vessel has even started to earn revenue for him.

The usual source of finance is a loan from one of the commercial banks. The Agricultural Development Bank is estimated to provide 60% of all loans to operators. These are for:

- purchase of vessels
- major repairs, re-equipment and conversion
- purchase of nets.

Normal terms are 5 years repayment for vessel purchase and 1 year for net purchase; 10% down payment by the client and 90% by Agricultural Development Bank. Other conditions before which a loan is granted are:

- client must have a background and knowledge of fishing
- fishing must be his only business enterprise
- he must have a qualified Captain
- he must open a current account with Agricultural Development Bank.

During the past 5 years Agricultural Development Bank has lent over [illegible] million to the fishing sector. Annual amounts are as follows:

Year	Amount ([illegible])
1970	218
1971	456
1972	1,030
1973	1,108
1974	922 3,553
1975	(est.) 704

In and following the good fishing a year of 1972, Agricultural Development Bank's loans programme was set to expand. However their experience with loans since 1974 has not been good. Agricultural Development Bank has thus reduced loan amounts by 40% from 1973 and has been much stricter in its lending practices.

Out of 187 applications, worth [illegible].6 million, received since 1974 only 47 were approved.

Clients have been unable to repay loans for two main reasons:

- many operators have paid insufficient attention to regular preventive maintenance. Malfunctions are allowed to become major breakdowns needing spare parts which are unavailable. The vessel is therefore idle and the operator earns no revenue from fish catches

- operators have not kept abreast of the need to change fishing techniques from the seasonal purse-seine to the more flexible dual purpose methods. Even when purse-seine catches are good, the operator's cash flow position is only strong from July to October. A more balanced catch throughout the year would enable him to achieve a more regular income.

As a result of poor repayments by operators, Agricultural Development Bank has suspended for 1975 loans for new vessel purchases, and has concentrated investment in spare parts procurement, re-equipment and repairs. It is also taking action to encourage standardisation of marine engines to alleviate problems of spare parts procurement. For 1976, the Bank's main priority is to convert 10 World Bank sponsored vessels to dual purpose trawlers by obtaining engines and spare parts from Europe.

Its investment programme for new vessels in 1976 is confined to 70' vessels which are to be dual purpose trawlers. The programme, at November 1975 was:

Type	Size	No.	Value Cedis
Vessel	70'	4	700
Hull	70'	4	272
Trawl Boards		10	20
Conversions			
Vessels	37'-39'	10	20
"	40'-43'	10	200
			1,212

The value of the above programme indicates a willingness by Agricultural Development Bank to continue financing operators in the next 5 years. This can only be an encouraging sign for [illegible]. Indeed, Agricultural Development Bank have implied that the amount of loans planned for new vessels in 1976 would be larger if they had more confidence in [illegible]'s production performance. Achievement closer to Tema's capacity of 12 vessels would encourage Agricultural Development Bank to devote more finance to the fishing industry. Even so, the fact that the bank is prepared to finance as many as 8 x 70' vessels in 1976 clearly indicates a potential demand for [illegible], provided it can speed up vessel production.

5.3.3 [illegible]

At a time when an operator's revenue from fish catches is depressed, increases in running costs accentuate his problems, particularly in funding any expansion of his fishing interests. This is borne out by a survey conducted by the Department of Fisheries in 1973.

The aim of the survey was to achieve some measure of operating profitability. Studies were conducted with a sample of fishing vessels in the Tahoradi, Sekondi, Shama and Anin area, during July, the high sardinella season. The results of the survey are summarised in Table 13 below.

Table 13: Costs and Revenue of Fishing Trips from Selected Ports - 1973

	Tahoradi cedis/trip	Sekondi cedis/trip	Shama cedis/trip	Anin cedis/trip
Fish Sales	31.90	18.20	35.60	40.10
Less:				
a) Running costs (excl. repairs maintenance)	13.10	12.30	17.40	9.30
b) Wages for crew	10.45	7.45	7.10	6.30
c) Repairs to gear, engine, hull	10.00	10.00	10.00	10.00
d) Depreciation & maintenance costs (loss of earnings)	47.60	25.30	24.60	20.50
Total Costs	81.15	55.05	59.10	46.90
Sales less a) & b)	8.35	(1.55)	11.10	33.30
Sales less a), b), c)	(1.750)	(11.150)	0.50	23.70
Sales less a), b), c), d)	(49.250)	(36.450)	(23.500)	3.20

The above table shows that only operators at Anin managed to cover all fixed and running costs. Even there profitability was marginal, at ₵3.20 per trip. At the other three centres, operating losses were substantial, at ₵50.25, ₵36.45 and ₵23.50 respectively. When one considers that in the last two years average catches have if anything deteriorated and that fuel costs have doubled, the pressure on the operator must be much greater now than in 1973.

The survey indicates that an operator is unjustified in expanding his investment in fishing by the purse-seine method, but it also demonstrates that he is not generating enough cash to enable him to change to more successful fishing methods.

However, bearing in mind the common practice of paying the crew with a share of the catch, it is also clear from the table that the marginal cost of operating boats is quite low. They could thus continue to operate for a long period of low fish catches without being driven out of business.

5.3 Competition

Competition for GBBC is in two forms:

- material, from steel and aluminium
- other manufacturers of GBBC-type wooden vessels:

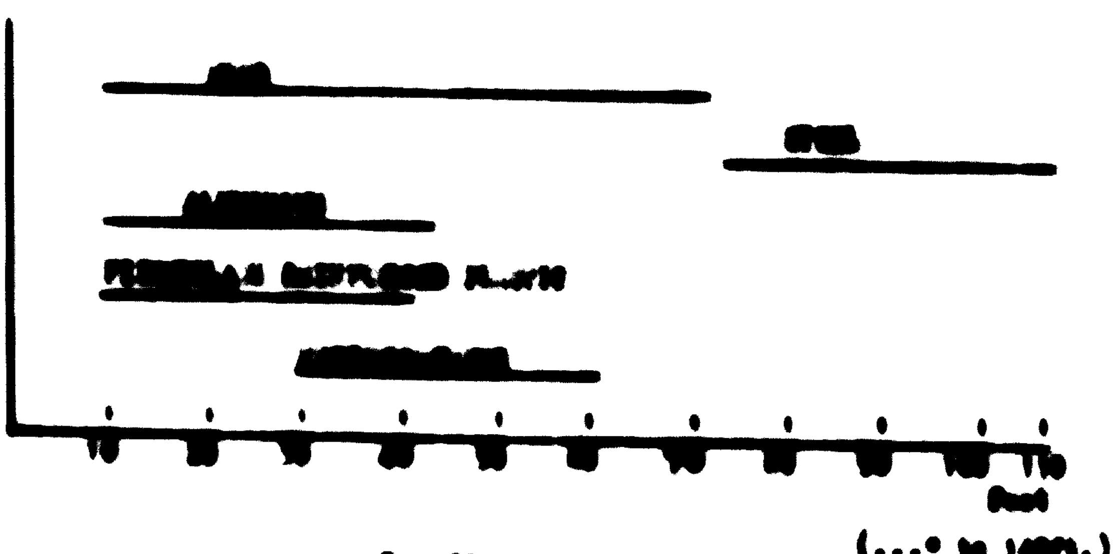
  (i) Tartel, at Elmina

  (ii) two small Tema competitors

5.3.1 Material

The main potential competitor to wood is steel. Aluminium, FRP (fibreglass reinforced plastic) and ferro-concrete are used in Europe and Canada, but in Ghana are not yet serious competitors to wood, at least in the 30' - 70' category. Recent FAO research indicates the following size ranges where particular boatbuilding materials are favoured:

Figure 3: Favoured Size Ranges for Boat Building Hull Materials



The economic minimum for wooden vessels is shown as just over 30'; conversely steel vessels are not economic much below that size. The two materials scarcely compete one with the other. Aluminium and FRP are confined to hulls considered to be on the small side, although they may still be used for river work. Ferro-concrete, like steel, uses imported material, and therefore is unlikely to offer serious opposition to wood on grounds of cost and reliability of supply.

Table 14: Registration of Diesel Vessels 1961-75

Size	1961-65 Number	1966-70 Number	1971-75 Number	Total 1961-75
30'		1	-	1
40'	1	3	-	4
50'	8	6	2	16
60'	8	11	1	20
70'+	1	27	19	47
80'+	8	17	5	30
90'+	4	2	5	11
100'+	1	15	10	26
110'+	10	10	9	29
TOTAL	41	100	50	191

Source: Fisheries Department Register

The table above shows a total purchase pattern for steel vessels which in some respects reflects what has used. Of 213 steel vessels registered since 1961, 100 registrations were in the plentiful fish catch years of 1966-70.

The size pattern, however, is quite different. Out of 30 vessels registered since 1971, only 5 were under 70 feet long. Similarly, out of 100 registered between 1966 and 1970, only 21 were under 70'. These figures tend to bear out the FAO research conclusions, and also our findings in Europe, that steel and wood are, for the most part, not in direct competition.

The choice of wood or steel material for a fishing vessel depends on the following factors:

- availability of material. Wood is still plentiful in Ghana, whereas steel has to be imported at a high foreign exchange cost

- the type of fishing for which the vessel is needed. For inshore fishing on the continental shelf of West Africa, wood is considered sufficiently robust. For lengthy deep-sea trips, a larger vessel would be necessary, for which only steel would be sufficiently strong

- repair and maintenance costs. Wooden vessels probably require more attention than steel, since they are more prone to damage and need to be scraped periodically. Steel vessels are, however, more difficult and expensive to repair, often requiring welding or riveting to be done

- prices. As already shown, it is usually uneconomical to build wooden boats much above 70 feet in length.

- personal preference. This is particularly important in fishing vessels under 70 feet in length, which are often owned by their skipper.

We conclude from an assessment of the above factors that in the short term wood is unlikely to receive strong competition from steel, at least in the 30' - 70' vessel size range. If GNRC were to move to building larger wooden vessels in the 70' - 100' range (which research has shown to be hardly economical) it might well encounter competition.

A further material for small vessels is aluminium. Ghana Aluminium Products (GAP) has recently diversified into production of aluminium pleasure boats (size 14'0" to 17'0") and 30' cances for fishing and passenger transport. To date it has built about 10 of the latter, at a selling price of some ¢5,000. It has enquiries from Tema Harbour, Ports and Railways for boats in the 30' - 40' range. Future expansion is constrained by capacity, currently only 1 boat per month.

Because of this limited capacity, and because of the greater suitability of this material for inland waters, we do not see GAP as providing serious competition to GIHMC in the short term.

3.3.2 Competitors Using Wooden Construction

One private yard, Tartel at Elmina, builds vessels in the size range 30' - 45'. Since production began in 1971, it has built 30 vessels, an average of 6 - 7 per year. All 30 vessels so far built are dual purpose trawlers. One of his customers are individual operators based at Elmina.

Tartel's future prospects are an order book of ten 35' - 40' fishing vessels, 2 yachts and 4 passenger boats for the Volta Lake. He is keen to expand, evidence of which is his application for ¢1 million of import licences to purchase engines.

Tartel claims his present price structure for a 35' vessel is:

	¢
Hull	15,000
Engine	18,000
Accessories	3,000
	36,000

If his claim is correct, he is undercutting GIHMC prices by several thousand cedis. This factor may have its effect more on demand for GIHMC vessels at Takoradi rather than at Tema. Tartel's repair turnover is currently very low at ¢1,000, mostly for hull work and plumbing. Since his vessels are all under 3 years old little repair work is yet needed.

Our conclusions from visits to Tartel is that although he has a healthy order book he is under pressure from financial problems which he mentioned but was unprepared to specify in detail. As a result his expansion plans may be limited in the short term. Furthermore, his boatbuilding experience, and also local demand, is geared very much to the small end of the size range (under 40'). He has never built a 70' vessel, nor has he one on order. Evidence from GIHMC's order book and from discussions with Government, ADB and FAO, suggest a strong trend away from the smaller sizes to 60', 65' and 70' vessels in order to take advantage of economies of scale and capacity for more powerful engines and sophisticated fishing equipment.

It would be rash to underestimate Yartel. On the other hand, we believe that his potential market in the short term may be a fairly small replacement one, of 30' - 40' vessels in the Tahoradi-Elmina area. He may also take a small share of the developing Volta Lake market. GIHOC seems to be adapting quicker to future fishing vessel trends than Yartel.

We have heard of two other small manufacturers at Tema, one named C.W. White and the other Bonney. Bonney's 'yard' is located beyond the Tema Dry Dock site and comprises two timber cradles. At the time of our visit, each cradle held a 30' vessel in process of construction. This suggests that his operation is very small and concentrates on the lower end of the 30' - 70' range. He is reputed to be planning a manufacturing operation at Winneba, in a joint venture with a European firm. This longer term development needs to be watched.

3.4 [illegible]

Production and procurement difficulties (see paragraph 3.1) have, on the evidence of our discussions with respondents, had a damaging effect on GIHOC's reputation as a reliable boatbuilder giving value for money. Adverse comments from operators give strong evidence that GIHOC's recent reputation must have had a restraining influence on demand for its products. Criticism relates more to excessive delays in vessel completion rather than to defective workmanship, although there was some criticism of the quality of hull caulking.

We have already cited the view of the ADB who, aware of Tema's poor output record, have limited their 1978 loan disposal to only 8 vessels. One of the co-operatives is so frustrated with GIHOC's inability to complete vessels in a reasonable time that it is thinking of buying a steel vessel from abroad. The very existence of Yartel, who has been producing 6 smaller vessels per year since 1971, has resulted from GIHOC's lack of success in satisfying demand.

This is not to say of course that irreparable damage to GIHOC's reputation has been done. The schedule of prospective orders in itself is strong evidence of a continuing demand for GIHOC vessels, but repeated delivery delays have caused a lack of confidence in the fishing industry, and must have weakened demand to some degree.

6. IMPLICATIONS AND PROSPECTS FOR GIBEC

We believe that the survey of the Ghanaian market for small vessels indicates a general promising situation for GIBEC. There is adequate evidence that their products are suited to market needs and that there is a continuing demand for them, but urgent action is needed to resolve the procurement and production problems, so that the potential demand can be exploited. Our main conclusions are given in the following paragraphs.

6.1 Fish Demand and Supply

The survey has shown that consumer demand for fish is substantially greater than available supplies. The Government has set a programme to close the demand/supply gap of 100,000 tonnes from indigenous sources. This extra tonnage should provide scope for the inshore fleet substantially to increase its catch both absolutely and as a proportion of overall supplies, provided two criteria are met. First, there must be sufficient stocks of fish to sustain an increase in catches by the inshore fleet from 30,000 to say, 80,000 tonnes. If fish stocks seriously diminish or if the accessible grounds are fished by too many vessels there will be poor catches, and this will seriously affect the demand for GIBEC vessels. Second, provided the fish are there, they still have to be caught - and this means using the right fishing techniques and equipment.

The Ghana inshore fleet is now at a key point in its development. The traditional fishing technique has been purse-seining, but this has had two serious defects - it is seasonal, and sardinella stocks are very variable. For the last three years these have declined severely which has badly affected the profits of operators. The industry, however, is beginning to react to this change and sees a move to dual purpose trawling as a priority in restoring prosperity.

The virtual disappearance of sardinella sardina, the inshore industry's staple catch and its effect on existing operators' willingness to invest in fishing, indicates how closely the operating prosperity of the operator and the demand for GIBEC vessels are connected. It is therefore vital for GIBEC continually to observe the shifts in fish supplies and the way in which the industry reacts so that it can anticipate changes in demand for vessels.

6.2 The Fishing Fleet

There is a gathering trend towards larger multi-purpose vessels in the 45' - 70' range, with their advantages of economies of scale and superior accessories, storage and equipment. Would-be buyers are mainly newcomers who want 70' vessels and who have not been deterred by the plight of the existing operators. The strength of immediate demand is reflected in outstanding quotations which are likely to result in orders for 1 x 70' and 1 x 49' vessels for delivery over the next 12/18 months. Since these vessels can exploit a wider area of fishing grounds from the limited number of fishing harbours than the smaller vessels hitherto used, we expect internal demand to continue at this level for several years. Development by other West African countries of their inshore fisheries could also lead to export sales, but it is not possible to estimate the size of these without further detailed investigation. At the smaller end of the marine range, we expect a continuing limited demand, and this is substantiated by Tertel's experience. It would be encouraged by any action of Government to provide extra shelter and moorings along the coast. Although the size and age of the existing fleet would suggest a steady replacement market on which this unlikely. Indications are that the fleet is too large for available fish stocks and is mostly not fitted for multipurpose fishing. In the circumstances the demand is likely to be for dual purpose trawlers and is more likely to come from new entrants to motorised fishing than from existing operators, who have available the cheaper option of converting their vessels.

In both cases a crucial factor is the availability of finance and it is clear that the ADB's loan provision would be longer if it had more confidence in SIMEC's productive ability.

Finally there could be a longer term specialist market in re-equipping the secondary transport fleet on Lake Volta, or providing craft capable of fishing safely in the deeper waters of the lake.

6.3 Repairs, Maintenance and Conversions

Due to poor fish catches and the lack of speedy maintenance service, operators have been reluctant to withdraw their vessels from service for maintenance. As a result, malfunctions have been allowed to go untreated

until they have become major breakdowns. We have identified four areas of sales potential which could realise ultimately an annual revenue of at least £½ million for GHBC if boat owners can be educated to the need for preventive maintenance.

Achievement of this depends on a drastic speeding up of GHBC's repair service, both through quicker procurement of spares and more slipway space. Once operators are convinced that a first class maintenance service is at hand, they will be more likely to use it.

6.4 Summary of Estimated Demand

Any precise estimate of demand must be speculative because of the number of unknowns, but we believe that for planning purposes over the next few years the annual demand could be assumed as follows:

	Number	Value
40' - 50' dual purpose boats	8	
30' - 40' " " "	6	
Special orders e.g. Research vessels, Yachts	2	
Conversions of single purpose boats	20	
Other lesser craft		Say, £100,000
Repairs		Say, £400,000

6.5 Conclusions

Fulfilment of the potential demand outlined above depends on GHBC solving a number of severe problems of procurement and production, so that potential customers can have confidence in the prices and delivery times quoted

The solution is likely to necessitate further investment in physical assets, for example in an extra slipway and possibly some extra machinery. In addition extra finance will be necessary for working capital, and simultaneously managerial assistance in running the yard would be desirable.

[illegible]

Manufacturers:

Vartel Limited

Ghana Aluminium Products

Tema Dry Dock Corporation (Repairs)

Operators:

Ghana Boatowners Association

Ghana Co-operative Fisheries Association

Eight owner-operators, (Bell, Baugh, [illegible], [illegible], [illegible], Pagar, [illegible], [illegible])

Star-Kist International

Mankoadze Fisheries Limited

Ocean Fisheries Limited

State Fishing Corporation

Alpha Fisheries Limited

Amayi Fisheries Limited

Banks:

Agricultural Development Bank

Ghana Commercial Bank

Barclays Bank of Ghana Limited

Standard Bank Ghana Limited

National Savings and Credit Bank

Volta Lake:

Volta River Authority

Government and International Agencies:

Ministry of Agriculture, Fisheries Department

Food and Agriculture Organization

Fisheries Research Unit, Tema

Lloyds Register of Shipping, Tema

DEFINITION OF TECHNICAL TERMS

Inshore:

Up to the edge of the continental shelf, or up to 30 miles from the coast.

Open Sea:

Beyond 30 miles

Fishing Techniques:

Purse-Seining

Drawing a (purse-seine) net through the upper waters of the ocean.

Trawling

Drawing a (trawl) net along the ocean bed.

Dredging

Drawing a net (similar to a purse-seine) through the upper waters.

Fish Harvesting Vessel:

A vessel equipped for purse-seining and trawling.

Fish Categories:

Demersal Fish

These fish feed on or near the bottom of the ocean and are caught by means of trawl nets; typical examples are: flatfishes, halibut, rugger fish.

Pelagic Fish

These fish move in shoals in the upper waters and are caught by means of purse-seine or similar nets. The purse-seine net is of lighter less robust material than the trawl net. The round and flat sardine (the 'sardinella sprats') are examples of pelagic fish.

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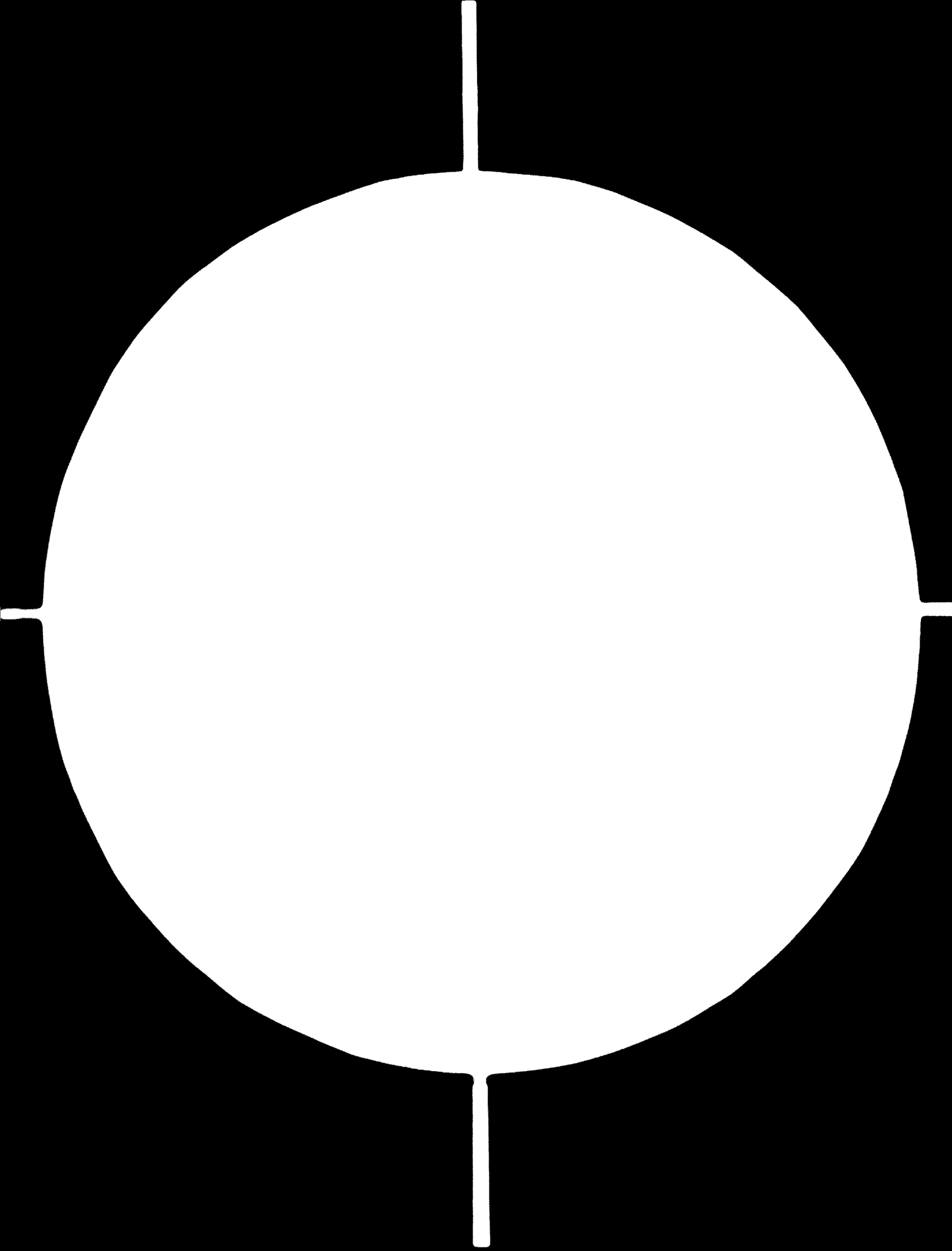

PRINCIPAL FISH CATCHES BY WEST AFRICAN COUNTRIES

	1966	1967	1968	1969	1970	1971	1972	1973
Cape Verde Islands	4.0	5.9	4.9	4.0	5.1	4.5	4.8	4.4
Dahomey	18.8	35.6	29.0	29.7	31.5	32.9	32.9	32.9
Gambia	3.7	4.1	5.1	5.1	5.8	6.0	6.0	6.0
Ghana	68.2	95.0	70.1	127.1	171.5	216.4	281.2	195.5
Guinea	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Guinea Bissau	0.7	0.7	1.3	1.4	1.5	1.4	1.7	1.7
Ivory Coast	61.6	66.9	69.8	71.0	57.9	62.6	72.4	51.0
Liberia	15.8	17.5	19.6	22.5	23.0	23.0	23.0	23.0
Mali	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
Mauritania	27.0	30.7	30.0	30.0	21.0	25.0	25.0	25.0
Niger	5.0	3.7	4.3	5.0	8.0	12.5	12.5	12.5
Nigeria	110.0	119.3	120.0	115.1	542.9	592.7	645.6	664.8
St. Helena	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Senegal	141.5	155.0	174.7	182.1	189.2	239.8	268.1	323.8
Sierra Leone	32.2	33.6	23.5	25.5	30.6	30.6	51.0	51.3
Togo	7.0	6.5	10.0	10.5	8.9	10.6	10.6	10.9
Upper Volta	4.0	4.5	4.5	5.0	5.0	5.0	4.0	3.5
	596.0	675.0	663.0	730.0	1,198.0	1,359.0	1,535.0	1,502.0

ANNEX B-IV

MARINE FISH LANDINGS 1967 - 1974

	SOURCE	ANNUAL CATCH ('000 TONNES)						Share of
		1967	1970	1971	1972	1973	1974	% Share 1974 Supply
INSHORE	a. Canoes	39,870	89,960	113,260	153,690	73,010	108,880	59%
	b. Inshore Motor Vessels							
	(i) Trawling	3,610	7,500	7,020	10,800	11,460	12,680	
	(ii) Purse-seining & similar methods	20,800	12,700	12,020	19,270	5,190	3,120	
	Sub Total	24,410	20,200	19,040	30,070	16,650	15,700	
	c. Total Inshore Catch (a & b)	64,280	110,160	132,300	183,760	89,660	124,580	67%
OTHER	d. Distant Water Vessels	27,550	47,440	43,900	65,300	65,400	55,400	30%
	e. Fish Imports (Frozen)	12,050	16,600	20,500	500	1,000	4,900	3%
	f. Tuna Sold Locally	1,300	470	360	330	430	880	-
	Total Marine Fish Supply (c + d + e + f)	105,180	174,670	197,060	249,890	156,490	185,760	100%

DEPARTMENT OF FISHERIES - ACTION PROGRAMME

1. Introduction

Fish is a very important source of protein in the Ghanaian diet. The Ministry will therefore undertake a promotion programme which will ensure regular and adequate flow of fish to the markets.

Since 1972, the annual tonnage of fish has ranged from 180,000 to 200,000 metric tons. The estimated yearly consumer demand now stands at 300,000 metric tons. There is therefore a shortfall of over 100,000 metric tons. The action programme will be aimed at eliminating this shortfall in production.

2. Programme Structure

The programme structure for the action programme takes into account the extent of our present dependence on marine fishing which has been quite well developed. Our problems in this sector have been those of infrastructural services and support. Inland fishing on the other hand has not received much attention and therefore needs to be given sufficient attention in order to raise substantially our present production in this sector. The Ministry is aware that the main constraint is the inadequacy of fish ponds.

Aims and Objectives

a) To achieve self-sufficiency in fish supply from marine as well as from inland water resources.

b) To provide firm technical services to support the fishing industry.

c) To determine specifications for fishing boats in general.

d) To formulate a standardisation programme for all categories on marine engines as well as for other engines, machinery and equipment of general application in the fishing industry.

e) To evolve and enforce fishing nets policy to ensure that only mature fish are landed.

f) To zone fishing areas for administrative purposes.

g) To establish fisheries administrative units for each zone.

h) To provide an intensive research programme in support of the fishing industry.

i) To evolve an effective communication network for the fishing fleet.

j) To provide search and rescue services for the industry in collaboration with other agencies such as the Armed Forces.

k) To ensure equitable distribution of fish throughout the country.

l) To promote the development of fish culture in collaboration with the Department of Irrigation.

m) To provide harbours and landing stages for the fishing fleet.

3. Fisheries Administrative Units

For the effective implementation of the action programme the country will be divided into a number of fisheries administrative units with the requisite technical and other supporting staff to enhance fisheries activities in that unit. The following units will be set up in the various regions:

i) Marine Fisheries Administrative Units

(a) Western Region - Half Assini, Axim, Bonwere, Miemia, Princess Town, Dixcove, Sekondi/ Takoradi and Shama

(b) Central Region - Komenda, Elmina, Cape Coast, Moree, Biriwa, Anomabo, Saltpond, Akumpuano, Sarafa/Tantum/Legu, Mumford, Apam, Winneba, Senya-Breku Faste

(c) Greater Accra Region - Nyenyenu/Kokrobite/Botiano, Oshie, Chorkor, James Town, Osu, Labadi, Teshie, Tema, Kpone, Prampram, Ningo and Ada

(d) Volta Region - Anloga, Anyanui Dzelokope, Adina/Kedzi Denu/Aflao.

ii) Inland Administrative Units

Sogakope, Akosombo, Kpandu-Torkor, Abotoase, Kete-Krachi Amankwakrom, Adawso, Yeji, Tamale, Navrongo, Bawku, Lawra, Wa and Aveyime.

iii) Special Irrigation Project

Fish culture programmes will be developed in conjunction with the following irrigation projects:

Vea, Tono, Zongo-Macheri, Atebubu, Ejura, Tano, Accra Plains irrigation projects, Ho/Keta irrigation project.

4 Fish Production Agencies

The programme will be carried out through the following agencies:

(a) The Department of Fisheries
(b) The State Fishing Corporation
(c) Fishing Co-operatives and Associations
(d) Private Fishing Companies

The Department of Fisheries will develop and manage all public inland fish farming projects. The Department will also provide technical support for the programme.

State Fishing Corporation

The Ministry will monitor the operations of the State Fishing Corporation from time to time to ensure that targets are met.

Fishing Co-operatives and Associations

The Ministry will assist the small scale fishermen and encourage the formation of fishing co-operatives in each fisheries administrative unit. It will also assist the fishing co-operatives to expand their activities.

Private Fishing Companies

The Ministry will encourage Ghanaians with adequate financial support to go into commercial fishing.

5. Financial Support

(a) Every individual co-operative or Association will operate as a commercial concern under a project programme.

(b) The Agricultural Development Bank and other financial institutions will be invited to participate in the project to be launched later.

6. Target Achievements

The level of targets depends on port facilities and the fishing fleet. There will be an increase in the number of the fishing fleet. Recommendations will be made to the Government to establish landing stages, cold storage facilities as well as facilities for processing at the following locations:

i) Coastal - Half-Assini, Miemia, Kromantse/Saltpond Winneba, Mumford, Old Accra Port, Prampram, Ada, Anloga, Adina

ii) Inland - Kete-Krachi, Kpandu-Torkor, Yeji and Yapei.

The national target under the plan programme is 400,000 metric tons out of which 50,000 metric tons is to be produced from inland sources. The increase in production can be achieved under the following conditions:

i) Increase in the number of the fishing fleet
ii) Acquisition of additional carrier vessels
iii) Establishing landing stages and harbours
iv) Stepping up the development of fish culture
v) Negotiating reciprocal fishing rights with friendly countries
vi) Setting up a tuna fishing company to undertake tuna fishing
vii) Intensifying activities in shrimp fishing in both marine and inland waters. The shrimp fishery of the Keta Lagoon will be developed in conjunction with the Avu/Keta project.

7. Technical Support

a) Base Workshops: To be established at each of the following stations:

i) Sekondi/Takoradi
ii) Elmina
iii) Accra
iv) Tema
v) Ada
vi) Anloga

b) Maintenance Workshops: To be located in all administrative units.

c) Mobile Repair Services: To be operated in demarcated operational areas. These services will be established in conjunction with manufacturers and suppliers of standardised equipment.

8. Fisheries Research

Research activities will be intensified and given prominence during the plan period. All-purpose research vessels will be procured to support the programme in both marine and inland fisheries development.

9. Standardisation Policy

a) Engines for both inshore vessels will be standardised

b) The standardisation programme will also ensure that adequate spare parts and maintenance cover services are made available

c) The use of all purpose fishing vessels for operation all the year round will be encouraged.

EXPORT PROSPECTS IN WEST AFRICA

Lack of information about boatbuilding and fishing industries in West African countries other than Ghana has made an assessment of export potential for GIHOC vessels difficult. The evidence suggests that export opportunities exist in the following countries:

- Sierra Leone
- Gambia
- Nigeria
- Cameroons

1. Sierra Leone

The country produces about 30.6 thousand tonnes of fish and has an annual per capita fish consumption of 14.7 kilograms. Most fish are caught by dugout canoes and surveys indicate substantial sardinella stock in inshore waters. Experts are of the opinion that medium sized purse-seiners are most suited to exploiting the species which suggests an export potential for GIHOC vessels.

2. Gambia

The country has a high annual per capita fish consumption of 23.7 kilograms. The fishing industry produced 16 thousand tonnes of fish in 1971. It relies heavily on a fleet of some 600 narrow beamed canoes. The government is involved in developing the industry by providing training facilities and better equipment. It is intended that stronger, more stable vessels should be acquired to replace existing canoes. This also could offer an opportunity for GIHOC to supply boats.

3. Nigeria

Nigeria's per capita fish consumption is relatively low at 3.6 kilograms. Despite this fish production reached 155 thousand tonnes in 1970. Estimates of demand for fish (based on FAO research) are 360 thousand tonnes in 1975 and 520,000 tonnes in 1980.

About 60% of domestic production is from canoe fishing. There are also about 50 Nigerian trawlers operating in inshore waters but it is not known where they were acquired. The country will probably have to supplement this fleet of 50 vessels if it is to satisfy the demand increase of nearly 400,000 tonnes estimated for the period 1970 to 1980.

4. Cameroons

The country has an annual per capita fish consumption of 13.1 kilograms and produces about 70 thousand tonnes of fish annually. Its fleet comprises 25 trawlers, 12 shrimp vessels and 600 dug out canoes. The national economic plan envisages an expansion in the industry through investments from the public and private sectors of the economy.

In sum it would appear that future development trends in the fishing industry in all four countries anticipate an expansion in domestic production and therefore increase or modernisation of the inshore fishing fleet. So far Ghana is the only country in West Africa with a boatbuilding industry. This presents an opportunity for GIHOC. As a next step, more detailed market studies and pre-sales contacts must be conducted in the individual countries.

ASSESSMENT OF ECONOMIC SIZE, [illegible]

Assumptions:

- Fishing methods are purse-seine and ring-ali
- All vessels are under 60 foot
- 1972 is a good fishing year: high catches, low fish prices, low operating margins.
- 1974 is a poor fishing year: low catches, high fish prices, high operating margins.
- Number of vessel fishing trips per year: 150 (based on estimate by Fisheries Dept.)
- Fleet size based on operating vessels only.

A. 1972 - a good fishing year.

A.1 REVENUE		
Total Inshore Catch from motor vessels (based on Fisheries Dept Annual Report)		4,200
Less: trawl catch		2,050
Purse-seine and ring-ali catch		2,150
A.2 COSTS		
Average cost per trip (deduct 10% from 1973 Fisheries Dept. costs/earnings survey)	$ 55	
No. of trips per vessel per year	150	
Total annual running costs per vessel (inc. depreciation	$ 8,250	
A.3 FLEET SIZE		
No of Operating vessels under 60'	263	
A.4 OPERATING MARGIN		
Low Prices and good catches		
.. assume 10% margin		
10% of $2,150,000 =	$ 215,000	
A.5 BREAK-EVEN REVENUE	$2,150,000	
	215,000	
Total costs =	$1,935,000	
A.6 ECONOMIC FLEET SIZE		
No. of vessels needed to break-even:		
Break-even revenue		1,935
Costs per vessel		8.25
∴ Vessels at b/e	234	
A.7 CONCLUSION		
Actual size of fleet (operational)	263	
Economic size of fleet	234	
∴ Economic fleet size is 89% of the actual		

B. 1974 - a poor fishing year

B.1 REVENUE		¢'000
Total inshore catch from motor vessels		4,820
Less: trawl catch		3,370
Purse-seine & ring-seli catch		1,450
B.2 COSTS		
Average cost per trip (add 50% to 1973 survey)	¢90	
No of trips per vessel per year		
Total annual running costs per vessel (inc. depreciation)	$ 13,500	
B.3 FLEET SIZE		
Operating vessels under 60'	244	
B.4 OPERATING MARGIN		
Poor catches & high prices		
∴ assume 20% margin		
20% of ¢1,450,000 =	¢ 290,000	
B.5 BREAKEVEN REVENUE:	¢1,450,000	
	290,000	
Total Costs	¢1,160,000	
B.6 ECONOMIC FLEET SIZE		
No. of vessels needed to breakeven:		
Breakeven revenue:		¢1,160,000
Costs per vessel		13.5
∴ Vessels at breakeven:	86	
B.7 CONCLUSION		
Actual size of fleet (operational)	244	
Economic size of fleet:	86	
∴ Economic fleet size is 35% of the actual		

It is clear from the calculations above that in a 'good' year nearly all the existing operational fleet should be able to cover all their costs and make a profit. Conversely in a 'bad' year total catches would only be enough to warrant a much smaller fleet. It follows that most owners in such a year cannot hope to operate except on a marginal cost basis.

VOLTA LAKE DEVELOPMENTS

1. Introduction

The Volta Lake is the largest man-made lake in the world, and as such should generate an appreciable demand for boats. We discuss the opportunities for GIHOC under the following headings:

- Fishing
- Lake Transportation
- Future Trends and Implications.

Volta Lake has an area of 3,275 square miles stretching from the north of Ghana to the south. It has a shoreline of 3,000 miles on which numerous fishing villages are located. The immediate catchment area of the lake covers 20,000 square miles with an estimated population of one million people.

2. Fishing

2.1 Lake Fish Catches

Fishing is the main occupation of the people who live along the lake. The total number of employed fisherman is estimated at 26,000.

Table 1 below compares fish catches from the lake with total domestic catch:

Table 1: Volta Lake and Domestic Fish Catches ('000 Tonnes)

Year	Domestic Catch	Volta Catch	Volta Share %
1971	215	39	18.1
1972	281	32	11.4
1973	195	40	20.5
1974	221	39	17.6

Source: Department of Fisheries, Volta River Authority

Fish catches from the lake have increased from 15,000 tonnes in 1967 when the lake was formed to 61,000 tonnes in 1970. Since then catches from the lake seem to be stabilised at about 40,000 tonnes. In 1972 Lake Volta's share of total domestic fish production was 11.4%, but this rose to 20.5% in 1973 largely because of the decline in marine catches. Lake Volta is thus an important source of domestic fish supplies particularly when the catches of sardinella are in decline.

2.2 Canoe Population and Fishing Technique

Nearly all fishing boats using the lake are dug-out canoes. The canoe population was estimated at 13,000 in 1970, and is thought to be about the same now. Most of the canoes are non-motorised, and are considered unsuitable for fishing in the deeper waters of the lake where waves could rise to five feet. More recently there has been a move to fit some boats with outboard motors but the number is still insignificant.

Because the lake is scattered with tree stumps, neither purse-seining nor trawling techniques can be effectively employed. Consequently there is extensive use of one type of fishing gear - the stationary gill net made of multifilament nylon. An FAO fishery biologist estimated that over 75% of fishing is done using this technique.

3. Lake Transportation

Two types of transportation systems are currently operated on the lake, there are:

- Primary Lake Transportation (PLT) which operates a long distance route between Akosombo and Yapei in the North

- Secondary Lake Transportation (SLT) which covers short distances between ports along and across the lake.

3.1 Primary Lake Transportation

Primary lake transportation which links southern and northern Ghana is regarded as an economically attractive alternative to the road traffic system between Accra, Kumasi and Tamale.

PLT has made great progress since its inception in 1970. Between 1970 and 1975 passenger transport increased fourfold from 6,500 persons to 28,000.

The growth of cargo traffic has also been marked, increasing eightfold from 3,000 tonnes in 1970 to 24,000 tonnes in 1975. PLT currently operates with one steel passenger boat of 250 tons and two barges.

3.2 Secondary Lake Transportation

in 1969, 123 launches operated between the seventeen secondary ports of the lake and a similar number still operate. The distribution of the launches among the ports in 1969 is shown on Table 2 below.

Table 2: Secondary Lake Transport Launches and Their Bases

Base	Launches (Number)
Yeji	45
Abotoase	26
Kpandu	19
Adanosu	5
Wusuta	5
Others	23
TOTAL	123

The launches are used to convey passengers, fish and agricultural products from outlying villages to large market towns and beachhead trade centres along the lake. They return to the villages with passengers and general merchandise from the market towns.

Estimates of secondary passenger and cargo volumes transported on the lake in 1970 were:

- Passengers 100,000
- Cargo 140,000 tonnes

Since 1970 a modest annual growth rate of about 1% in tonnage has been achieved.

4. Future Trends and Implications

4.1 Fishing

Fish stock surveys on the lake suggest a potential annual supply of 60 - 80,000 tonnes. This should permit an increase in Lake Volta's market share to 20% of an estimated total domestic demand of 300,000 tonnes. There are four ways of achieving this aim, namely:

- improvement of infrastructure and facilities for fish marketing
- use of improved fishing techniques
- more extensive exploitation of the deeper waters of the lake
- use of improved boats.

4.1.1 Infrastructure

Fish is a highly perishable food and hence requires speedy distribution to avoid wastage. To this end, a fish complex with a planned boatyard unit has been recently commissioned at Kpandu-Tokor. It is intended to build one more such complex at Yeji in the very near future. In addition landing facilities are to be provided in selected towns along the lake shore. These facilities should not only streamline the fish marketing process, but by the creation of more effective distribution outlets should encourage fishermen to step up their fishing performance.

4.1.2 Improved Fishing Techniques

Experiment has indicated that the use of monofilament nets would result in increased fish catches, compared with the multifilament nets now currently used.

4.1.3 More Extensive Exploitation of Deeper Waters

Currently most fish is caught in shallow water areas having depths of 5 - 10 feet, while deeper waters are still unexploited. It is anticipated that as fishing techniques improve, fishermen will become increasingly motivated to explore deeper water areas with depths ranging from 15 - 40 feet. It is believed that the additional catches from these areas will contribute a significant proportion to the total lake catch.

4.1.4 Improved Boats

It is clear that the commonly used dug-out canoes are unsuitable particularly in rainy weather, for fishing in the areas of open water along the lake. As a result fish resources of these waters are only marginally exploited. A prototype hull suitable for fishing in open waters has already been developed by the Volta River Authority with Boatyards Division. A few of these hulls have been sold to the fishermen at a nominal price to test their acceptability.

These developments point to a likely increase in the rate of fish production from the lake. The demand for more durable boats is likely to increase in the longer term, and if Boatyards Division can develop their prototype boat to suit the needs of lake fishing and produce and market it profitably, then sales prospects should be encouraging.

4.2 Primary Lake Transportation

In paragraph 3.1 above we noted PLT operates one steel passenger/cargo vessel. The VRA has indicated its intention to buy one further steel vessel. Thus estimates of appreciable increases in PLT traffic (to 125,000 tonnes of cargo and 60,000 passengers in 1980) are unlikely to result in work for GIHOC.

4.3 Secondary Lake Transportation

In 1969, 123 launches were operating between the secondary lake ports. By the end of 1975 this number had risen only to 130, indicating a very slow rise in economic activity along the lake shore during this period.

However key respondents claim a continuous expansion in this activity both in the development of fisheries and in agricultural production. Table 3 below gives a forecast made in 1969 of the volume of traffic for secondary lake transport in 1980.

Table 3: Estimates of Secondary Cargo and Passenger Traffic

Commodity	Year 1980 '000 Tonnes
Fish	37
Yams	70
Other Agricultural Produce	65
Cocoa	35
General Merchandise	18
Total	225
Passengers	155,000

This forecast seems to have been unduly optimistic in the light of progress so far made. The increase in numbers of boats in service is less than 1% a year compared with forecast traffic increases of about 6%.

Both the Eastern and Volta Regional Development Corporations have initiated design studies with GIHOC for barges to be used on the lake, but even if successful they are unlikely to indicate an increase in the total traffic; rather they will be substitutes for an increased number of launches.

In the longer term the factors mentioned in paragraph 4, and the barge development mentioned above should generate additional traffic, but we do not believe that this is likely to result in the need for major increases in the secondary transport fleet.

Although we do not see a need for large increases in the secondary fleet, there is the question of replacement of the existing boats. The Volta River Authority are dissatisfied with the suitability of existing designs to stand up to rough water conditions on the lake. Moreover, the use of outboard engines with a high fire risk is not regarded as wholly satisfactory. Thus if GIHOC could develop a more stable and inherently safer vessel for this secondary traffic, and could sell it at an economic price, then there would be good prospects for eventual replacement of the whole of the existing fleet as a matter of VRA policy.

VOLUME 3
ANNEXE II

EXPORT MARKETING CAMPAIGN

PROGRESS REPORT

GIHOC

EXPORT MARKETING CAMPAIGN

PROGRESS REPORT

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(continued)

APPENDICES

PROGRESS REPORT

EXPORT MARKETING CAMPAIGN

1. INTRODUCTION AND OBJECTIVES

The export promotion campaign is an important part of the UNDP/GIHOC marketing programme. The Ghana Government is urging companies to export to earn much needed foreign exchange for the country. Indeed, GIHOC Cannery Division has been told to export all its canned pineapples when hitherto it has exported little or none. The first phase of the campaign has comprised a survey of the West European market for canned products. Most attention has been given to canned pineapples. Such a survey is essential if GIHOC is to find out more about an unfamiliar and highly competitive market and is to plan the way ahead carefully before risking its resources and reputation.

This report outlines progress to date, both in the West European market study and in associated export work in Accra. The former has been conducted from the United Kingdom by the P-E Group and is the subject of a separate report. Work in Accra has been done mainly by Y.C. Gaikpa, GIHOC Export Promotion Officer, helped by K.M. Ananga and R. Meyer. The work has involved: establishing contacts through the Foreign Affairs Ministry with Ghana trade missions in Eastern Bloc countries to find out about potential demand there; interviews with embassies and corporations; also some technological and packaging studies. The report is arranged as follows:

We would like to thank Mr. F.J. Tekyi, General Manager of Cannery Division, and Mr. L.A. Odotei, Factory Manager, very much for their guidance and co-operation.

2. CONCLUSIONS AND RECOMMENDATIONS

2.1 The European market survey for canned products shows scope for new producers, including GIHOC, to enter the market, but the European importer's requirements of his supplier are demanding: he expects continuity of supply (usually in large quantities); competitive prices; consistent quality and eye-catching labelling (particularly for the consumer section).

In order to have any hope of penetrating the market on a significant scale, it is vital first to resolve serious rpoblems of supply, prices, quality consistency and labelling.

Our recommendations for action are as follows:

i) An investigation of the Nsawam plant's existing and potential supply sources in order to determine:

- purchase price arrangements, relating to GIHOC and competitive purchasers
- the efficiency of GIHOC's purchasing organisation
- the need for GIHOC to become self-sufficient in fresh pineapple production.

ii) Detailed costing studies to identify the cost structure of the canned pineapple product as far as the buyer and to pin-point where costs are excessive. This should include a study to determine the minimum economical level of output from the factory in order to supply export markets at competitive prices.

iii) Investigation of quality control procedures to identify where standards are inadequate.

iv) Work to improve the standards of GIHOC's packaging and labelling.

The above is a summary of the action needed as a first stage for GIHOC to realise the potential demand for one of its canned products in the European market.

2.2 A limited number of other GIHOC products suggest scope for export to the West African markets, particularly footwear and fishing vessels. We plan to conduct an export market survey in Nigeria and Upper Volta, starting in April 1976, the objective of which will be to identify those products and markets which offer the best chance for export.

The survey will be led by Mr. Gaikpa, Export Promotion Officer, with help from divisional marketing staff as required. Planning of the survey will take place in February and March 1976.

3. SURVEY OF WEST EUROPEAN MARKET FOR CANNED PRODUCTS

3.1 Survey Objectives

P-E Consulting Group was asked to help GIHOC Cannery Division in a survey of the market for canned pineapples in the UK, West Germany, the Netherlands and Belgium. The study was required to examine in detail the UK market for canned pineapples and, to a lesser extent, the markets in West Germany, the Netherlands and Belgium, in terms of product type and quality, can size and labelling, shipping and payment terms, broad market structure and distribution. Those market sectors offering the best opportunities for new supplies would be identified and related to GIHOC's potential as a supplier.

3.2 Study Results

The study's main recommendations are:-

1. GIHOC Cannery Division should plan to enter the West German and UK markets for canned pineapple.

2. Initially, market strategy should be to sell standard quality pineapple pieces in A10 sizes to the catering section through one or two selected importers.

3. As experience is gained in these competitive markets, and as quality and quantity become more predictable, it should be possible to supply an increasing proportion of higher quality cuts and packs to selected consumer sectors.

4. GIHOC should not enter the West European market for tomato puree.

5. It should not enter the UK market for pineapple juice. Other EEC countries should be studied in closer detail before considering entry.

6. Specialised markets in the UK for other canned products (such as mango juice, garden eggs, pepper puree and snails) may offer scope to GIHOC. Direct contacts with specialist importers should be developed.

3.3 Technical Inspections

In the course of the above study, we sent samples of GIHOC canned pineapples to three potentially interested UK importers for technical inspection. Details of their comments are given in Appendix D-1. The comments vary. Some variations may be due to differences in subjective opinion about flavour and colour. It is as likely, though, that the differences are due to inconsistencies in the quality of pineapple received at the factory or in the canning process or in the time the can has been stored. Importers seem unanimous about irregularity of cut and piece size; this must be due to the type of cutting machinery or its operation.

3.4 Conclusion from European Survey

GIHOC will be unable to penetrate the competitive West European market unless it can offer a regular supply in predictable quantities and to a consistent standard of fruit and pack quality. Problems of inadequate supplies, uncompetitive prices, irregular and inadequate quality and outdated packaging need to be resolved before GIHOC can penetrate the West European Market on more than a very modest scale.

4. WORK IN ACCRA

Concurrent with the W. European market survey the following work has been done in Accra:

- interviews with embassies and corporations
- investigation through Ghana trade missions in Eastern Bloc countries of the market for canned products there
- technological and packaging studies.

4.1 Embassies and Corporations

Two European embassies expressed interest in importing GIHOC canned products, namely Yugoslavia and Poland. GIHOC has previously exported to Yugoslavia on a small scale, and has received enquiries from Poland.

Yugoslavia

Estimated annual consumptions of canned pineapple products is 1,500 tonnes; of this about 500 tonnes are slices and 500 tonnes concentrate. This is a very small market when compared with the UK, Netherlands and West German markets and as such may offer better opportunity in the short term, while GIHOC's ability to produce on a big scale is limited by supply constraints.

The main existing supplier is the Kenya Delmonte company, whose products are well-known and established in European markets. Although GIHOC has a good reputation for quality in Yugoslavia, it would need to make prices and packaging much more competitive in order to capture a significant share of even this market against existing competition.

Appendix D-II shows Yugoslavian market data.

Poland

We were unable to obtain import statistics from the Polish Embassy, but according to commercial staff, the current supply of pineapple products does not meet demand.

The Polish state import organisation for agricultural products is AGROS, who have recently made an enquiry, unfulfilled due to supply shortages, for 2,500 cartons of juice, pieces and pulp.

The Polish Embassy advises GIHOC to re-establish contact with AGROS, stating types, quantities and prices.

4.2 Ghana Airways Flight Catering

The Ghana Airways Flight Catering Division supplies meals to all airlines operating out of Kotoka Airport. Estimated weekly passenger traffic out of Kotoka could be as high as 5,000, generating up to 10,000 full and snack meals, and soft drink refreshments. By selling to foreign airlines the Division is earning foreign exchange. Monthly demand by the Catering Division for fruit juice is over 2 tonnes, and for canned fruits more than 3 tonnes. Annual demand for canned fruit products is about 60 tonnes. Details of monthly demand, by main product, are shown in Appendix III.

Flight Catering Division is keen to do business with GIHOC, since GIHOC canned products have a good reputation with airlines. However, continuing failure by GIHOC to deliver in anything like adequate quantity have forced the Division to import the canned fruit products from the UK, (main supplier is Chef's Larder Services Ltd.), and 're-export' the prepared meals. The General Manager has said that if GIHOC supplies were secure he would prefer GIHOC canned pineapples to imported products.

We conclude that although Ghana Airways Catering Services only represents a modest demand, sales to the Division have the advantage of earning foreign exchange at very low distribution cost. This opportunity is therefore worth pursuing.

4.3 Ghana Trade Mission Contacts

Brief market reports have been received from Ghana trade missions in USSR and China These vary in the detail of information given about the markets for canned products. A summary of information gathered is given below:-

4.3.1 USSR

Imports of tropical fruit to USSR increased from 395 thousand tonnes in 1972 to nearly 450 thousand tonnes in 1974, an annual growth rate of 7% (see Appendix IV). Imports of fresh and canned pineapples form a very small part of this total, with between 6 and 8 thousand tonnes. Of this figure, the share of canned pineapples is unknown, but indications are that the market for canned pineapples is very small, and therefore not worth pursuing in the short term.

There appears, however, to be an annual market of around 7,000 tonnes for canned mango products. Appendix V gives a breakdown of USSR imports of mango products from India alone (6,500 tonnes). It is likely that the total import market for mangoes could be substantially larger than this.

Since mango imports from India to USSR are under reciprocal trade agreement, further investigation should be made as to whether mangoes are subject to similar conditions between USSR and Ghana.

If such an agreement exists, GIHOC should send samples, price quotations and qualities available to the USSR import organisation in Moscow.

4.3.2 China

Market opportunities for GIHOC products in China are not good since China produces and exports many of them herself. Furthermore, the Chinese prefer fresh fruits to canned, partly because of the high prices of the latter.

4.3.3 Hong Kong

The report is very sketchy but suggests that more detailed research would identify a substantial market for canned fruit products.

4.3.4 Czechoslovakia

This country depends heavily on imported fruits and vegetables. In 1973 total fruit and vegetable imports were $9.74 million, and in 1974 they rose to $10.03 million. Main sources of tropical fruit imports are Cuba, the Philippines, China and the Ivory Coast. More detailed figures on canned fruit imports are not available, but there seems to be scope for Ghanaian pineapples, pineapple juice, and orange juice provided supplies are reliable, quality is good, and above all, prices are competitive. In respect of the latter, a retail selling price of Kcs.17.00 per half kilo is deemed acceptable.

4.4 Packaging Studies

Research has shown that labelling is important for cans sold in consumer markets (e.g. supermarkets, grocery stores), whereas it is relatively unimportant in the institutional and mass catering markets. In the latter a plain white label with black print indicating the contents is often quite adequate. However, in a supermarket GIHOC canned products will compete with other cans in catching the purchaser's eye and as such must have striking visual appeal. A comparison of GIHOC labels with those of potential competitors on the European consumer markets, such as Tesco, St. Michael, Delmonte and Wavy Line, suggests that GIHOC labels do not show up well. The main deficiencies are:

- ill-defined and blurred colouring
- dull colours
- outdated lettering
- unimaginative, often unclear, product messags
- poor quality of paper which tears easily.

Quality of itself will not sell a product in the consumer market. If GIHOC is to compete for the customer's attention in the supermarkets of Western Europe, colourful, exciting packaging is as important as competitive prices and good quality. The appearance of GIHOC canned products must be improved before a serious attack on the West European consumer markets is contemplated.

5. IMPLICATIONS FOR GIHOC AND RECOMMENDATIONS FOR ACTION

5.1 Introduction

The survey of the European market for canned products shows a promising potential for GIHOC, but success will depend on improvement of supplies, quality, prices and packaging, none of which now meets the requirements of the market. We elaborate on these points below.

5.2 Supply

Supplies are inadequate in volume to satisfy any major importer. Moreover, they are uncertain since GIHOC has no control over the growers.

These are fundamental disadvantages, since export orders tend to be in large quantities and importers attach great importance to continuity of deliveries. GIHOC Cannery Division has taken the first steps, through cultivating its own pineapples on a 60 acre plot, to increase supplies, but will still have to rely on peasant farmers and co-operatives for some time to come. It needs now to be considered what tonnage of pinsapples GIHOC should be processing annually if its export prices are to be competitive and what steps should be taken to reach this state.

5.3 Price

Research shows strong evidence that price is an important factor in a foreign importer's purchase decision and that GIHOC's prices of most pineapple products are substantially above (sometimes even double) those quoted by competitors. Part of the reason for this may be that GIHOC's purchase prices for fresh pineapples are too high and that 'home-grown' pineapples would be much more economic. However, detailed costing studies should be conducted to determine the cost structure of the finished canned product and to identify where excessive costs are being incurred.

5.4 Quality

The quality of Ghana produced pineapples is generally thought by European consumers to be at least as good as of those produced elsewhere. However, the comments on canned samples by potential European importers suggest that quality control, particularly in relation to piece cutting, acidity, smell, colour, ripeness and size consistency should be tighter. Detailed investigation of current quality control procedures should be conducted and improved methods introduced.

5.5 Output

Most of the problems connected with GIHOC's inadequate output are caused by supply shortages. The capacity of the Nsawam factory is claimed to be 12,000 tonnes a year of pinsapples. However, this figure has clearly been based on an unlimited supply of pineapples all the year round, and on operating 3 shifts for 50 weeks a year. In fact, throughput is about 1¼ - 1½ tonnes per hour of raw pineapples, resulting in about

one tonne per hour of the canned product. The true capacity of the plant is therefore determined by the length of the pineapple harvesting season and the number of hours a week that the plant can be operated at peak periods. Actual output in recent years has seldom exceeded 2000 tonnes p.a. This contrasts with the statements of the Ivory Coast and other large producing countries that for a canning plant to make a continuing acceptable profit an output level of at least 30,000 tonnes is essential. Detailed costing studies should be made to determine whether the GIHOC plant can produce at an economical level and at competitive selling prices even at full capacity. If not, GIHOC needs to consider whether steps should be taken to expand the plant to a more economical level of production, which would involve a very large investment, or whether some more modest role for the existing plant would be preferable.

5.6 Packaging

Plain labelling is adequate for the catering industry, but imaginative, attractive labels are an important selling feature in the consumer sector. Work should begin as a priority to improve GIHOC's labelling.

5.7 Follow-up to European Market Survey

The Government has told GIHOC Cannery Division to export, and the European market survey has shown market potential, particularly in West Germany, but has also suggested that GIHOC's products are uncompetitive. It is undesirable to contact potential customers only to disappoint them, either through supply shortages or by quoting uncompetitive prices. The problems outlined in paragraph 4.4 must be resolved first. It would be better to ensure a really solid base, in quantity of supply, quality and price and packaging of product, rather than to waste resources and create customer resistance with an uncompetitive product and inconsistent delivery.

6. NEXT STEPS IN EXPORT PROMOTION CAMPAIGN

Preliminary assessments have suggested potential markets for other GIHOC products in West Africa. The Footwear and Boatyards market surveys have recommended detailed study of the potential for footwear and fishing vessels. Indeed, Footwear Division has just received a substantial export order for Nigeria. We therefore plan to undertake, as the next stage of the export promotion campaign, an export market survey in West Africa.

The countries selected for the survey are Nigeria and Upper Volta. Nigeria has a population numbering some 70 million and a buoyant oil economy. It has also been the source of enquiry to GIHOC, not only for footwear, but for other GIHOC products. Moreover, the Ghana Government has identified GIHOC footwear and electrical products as possible exports to Nigeria. Upper Volta is a relatively poor country with a small population. However, it is a major West African cattle producer, and live cattle and carcass meat supplies are vital to the prosperity of the GIHOC Bolgatanga factory. There may here be the prospects of a reciprocal trade arrangement, with exports of, say, GIHOC footwear to Upper Volta in exchange for cattle and meat imports to Ghana.

The objectives of the West African survey will be to identify the products and markets giving GIHOC scope for export penetration. Main areas of study will be as follows:

- trade practices, such as import licences and controls, in relation to Ghana products
- tariff structure as it affects GIHOC products
- transportation routes and special factors
- names of importers and GIHOC products which they are most interested in purchasing
- competitive prices
- competitive products and sources
- market preferences, such as quality, price, quantity, supply continuity
- market trends and main product growth segments.

The survey will be conducted by Mr. Gaikpa, Export Promotion Officer, in April and May 1976. If the survey is to be of value to GIHOC, it must be carefully planned. By mid-March, we intend to have defined:

- the GIHOC products which will be included in the survey

- a timetable for the survey

- names of key respondents, such as importers, Chamber of Commerce etc.

- other GIHOC management who will assist Mr. Gaikpa in the survey

- outline programme of visits to importers and other respondents.

COMMENTS ON GIHOC SAMPLES FROM SOME BRITISH IMPORTERS

1. Baverstock & Co.

'Good flavour and quite tender, but the cutting resulted in very irregular pieces. As a result the pineapples would be hard to distribute in Englend but might be more eccepteble in West Germany'.

2. John Martin (London) Ltd. (a well reputed firm with unusually high standards)

'These pineapples would not sell on UK market. John Martin would not market them'.

- pieces: not uniform enough
- juice: rather cloudy
- texture: too firm, almost chewy
- colour: too pale
- flavour: rather insipid.

3. Peabody Foods Ltd.

'Pineapple juice - sweet, but e slightly 'oily' flavour

Pineapple pieces - flavour OK; colour pale; smell slightly 'beery', could be ceused if sample kept too long and fruit acid eets into tinplate, or if fruit too ripe when canned.

Garden eggs - more a vegetable than e fruit. Highly specialised product which probably only West Africans would recognise - would not fit into our range'.

Mango juice - setisfactory.

YUGOSLAVIAN MARKET DATA

1. Estimates of Annual Consumption of Canned Pineapple Products

PRODUCT	TIN SIZE/WEIGHT (gms.)	ANNUAL CONSUMPTION	
		CARTONS	TONNES
Pineapple:			
- slices (i)	850	6,000	120
- slices (ii)	450	15,000	320
Total slices:		21,000	440
- pieces	450	5,000	110
- pulp	-	-	400
- concentrate	-	-	500
Total annual consumption			1,450

2. Agencies and Importing Organisations

(i) Accra-based agency: OMNICO

(ii) Importing companies:

1. VOCE, 41001 ZAGREB, P.O. Box 53
2. EMONA, 01001 LJUBLJANA, P.O. Box 140
3. COBEX, 11001 BELGRADE, P.O. Box 138

Sales to the importing companies are handled through OMNICO.

GHANA AIRWAYS CATERING SERVICE

MONTHLY CONSUMPTION OF FRUIT JUICE

CANNED FRUIT JUICE		TOTAL WEIGHT Kilograms	Tonnes
Orange Juice (Israel)			
6 x A10	40 x 6 x A10 (71b)	800.00	
24 x A2	60 x 24 x A2	990.00	
24 x A2	16 x 24 x 14 oz	150.00	
24 x 14	14 x 24 x 14 oz	140.00	
6 x A10	6 x 6 x A10	120.00	
Grapefruit Juice 6 x A10	3 x 6 x A10	60.00	
Total		2,260.00	226

GHANA AIRWAYS CATERING SERVICE

MONTHLY CONSUMPTION OF CANNED FRUITS

CANNED FRUIT		TOTAL WEIGHT Kilograms	Tonnes
Grapefruit 6 x A10	48 x 6 x A10	900.00	
Peach Halves 6 x A10	60 x 6 x A10	120.00	
Rasberries 24 x A2	24 x 12 x A2	210.00	
Pear Halves 6 x A10	20 x 6 x A10	380.00	
S.P. Apples 6 x A10	24 x 6 x A10	460.00	
Fruit Cocktail 6 x A10	40 x 6 x A10	800.00	
Mandarin Oranges 24 x A2½	4 x 24 x A2½	80.00	
Black Cherries 6 x A2½	10 x 6 x A2½	50.00	
Strawberries 24 x A2	8 x 24 x A2	120.00	
Red Cherries 24 x A2½	8 x 24 x A2½	160.00	
Total		3,280.00	328

USSR MARKET DATA

1. Import of Tropical Fruits ('000 tonnes)

PRODUCT GROUP	1969	1970	1972	1973
Oranges	233	250	331	312
Pineapples	5	5	8	6
Lemons	53	56	56	49
Total	291	311	395	367

2. Importing Organisation

V/O SOJUZPLODO IMPORT,
SMOLENSKAJA - SENNAJA P1, 32/34
MOSCOW G-200
USSR

APPENDIX V

USSR IMPORTS OF MANGO PRODUCTS FROM INDIA

PRODUCT GROUP	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70
Mango Juice:						
M. Tons	...	1,012	1,397	2,062	1,966	6,367
% of India's exports	...	(75%)	(70%)	(62%)	(67%)	(84%)
Mango Slices in brine:						
M. Tons	10	50	100	-	-	-
% of India's exports	(2%)	(9%)	(37%)	-	-	-
Fruit preserved in syrup:						
M. Tons	-	-	-	-	-	15.4
% of India's exports	-	-	-	-	-	(5%)
Mango Jams, Jellies, Purees Pastes etc.						
M. Tons	n/a	118	-	-	-	100
% of India's exports	n/a	(72%)	-	-	-	(27%)
Tons Total	n/a	1,180	1,497	2,062	1,966	6,482

... Not available

- Nil or negligible

Source: Foreign Trade of India
Department of Commercial Intelligence & Statistics

VOLUME 3
ANNEXE III

SURVEY
OF
THE EUROPEAN MARKET FOR CANNED PRODUCTS

October 1975

GHANA INDUSTRIAL HOLDINGS CORPORATION

CANNERIES DIVISION

SURVEY OF THE EUROPEAN MARKET FOR CANNED PRODUCTS

CONTENTS

October 1975

GHANA INDUSTRIAL HOLDINGS CORPORATION

CANNERIES DIVISION

SURVEY OF THE EUROPEAN MARKET FOR CANNED PRODUCTS

INTRODUCTION

On 28th August 1975 the P-E Consulting Group was requested by telex to help GIHOC's Canneries Division in a survey of the market for canned pineapples in the UK, West Germany, the Netherlands and Belgium. In response to this P-E sent telexes on 1st September 1975 and 3rd September setting out its terms of reference. These were agreed by GIHOC on 5th September 1975. Detailed questions relating to the market for canned pineapples were sent to P-E on 9th September 1975 and mango juice, pepper puree, garden eggs and snails were added to the product list for brief investigation on the UK market. On 11th September 1975 GIHOC requested statistics to update those contained in a previous pineapples study report of which a copy had been sent earlier to Accra. These were telexed to Accra on 26th September 1975. A copy of the detailed terms of reference is given in Appendix I. The main purpose of the study was to examine in detail the UK market for canned pineapples and, to a lesser extent the markets in West Germany, the Netherlands and Belgium, in terms of product type and quality, can size and labelling, shipping and payment terms, broad market structure and distribution. In so doing it was intended that those market sectors offering the best opportunities for new suppliers could be identified and related to GIHOC's overall potential as a supplier.

The following contacts were made among food importers, brokers, retail chains and professional associations in the course of P-E's field interviews.

Table 1: Interview Schedule

	Personal Interviews	Telephone Interviews	Dates
UK	13	11	15th - 23rd Sept. 1975
West Germany	-	7	23rd - 26th Sept. 1975
Netherlands	-	5	10th - 26th Sept. 1975
Belgium	-	5	29th Sept. - 3rd Oct. 1975

R.C. Windsor

J. Wilson

1 SUMMARY OF FINDINGS AND RECOMMENDATIONS

FINDINGS

1 The market for canned pineapples in UK, West Germany, Holland and Belgium in 1974 amounted to over 120,000 tons, compared with 140,000 tons in 1970. Although 1975 is likely to show a further decline, market demand should recover by 1977 to a more normal level of (say) 140,000 tons p.a.

2 Although we expect little growth in market size, there is some scope for new suppliers as the changing EEC tariffs give progressive advantages to ACP (African, Caribbean and Pacific countries under the LOME convention) suppliers against traditional exporters such as Malaysia, S. Africa, the Philippines and Taiwan.

3 W. Germany represents over 50% of demand, UK over 30%, Holland and Belgium about 15%. Catering/institutional buyers account for some 40% of the total market demand.

4 International pack sizes are clearly defined and uniformly observed. There are three recognised quality grades for canned pineapples. Price differentials for different quality grades, type of cut and can sizes vary marginally from different suppliers.

5 A new and regular source of supply would be acceptable in all four country markets, provided that the supplier could comply with the generally accepted standards of presentation and price. We estimate that a typical price standard (1975 end-season price for A10 can, standard pieces) would be about 10½p per lb f.o.b. West African port. This is equivalent to approximately 99¢ per case. Current prices are artificially low at present, and - once present surplus stocks are sold - maybe expected to increase quite sharply in line with improvements in the economic situation of EEC countries.

6 The markets for pineapple juice and tomato puree appear less attractive. Pineapple juice demand has collapsed in the UK this year, the market is either dominated by large bottlers or increasingly supplied to consumers as a frozen concentrate. The EEC tomato puree market gives a high degree of protection to EEC producers.

7 A small but highly specialised market may exist for garden eggs, pepper puree, snails and mango juice through specialist importers.

RECOMMENDATIONS

1. We recommend that GIHOC Canneries Division should plan to enter the West German and UK markets for canned pineapple. The West German market appears favourable for GIHOC's entry now. The UK market may be more attractive in 1 or 2 years.

2. To start with, the market strategy should be to sell regular quantities of standard quality pineapple pieces in A10 sizes to the catering sector through one or two selected importers.

3. As experience is gained in these competitive markets and as quality and quantity of production become more predictable, it should be possible to supply an increasing proportion of higher quality cuts and packs to selected consumer sectors.

4. We do not recommend that GIHOC seeks to enter the West European market for tomato puree.

5. We do not recommend entry to the UK market for pineapple juice. Other EEC countries should be investigated in closer detail before considering entry.

6. We believe that specialised markets in the UK for other products (such as garden eggs, mango juice, pepper puree and snails) may offer scope to GIHOC. Further specific research would be needed if significant quantities were available for sale. Otherwise direct contacts with specialist importers should be developed.

2. DESK RESEARCH

A large quantity of desk research data on the European and world markets for canned pineapples was forwarded to GIHOC prior to the commencement of this survey. Further data was provided by P-E for various tables contained in these two earlier studies and the updated versions are set out in Appendices III - VIII.

3. FIELDWORK FINDINGS

3.1 UK - Canned Pineapples

3.1.1 Present Situation and Influential Factors

Over the past decade the demand for canned pineapple in the UK has remained fairly constant, with consumption varying more as a function of the supply conditions than because of any fluctuations in demand. Indeed canned fruits have been comparatively inexpensive items on the household shopping list with pineapple cheaper than other canned fruits. Before 1970 the majority of UK canned pineapple imports came from traditional and commonwealth sources; in 1962 Australia, Malaysia, South Africa and Hawai supplied 85% of UK requirements.

In the last 1 - 2 years there have been several changes in the UK canned pineapple market. These can broadly be attributed to two main factors:

a) The economic depression which has brought about a severe decline in the sales of most non-essential goods. Imports of canned pineapples fell from 56,175 tonnes in 1973 to 46,421 tonnes in 1974. Increased freight charges, supply shortages and general inflation have forced up the prices of all canned fruits so that they have now become a luxury item for many previously regular buyers.

b) Britain's entry into the EEC and its transition over to EEC import duties with effect from 1st January 1974. Complete alignment with EEC tariff will be completed by 1st January 1978. From 1978 Commonwealth countries will lose their preference and be subject to full import tariffs. There will, however, be preferential rates for many 'developing' countries. Under the LOME convention Ghana, together with 45 other ACP (African, Caribbean and Pacific) countries is entitled to the free export of most of its goods to EEC countries; this agrsement took effect from 1st July 1975.

The following table shows the tariff rates on canned pineapple products from 1st January 1978.

Table 2: 1978 EEC Tariff Rates

	EEC	FULL	ACP
Canned pineapples with added sugar			
- more than 1 Kg	nil	22%	nil
- 1 Kg or less	nil	24%	nil
Unsweetened cans			
- 4.5 KG or more	nil	23%	nil
- less than 4.5 Kg	nil	23%	nil

Despite the obvious advantages for ACP countries under this system, most buyers did not foresee their sources of canned pineapple changing as drastically as might be expected. It was generally felt that the price gap occasioned by differences between full and ACP tariffs would be considerably narrowed by the suppliers themselves: countries such as South Africa anxious not to lose their market in the UK and other EEC countries will probably absorb some of the tariff increases, whilst poorer countries might see them as an opportunity to improve their profit margin and hence boost their export revenue. Furtharmore, the price of canned pineapples is not solely dependent on tariff rates: with higher raw material input, more efficient working methods and modern plant, the traditional suppliers may still be able to offer their goods at competitive prices.

3.1.2 The Market

The UK canned pineapple market can be divided into two main sectors:

- the consumer sector
- the manufacturing and catering sector.

The Consumer Sector

This sector estimated to represent about 70% of the total canned pineapples market, is largely dominated by retail chains and voluntary associations of retailers e.g. Tesco, Fine Fare, Wavy Line who probably

account for about 85% of sales, with a correspondingly high proportion of business in 'own brand'. Most of the canned pineapples sold in this sector are of choice grade; the most popular can size at present is the 16oz in which an estimated 80% of sales are made. Second in popularity is the 30oz can in which sales have declined considerably over the past two years. Promotion particularly in terms of labelling are important selling requisites in this market.

The Manufacturing and Catering Sector

This sector can be further subdivided into:

- 'professional' caterers and institutions
- other caterers and institutions
- manufacturers.

Professional caterers incorporate hotels, restaurants, and retail catering chains. For such concerns the quality requirements are clost to those of the consumer sector, the main difference being the quantities bought and hence the size of can.

The remainder of the catering sector consists of boarding houses, hospitals, schools and industrial canteens. In some cases quality requirements particularly with regard to colour, size and regular cut of fruit are less stringent in favour of corresponding price advantages. A high proportion of purchases by catering establishments are made through Cash & Carry shops. A number of importers claimed that most of their business in the catering sector was with Cash & Carry.

Canned pineapples are also bought by manufacturers as ingredients for yoghurts, dessert creams, fruit salads and several other products. For such purposes crushed pineapple is generally used.

About 95% of sales in the manufacturing and catering sector are in the A10 (64oz net drained weight) can, the remainder being in the A5 size (46-8oz). Labelling of cans is not important, and in some cases black and white strip labels are adequate.

3.1.3 Sources of Supply

In the last five years there has been a gradual change in the UK sources of canned pineapple. At present Malaysia supplies about 45% of UK requirements, South Africa about 30%. Imports from Hawai and Australia have declined considerably largely for price reasons. While imports from the Philippines, Kenya and Taiwan remain constant, countries such as Swaziland and Thailand are posed to increase their share of the market. The changes that have taken place in recent years have shown a movement away from traditional commonwealth sources towards a broader selection of supplying countries. While conditions may at present favour new sources of supply, it is only by offering price advantages that a new supplier will be able to penetrate this highly competitive market.

3.1.4 Distribution

Various methods of distribution exist for canned pineapples. These may involve first hand distributers, wholesalers, agents and brokers. Frequently all these functions are filled by one firm. There is, however, a visible trend towards direct shipment of goods between the port of entry and the end user or retailer, in order to avoid delays and minimise storage costs - this is facilitated by containerisation and it is thought that in the long term the shipment of all canned fruits will be containerised. Documentation, payment and the mediation between buyer and supplier is handled by agents and brokers. This function remains an important one due to the introduction of EEC tariffs, and payment complications arising from fluctuating exchange rates. It is the duty of the importer/broker to keep abreast of changes in tariff regulations and exchange rates, whilst finding alternative sources of supply to meet his sales commitments, should a shortage occur due to crop failure. As a result importing companies are for the most part open to potential new sources of supply, providing minimum quality standards can be complied with at a competitive price. Payment is generally made in cash to banks on receipt of shipping documents, importers may book foreign currency up to six months in advance as a hedge against falling exchange rates. Most prefer to deal in c.i.f. or at least cost and freight terms, insurance presenting no great problem. It is, however, easier for the canner to calculate freight costs basing these on his knowledge of local freight services and his proximity to the port of shipment. Quantities bought vary greatly: some importers would

not consider buying in regular quantities of less than 5,000 cases a time. A typical importer might buy 10 containers of canned pineapples over the year, having these shipped over one container at a time: one container holds 840 cases and is roughly equivalent to about 20 tonnes. These would be paid for c.i.f. by the importer upon their arrival. He would then have to pay inland haulage and RHD (receiving, handling and delivery i.e. storage) costs amounting to approximately £120 per container. Examples quoted are all taken from importers. Retail chains often go through such motions of dealing direct with suppliers as visiting canners or packers, and deciding upon the type of product, labelling and approximate quantities. Shipments are then made direct to the retail firm in regular monthly/quarterly quantities. In the majority of cases, however, documentation and payment is handled by importer/brokers, who combine the orders of several clients to make larger orders. Many pineapple plantations have an output of 20-30,000 tonnes per annum. It was, however, stressed that actual quantities are less important than the capacity to maintain a regular supply, however small the quantity. A new supplier may sometimes find it easy to sell small quantities on a 'one-off basis' where supplies from other sources have fallen short, but if he is to enter the market in a more permanent capacity, he must be able to provide regular shipments.

3.1.5 Quality

There is not a wide divergence in the quality of the different brands of canned pineapple sold on the UK market. Several respondents in the trade were at a loss to define the exact differences between the grades: fancy, choice and standard. Major producing countries such as Malaysia and South Africa enforce rigid quality control through specially appointed boards. Yet for importing countries the decision to buy a new product is based largely on taste and visual aspect, and the 'minimum quality level' is essentially the lowest level which is acceptable to the market at a given time. While some importers felt that the UK market had become accustomed to choice quality and would not accept a lower standard, others maintained that there is always a market for standard products providing the price is low enough. One large supplier of canned fruits to the consumer sector was convinced that the price threshold in canned fruits had been reached, and any further price rises would cause these to be

regarded as luxury foods. For the first time he was contemplating the sale of standard quality products at a lower price in order to offset a heavy decline in sales over the past year.

3.1.6 Price

Prices fluctuate heavily on the canned fruit market, since prices are highly susceptable to shortage of supply, increased freight charges and rises and falls in demand. For this reason it is difficult to assess the prices for the canning season. The following table gives examples of recent prices paid for canned pineapples.

Table 3: UK Canned Pineapple Prices

Source	Pineapple Product	Quality Grades	Size of Can	No. per Case	C.I.F. Price per Case
Malaya	Rings in Juice	Choice	A10	6	£5.12 (6.12) *
Malaya	Rings in Syrup	Choice	A10	6	£5.35 (6.36) *
S. Africa	Rings in Juice	Choice	A10	6	£3.75
S. Africa	Rings in Syrup	Choice	A10	6	£4.04
S. Africa	Rings	Standard	A10	6	£3.50
S. Africa	Pieces	Standard	A10	6	£3.12
S. Africa	Rings	Choice	16oz	24	£2.58
S. Africa	Rings	Standard	16oz	24	£2.48
S. Africa	Pieces	Fancy	16oz	24	£2.28
S. Africa	Pieces	Choice	16oz	24	£2.22
S. Africa	Pieces	Standard	16oz	24	£2.11

* One importer supplied his selling price together with his price of purchase.

N.B. Sterling prices are based upon the following exchange rates:

£1 = 5.60 Malaysian Dollars

£1 = 1.80 South African Rand (following South Africa's 17.9% devaluation on September 21st 1975)

It can be seen that variations between different quality grades are small, even when one compares the purchase of cases at wholesaler/first distributor level. The corresponding price difference reflected at retail level per can would be minimal.

3.1.7 General Comments

In the past two years the economic depression and inflation have pushed up the prices of canned fruits with a resulting fall in demand. Such a situation cannot be favourable for a new supplier wishing to enter the market. The situation is, however, seen by many to be short-term. Furthermore the world supply of pineapples has in the past followed a cyclical pattern in which shortages occur every 4 - 6 years. Such a shortage can provide an opportunity for a new supplier to enter the market; under normal circumstances he would need initially to offer goods of comparable quality 5 - 8% cheaper than his competitor. Ghana should attempt to base their prices upon those of Kenya, Swaziland and South Africa, the latter having sustained considerable price advantage through their recent devaluation.

3.2 UK - Pineapple Juice

Respondents interviewed appeared little interested in the purchase of pineapple juice. Indeed the greater proportion of pineapple juice in the UK is sold to the licensed trade through such well-established companies as Cadbury Schweppes, Britvic and Canada Dry. A small proportion of pineapple juice imports is used in the producing of mixed fruit squashes and concentrates. Consumption of pineapple juice has declined in relation to grapefruit and orange juice with no prospect of a change in consumption patterns to redress the balance. In 1974 South Africa and the Philippines supplied 88% of UK pineapple juice imports; there is, however, considerable competition from other sources. EEC import tariffs[1] on concentrated fruit juices are scheduled to rise from the present 19.8% to a colossal 42% by 1978. This may well cause the consumption of fruit juices in unconcentrated form to decrease. Clearly any tariff preference under the LOME agreement could prove of considerable benefit for pineapple juice.

(1) The question of tariffs is a highly complex one, and we were unfortunately not able to discover the precise tariff ratee for pineapple juice in the time allotted. For detailed information on this a copy of Tariffs and Amendments should be obtained from H.M.S.O.

3.3 UK - Tomato Puree

There is undoubtedly a market for tomato puree in the UK and other EEC countries. The following table shows UK imports of tomato puree from 1969 to 1974.

Table 4: UK Imports of Tomato Puree

					Quantity in tons	
Country of Provenance	1969	1970	1971	1972	1973(1)	1974
France	-	7	1,007	1,243	-	934
Italy	5,665	2,072	4,639	4,653	478	7,489
Spain	2,522	1,896	6,526	9,668	1,922	7,829
Portugal	38,158	48,740	36,163	33,433	3,662	32,057
Bulgaria	3,052	541	2,138	2,644	797	2,072
Rumania	92	80	106	168	1,667	2,928
Hungary	1,479	1,174	656	2,080	149	1,462
Greece	489	179	4,027	7,768	710	10,526
Turkey	1	2,696	4,185	4,229	753	6,658
Canary Islands	228	-	384	498	339	759
Other	530	277	456	537	16	8,406
Total	52,216	57,662	60,287	66,921	10,493	81,120

(1) 1973 was a notably bad year for tomatoes. Furthermore with the beginning of a boom in commodity prices, many suppliers held back their stocks in order to profit from the higher prices.

N.B. Imports of pulp or paste wholly tomato and water (including preservative etc) with dry weight of tomato not less than 25% weight of container content. - Official Customs Tariff definition.

Although the import tariffs set Italy as an EEC member at an advantage, Italy sells much of its produce to America, and has not sufficient quantity to cover EEC demand. A substantial amount of tomato puree is imported from Portugal, whilst Greece and Turkey have steadily increased their market share over the past five years. Whilst there is undoubtedly a market for tomato puree, it must comply with health and quality standards e.g. the mould count must not exceed 50%. Furthermore, in August 1975 the EEC decided to impose minimum import prices on tomato puree, in order to offset heavy competition from third countries selling at 30-40% less than EEC countries. The EEC also require importers to pay a deposit of three units of account per 100 kilogrammes of tomato puree as a security against non fulfillment of allocations. The combined effects of these moves are possibly still to be felt.

3.4 UK - Mango Juice, Garden Eggs, Pepper Puree, Snails

These are products for which a limited market may exist. Mango juice is only sold in small quantities in the UK, having never proved very popular as a drink. None of the companies spoken to had ever heard of garden eggs or pepper puree. Snails have previously been imported only from France, but there is no reason to prevent another source of supply being adopted. Unlike canned pineapples, pineapple juice and tomato puree,the above products would not be handled by large companies, but by small importers specialising in the supply of a wide range of goods to delicatessen shops, chinese and indian restaurants, African and Asian communities. When introducing new products, samples are circulated through sales representatives to see if they evoke any interest. If the reaction is positive, a small order for about 50 cases would be placed. If sales prove successful, further orders would be placed.

3.5 WEST GERMANY - Canned Pineapples

West Germany has in the past offered a large steady demand for canned pineapples. Recently there has been a slight fall-off in demand following sharp price rises. All the importers spoken to were, however, confident that this was only a short term development, and that demand would recover in the long term. As in the UK, the consumer sector absorbs 70-75% of W. German canned pineapples, the remainder of the market being more or less equally divided between industry and the catering sector.

The most popular consumer can sizes are the 2 (24oz) and the 2½ (30oz), the latter larger size still maintaining the lead despite a marginal drop in sales. In the catering and manufacturing sectors sales are almost exclusively in the A10 sizes.

Different quality grades are less well defined in W. Germany. Imports from the Philippines are normally regarded as the highest quality; excluding these there are only two standards: acceptable and non acceptable. Acceptable quality is determined by the usual universally applied criteria: flavour, texture, colour, cut. Most canned pineapples sold in Germany are, however, roughly equivalent to UK standard quality, and some importers maintain that there is always a market in cheap discount stores for low quality providing the price is low enough, the only exception to this being pineapple rings which will not sell if the cut is too irregular.

Consumption is mainly in rings and pieces, tidbits and chunks being less popular for price reasons.

Although methods of payment differ according to the country of provenance, the most common and preferred method is cash on documents paid at C and F or c.i.f. prices. The respondents interviewed were keen to import from African countries, largely because of the duty advantages enjoyed by ACP (African, Commonwealth and Pacific) states under the LOME agreement. The German canned pineapple market has many competing suppliers, but at present demand is thought to marginally exceed supply. Last year Indonesia successfully entered the market. At present conditions are favourable for new suppliers wishing to enter the market, but this could change rapidly. In order to enter the market, a new supplier would need to offer his goods at 2 - 3% below the 'going price'. Price can change from day to day, and competitive prices must be based on those operating at the time of entering the market. Prices between the upper and lower quality grades would differ by about 3 - 4%.

3.6 THE NETHERLANDS - Canned Pineapples

The Netherlands offer a stable market demand for canned pineapples. Last year consumption dropped due to supply shortages and price increases, but it is expected that consumption will rise again to its previous level. The four major supply countries are the Ivory Coast, the Philippines, Hawai and Taiwan, who together supplied 85% of the Dutch market in 1974. The consumer sector represents about 75% of the total canned pineapple market the majority of sales being in the 2½ can size. The catering sector also use the 2½ size, and the A10 is sold both in the catering and manufacturing sectors.

As in the UK, most of the canned pineapples sold in the Netherlands are of 'choice' quality, with only a small percentage of business in fancy and standard, the latter being sold mostly to independent retailers. Canned pineapple products include half slices, chunks, pieces, tidbits and crushed (in its own juice). Labelling is important particularly in the consumer sector, and is usally carried out in the country supplying the canned goods. The Netherlands market is very price conscious, and prices vary between different quality grades. The following examples of current prices were provided by a large Dutch importer. All prices are c.i.f. in Dutch guilders per case.

Table 5: Netherlands Canned Pineapple Prices

Pineapple Product	Can Size	Country of Origin	Price per Case
Slices	2½	Hawai	39.51
Slices	2	Hawai	29.90
Pieces	2½	Kenya	26.49
Pieces	2	Formosa	18.16
pieces	2	Ceylon	17.94
Coarse crushed	A10	Kenya	30.70

The preferred method of payment is cash against documents for C and F terms (insurance being arranged in the Netherlands), although some countries (e.g. Formosa) will only accept letter of credit. Most of the goods are shipped by container, but some countries still use conventional shipping. On principle all the Dutch importers spoken to, were aware of the duty advantages of African countries under the LOME agreement, and expressed interest in Ghana as a potential new source for canned pineapples.

3.7 BELGIUM - Canned Pineapples

The demand for canned pineapples is very stable in Belgium, pineapples being one of the most popular canned fruits. The main countries of origin are the Ivory Coast, the Philippines, Hawai, Formosa and Kenya. The most popular form of canned pineapples are fancy and choice rings in syrup of 18 - 20° brix in can sizes 1 flat, 2, 2½ and A10. Half slices of standard quality are also popular in sizes 1 and 2. In the A10 size choice and standard quality tidbits and crushed pineapple sell well. Unlike Germany, the Netherlands and the UK pineapple pieces do not sell in Belgium. Bills are most commonly paid cash against documents for C & F prices. Belgium was not thought by respondents to be oversupplied but rather to tend the other way, with occasional shortages. Last year Thailand successfully entered the market, and the road is clear for new suppliers.

4. GENERAL FINDINGS & RECOMMENDATIONS

4.1 Canned Pineapples

4.1.1 Market Size and Growth

Table 6 Comparative Market Growth in EEC Countries

	United Kingdom		West Germany		Netherlands		Belgium	
	Imports tonnes	% Growth over Previous Year	Imports tonnes	% Growth over Previous Year	Imports tonnes	% Growth over Previous Year	Imports tonnes	% Growth over Previous Year
1970	65,302	+ 19%	67,441	+ 25%	9,037	n.a.	7,100	n.a.
1971	53,650	18%	83,465	+ 24%	11,127	+ 45%	10,600	+ 46%
1972	53,790	n.c.	83,080	+ 0.1%	11,068	- 16%	9,600	- 8%
1973	54,175	+ 0.6%	79,914	6%	12,758	+ 15%	9,300	- 3%
1974	44,621	17%	59,236	26%	9,453	- 26%	7,800	- 16%

The demand for canned pineapples is known to fluctuate over a 4 – 5 year cycle, apparent decreases in demand being often due to supply shortages. Yet in the past 3 years the downward trend has been more pronounced, particularly in West Germany and the UK, the latter of which recorded its lowest level for over 10 years in 1974.

4.1.2 Major Suppliers and Their Market Shares

Table 7 Trends in the Market Shares of Supply Countries

Supply Countries		United Kingdom		West Germany		Netherlands		Belgium	
		Imports tonnes	% of Total Imports	Imports tonnes	% of Total Imports	Imports tonnes	% of Total Imports	Imports tonnes	% of Total Imports
[illegible]	1970	[illegible]	[illegible]	[illegible]	[illegible]				
	1972	[illegible]	[illegible]	[illegible]	[illegible]				
	1974	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	1970	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1972	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1970	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1972	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1970	[illegible]	[illegible]	[illegible]	[illegible]				
	1972	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
	1974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	1970			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1972			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1974			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
South Africa	1970	[illegible]	[illegible]	[illegible]	[illegible]				
	1972	[illegible]	[illegible]	[illegible]	[illegible]				
	1974	[illegible]	[illegible]	[illegible]	[illegible]				
[illegible]	1970	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1972	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1974	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1970	[illegible]	[illegible]						
	1972	[illegible]	[illegible]						
	1974	[illegible]							

From this comparison chart, certain patterns become evident:

- the gradual withdrawal from the market of two traditional supply countries: USA (Hawai), Australia

- a decrease in the market shares of the Phillipines and Taiwan (Formosa), both of whom have lost much of their original price advantage since entering the market

- an increase in the market shares of the Ivory Coast (except in the UK), and Malaysia in the UK and West Germany.

Thailand and Swaziland have also entered the market in recent years, but have yet to attain significant shares.

It is significant to note that in West Germany, the Netherlands and Belgium, where the EEC import tariff regulations detailed earlier in this report are already in force, ACP countries Kenya and the Ivory Coast have steadily increased their share, while other countries subject to tariffs (Philippines, Taiwan) have declined in importance. A similar trend will undoubtedly emerge in UK imports with ACP countries increasing their shares and Malaya declining.

It is also interesting to compare the progressive changes to the imports of the different countries. In the UK, the Netherlands and Belgium minor fluctuations detract from the overall patterns showing the increase and decrease in the market shares of various suppliers. West Germany, however, follows a steady predictable pattern reacting to price advantages. Indeed it was confirmed by the importers spoken to that Germany is a highly price-sensitive market. The UK market is similarly predictable, whilst Belgium would appear to be the least price sensitive, probably due to the preference of pineappla over other canned fruit.

4.1.3 Can Sizes

Table 8: Preferred Can Sizes and Quality Grades in EEC Countries

	United Kingdom		West Germany		Netherlands		Belgium	
	Can Sizes in Order of Preference	Relative Preferred Quality Grade	Can Sizes in Order of Preference	Reletive Preferred Quelity Grade	Can Sizes in Order of Preference	Relative Preferred Quality Grade	Can Sizes in Order of Preference	Relative Preferred Quality Grade
Catering Sector	(1) A10 (2) (A5)	Choice/std Choice/std	(1) A10 (2) 30os (2½)	Stenderd Standard	(1) A10 (2) -	Choice/std -	(1) A10 (2) -	Choice/std -
Consumer Sector	(1) 16os (2) 30os (2½) (3) 24os (2)	Choice Choice Choice	(1) 30os (2½) (2) 24os (2) (3) 16os	Stenderd Standerd Standard	(1) 30os (2½) (2) 24os (2) (3) -	Choice Choice -	(1) 24os (2) (2) 30os (2½) (3) 16os	Fancy/choice Fancy/choice Fancy/choice

The above table is not based on statistical data, but reflects the information and impressions gained by talking to a small number of canned pineapple importers in each country.

4.1.4 Quality and Price

Three main factors must be taken into account when determining the quality level of canned pineapples and the price at which they may be sold:

1) Explicit standards relating to taste, colour, texture and cut may be used to determine the quality grade of the raw material.

2) The quality of the cans and labels used must be taken into account, as these may be important for promotion in the consumer sector.

3) Price levels must be geared to those of competing suppliers.

4.1.5 Prices

In the following table an attempt has been made to compare the examples of price obtained from the different countries covered in the survey. Direct comparison is difficult since different can sizes, type of pineapple product and quality grades are sold in each country. Furthermore various different exchange rates will in many cases have been used by importers for converting prices into local currencies. Nevertheless they do provide some measure of the differential in price between different can sizes, quality grades and countries.

It can be seen that price differentials between different quality grades in similar products vary between 3 - 7%, the margin being highest on the largest can sizes. Price differentials between countries are largely dependent on the country of origin. All the prices supplied by UK importers were for Malayan and South African pineapples, since the majority of UK canned pineapples are imported from these two countries.

Belgian, Dutch and German importers were in most cases not able to quote prices for Malayan and South African pineapples, since most of their imports come from different sources. In the one case where a Belgian importer provided a price for South African pineapples, the price was given in Rands, and this was identical to the London price. All the prices shown are net of duty. South African prices are artificially low due to the recent devaluation, and to the fact that the prices quoted are end of season prices for remaining stocks to be sold before the new season. Whilst allowing for this fact, we have based our calculations in Table 10, estimating possible price levels for Ghana, on South African prices.

Table 9: Comparative Price Levels in UK, the Netherlands and Belgium

Canned Pineapples						United Kingdom		Netherlands			Belgium		
Country of Origin	Can Size	lb per Case	Pineapple Product	Quality Grade	Price Terms	Price per Case £	Pence per lb	Price per Case Guilder	Price per Case £	Pence per lb	Price per Case B.Frs	Price per Case £	Price per lb
S. Africa	A10	40	Rings (in juice)	Choice	c.i.f.	3.75	9.38						
S. Africa	A10	40	Rings (in syrup)	Choice	c.i.f.	4.04	10.10						
S. Africa	A10	40	Rings	Standard	c.i.f.	3.50	8.75				386.65	3.50	8.75
S. Africa	A10	40	Pieces	Standard	c.i.f.	3.12	7.80						
Malaysia	A10	40	Rings (in juice)	Choice	c.i.f.	5.12	12.80						
Malaysia	A10	40	Rings (in syrup)	Choice	c.i.f.	5.35	13.38						
Ivory Coast	A10	40	Rings	Choice	c.i.f.						484.19	5.18	12.95
Kenya	A10	40	Crushed	Standard	c.i.f.			30.70	5.50	13.75			
Hawai	2½	44	Rings	Fancy	c.i.f.			29.71	7.11	16.16			
Kenya	2½	44	Pieces	Choice	c.i.f.			26.69	4.74	10.77			
Malaya	2½	44	Rings	Fancy	c.i.f.	5.86	13.32						
Malaya	2½	44	Rings	Choice	c.i.f.	5.56	12.64						
Malaya	2½	44	Cubes	Fancy	c.i.f.	6.20	14.09						
Malaya	2½	44	Cubes	Choice	c.i.f.	5.82	13.23						
Malaya	2	36	Rings	Fancy	c.i.f.	3.65	10.14						
Malaya	2	36	Rings	Choice	c.i.f.	3.45	9.58						
Malaya	2	36	Cubes	Fancy	c.i.f.	3.91	10.86						
Malaya	2	36	Cubes	Choice	c.i.f.	3.63	10.08						
Hawai	2	36	Rings	Fancy	c.i.f.			29.00	5.36	14.86			
Formosa	2	36	Pieces	Standard	c.i.f.			18.16	3.25	9.03			
Ceylon	2	36	Pieces	Standard	c.i.f.			17.94	3.21	8.92			
S. Africa	16oz	24	Rings	Choice	c.i.f.	2.58	10.75						
S. Africa	16oz	24	Rings	Standard	c.i.f.	2.48	10.33						
S. Africa	16oz	24	Pieces	Fancy	c.i.f.	2.28	9.50						
S. Africa	16oz	24	Pieces	Choice	c.i.f.	2.22	9.25						
S. Africa	16oz	24	Pieces	Standard	c.i.f.	2.11	8.79						

N.B. West Germany: Importers were reluctant to quote examples of recent prices for canned pineapples because they considered these were not typical and were likely to change in the near future. Ref. Unilever Rotterdam letter - October 8th 1975

Table 10: Recommended Price Levels for A10 Pieces of Standard Quality

Base c.i.f. prices per case (6 A10s): £4.20
£4.30
£4.40

A + Import Duty at Full Rate

Base c.i.f. Prices	1975 + 9.2%	1976 + 13.8%	1977 + 18.4%	1978 + 23%
£4.20	£4.59	£4.78	£4.97	£5.17
£4.30	£4.70	£4.89	£5.09	£5.29
£4.40	£4.80	£5.01	£5.21	£5.41

B - Insurance (1% c.i.f. price) and Freight (56p per case)
= f.o.b. Price Per Case

Base c.i.f. Prices	1975 f.o.b.	1976 f.o.b.	1977 f.o.b.	1978 f.o.b.
£4.20	£3.99	£4.17	£4.36	£4.56
£4.30	£4.09	£4.28	£4.48	£4.68
£4.40	£4.19	£4.40	£4.60	£4.80

C Price per lb (÷ 40)

Base c.i.f. Prices	1975 pence lb	1976 pence lb	1977 pence lb	1978 pence lb
£4.20	10.0	10.4	10.9	11.4
£4.30	10.2	10.7	11.2	11.7
£4.40	10.5	11.0	11.5	12.0

In the above table we have calculated three possible f.o.b. prices at constant prices for a case of A10 pieces of standard quality. To arrive at the f.o.b. prices, we have added the full duty rates (payable on imports from most non EEC countries) to the basic c.i.f. prices, and subtracted insurance and freight costs (based on South African examples). In order to compare these with the Ghanaian prices quoted to us, the f.o.b. price per lb should be multiplied by 44 (to compare with Ghanaian cases) and converted to US dollars.

Thus

	1975	1976	1977	1978
£4.30	10.2	10.7	11.2	11.7
x 44:	£4.49	£4.71	£4.93	£5.15
x 2.0615:	$9.25	$9.70	$10.16	$10.61

4.1.6 Distribution and Promotion

For distribution and promotion purposes, the market can be divided into two main sectors:

- consumer sector
- catering and industrial sector.

Consumer Sector

The consumer market is served by three main types of company:

- retail chains importing direct and through large importers, selling both 'own brand' canned pineapples and competitive labels e.g. Sainsburys, Tescos etc.
- large canned fruit importers selling under their own name and label e.g. Libbys, Del Monte
- other importers of all sizes importing a wide variety of products from many countries of origin on behalf of other companies.

The consumer sector is demanding where labelling is concerned, and supermarket shelves carry many competing brands with brightly-coloured labels placed side by side. There is also a certain amount of variation in can shapes: e.g. pineapple rings in 16oz tins may be in tall or flat tins, and these may be of varying diameter in accordance with the size of the original pineapple. Del Monte and Libbys also sell 13½oz and 11½oz can sizes, but most other brands adhere to standard weights.

Catering and Industrial Sector

The catering and industrial sector consists of three main sub-categories:

- professional caterers such as hotels, restaurants and catering chains presenting food of a high standard
- other caterers e.g. seaside boarding houses, and industrial canteens; institutions e.g. schools and hospitals
- manufacturers of food products incorporating pineapple e.g. fruit yoghurts and deserts, mixed salads etc.

Caterers may often be served by some of the same importers who serve the consumer sector, but supplying the industrial sector is often more specialised. The A10 can size is standard for all three sectors with a minimal amount of sales in the A5 size. There is little variance in can shape and labelling is unimportant.

4.1.7 Seasonality

Pineapple suppliers usually have two pineapple seasons each year, and the new pineapple crop is offered for sale at new season prices shortly after it has been picked. However, pineapple seasons vary in different countries, and canned pineapples can be bought as long as stocks last in some cases carrying right over to the following season. For this reason importers were not preoccupied by the question of seasona.

4.1.8 Quantities

It is impossible to set a minimum quantity level which a supplier must be capable of producing. Orders vary tremendously in size and importers insisted that only regularity of supply, whatever the quantity, was important.

4.1.9 Conclusions - Future Trends

A. Market Growth

The demand for canned pineapples in the UK, West Germany, the Netherlands and Belgium has fallen in the past year as a result of the economic depression. Demand in the short term will undoubtedly be influenced by the economic fortunes of the countries concerned.

UNITED KINGDOM Although some improvement can be expected in the next year it is unlikely that demand will revert to the normal annual level of 54-60,000 tonnes. The pattern of demand in the UK will also be affected by the latter's gradual change-over to the EEC tariff system, under which major suppliers such as South Africa will lose their preferential status and be subject by 1978 to a 24% tariff rate. Although UK importers expect much of the price differential caused by the change in tariff rates to be narrowed by suppliers (some absorbing a portion of the extra cost in order to maintain their markets, others marginally increasing their profit margins), if the overall effect is to increase the price of canned pineapples, then demand will probably not increase beyond its 1974 level - thus representing a fall in the size of the market.

WEST GERMANY The demand for cannad pineapples fell by 26% in 1974. German importers ware, however, confident that sales would racover in the long term, some reporting that the situation was alraady baginning to improve.

THE NETHERLANDS The demand for canned pineapplas has in the past been steady, but fell by 26% in 1974 due to economic prassures. Importars expact the market to recover, and are eager to find new aourcas of supply.

BELGIUM The market for cannad pineapples is particularly stabla due to the precedence of pineapple over other canned fruita. The 1974 fall in demand is only partly attributed to aconomic raasons, canned pineapples having been in short supply for part of the yeer.

B. Tariff Rates

The UK market is particularly susceptible to the EEC tariff rates, since these will represent a considerable change away from the previous UK teriff system under which commonwealth countries were granted preferential status. For this reason the old tariff rates are gradually being phased out and replaced by the EEC tariffs - a typical progression is shown below:

Phasing Import Duties During Transition for Canned Pineapples

Cans 1kg or less

Old Praferantial Rate	1.1.74	1.1.75	1.1.76	1.1.77	1.1.78
NIL	4.8%	9.6%	14.4%	19.2%	24.0%

C. Future Competition

UNITED KINGDOM This is the most difficult and competitive of the markets investigated. Canned pineapples are imported from many different sources, but two countries dominata the markat: Malaye with 40-45% of the markat, and South Africa with 30-35% of the market. Both countrias can pineapples on e vast scala with the rasulting economies of large scale operationa; Malayan pricas ere higher than South African prices, but their products ara mora apecialised. Maleya is the only country to produce the thin 2" diameter pineappla rings in A10 115/120 count, these are much used in professional catering. Other countries wishing to supply the market

are forced to keep their prices on a similar low level to those of South Africa. It is, however, certain that the UK market will alter considerably in the next few years as the new import tariffs begin to take effect. This should mean a swing away from present suppliers (previously enjoying preferential tariffs as Commonwealth members) towards ACP countries, eventually conforming to the import patterns of other EEC countries.

WEST GERMANY The market is competitive but imports are at present more evenly spread among different suppliers. Only the Ivory Coast, which has trebled its market share in the past four years, holds a substantial part of the market. Ivory Coast prices are undoubtedly higher than South African prices, but their tariff advantage (as ACP members) would offset this.

NETHERLANDS The pattern of imports is similar to that of West Germany, although large quantities are still being imported from the Philippines.

BELGIUM The Belgian market has a smaller number of suppliers, and is reported by importers to tend towards undersupply. The largest supplier is the Ivory Coast with a market share of 30%. Other imports are distributed evenly between various countries.

4.2 Other Products

4.2.1 Pineapple Juice

The UK market is declining. The market is dominated by large bottling companies who distribute mostly to the licensed trade. A small proportion of pineapple juice is sold to the manufacturing industry for use in mixed fruit squashes and concentrates. In the retail sector the trend is towards frozen concentrates, which enjoy lower tariff rates.

4.2.2 Tomato Puree

There is a large market for tomato puree in the UK and other EEC countries. Health and quality standards must be complied with, furthermore minimum import prices imposed recently by the EEC to protect member producing countries will make it difficult for third countries to compete.

4.2.3 Mango Juice, Garden Eggs, Pepper Puree, Snails

The market for these products is highly specialised and unpredictable. Importers specialising in this type of product proceed by testing new products cautiously, and ordering in direct proportion to demand.

5. RECOMMENDATIONS

5.1 Canned Pineapples

The two main criteria which will decide the success of a potential new entrant to any of the markets investigated are quality and price. Information received to date indicates that the canned pineapple produced by Nsawam canneries division is of standard quality (largely due to the irregular cut of the pieces). From the price examples provided by importers it is evident that Ghana's prices are too high and must be lowered substantially if Ghana is to enter the market. Assuming that the products can be produced at a competitive price, the most suitable markets will be those where there is a demand for standard quality. On this basis West Germany is the most attractive market since it offers a large stable demand for standard quality pineapple. The UK market is the second most attractive; although at present choice quality is the most widely sold, there are signs that quality standards may be forced down to prevent further price rises. In addition the UK can shortly be expected to change its sources of supply moving away from former Commonwealth countries towards ACP countries in line with other EEC countries. Since few formal links already exist between the UK and ACP suppliers, the time could be right for Ghana to begin dealings with importers. Quality grades in the Netherlands and especially Belgium are mostly in the choice/fancy range, and would make them unsuitable markets for GIHOC.

Having decided upon which countries to aim at, the most appropriate market sectors must also be determined. * Initially GIHOC should sell to the catering and industrial sectors which present three clear advantages:

1) Quality grades tend to be a little lower than in the consumer sector.

2) Promotional aepects such as can shape and labelling are important.

3) Pineapples need be packed in only one can sise: A10.

* This recommendation is based on our findings in the UK; although the West German market is thought to be similar in many respects, further research is needed to acquire more detail on market sectors.

Essential preliminaries to entering either the UK or the West German market are to write to a number of importing companies (listed in Appendix II) supplying details of:

- the product: slices/pieces/tidbits etc in juice/syrup X^{o} brix
- can sizes and quantities available
- canning seasons i.e. when products will be ready for sale
- prices stating currency/exchange rate upon which these are based and period for which they are valid
- any legal/political limitations which might affect payment.

It is also essential to provide samples: at least 8 - 10 cans per company to show that the quality is consistent. Subsequent to agreement being reached on the points listed above, GIHOC could appoint one or two agents in each of the countries.

5.2 Other Products

Pineapple Juice and Tomato Puree

Research has shown that conditions on the UK market are not favourable for GIHOC to sell the above products. From our research to date it would seem unlikely that EEC countries are a feasible market for tomato puree, but this should be investigated more thoroughly and the possibility of exporting to other European/Scandinavian countries explored. Similarly, further research is necessary to become familiar with the markets for pineapple juice in other EEC countries.

Mango Juice, Garden Eggs, Pepper Puree and Snails

It is recommended that a similar course of action be adopted to that set out for canned pineapples, with greater emphasis laid on the providing of samples to potential importers. These could also suggest appropriate price levels for the products once these have been tested among their customers.

TERMS OF REFERENCE

PROPOSED EUROPEAN STUDY FOR CANNERIES DIVISION PRODUCTS

Introduction

GIHOC's Canneries Division plan to export all (or as much as possible) of their production of canned fruit, particularly pineapples and mangoes. GIHOC are conducting their own export market survey and seek help from P-E Egham in interviewing a small sample of large retailers in UK and Western Europe.

Study Objectives

1. To help GIHOC identify immediate potential for this year's (1975/76) production of canned production.

2. To identify present suppliers, their presentation and prices.

3. To assess best opportunities for short term sale of fruit, including channels to be used, packaging, type of product and likely prices and quantities to be purchased.

4. To provide a basis for a longer term marketing campaign.

Proposed Approach

Ghanaian products are presently best known in the UK as a result of traditional trading and shipping links. We would agree that UK retailers and first-hand fruit importers offer the most likely immediate opportunity in West Europe. The next most likely opportunity lies in the West German market, access to which is usually through the North West German, Dutch or Belgian ports. We believe that a programme of interviews should cover importers/wholesalers in the UK and in West Germany/Holland/Belgium as well as the major retail chains in the UK.

Study Method

After agreeing on the proposed terms of reference, P-E would propose to carry out the study as follows:

1. Desk Research and Sample Selection. Data is readily available on food consumption and trade patterns in Western Europe and P-E has additional data from previous studies on pineapples. We would establish comparative sizes, growth trends and competitive suppliers of the main Western European markets (say) UK, West Germany, Holland, France, Belgium and Sweden. This data would be used to select the final sample of contacts to be interviewed.

2. Fieldwork. One of our multi-lingual consultants would carry out a programme of semi-structured telephone interviews in English, French and German. It may be possible to carry out a few personal interviews in Covent Garden, the main London imported fruit market. We envisage a programme of interviews of the order:

	UK	West Germany	Holland/Belgium	Total
Importers/wholesalers	10	6	4	20
Retailers	10			10
	20	6	4	30

The interviews would include some of the main UK importers in London, Southampton, Bristol and Liverpool and the major UK food retail chains or wholesalers such as Tesco, Safeway, Wavyline, Waitrose, Sainsburys, Marks & Spencer, Spar etc. We would concentrate on major first-hand importers in the main Hamburg, Bremen, Rotterdam, Antwerp areas for Germany, Holland and Belgium.

3. Analysis and Reporting. Results of the desk research and the field interviews would be collated and analysed by a market research consultant. The results would be included in a report which summarises the study findings and recommends further action to meet your study objectives.

Staffing, Time and Cost

The external content of the study would be supervised by Eric Webber who visited CIDA Commerce Division in June. The desk research, fieldwork analysis and summary of results would be done by a technical consultant from P-E's Marketing Services Department at Egham with experience of similar research assignments.

We could start the study after agreement of the terms of reference, by September 8th. Fieldwork and analysis would be completed 2 weeks after starting work: the printed report would be despatched a week later. The cost would be £925, to be treated as the equivalent of 11 consultant weeks work from the Stage II marketing provision under P-E's contract with CIDA for consulting assistance to CIDA.

Action

1. CIDA to submit details of product type, quantities, packs, timing and likely prices of economy products for sale and to amend terms of reference as required.

2. P-E to proceed with study on instructions from CIDA.

COMPANIES INTERVIEWED

The following importing companies expressed an interest in the prospect of importing canned pineapples from Ghana:

UK

Gill & Duffus,
8 Victoria Street,
Liverpool 2
Tel: 051 236 6871

Anglo-Baltic Produce Ltd.,
52/4 Tooley Street,
London SE 1
Tel: 01 407 4343

Deltec Foods Ltd.,
Deltec House,
193 St John Street,
London EC 1
Tel: 01 253 8400

(1/2) Baverstock & Co.,
St George's Road,
London SE1
Tel: 01 928 7638

(1/2) Peabody Foods Ltd.,
Astronaut House,
Hounslow Road,
Feltham, Middx.
Tel: 01 890 1433

(1) Macloud Ross & Harmony,
76 Long Lane,
London EC1
Tel: 01 606 6407

Rodema Canned Foods Ltd.,
Town Hall Chambers,
32/4 Borough High Street,
London SE 1
Tel: 01 407 8196

J. Gerber Foods Ltd.,
Mappin House,
4 Winsley Street,
Oxford Street,
London W.1
Tel: 01 580 0370

(2) John Martin (London) Ltd.,
Battlebridge House,
87 Tooley Street,
London SE 1
Tel: 01 407 3155

A.J. Mills & Co. Ltd.,
Colonial House,
Tooley Street,
London SE 1
Tel: 01 407 3180

West Germany

Arnold Otto Maier,
Hamburg
Tel: 040 30011

Suesmann,
Hamburg
Tel: 331201

Riccerdeen,
Hamburg
Tel: 2870218

Faust,
Hamburg
Tel: 2509656

(2) Nolting
Hamburg
Tel: 441431

NOTES:

(1) Also sell some more specialised products which might incorporate mango juice, pepper puree, garden eggs and snails

(2) Samples have been given to these companies.

Netherlands

Boas B.V.
Den Haag
Tel: (070) 99 31 00

Winter & Konijn N.V.
Amsterdam
Tel: (020) 10 02 34

E. van de Sandt,
Rotterdam
Tel: (010) 18 20 20/40

Catz International,
Rotterdam
Tel: (010) 31 10 365188

Belgium

Helcotra,
Antwerp
Tel: (031) 33 76 36

Boost,
Antwerp
Tel: (031) 41 37 40

UK CANNED PINEAPPLE IMPORTS

IMPORTS OF PRESERVED, TINNED OR BOTTLED PINEAPPLES INTO THE UK

(1962 - 1975)

YEAR	IMPORTS ('000 Metric Tons)
1962	67.8
1963	53.2
1964	57.4
1965	55.3
1966	64.3
1967	64.0
1968	57.7
1969	54.9
1970	65.3
1971	53.7
1972	53.8
1973	56.2
1974	46.4
1975 (Jan - June incl.)	18.3

Source: H.M. Customs and Excise
Trade of the UK

IMPORTS OF CANNED AND BOTTLED PINEAPPLES INTO THE UK

JANUARY - JUNE 1973 - 1975

Quantity in metric tons

Jan-June 1973	Jan-June 1974	Jan-June 1975
25,391	25,189	18,264

Source: Commonwealth Secretariat, Fruit Intelligence

UK IMPORTS OF CANNED PINEAPPLES AND PINEAPPLE JUICE

VALUE OF IMPORTS OF PRESERVED, TINNED OR BOTTLED PINEAPPLES (1962 - 1974)

YEAR	IMPORTS (Metric tons)	TOTAL VALUE (£'000)	£/TON
1962	67,802	6,953	102.5
1963	53,216	5,292	99.4
1964	57,444	5,739	99.9
1965	55,276	5,651	102.2
1966	64,296	6,587	102.4
1967	63,952	6,409	100.2
1968	57,716	6,283	108.8
1969	54,912	6,246	113.7
1970	65,302	8,255	126.4
1971	53,658	6,990	130.2
1972	53,799	6,816	126.6
1973	56,175	8,917	158.7
1974	46,421	11,044	237.9

Source: H.M. Customs & Excise

IMPORTS OF PINEAPPLE JUICE INTO THE UK (1970 - 1975)

Quantity Imported in Thousand Gallons by Country

YEAR	AUSTRALIA	PHILIPPINES	S.AFRICA	KENYA	USA	OTHER	TOTAL
1970	71	599	1,557	239	72	141	2,679
1971	79	693	1,729	143	50	158	2,852
1972	60	846	1,286	-	13	250	2,455
1973	191	754	1,931		-	245	3,121
1974	97	1,059	1,703	60	18	201	3,138
1975*	-	109	462	-	51	108	730

* These figures for 1975 are for the first six months only

Source: Commonwealth Secretariat, Fruit Intelligence

IMPORTS OF CANNED PINEAPPLES INTO THE UK IN SELECTED YEARS BY COUNTRIES OF ORIGIN

YEAR	EXPORTING COUNTRY - METRIC TONS								
	MALAYSIA	TAIWAN	KENYA	S.AFRICA	PHILIPPINES	USA (HAWAI)	AUSTRALIA	OTHERS	TOTAL
1963	24,760	2,688	3,386	22,415	3,363	4,992	5,298	920	67,802
1964	18,920	994	5,279	20,936	3,623	4,310	2,597	785	57,444
1966	26,607	2,356	3,284	17,275	5,949	3,514	3,787	1,524	64,296
1968	23,148	290	1,863	17,853	6,128	857	6,548	1,029	57,716
1970	25,036	2,101	3,184	19,128	8,214	1,150	2,269	4,220	65,302
1971	21,042	1,153	3,153	18,108	6,057	1,458	538	2,149	53,658
1972	22,030	1,329	3,045	19,074	5,200	1,081	846	1,194*	53,799
1973	22,776	1,753	4,794	16,575	4,283	1,995	699	3,300*	56,175
1974	21,123	1,046	1,647	13,408	5,086	589	154	3,368*	46,421

* Incl. Swaziland: 1972 - 682; 1973 - 2,278; 1974 - 1847

Source: Customs & Excise, Trade of the UK

IMPORTS OF CANNED PINEAPPLES PRESERVED IN SYRUP INTO WEST GERMANY

(1969-1974)

Quantity Imported (Tons)

EXPORTING COUNTRY	1969	1970	1971	1972	1973	1974
Kenya	448	407	2,021	2,791	2,705	2,091
Malaysia	4,166	4,982	4,191	3,433	1,946	4,726
China	2,957	4,641	2,749	4,267	3,407	4,561
Ivory Coast	5,194	7,472	12,302	19,086	19,285	20,471
Philippines	5,654	6,815	11,667	12,708	12,094	3,821
S. Africa	7,737	14,150	12,739	18,256	12,588	7,686
Taiwan	17,980	17,875	24,961	13,034	14,819	7,113
Thailand	1,489	1,696	1,305	1,138	2,012	3,171
USA	8,014	8,997	11,340	9,839	10,328	4,596
Other	117	408	190	508	730	1,000
Total	53,756	67,443	83,465	85,060	79,914	59,236

Source: German Trade Statistics

IMPORTS OF CANNED PINEAPPLE PRESERVED IN SYRUP INTO THE NETHERLANDS

(1965 and 1970-1974)

Quantity Imported (Metric Tons)

EXPORTING COUNTRY	1965	1970	1971	1972	1973	1974
Ivory Coast	125	2,250	3,334	3,011	3,953	3,212
Kenya	-	-	481	588	1,059	528
Philippines	820	1,959	3,712	3,504	2,982	2,715
Taiwan	3,077	2,391	2,730	1,545	1,756	841
USA	3,364	1,456	2,146	1,784	1,942	1,201
Others	679	981	724	616	1,066	956
Total	8,065	9,037	13,127	11,048	12,758	9,453

Source: National Trade Statistics

IMPORTS OF CANNED PINEAPPLE INTO BELGIUM/LUXEMBOURG (1965 and 1970 - 1974)

Quantity Imported (in Metric Tons)

EXPORTING COUNTRY	1965	1970	1971	1972	1973	1974
Ivory Coast	-	1,747	-	2,300	2,000	2,300
USA	3,299	2,353	2,300	1,200	2,000	1,200
Taiwan	1,821	1,211	2,800	3,300	1,800	1,000
Philippines	468	1,400	2,500	1,700	2,100	1,400
Other	994	389	2,800	1,100	1,400	1,900
Total	6,582	7,100	10,400	9,600	9,300	7,800

Source: National Trade Statistics

IMPORTS OF CANNED PINEAPPLE INTO ITALY (1965 and 1970 - 1974)

Quantity Imported (in Metric Tons)

EXPORTING COUNTRY	1965	1970	1971	1972	1973	1974
Ivory Coast	108	2,020	2,579	2,850	2,898	a
S. Africa	85	1,174	919	874	1,568	a
Taiwan	37	304	476	418	-	1,119
Other	724	1,874	2,430	1,837	2,356	4,616 [b]
Total	954	5,372	6,404	5,979	6,822	5,735

a Included if any in 'other countries'

b Of which Costa Rica: 2,398

Source: National Trade Statistics

IMPORTS OF CANNED PINEAPPLE INTO [illegible] (1960 - 1974)

Quantity Imported (tons)

1960	1970	1971	1972	1973	1974
5,400	6,100	6,200	8,700	9,000	5,000

Source: National Trade Statistics

IMPORTS OF PINEAPPLE JUICE INTO SELECTED EUROPEAN COUNTRIES

Quantity (in Tons)

IMPORTING COUNTRY	1971	1972	1973	1974
Netherlands	385	541	130	55
Norway	259	455	525	297
West Germany	1,604	2,528	1,890	998
UK *	2,852	2,455	3,121	3,138

* In thousand Gallons

Source: Commonwealth Secretariat, Fruit Intelligence

[redacted]

[redacted]

[redacted]

MARKETING STUDIES FOR GIHOC DIVISIONS

Division	Previous Studies	Completed During Project to Date		Future Studies		
		Home	Export	Divisional	Multi Divisional	Export
Boatyards		x	x			
Brick & Tile		x			x B	
Cannery			x			x
Distilleries			x			x
Electronics						
Fibre-Bag Mfg.		x				
Footwear		x x		x		x
Glass Manufacturing	x (Czech)	x		x		
Marble Works					x B	
Meat Products		x				
Metal Industries		x x			x B	
Paints	x (MEPI)				x B	
Paper Conversion						
Pharmaceuticals		x		x		
Steelworks	x(Canadian)				x B	
Vegetable Oil Mills	x(Belgian)					

B - Building Materials Survey

The United Nations Industrial Development Organization
Government of Ghana

02599
(4 of 5)

Management Assistance to the Ghana Industrial Holding Corporation

Unido Contract No. 75/3
Project No. DP/GHA/74/002

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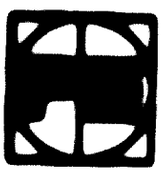

The P-E Consulting Group

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

FINAL REPORT

VOLUME 4

ANNEXES

PRODUCTION AND TECHNICAL

OCTOBER, 1977

THE P-E CONSULTING GROUP

Park House,
Wick Road,
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Surrey.
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THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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PRODUCTION AND TECHNICAL

CONTENTS

[redacted] INDUSTRIAL HOLDING CORPORATION

[redacted] TO STOCK CONTROL IN [redacted]

CONTENTS

CONTENTS
(Continued)

PART A

INTRODUCTION

This guide has been prepared at the end of a two year programme of assistance to GIHOC during which formal stock control systems have been developed and introduced in a number of divisions, for the control of spare parts and raw materials

The purpose of the guide is to

record the background situation in Ghana at the present time which constrains the procurement of adequate quantities of materials for stock, in so far that the stock control systems must take account of these constraints

provide an understanding of the underlying principles upon which the stock control systems have been built

record some of the background problems which existed and how these have been overcome

record the methodology used in making the application

describe the audit of the operation of the system

indicate ways by which greater control can be exerted in the future

provide a reference to enable stock control to be applied to other divisions or other types of material at a future date

It should be noted that although we have adopted a standard approach across all the divisions, there are small differences in each case to meet particular requirements Therefore this guide describes the general situation and an examination in any single division might reveal individual variations

Finally, this guide is NOT intended as a textbook on stock control

L A Abatol
Production Coordinator

A M Marshall
Principal Production
Consultant

Accra, July, 1977

PART B

BACKGROUND

During the period of the project, import controls have been in operation and are likely to continue for some time to come. One of the effects of these controls is that there can at times be a delay in placing an order with an overseas supplier because there is no import license or letter of credit. In introducing the stock control system this extended delivery time has been recognised and incorporated.

Another implication of the controls is that a division may not get sufficient foreign exchange to meet its requirements for raw materials and/or spare parts. If this happens it is beyond the scope of the system to prevent supplies of some items becoming exhausted. However, the procedures do enable the funds available to be spent on those items most in need of replenishment.

Whilst a number of divisions had very good systems for recording stock movements there were no stock control systems which specified when orders should be placed and the quantity to be re-ordered. Accordingly there were few people with any previous experience of stock control. Throughout the project therefore the emphasis has been on a practical approach aimed at

> specifying the items to be held in stock with their quantities, taking stock-room action, as far as possible, to build up stocks, auditing the operation of the system and the actions taken.

No attempt has been made to use anything more than basic stock control techniques, so that, for example, the use of exponential smoothing is for possible consideration at a later date.

A good knowledge of the past or present usage of items to be stocked is a necessity for effective stock control. In many cases, particularly with spare parts, this information was not available, often because the parts had not been previously stocked or had been out of stock for a year or more. In every case we have obtained estimates of usage from those persons most likely to know e.g. engineers under the direction of a Chief Engineer. Inevitably there will be some mistakes both up and down but these can be corrected in the future as accurate information becomes available.

Considerable attention has been paid to training those persons operating or affected by the systems. This has consisted of both on-the-job training and appreciation seminars. This has been consolidated at the time of auditing the systems. Each person involved in the operation of some part of the procedures has also received a manual describing in detail the work to be done both by himself and others.

In each division a senior manager has been made responsible for the effective operation of the procedures. This responsibility has been assigned to the officer most concerned with the use of the materials, irrespective of any control of stores personnel which may be with the Accountant. The responsibilities in the divisions have therefore been allocated as follows:

Cannery, [illegible]	Spares - Commercial Manager
Distilleries	Raw Materials - Procurement Manager
Distilleries	Spares - Engineering Superintendent
Fibre Bag	Spares - Chief Engineer
Footwear	Spares - Chief Engineer
	Raw Materials - Commercial Manager
Glass	Spares - Senior Electrical Engineer
	Raw Materials - Commercial Manager
Metal Industries	Spares - Production Manager
Paint	Spares - Engineering Superintendent
Paint	Raw Materials - Production Manager
Paper	Spares - Chief Engineering Superintendent
Pharmaceuticals	Spares - Senior Technical Assistant
	Raw Materials - Commercial Manager
Vegetable Oil Mills (Estates)	Spares - Engineering Superintendent

These officers are also responsible for the financial investment in stock and ensuring that stockholdings are well balanced. This involves, among other things, adjusting the control parameters in line with current usage. For this purpose they have been given copies of the tables for setting the controls which were designed for their division. They have also received training in the use of these tables.

PART C

SOME GENERAL NOTES

1. WHY HOLD STOCK?

The main reasons for holding stock are because

- the rate of supply cannot match the rate of demand

- it is not feasible to wait until a demand occurs before ordering raw materials or spare parts

- it can be cheaper to buy in quantities greater than required for immediate needs (with very small items it may be the only way of obtaining them)

2. HOW MUCH A SYSTEM

To say WHEN items should be ordered and HOW MUCH should be ordered

WITHOUT
FIXED

- holding excessive quantities in stock
- running out of stock

There is a need to consider

- whether the demand is known or not

- whether the actual demand is likely to vary from what was thought probable

- the length of time it takes to obtain supplies

- the reliability of the supplier in keeping to his quoted delivery time

- the constraints imposed by the import licensing scheme.

3. PURPOSE OF STOCK CONTROL SYSTEM

To indicate in a systematic way

- when an item should be ordered
- how much should be ordered

With the object of

- eliminating the disruption to production which can occur when
  - a machine or piece of equipment fails
  - the stock of materials is exhausted

by maintaining an adequate well balanced stock of spare parts or raw materials

It is NOT economical to maintain stocks sufficiently large to cater for every eventuality To do so would require an excessively high investment

4 THE STOCK CARD

This is the heart of the system It has 3 main purposes

(a) to record stocks, receipts, issues, etc

(b) to provide a means of deciding when to re-order

(c) to provide a means of raising the alarm if stocks fall too low

A common system has been adopted for all divisions and the new stock cards are the only ones which show the quantity in stock and on order, the rate of usage and the cost

5. [redacted]

On the stock card there are three items which help to control stocks. These are -

RE-ORDER LEVEL
ALARM LEVEL
[redacted] ORDER QUANTITY

} These three items are all based on the [redacted] usage of the item.

[redacted] usage has been obtained from -

- forecasts for this year
or - recorded usage for the past 2/3 years
or - estimates

The accuracy of the annual usage figure is vital. It affects -

- when to re-order
- how much to re-order
- when to press the supplier for urgent delivery

If annual usage is estimated too high, the result is

- too much money invested in stock
- too much foreign exchange spent

If estimated too low, the result is

- no materials or spare parts in stock with consequent stoppage of production.

PART D

SETTING THE CONTROL PARAMETERS

On the stock card are entered the BUFFER STOCK, ALARM AT, RE-ORDER AT and MINIMUM ORDER QUANTITY figures. These are known as the control parameters. This part of the guide describes these parameters and how they are calculated.

There are three factors which govern the amount of stock it is planned to hold and these are:

- time taken to order the item
- buffer stock
- minimum order quantity.

1 TIME TAKEN TO ORDER THE ITEM

In the stock control system the delivery period entered on the stock card will be the actual time recorded from a previous purchase or the reliable estimate of the Procurement Officer. For items which can be bought in there the time required may range from only a few days to several weeks.

For imported items the delivery time is complicated by a variety of factors including licencing, letters of credit, relationship between supplier and division, method of transport, time of year etc. Nevertheless in order that a systematic approach can be used it is necessary to determine a standard delivery time.

The delivery time for an imported item can be said to consist of two elements:

- time to place the order with supplier
- time required for supplier to deliver

1.1 TIME TO PLACE ORDER WITH SUPPLIER

In some cases an order can be sent by telex and the supplier will make immediate arrangements to obtain and deliver the part if he has confidence in the division's ability to obtain letters of credit. In other cases however it will be necessary to obtain

pro-forma invoices from overseas. These may be even further delayed at certain times if import licences are not available or letter of credit can not be established readily.

Taking all things together it has been estimated that it is reasonable to assume a period of 1 months is required to place an order with a supplier.

1.2 [illegible]

This can obviously vary depending on whether the item is held in stock or not, and also whether delivery is made by sea or air.

The normal method of delivery will be by sea and a reasonable estimate of time required including delivery to and from the ports at each end will be 1 months.

Providing the part is not obsolete the supplier may need to make or buy the item. Clearly the time for this is variable but most industrial spares would be available within 6 months. That is, the time to obtain the part ranges from 0 (off the shelf) to 6 months, giving an average of 1 months.

The time required by the supplier therefore is

Shipping time + supplier's time

i.e. 1 + 1 = 2 months

1.3 [illegible]

The total delivery time therefore is:

time to place order with supplier + time for supplier to deliver

i.e. 1 + 6 = 9 months

As a general rule therefore a delivery time of 9 months is used as an average value for imported spares.

However, there are exceptions and, for example, the delivery time at Fibre Bag Manufacturing Division has been taken from actual cases as 18 months. For locally obtained items, delivery again can vary and is not always as quick as many people believe. It is useful to standardise and a figure of 3 months is realistic.

2 BUFFER STOCK

Buffer stock is a small amount of stock acting as an insurance against late delivery or usage being greater than estimated.

In a perfect situation a new supply would be received just as the last item was issued from stores. However, in real life the supply can be delayed, for example, as a result the stock is exhausted and any future demands cannot be met. It is to guard against this type of incident, and that of greater than estimated usage, that buffer stock is carried. That the new order should now reach stores just as the stock falls to the buffer level.

Because of the 31st December deadline, the delivery of an imported item cannot usually take longer than 12 months. As a figure of 9 months has been estimated as the time required to obtain an imported item, and as delivery could be shorter, it is in fact not considered necessary to make any buffer stock provision for the late delivery.

If buffer stock is to be provided against demand being greater than estimate, some systematic approach has to be adopted. Therefore, the question to be resolved is by how much will actual demand exceed the estimated usage during the delivery period. There is at present insufficient information available on which to make an accurate estimate of this figure. However, an initial judgement is that a value of 50% of the usage during the delivery period is not unreasonable. With a delivery time of 9 months this is 1/6th of annual usage in the case of imported items, and 1/8th of annual usage for local items with a 3 month delivery period.

3 RE-ORDER LEVEL

In the simplest type of stock control systems a replacement order is raised when the stock actually in stores reaches a pre-determined level known as the re-order level. After this time the stock will continue to fall until, just as the buffer level is reached goods are received into stores. The quantity in stock then rises because of the order received. If the system is to work, the size of the incoming order must be sufficient to raise the quantity held in stores to above the re-order level.

From the above it can be seen that the difference between the re order level and the buffer stock level is the usage during the delivery period, and therefore the order quantity must be greater than the usage during the delivery period. But if the delivery time is very long the order quantity would be correspondingly large. For example, with a delivery period of eighteen months the order quantity would need to be greater than eighteen months usage. However, when a large quantity is received into stores the financial investment will also be very large. This is an undesirable situation as one of the aims of stock control is to minimise the amount of money invested in stock whilst at the same time providing a good level of service to maintain production output.

To overcome this problem and operate in a planned manner with a lower level of stockholding through the use of smaller order quantities, we make use of TOTAL COVER. This term is used to include not only the stock held in stores but also the "stock" which is on order with the supplier. Thus

TOTAL COVER = STOCK + OUTSTANDING ORDERS

Thus on the stock card a record is kept not only of the physical stock and orders, but also of the total cover. As each issue takes place the new value of total cover is compared with a pre-determined re-order level. The value of this re-order level is

RE-ORDER LEVEL = BUFFER STOCK PLUS USAGE DURING DELIVERY PERIOD

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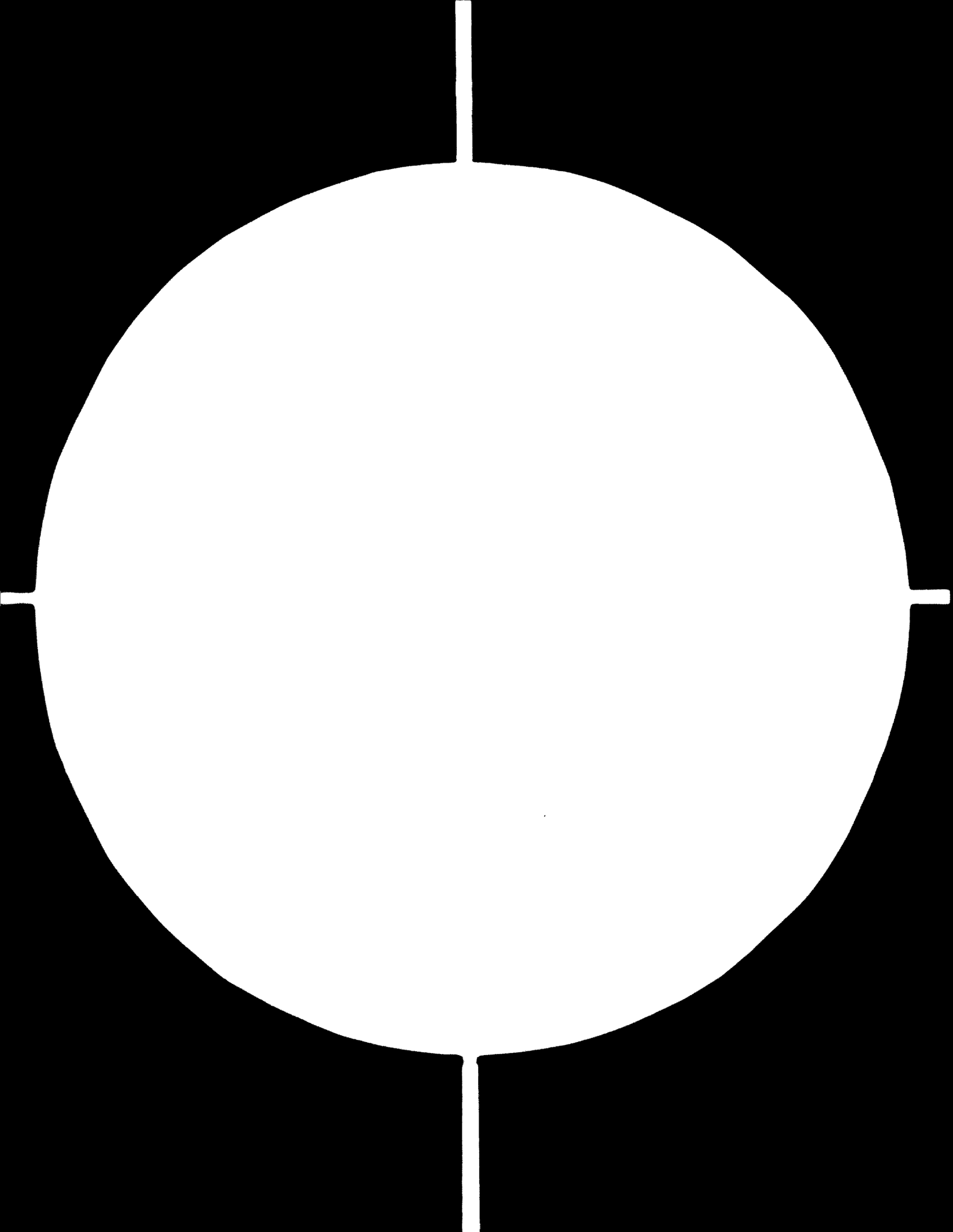

4. MINIMUM ORDER QUANTITY

For some items, mainly small proprietary ones, the order quantity will be fixed by the supplier. That is, he will only accept quantities convenient to himself which could, for example, be dozens, hundreds etc.

For most items however, the quantity to be ordered will be decided by the division. Without any rules for guidance there is a natural tendency to over-order especially where the unit cost is low or will probably rise due to inflation. This is a mistake because:

- it can tie up unnecessary amounts of GIHOC's money in stocks that are unwanted

- it can use up foreign exchange

- if the division does not have the funds it will have to borrow - possibly at high rates of interest

- there is a risk of - spoilage
  - pilferage
  - obsolescence.

The quantity to be ordered therefore needs to be related in some way to the estimated usage. In fact if a new order is raised just as the previous order is received into stores then the quantity received must be sufficient to last until the new order is delivered. That is, the order quantity must be equal to the estimated usage during the delivery period.

It should be noted that the estimated usage during the delivery period is the minimum order quantity. In practice, it may be necessary to make the actual quantity ordered greater than the minimum. This will occur in the situation when the actual cover falls below the re-order level. As a guide, the quantity to be ordered should be the minimum plus the amount the actual cover is below re-order level. Failure to do this will mean a second order will have to be placed shortly after the first as the re-order level is reached again.

Therefore, in the general case where:-

minimum order quantity = usage during delivery period

with a delivery time of 9 months the minimum batch quantity can be expressed as 75% of annual usage.

However, where the delivery period is very long, as the 18 months at Fibre Bag, it is preferable to review each item annually with the object of ordering every 12 months. In this case the quantity to be ordered must be sufficient so that when it arrives in stores it will last until the next order is due to arrive i.e. it must be the equivalent of 12 months usage. As will be seen below the result will be a lower investment in stock than if a quantity sufficient to last 18 months were ordered.

5. ALARM LEVEL

In theory an order is received into stores just as the stock reaches buffer level. If however delivery is longer than expected and/or usage greater than estimated the stock will fall to below buffer level. However, it is not very sensible to allow the stock to be used up without taking action to get the next order delivered. To help prevent this situation arising it is necessary to set an alarm level on the stock card. When the physical stock falls to the alarm level the storekeeper notifies management who must decide what action, if any, is required to expedite delivery of the outstanding order.

There is no cause for alarm when the physical stock falls to the buffer level as indeed it is expected to do so. It follows therefore that the alarm level must be below the buffer stock. The amount by which the alarm is below buffer is a matter of judgement but a figure of 50% is not unreasonable.

Therefore:-

Alarm level = 50% of buffer stock
= 50% x 37.5% of annual usage
Alarm level = 18.75% of annual usage.

Within GIHOC there is a wide variety of delivery periods but in the general case mentioned earlier a figure of 9 months was used. Buffer stock was taken as 50% of usage during the delivery, therefore:-

ROL = 50% of 9 months + 9 months
= 112.5% of annual usage.

For convenience, a figure of 1 times annual usage can be used. Therefore the re-order level will be set at the estimated annual usage.

With spare parts there can be examples where the usage may well be less than one per year, say one every two or three years. In these situations the re-order level might be set at 1. However, there can be a special case where the spares item concerned is very expensive as might be with a replacement gearbox or motor. If the re-order level is set at 1 there could be a high probability of receiving the new order into stores a very long time before the first one was used. Thus for much of the time the division would have two in stock, a situation which would provide one excellent service to production but would involve a heavy financial investment and be wasteful of foreign exchange.

One solution to this particular problem is to set the re-order level at 0. In this way, re-ordering only occurs once the item has been issued from stores. The general expectation would be that the next order would be received into stores before the next breakdown occurred. Of course there is a risk with this policy of the opposite happening in which case production might be severely disrupted. Decisions on important items such as these must be made by management and reviewed by them in the light of experience.

6. AVERAGE STOCK

At any given point in time some of the items in stock will be at their buffer level. Other items will have just been replenished and the quantity in stock will be the buffer plus the order quantity. Thus for any item and for the stores as a whole there will be a stock fluctuation due to the order quantity. The average amount held in stock however will be:-

$$\text{average stock} = \text{buffer stock} + \frac{\text{order quantity}}{2}$$

If the figure of average stock is multiplied by the unit cost the answer will be the average investment. This figure of average stock is a useful measure and it makes it possible to calculate the average stock investment after the stock control application or when the parameters are changed.

7. CONCLUSION

Appendices II, III and IV are typical tables of control parameters for items with delivery periods ranging from 3 months to 18 months. Similar sets of tables have been made available at the end of each stock control application to enable divisional personnel to modify the control of parameters when necessary and also extend the range of items subjected to stock control.

PART E

ESTABLISHING STOCK RECORD CARDS

In this part of the guide we describe the procedure recommended for setting up the stock records. It is important that this task is carried out in a methodical manner to avoid mistakes being made which could have serious consequences. In particular it is important that each item is correctly identified and a physical check taken of the quantity held in the store.

1. ITEMS TO BE RECORDED

1.1 SPARE PARTS

It is necessary to decide which parts should be held in stock. Clearly not all parts of a machine will wear out or get broken. On the other hand, the range of parts which should be held in stock may be greater than the range actually held in stores. The engineers are the only people with sufficient knowledge of the machines and it is their responsibility to specify the items to be stocked. This should be done by examining each machine in turn and creating a stock card for each item specified. Stock cards should also be created for any part held in stock, even if not specified, but only for a machine in current use. In this case it is unlikely that the part will need to be re-ordered and therefore the front of the card should be marked "Do not re-order" in pencil.

Parts which are held in stock for machines which are truly obsolete will not be applied but will be listed for possible disposal.

1.2 RAW MATERIALS

A stock card will be created for all production materials currently used and also for redundant items held in stock. In the latter case the cards will be marked in pencil "Do not re-order".

2. STOCK CARDS

Two standard stock cards will be used, a green one for production materials and a brown/pink card for spare parts. The size of card is 11⅛" x 8¼". The method of storage can be left to the division but a convenient method is to store in a box approximately 4¾' deep by 10" long. An example of a stock card is given in Exhibit I.

3. SEQUENCE OF IMPLEMENTATION

The system should be introduced in a logical manner. For spare parts it should be on a machine by machine basis with priority being given to the most important machines in the plant. These may either be machines which are the most numerous or those of vital importance. Priority should not be given to machines which are about to be scrapped or replaced by another of a different model. All the parts on the machine which are to be stocked should be completed before moving on to the next machine. Where possible a machine should be dealt with in a logical manner by sub-dividing into units e.g. gearbox, and creating new record cards for all parts in one unit before proceeding to the next. When it appears that all parts for a machine have been included, a check should be made in the stores to ensure that there are no other parts in stock which may have not been listed.

4. CO-OPERATION

In establishing stock records, information is required from various departments whose personnel will probably be busy with their daily routines. Requests for information for a batch of cards may be countered with a suggestion to return later and possibly to leave the cards. This situation must be avoided as errors can easily occur and cards get lost due to the delay. Where possible the person doing the application should offer to obtain the information himself from the departmental files.

5. NUMBER OF PARTS TO BE APPLIED AT ONE TIME

In applying the system it is necessary to collect, check and record information. This is gathered from a number of sources such as engineering, purchasing and stores. For each part or item there is therefore a sequence of events to be followed. It would be uneconomic to process only one part at a time through this sequence and therefore a number of items should be taken together as a batch. A useful "batch size" is 20-25 items. Any larger number may lead to difficulty in reconciling the actual state of affairs due to the time taken to pass through the sequence.

6. METHOD OF APPLICATION

The following is a suggested method of application referring to a situation where some form of stock card exists although only for the purposes of stock recording and not for control. The example is for spare parts but the procedure for raw materials would be similar.

Take a batch of 20-25 new stock cards and proceed as follows:-

6.1 Select an appropriate number of existing stock cards and copy PART No. and (machine) USED ON in ink on new card. Also enter part name in space headed DESCRIPTION - but in pencil

6.2 From the original stock card copy onto the new stock card the supplier's name (if known)

6.3 If the information is available, calculate the annual usage for each of the last 2 or 3 years and enter on the card; otherwise estimate the annual usage

6.4 Make a physical check of the quantity in stock and mark the bin location in a distinctive manner to show this has been done

6.5 Enter the stock check figure on the OLD STOCK CARD. If there is a discrepancy take account of any requisitions that may be in stores but which have not been posted.

6.6 When the physical stock quantity has been agreed enter onto the NEW STOCK card:

- the date
- the words 'STOCK CHECK' in column headed REFERENCE
- the quantity in stock - in column headed IN STOCK 'a'.

6.7 Enter lightly in pencil (so that it can subsequently be erased) in some convenient place on the card the date and reference numbers of the last two orders received.

6.8 Replace OLD STOCK CARDS in original filing location and take batch of new cards to Purchasing department.

6.9 Enter name of supplier if not previously recorded in stores.

6.10 It is necessary to enter the delivery time for the previous two orders received. Using the reference pencilled on the cards in stores, check with the purchasing copy orders to find the delivery time involved. It is important that this figure spans the period from when the puchasing department received the request to purchase through to the receipt of those parts in stores.

If there has not been a receipt for that item during the previous two years, either obtain an estimate from the Purchasing Officer or use a typical delivery time for other parts from that supplier.

Enter the delivery time on the cards with that for the most recent in the second line. Erase the order references pencilled on the stock card

6.11 Check for any outstanding orders and enter on card with the longest dated order written first:-

date		
purchase order number	- in column headed	REFERENCE
unit price	- " " "	UNIT PRICE
quantity	- " " "	ORDER QUANTITY
add the order quantities		
and enter the total	- " " "	TOTAL ON ORDER
opposite the last order		

6.12 Add the quantity in stock to the total quantity on order and enter the sum in the column headed TOTAL COVER a + b opposite the entry of total on order.

6.13 Enter in pencil, the BUFFER STOCK, ALARM AT, RE-ORDER AT, and MINIMUM ORDER QUANTITY figures. The method of doing this is described in PART F of this manual.

6.14 Compare the TOTAL COVER with the RE-ORDER AT figure. If the total cover is at the re-order level raise a requisition to order the minimum order quantity. If the total cover is below the re-order level the quantity to be ordered will be the minimum order quantity plus the amount by which total cover is below re-order level.

6.15 Compare the quantity in stock with the ALARM AT figure and discuss with the Purchasing department the action to be taken if stocks are below the alarm level.

6.16 Check with the engineering department that the part description pencilled on the card is the correct one as used by the manufacturer. Enter the correct description in INK on the card. Also ensure that the stores ledger in the accounts department carries the correct description.

6.17 Where the confirmed name differs from that used in stores a note will be given to stores personnel of the correct name for future use.

6.18 Return to stores. Remove OLD STOCK CARDS. Check both sets to see if any movements have taken place since the new cards were made out. If so, copy the entries onto the NEW CARD and produce new totals for IN STOCK, ON ORDER, and TOTAL COVER as may be necessary

6.19 Place NEW STOCK CARDS into storage file and OLD STOCK CARDS into a dead file.

7. ANNUAL USAGE

Whilst the annual usage described under 6 above was the historical usage based on previous consumption, with raw materials it may be possible to use the more accurate information obtainable from the annual production plan for the current or following year.

8. RATE OF APPLICATION

Once the application has started and the personnel concerned have gained experience it is essential that momentum is maintained. For this purpose an equitable target should be set for the number of parts to be applied each week. The actual performance against this target should be recorded weekly and cumulatively.

9. TAKING ACTION TO ORDER ITEMS AS A RESULT OF APPLICATION

IMMEDIATE ORDERING

Arising out of a stock control application there are usually a number of items which are at or below re-order level. It is important to list these and start the process immediately of requisitioning for eventual purchase.

PART F

STOCK CONTROL RESPONSIBILITIES AND PROCEDURES

Having established the stock record cards it is necessary to establish the organisation and administration essential to make the system operate. In particular attention must be given to:

- clearly defining who is to be responsible
- for the effectiveness of stock control including procedures, investment and balance of stocks
- setting out the duties and responsibilities of each individual who has some part to play
- setting down how the pieces of information used in the procedures should be transmitted and recorded
- clearly defining what ACTION is required under a variety of conditions.

The way in which responsibilities are allocated and detailed procedures developed depends to some extent on the existing organisation and administration of a division. There is a need therefore to introduce these new features within an existing framework. This requires clear discussion with all personnel involved, for example, Accountant, Storekeeper, Works Manager, etc. Each of these officers must be instructed in his responsibilities and duties. The whole scheme should be discussed in detail with all the officers together, so that all are aware of the part played by each other.

Finally, it is necessary to set out the detailed responsibilities in a divisional manual. Copies of this manual should be issued to each individual who is involved and care taken to ensure they understand both what is required of them and also of others. A copy of a typical divisional manual is given in Appendix V.

PART G

IMPORTANT OPERATING POINTS

Part of the operation of the stock control system is the routine recording of receipts, issues and balances on the stock record cards held in stores. Usually this task is done neatly and methodically with few problems. Experience has shown that the difficulties which arise are not with the day-to-day routines but concern important matters which occur periodically. In these cases it is not uncommon for senior officers to forget or ignore their responsibilities under the system, a practice which can lead to severe operating difficulties at a later stage.

This part of the guide is concerned with setting out the more important operating points so that DECISIONS will be TAKEN and RECORDED in a PROPER MANNER.

1. REQUISITIONS AND ORDERS

It is important to recognise the difference between a REQUISITION and an ORDER.

A REQUISITION is a request to order an item. Once raised the requisition exists during the whole of the period of obtaining pro-forma invoices, import licences and letters of credit. A requisition is cancelled either by:

- the action of placing an official ORDER on a supplier
- deciding NOT to place an ORDER.

By definition an ORDER is an official request from a division to a supplier. With imported items it will usually only be raised when the letters of credit have been obtained.

2. NEW ITEMS TO BE STOCKED

When new items are to be stocked the officer responsible (as set out in the manual of stock control procedures for that division) will:

- specify the items to be stocked
- estimate the annual usage

- create the stock cards in the approved manner

- set the control parameters on the cards

- decide the quantities to be purchased

- requisition the items to be purchased

- enter the date and quantity requisitioned on the card in pencil

- send the stock card to the storekeeper.

Where new items of plant are being ordered the essential spare parts should be ordered at the same time.

3. OLD ITEMS TO BE REMOVED FROM STOCK

Where plant is made redundant any spare parts in store should be withdrawn together with the stock cards. This action is the responsibility of the Chief Engineer in liaison with the Accountant. The same principle applies to production materials, the responsibility being that of the Production Manager.

4. REQUISITIONING NEW ORDERS

In the process of requisitioning the Production Manager/Engineer have responsibilities as does the storekeeper. The responsibilities of these two officers are:-

a) Storekeeper's responsibility

- as each issue is entered on the stock card, check the total cover against the re-order level

- when re-order level is reached enter item number and description on requisition

- enter details of requisition in pencil on the left of the stock card.

Requisitions are sent to Production Managers or Chief Engineers together with the stock cards either as the requisition is entered or periodically, e.g. every 3 months, as set out in the procedure manual for that division.

b) Production Manager/Engineer's Responsibility

On receiving a requisition the responsibilities of these officers are:

- to VERIFY an order is required

- to approve requisitions and pass to Procurement Department

- to notify stores of action taken by copy of requisition and return of stock card.

NOTE:- If it is decided NOT to REQUISITION an item which has reached its re-order level this decision should be recorded on the stock card with the reason and the initial of the officer involved.

When planning major overhauls there is frequently a need to order sets of parts, some of which will not be held in stock, but the quantities of all must be sufficient.

VERIFICATION

When an item reaches its re-order level and is requisitioned, the process of re-ordering is NOT AUTOMATIC. It is necessary for the Production Manager/Chief Engineer to verify that an order is in fact required. In doing this the officer responsible must approach his decision in a logical manner and be prepared to justify the decision.

The process of verification is therefore:

- to check that the items will in fact be required and the product or machine is not obsolete

- to check that actual usage shown on card is the same as estimated in setting control parameters - if not - RE-SET CONTROLS

- if usage is correct - requisition quantity in list

- if usage is higher - use appropriate quantity shown in table of control parameters

- if usage is lower - do not requisition or - use smaller quantity shown in table.

NOTE:- The officers responsible DO NOT have the discretion to order any quantity they think suitable. They MUST ESTIMATE the USAGE and use the RE-ORDER QUANTITY in the TABLE.

5. RAISING THE ALARM

The stock control implementation has been carried out at a time of severe shortage of spare parts and materials. It is hoped that at a future date this situation will have been largely overcome by an additional in-flow of foreign exchange to enable sufficient items to be purchased on a regular basis. At this time therefore it will be necessary for divisional staff to take action to prevent an out of stock situation. For this purpose an 'alarm level' has been set against the physical stock. The responsibilities involved are:-

a) Stores responsibility

- as each issue is posted check quantity 'in stock' against 'alarm level'

- if at or below alarm level - notify Procurement Officer giving order number.

b) Procurement Officer's responsibility

- check to see if supplier has sent any notification of despatch

- if no notification, contact supplier for urgent delivery.

6. ANNUAL REVIEW

It is necessary for the officer responsible for stock control in each division to conduct an annual review of the stock cards. The purpose of this review is to make the control of stock more effective. It is carried out in early January each year after the storekeeper has entered the consumption for previous year. The Production Manager/Chief Engineer examines each stock card in turn and:

- checks the accuracy of the 'total cover' quantity

- checks that action has been taken on all items at or below re-order level and alarm level

- checks that actual usage is the same as estimated in setting the controls. IF NOT HE RE-SETS CONTROLS USING THE TABLE PROVIDED.

7. AUDIT

Stock control is a new development within GIHOC and its success in any division depends on the efforts of a number of officers who must do things in a different way from previously. Although a considerable time has been spent on in-plant training it is nevertheless possible that in the first year or so of operating, some matters may be overlooked or performed incorrectly. It is for this reason that an independent audit is undertaken periodically by the Production Co-ordinator.

The purpose of the audit is to measure the expected improvement in the stock situation as a result of the proper operation of the system.

Therefore the audit:

a) Measures:-

number of items - on stock control
- at or below re-order level
- have been actioned
- not yet actioned
- out of stock.

b) Compares - the results in (a) with previous audits and the situation when the system was introduced.

c) Examines - the operation of the system
- that action has been taken.

d) Discusses - findings with personnel involved and and with the General Manager.

e) Prepares a Report - issued to the General Manager and Deputy Managing Director (Operations).

8. STAFF

A large number of people have been trained to understand and operate the stock control procedures in ten divisions. If any of these personnel leave or are transferred it is essential that their replacements are properly trained. This is the responsibility of the officer responsible in each case. Assistance can be obtained from the Production Co-ordinator at Head Office if required.

PART H

STOREKEEPING

Good storekeeping practice is an essential element of efficient stock control. During the course of the many stock control applications, a number of situations have been observed within the stores which have had to be corrected before the application could continue. In the following paragraphs we quote these instances as an aid to good storekeeping and stock control.

1. IDENTIFICATION

Every material or part must have a proper description by which it is identified and which differentiates it from all others. If there is a physical or chemical difference a separate identification is required.

EXAMPLES

a) Parts which are "left hand" and "right hand" are not the same and must be stored and recorded as separate items. The same separation is required between single parts and sub-assemblies containing them.

b) Some suppliers have poor parts numbering systems and, as a result, the same number may be applied to similar items of different sizes or features. These differences must be recognised and the parts treated as different items with appropriate descriptions.

c) Some equipment suppliers may use the same part in different locations on a machine and give them either the same or different part numbers. In these cases all these common parts should be stored together and controlled with one stock card. A dummy stock card should be prepared for any part number which is not being used. It will carry no entries but, will be cross-referenced to the 'live' stock card.

2. QUANTIFICATION

Every item held in stores must be capable of being quantified. That is, it MUST be possible to weigh, measure or count.

It may be necessary to make an allowance for any NATURAL loss that occurs between receipt and issue. Sand is often bought in a wet condition but issued dry. Therefore, in taking each delivery into stores the weight must be downrated. Failure to do so will result in an out of stock situation when the stock cards show otherwise.

3. UNITS OF ISSUE

It is the responsibility of stores to issue only the quantities requested on a duly authorised requisition. There can be instances however when the stores will vary the quantity issued. This can happen with very cheap items stored in boxes or very expensive items where only a small quantity is required.

a) Large quantities of very small pins are stored in boxes containing 5,000. The unit of issue will therefore be boxes and issues made in whole boxes.

b) Expensive belting is purchased in rolls. The Engineering Department really needs only a small amount per occasion. In this situation the stores will not issue a complete roll as, once outside the control of the stores, there is an increased risk of pilferage and misuse.

4. LOCATION

It is an essential requirement of good storekeeping that items held in stock can be located when required. This requires that each item should have an adequate allocation of space and a bin card carrying its identification. There should also be some logical layout of the stores such as:

- similar types of materials
- materials for the same product
- spare parts for the same machine

being grouped together.

The location of the item should, where possible, be given a reference known as a bin number. This reference is included on the stock card.

During the stock control application examples of illogical layout have occured. As a result we have found urgently needed spare parts hidden away and long considered to have been out of stock.

PART J

FUTURE DEVELOPMENTS

During the period of the project the major problem has been the difficulty of obtaining imported raw materials and parts due to restrictions on the amount of foreign exchange that can be made available. As a result, the stockholding position is distorted by shortages of many items. When replenishments are made of these items other items fall out of stock and so on. However, it is necessary to look ahead to the time when these problems are overcome and supplies are more plentiful. At that time the task of management will change. There will be much more of a need to look at the total financial investment in stock and to exert controls so that the investment does not just grow and grow in total whilst each individual item appears to be safely under control on the stock card.

There are a number of stock control techniques available, well documented in textbooks, which enable future usage to be predicted from past demand with greater precision than is sensible to do at this time. With greater accuracy it should be possible to reduce the number of occasions on which stock is excessive and therefore more closely fit the pattern of demand.

There is another simple but extremely powerful tool referred to as the Pareto Distribution, or ABC Classification, which enables very tight controls to be exerted. The total amount of money consumed by stock items each year consists of the quantity used of each item multiplied by the unit cost of each item. There is a special term, USAGE VALUE, used for the product of the usage of an item and the unit cost of an item.

For every item in a store we can calculate the usage value. Some will be very large and some usage values will be very small. Here it is interesting to note that whilst some of the large unit values are for items of high unit cost used perhaps no more than once or twice a year, other items of high usage value may have a relatively modest unit cost but be used in large quantities. It is the USAGE VALUE which is important not just the unit cost. The usage values for all the items can then be listed with the item of highest usage value at the top and going in descending order to the lowest usage value at the bottom. Starting with the first item and working downwards, we can similarly write down the cumulative usage value so that the last entry is the total usage value for the whole of the stock.

If we examine the cumulative usage value listing again by starting at the top and going down we always find the few items at the top account for a large percentage of the total. We can call these 'A' items. It is quite common to have, say, 10% of all items classified as 'A' and accounting for perhaps 75% of the total usage value. At the bottom end of the listing it is usual for the last 60% of items to account for, say, only 10% of usage value. These are the 'C' items. In the middle range, the 'B' items which are perhaps 30% of all items may account for 15% of the total usage value. This can be represented graphically with percentage of usage value on the vertical scale and percentage of items horizontal. The result is a curve rising steeply then curving away with a long flat tail at the top.

The usefulness of the classification lies in the fact that so few items account for such a large percentage of the money being spent. It follows then that if a tight control is maintained over the few items this control will have a large effect on the total investment. As we have seen the investment in stock is related to the size of the order quantity. Thus by carefully examining each requisition for an 'A' class item, and ordering in small quantities only, the total investment can be kept well under control with the minimum of effort.

DIAGRAM SHOWING RELATIONSHIP BETWEEN STOCK AND TOTAL COVER

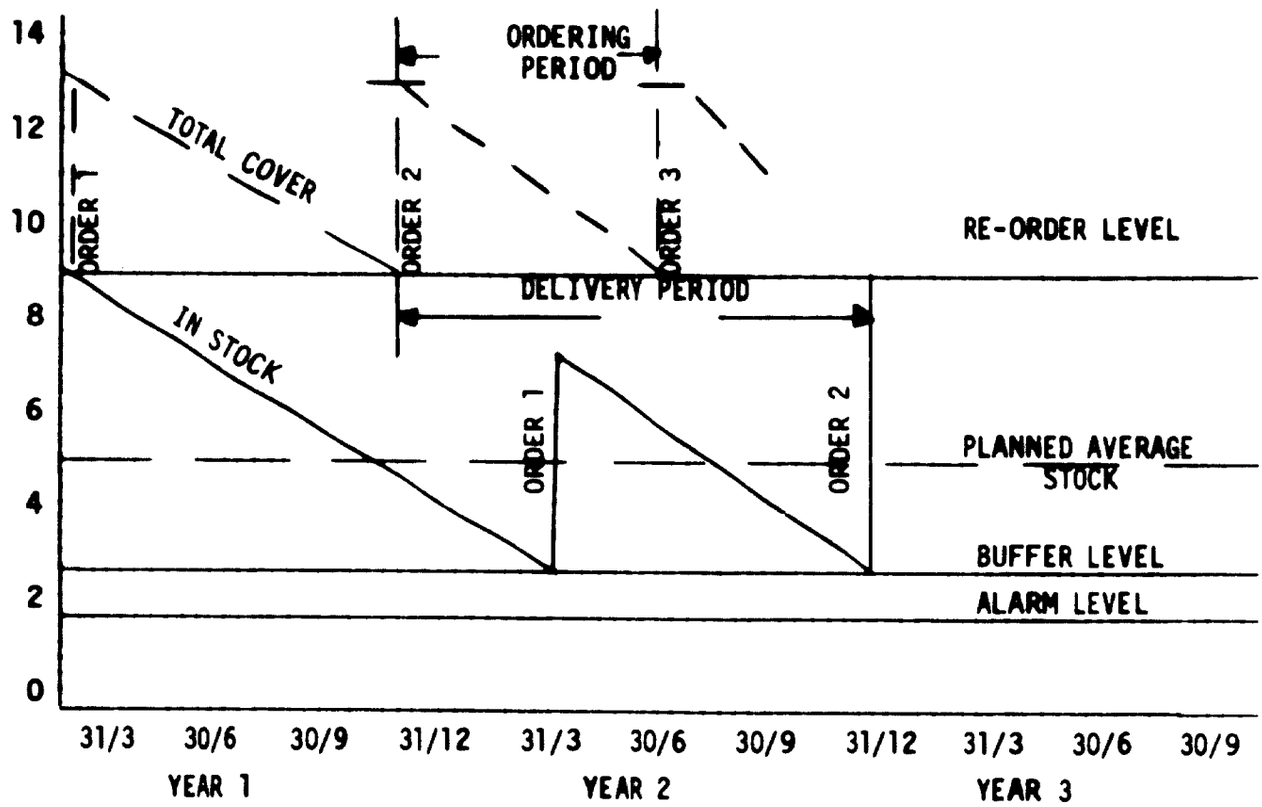

DIAGRAM SHOWING RELATIONSHIP BETWEEN STOCK AND TOTAL COVER

BASED ON: ANNUAL USAGE = 4
DELIVERY PERIOD = 18 MONTHS
ORDERING PERIOD = 12 MONTHS

$\therefore$ USAGE DURING ORDERING PERIOD = 4
MINIMUM ORDER QUANTITY = 4

THEREFORE:- USAGE DURING DELIVERY PERIOD = $4 \times \frac{18}{12} = 6$

BUFFER STOCK = 75% of ANNUAL USAGE = 3
RE-ORDER LEVEL = BUFFER + USAGE DURING DELIVERY PERIOD
= 3 + 6 = 9
ALARM LEVEL = 50% OF BUFFER = 2
PLANNED AVERAGE STOCK = BUFFER + $\frac{\text{MINIMUM ORDER QUANTITY}}{2}$

$= 3 + \frac{4}{2} = 5$

NOTE:- It is possible to have two orders with the supplier at the same time e.g. 31/12 to 30/6 of year 2.

TABLE SHOWING THE CONTROL PARAMETERS FOR ITEMS WITH 9 MONTH DELIVERY PERIOD

ANNUAL USAGE (A.U.)	BUFFER STOCK 37.5% of A.U.	RE-ORDER LEVEL 100% of A.U.	MINIMUM BATCH QUANTITY 75% of A.U.	ALARM LEVEL 18.75% of A.U.	PLANNED AVERAGE STOCK
Less than 1	0	0	1	0	0.5
1	0	1	1	0	0.5
2	1	2	2	0	2
3	1	3	2	0	2
4	2	4	3	1	3.5
5	2	5	4	1	4
6	3	6	5	1	5.5
7	3	7	5	1	5.5
8	3	8	6	2	6
9	3	9	7	2	6.5
10	4	10	8	2	8
11 - 25(18)	7	18	14	3	14
25 - 50(38)	14	38	29	7	28.5
50 -100(75)	28	75	56	14	56

- FOR IMPORTED ITEMS ONLY

TABLE SHOWING THE CONTROL PARAMETERS FOR ITEMS WITH

- AN 18 MONTH DELIVERY PERIOD
- ANNUAL RE-ORDERING

ANNUAL USAGE (A.U.)	BUFFER STOCK	RE-ORDER LEVEL	MINIMUM BATCH QUANTITY	ALARM LEVEL	PLANNED AVERAGE STOCK
	75% of A.U.	225% of A.U.	100% of A.U.	37½% of A.U.	
Less than 1	0	0	1	0	1
1	1	2	1	0	2
2	2	5	2	1	3
3	2	7	3	1	3.5
4	3	9	4	2	5
5	4	11	5	2	6.5
6	5	14	6	3	8
7	5	16	7	3	8.5
8	6	18	8	3	10
9	7	20	9	3	11.5
10	8	23	10	4	13
11 - 25 (18)	14	41	18	7	23
25 - 50 (38)	29	86	38	14	48
50 -100 (75)	56	169	75	28	93.5

- FOR SPECIAL GROUPS OF IMPORTED ITEMS ONLY
  e.g. AT FIBRE BAG MANUFACTURING DIVISION

TABLE SHOWING CONTROL PARAMETERS FOR ITEMS WITH 3 MONTH DELIVERY PERIOD

ANNUAL USAGE	BUFFER STOCK	RE-ORDER LEVEL	MINIMUM BATCH QUANTITY	ALARM LEVEL	PLANNED AVERAGE STOCK
2	0	0	1	0	0.5
4	1	2	1	0	1.5
8	1	2	2	0	2
10	1	4	3	0	2.5
12	2	5	3	1	3.5
16	2	6	4	1	4

- ONLY FOR ITEMS OBTAINED IN GHANA

EXAMPLE OF TYPICAL PROCEDURES MANUAL

GHANA INDUSTRIAL HOLDING CORPORATION

FIBRE BAG MANUFACTURING DIVISION
SPARES STOCK CONTROL PROCEDURES

CONTENTS

Prepared by:-

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FIBRE BAG MANUFACTURING DIVISION
SPARES STOCK CONTROL

PART A

INTRODUCTION

This paper sets out the main features of the spares stock control system being introduced into the division, together with the duties and responsibilities of the persons concerned with operating the system.

PURPOSE

The purpose of the spares stock control system is to indicate in a systematic way:

- when an item should be ordered
- how many should be ordered

with the object of:

- eliminating the disruption to production which can occur when a machine or piece of equipment fails

by:

- maintaining an adequate, well-balanced stock of spare parts.

It should be noted that it is NOT intended to maintain a level of spares stock sufficient to cater for every breakdown. To do so would require an excessively high investment.

SCOPE

Spares stock control is being applied to all mechanical and electrical items. Tools, consumables and vehicle spares which are stored in the same location have not been covered but could be done so at a later date using the same principles.

CONSTRAINTS

The system has been introduced during a period when purchases of materials from overseas, including spares, are subjected to annual import licencing. The system has been designed to cope with this constraint, but could be modified if licencing were abolished and spares could be purchased as and when required.

ORDERING FREQUENCY

It is intended that items requiring re-ordering should be collected together and ordered at the end of the quarter i.e. 31st December, 31st March etc. In theory this would mean ordering four times per year. In practice, it may not be possible to order items in the latter part of the year (if for example the licence has been used up). In these cases, re-ordering may have to be held over till the following year but the re-order levels are set sufficiently high to allow for this delay.

RESPONSIBILITY FOR SYSTEM

The spares stock control system is designed primarily to aid the work of the Engineering Department which includes the maintenance function. The Chief Engineer is therefore responsible for the efficient operation of the system across all departments within the Division.

The Production Co-ordinator from GIHOC Head Office is responsible for the future development of the system and it is to him that any operating queries should be directed.

FIBRE BAG MANUFACTURING DIVISION

SPARES STOCK CONTROL

PART B

STORES SUPERINTENDENT - DUTIES AND RESPONSIBILITIES

The Stores Superintendent is responsible for the safe keeping of the goods in his store. He is also responsible for the accuracy of the two main records; the bin card and the stock control card.

It is the duty of the Stores Superintendent to compare:

- quantity in stock (a) with the figure shown in ALARM AT
- total cover (a+b) with figure shown in RE-ORDER AT

and notify the Chief Engineer in all cases where the quantity in stock or total cover is less than or equal to the figure in the box i.e. the control parameter.

1. ROUTINE POSTING OF STOCK CARD

The following paragraphs describe the entries to be made on the spares stock control card on each occasion a stock movement occurs.

1.1 STOCK ISSUES

Enter
- date
- requisition reference - in column headed REFERENCE
- quantity issued - in column headed OUT
- new stock quantity - in column headed IN STOCK
- DEDUCT quantity issued from quantity shown as TOTAL COVER and enter new total - in column headed TOTAL COVER
- signature - in column headed INITIAL.

1.2 ORDER RECEIPTS

Enter
- date
- goods receipt numbers - in column headed REFERENCE
- quantity received - in column headed IN
- new stock quantity - in column headed IN STOCK
- DEDUCT quantity received from TOTAL ON ORDER and enter new total - in column headed TOTAL ON ORDER
- signature - in column headed INITIAL.

NOTE: If quantity received is greater than the quantity which was ordered, INCREASE the quantity in TOTAL COVER column by the excess quantity.

1.3 ORDER REQUISITIONED

Enter
- date) IN PENCIL - at top of card in
- quantity requisitioned) space marked DELIVERY TIME FOR ORDERS

NOTE: This information will be entered from a copy of the official requisition typed in the Chief Engineer's Office.

1.4 ORDER PLACED

Enter
- date
- purchase order number - in column headed REFERENCE
- quantity ordered - in column headed ORDER QTY
- ADD, quantity on order to total on order and enter new total - in column headed TOTAL ON ORDER
- ADD, quantity ordered to total cover and enter new total - in column headed TOTAL COVER
- signature - in column headed INITIAL.

and also:

ERASE - quantity requisitioned and date - written in pencil in space marked DELIVERY TIME FOR ORDERS.

NOTE: This information will be entered from a copy of the supplier's pro-forma invoice supplied by the Procurement Officer at the time of placing the official order.

1.5 RETURN TO STORE

Enter
- date
- RTS - in column headed REFERENCE
- quantity returned to store - in column headed IN
- new stock quantity - in column headed IN STOCK
- ADD quantity received to total cover and enter new total - in column headed TOTAL COVER
- signature - in column headed INITIAL.

1.6 STOCK CHECK

Entries to be made in RED ink.

Enter
- date
- stock check - in column headed REFERENCE
- quantity in stock - in column headed IN STOCK
- INCREASE or DECREASE in total cover by the amount physical stock has been adjusted (if any) - in column headed TOTAL COVER
- signature - in column headed INITIAL.

1.7 MONTHLY CONSUMPTION

Each time a card is withdrawn to requisition a new order, the quantity issued in each of the previous months will be entered in the table headed MONTHLY CONSUMPTION. The quantities entered must include any adjustments that might have been made due to returns to store or stock check.

During January of each year, monthly consumption and total usage for the previous year will be entered on all the stock cards. If there has been no movement during the year NIL should be entered.

2. REQUISITIONING PARTS FOR RE-ORDER

As each issue is entered on the stock card a comparison will be made between the quantity shown in the column headed TOTAL COVER and the quantity entered at RE-ORDER AT. Where the total cover becomes equal to or less than the re-order level, the part number and description will be entered on a requisition list.

At the end of each 3 monthly period, the stock cards will be withdrawn for all items on the requisition list. The proposed re-order quantities will be entered on the requisition list and the list together with the relevant stock cards will be sent to the Chief Engineer.

3. NEW PARTS TO BE STOCKED

When new parts are to be stocked, the Stores Superintendent will make out new stock cards. It is his duty to ensure that the Chief Engineer gives the correct specification of DESCRIPTION, PART NUMBER, and USED ON, and set the correct control parameters, i.e. ALARM AT, RE-ORDER levels, the MINIMUM BATCH QUANTITY and the BUFFER STOCK. He must ensure that the name of the suppliers and the delivery period are specified.

4. OLD PARTS TO BE REMOVED FROM STOCK

When old parts are to be removed from the store for disposal or scrapping, the Stores Superintendent will pass the relevant stock cards to the Chief Engineer who will in turn pass them to the Divisional Accountant with his recommendations.

5. WHEN PHYSICAL STOCK REACHES ALARM LEVEL

The Stores Superintendent will notify the Chief Engineer so that the necessary action will be initiated to obtain delivery of outstanding orders before shortage occurs.

FIBRE BAG MANUFACTURING DIVISION

SPARES STOCK CONTROL

PART C

CHIEF ENGINEER - DUTIES AND RESPONSIBILITIES

The spares stock control system has been established to assist the engineering section to maintain an efficient manufacturing and engineering operation. The Chief Engineer is therefore responsible for the total operation of the system. He is also responsible for the type and quantity of items held in the store and therefore the service provided and the investment this involves.

1. ROUTINE RE-ORDER

The Chief Engineer will receive from the Stores Superintendent, at the end of each quarter, a list of all parts which have reached their re-order levels during the previous three months, TOGETHER WITH the stock cards concerned. Normally he will take a decision to re-order the parts required, but will not do so if he knows a machine is to be withdrawn from service.

The Chief Engineer will check that the actual usage is the same as that used in setting the control parameters. If not, the parameters will be RE-SET using the table provided.

The Chief Engineer will issue a typed copy of the requisition list to the Procurement Officer. The quantities to be ordered will be:

- where usage is correct - requisition quantity as original list
- where usage is higher - use larger quantity shown in table
- where usage is lower - do not requisition - or use smaller quantity shown in the table.

The quantity to be requisitioned will be the minimum quantity shown on the card plus any difference between the total cover and the re-order level. In practice it may be necessary to increase the quantity to an economic purchase quantity. It may also be necessary to increase the order quantity to cater for any planned rehabilitation programme.

The stock cards will be returned to the Stores Superintendent together with a copy of the typed requisition sheet.

2. NEW PARTS TO BE STOCKED

The Chief Engineer will specify all new parts to be stocked. This will involve:

- specification of parts
- estimation of usage
- creation of stock cards
- determination of order quantities
- requisition of items for purchase.

New parts should be ordered at the same time that new items of plant and machinery are purchased.

3. OLD PARTS TO BE REMOVED FROM STOCK

The Chief Engineer is responsible for removing from stock all parts for machines which are permanently withdrawn from service.

4. ANNUAL REVIEW

The Chief Engineer will examine each stock card in January each year after the stores personnel have entered the usage for the previous year. The purpose of this annual review is to:

- check that all items requiring re-ordering have been actioned

- re-set the control parameters where actual usage is lower than previously stated.

FIBRE BAG MANUFACTURING DIVISION
SPARES STOCK CONTROL

PART D

DIVISIONAL ACCOUNTANT - DUTIES AND RESPONSIBILITIES

1. PRICE NOTIFICATION

The Divisional Accountant will notify the Stores Superintendent of the current landed prices for all imported items as well as the purchase price of all local items held in stock.

2. MANAGEMENT INFORMATION

The Divisional Accountant will prepare control returns in a form to be agreed with the GIHOC Head Office Production Consultant.

FIBRE BAG MANUFACTURING DIVISION
SPARES STOCK CONTROL

PART E

PROCUREMENT OFFICER - DUTIES AND RESPONSIBILITIES

The Procurement Officer is responsible for ordering the spares and obtaining their delivery by the time required.

1. ORDERING IMPORTED SPARES

When the Procurement Officer obtains the letters of credit he will send a copy of the pro-forma invoices to the stores for them to post the official order to the stock cards.

2. ORDERING LOCAL ITEMS

When ordering local items the Procurement Officer will notify stores using a copy of the Division's own pro-forma invoice.

3. EXPEDITING DELIVERY

The Procurement Officer will contact suppliers to urge delivery particularly when notified by the Chief Engineer that items have reached their alarm levels.

VOLUME 4

ANNEXE II

GUIDE TO PLANNED MAINTENANCE

IN

CIHOC

GHANA INDUSTRIAL HOLDING CORPORATION

A GUIDE TO PLANNED MAINTENANCE IN GIHOC

1. Introduction

This guide has been prepared at the end of a two year programme of assistance to GIHOC during which a formal planned maintenance system has been developed and introduced to the divisions for the control of their maintenance sections.

The purpose of the guide is to:

- provide an understanding of the underlying principles upon which the system has been built.

- record the methodology used in making the applications.

- record some of the background problems which existed.

- discuss some of the operating problems experienced after implementation.

It should be noted that although we have adopted a standard approach across all the divisions, there are small differences in each case to meet particular requirements. Therefore this guide describes the general situation although an examination in any single division might reveal individual variations.

By the end of the current UNDP/GIHOC project all divisions should be operating the new system. In some cases, notably Glass Manufacturing Division, the system is available but due to shut-down of the plant, the maintenance programmes have been suspended and only "moth-ball" maintenance is being carried out. At Glass

Manufacturing, the system has only been introduced to cover those items of plant that will be used after the rehabilitation programme has been completed. However, as the new plant is installed, maintenance routines and schedules will be completed ready for implementation at the commissioning of the plant.

Finally, this guide is NOT intended as a textbook on planned maintenance.

2. Definition of Planned Maintenance

Maintenance can be defined as all work of an engineering nature done to restore plant, machinery and equipment to an acceptable standard. Planned Maintenance is the application of techniques to achieve the systematic maintenance of facilities. Total maintenance planning embraces all activities necessary to plan, control and record all work done to keep an installation to an "acceptable" standard. This includes preventive and corrective maintenance, periodic overhaul, planned replacement, supplying of parts, workshop functions, repair scheduling, plant history compilation, plant modifications to facilitate maintenance, spare part manufacture and preventive maintenance of spare parts.

Often the terms "planned maintenance" and "preventive maintenance" are taken as synonomous. However, in the table given below showing the major sub-divisions of maintenance, preventive maintenance can be see to be only one aspect of planned maintenance.

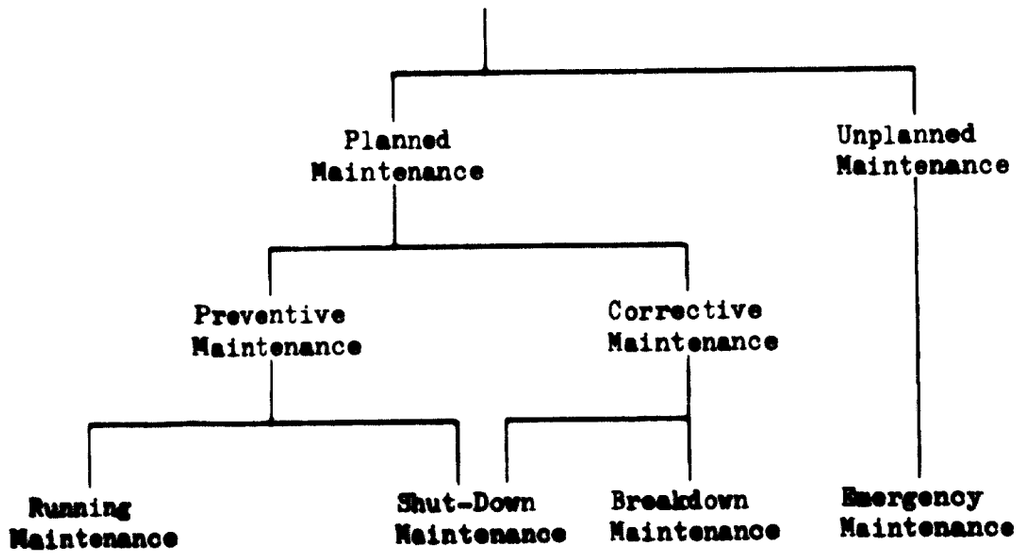

Table 1. Sub-divisions of Maintenance

In a well planned situation, the unplanned or emergency maintenance aspect of the department's work can be as low as five per cent of the total time spent on maintenance.

3. Objectives of Planned Maintenance

The primary objective of planned maintenance is to increase the company's profits or service it provides to society. It is notable that, even today, a large number of engineering and maintenance decisions are made without considering this objective. Planned maintenance contributes to this objective in the following ways :-

- by improving plant availability;
- by reducing the maintenance cost per unit of production;
- by increasing the effective life of capital equipment;
- by collecting and analysing information on equipment performance to ensure that replacement is done at the most economical time and with most economic equipment.

This is achieved in the following way:

- breakdowns are reduced by means of regular engineering inspections, adjustments, services and preventive replacements;
- equipment is neither neglected nor over-maintained;
- maintenance work is scheduled to fit in with production requirements;

- the total amount of maintenance work involved is reduced by the introduction of better methods of doing the work and the need for fewer replacement parts;

- the work of each member of the maintenance staff is planned ahead and maintenance labour requirements are reduced;

- maintenance budgeting and cost control are established;

- equipment is maintained in good working order and hence its useful life is prolonged;

- modifications to plant are planned systematically to ensure maximum productivity at all times;

- cost, performance and technical history is recorded; and this is used as the basis for making meaningful decisions on plant replacement;

- maintenance staff training is established which ensures a constant standard of work;

- continuity of maintenance is provided to ensure that the plan continues with minimum disruption during the course of staff changes;

4. The Cost of Maintenance

Planned maintenance is expensive, but failure to maintain is even more expensive.

The "direct" costs of maintenance are made up of :-

- the wages of the maintenance labour force
- the cost of spares and other materials used
- the overheads of the department itself.

The "indirect" costs of maintenance are incurred through the loss of output and consequent excess production costs.

The returns of these costs can be justified as follows :

- to protect the investment in plant and machinery through regular and adequate maintenance to ensure long life;
- to safeguard the return on investment by maximising plant utilisation with minimum downtime;
- to control and direct the maintenance labour force;
- to maximise utilisation of labour and resources;
- to prevent waste of tools, spares and materials.

There are three main sources of maintenance costs :

- Preventive Maintenance - work done in good time to ensure that an item of plant is available, in working order, when it is required;
- Corrective Maintenance - work done in restoring an unserviceable item to an acceptable standard;
- Indirect Costs of Maintenance - incurred through loss of output and consequent excess production costs.

It should be obvious that the more preventive maintenance is done, the less corrective maintenance will be necessary and that the indirect cost of maintenance will be lower. The optimum level of preventive maintenance will be when the total cost of

maintenance is lower. Table 2 shows this graphically -

(1) Preventive Maintenance
(2) Corrective Maintenance
(3) Indirect Maintenance

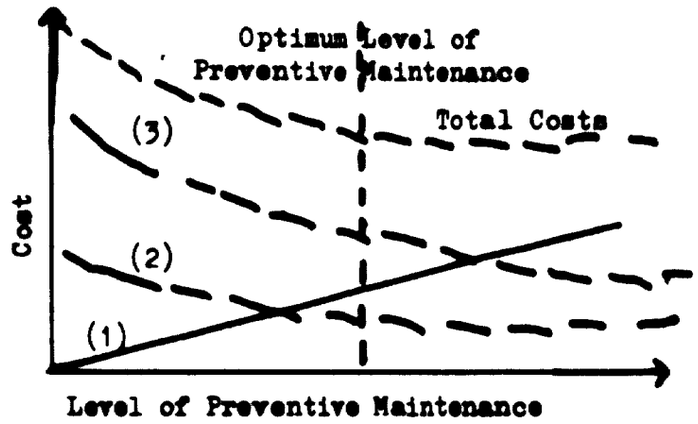

Table 2. Costs of Maintenance

The financial benefits of planned maintenance are not the only advantage. Other benefits, no less important are:

- improved quality of production;
- improved safety from plant and machinery in better condition;
- more reliable production scheduling as a result of increased plant availability;
- better industrial relations. Machine breakdowns are frustrating to operators and management alike.

5. The Elements of Planned Maintenance

As stated above, total maintenance planning embraces all activities necessary to plan, control and record all work done to keep an installation to an acceptable standard. The three basic requirements of a planned maintenance system can be summarised as follows :-

- a maintenance programme
- a means of ensuring the fulfilment of the programme
- a method of recording and assessing the results.

Table 3 gives a comprehensive list of all the elements that one should expect to find in a total planned maintenance system.

Element Number	Element	Description
1	Facility Register	A complete inventory of the items to be maintained.
2	Maintenance Schedule	Schedules for inspection, lubrication and preventive maintenance of the items in the register.
3	Work Specifications	General instruction cards or documents that identify exactly the tasks to be undertaken by the engineers within the maintenance syetem.
4	Maintenance Control System	A trigger system that initiates the activities on the maintenance programme at predetermined frequencies as listed on the maintenance schedule.
5	Resource Schedule	A manpower allocation system to ensure availability of the reeources to implement the maintenance requirements of the plant and optimum use of labour.
6	Maintenance Records	A record of maintenance carried out and a reporting system to management.
7	Maintenance Support Organisation	The organisation of maintenance support in respect of technical information, spare parts, tools etc.
8	Liaison with Production	An effective system of agreeing with production management when maintenance may be carried out.
9	Planned Overhaul	Provisions for ensuring the planned overhaul of plant, either on a regular basis in accordance with the maintenance schedule or during an annual shut-down period.

P.T.O.

Element Number	Element	Description
10	Costing System	Costing procedures to ensure adequate cost control and apportionment of costs in the maintenance department.
11	Training	The necessary training of plant engineers and supervisors in the operation of the systems, and training for works management and production management in aspects of co-operation with the maintenance department.

Table 3 The Elements of a Planned Maintenance System

With the exception of the costing system, all the above elements are discussed below in greater detail with particular emphasis on the application in the divisions of divisional accounting reports issued as a part of the UNDP/GIHOC project. The section headings are :-

6. Compiling the Plant Inventory

See P.M.2

7. Technical Planning

8. Programming and Issue of Planned Maintenance Work

9. Maintenance Organisational Structure

6. Compiling the Plant Inventory

This section describes the first step in the application of a planned maintenance scheme, that is, to compile the Plant Inventory. It sets out to answer the following questions :-

- what is the plant inventory?
- what information should be recorded?
- how should the information be recorded?
- what size of equipment should be uniquely identified?

6.1 What is the Plant Inventory?

The plant inventory is a list of all items of plant and machinery which are owned by a division. It should, however, not be confused with the Asset Register, which is maintained in the Accounts Department although they both contain much the same information. The plant inventory is designed for the use of the engineering department in a division and will contain considerably more detail about plant and equipment than the Asset Register. Furthermore, it will probably not take into account many of the things that appear in the Asset Register such as office furniture, office equipment and such like. The plant inventory for engineering purposes will cover all items of every description which require some kind of maintenance. It must be complete to be fully effective because major items of equipment can be brought to standstill by failure of an apparently insignificant item.

The plant inventory is the basis upon which planned maintenance is built. Its preparation is an essential step in the development and introduction of planned maintenance.

Equally important is the need for the plant inventory to be kept up-to-date. The responsibility for doing this and for feeding the up-dated information to the accounts department to maintain accurate records lies with the engineering department.

6.2 What Information should be Recorded?

The information contained in the plant inventory will vary from organisation to organisation, and will depend both on the requirements of the organisation and on the method adopted to record the inventory.

Essential plant inventory data is:-

- a unique identification for each item
- a description of each item
- manufacturer's name, model number and serial number
- relevant technical details (e.g. speed, rating, capacity, services etc.)
- maker's codes of spare parts.

In some cases, all the details of the plant will be contained on the inventory record, while in others supplementary records will be maintained if there is too much data to put on one record.

6.3 How Should Information be Recorded?

For the purpose of the UNDP/GIHOC Project the plant

inventory will be recorded on two documents. The information required is :-

- Plant Number
- Description of the item including machine type, manufacturer and model number
- serial number of the item (where available).

The list is completed on a department by department basis and care must be taken to ensure that all items are included. It is easy to overlook items that are in hidden corners or even out-of-doors. Therefore it is essential that a check, independent of the compiler, is made.

The Plant List is shown in Appendix I.

Plant History Card

For each item included on the plant list, a plant history card has to be compiled. An example of the card is given as EXHIBIT I.

All the relevant technical data for each item is entered on the front including a section noting the essential spares that should be in stock.

On the back of the card, the plant history is recorded giving details of breakdowns, overhauls and routine servicing.

6.4 What Size of Equipment Should be Uniquely Identified?

It is often difficult to decide what size of equipment should be uniquely identified. All plant and equipment can be categorised under the headings of :-

- A Unit

A Unit of plant could be a collection of pieces of equipment and machinery, all of which are inter-dependent upon and adjacent to each other. Examples of this might be: a rolling mill in a metal processing works comprising a series of roll stands, each of which is dependent upon its neighbour for operation; a boiler installation with all its associated water pumps, fuel feeds, etc. and so on. In effect the unit comprises all the items of equipment which will stop or cannot effectively produce in the event of failure of any single piece that goes to make up the unit.

- An Item

A unit consists of a series of items. An item may be described as a piece of equipment for which a specific maintenance schedule has to be written. An item might be: one of the roll stands of a rolling mill; a carding engine; a nail making machine; a capstan lathe; a bottle washing machine, and so on.

- Spare Parts

Each item of equipment will have a number of replaceable spare parts. Spare parts are generally pieces which are replaced and upon which work is not done. However, they may be subject to a routine re-working or reconditioning process.

In the plant inventory records, it is essential to identify each item of equipment and then indicate in some way that it is part of a composite unit.

6.5 How Should the Items be Identified?

It is essential that each item of plant is given some unique identification number of code so that it

may be clearly differentiated from other items of the same type and may receive individual maintenance attention.

Plant numbering can be :-

a) Systematic, using some type of coding
b) In an arbitrary sequence from 1, without any relation to the particulars of a piece of plant.

a) Coding is of value when plant information is of importance to Management :-

- For segregation of plant particulars of any sort by types, departments, products etc.
- With high value plant, requiring examination of financial return.
- With long-life plant, to assist revaluation in light of inflation.

In most cases complex coding should be avoided unless there is a clearly known use, and any form of coding should be closely examined before acceptance, as its adoption automatically entails work in classification and control.

b) Unrelated numbering is suitable for factories with :-

- Small number of items of plant - say a hundred at most.
- Relatively low value of individual items.
- Plant largely of same type.
- Small range of products.

In these circumstances there is unlikely to be much requirement for segregation into groups for costs, etc. and there is no object in complex coding. In practice this probably applies to a large majority of firms.

The physical numbering of items of plant is important. Standardised positions assist location and the number must be indelible.

For the divisions of GIHOC, it will not be necessary to have a complex coding system. The proposed system to be used is a two letter code, indicating department or section, followed by sequential numbers.

For example at Fibre Bag Division production department, loom section, the looms would be simply identified by :

LM/1 to LM/200.

6.6 Procedure for Completion and Updating of Plant History Card

This section outlines the procedure for entering the details of plant onto the plant history card and the routines to be followed for ensuring that the plant's maintenance history is recorded.

Each item of plant must be allocated a unique plant number following the method outlined above.

A plant history card will be required for each item of plant. Completion of the cards should be in a logical sequence i.e. section by section or machine group by machine group.

After completing the cards for each section an independent check must be carried out to ensure that all items of plant in that section have been included.

The plant history card will be completed as follows:-

1) Enter the plant number and location of the item;
2) Enter a detailed description of the item of plant including model number, capacity etc.

3) Indicate whether the item of plant is new or secondhand and enter the cost. Also enter the date the item was commissioned and its expected life (from the date of commissioning).
4) Note details of the prime movers (if any) under the headings provided.
   NOTE: prime movers are electric motors, diesel motors, belt drives etc.

5) Enter the services required, to enable the item to work, in the spaces provided.

6) Enter the name of the maker of the item, the serial number (if available) and the supplier in the spaces provided. Also note the drawing numbers of any appropriate drawings for the item.

7) Where special conditions apply to the item e.g. because of excessive weight, height, area or foundations, note the necessary information or appropriate drawing numbers.

8) Note the recommended lubricants required for the lubrication of the item.

9) Any further information deemed necessary on the item should be entered under "Notes" in the space provided.

10) Under "Spares to Stock", list those spare parts that should be kept in stock to ensure that no major delays are caused due to shortage of

spares. Examples of spares listed would be due to :

a) long lead time in obtaining them
b) wearing parts
c) parts frequently replaced from past knowledge.

The minimum and maximum numbers of the parts stocked should be noted. Where there are shared parts with other items, the total minimum and maximum numbers of the parts should be noted.

Once a plant history card has been completed, it must be filed section by section in numerical order.

One member of the maintenance staff should be chosen to keep the cards up-to-date. Details of any breakdown or major service must be noted on the back of the card at the time they occur so that a detailed history of the item can be built up.

Details of regular cleaning, lubrication, inspections and adjustments should be entered on the card.

Where alterations or additions are made to the item, this should be noted on the front of the card in the space provided.

It is essential that the senior manager in charge of maintenance carries out frequent, random checks on the history cards to ensure that they are being kept up-to-date and that the information is correct.

7. Technical Planning

This section outlines the next step in the introduction of planned maintenance following the preparation of plant history cards for all item of plant.

Before regular maintenance can be planned it is necessary that a schedule of maintenance practice is devised for each item. This schedule will cover the maintenance operations necessary, the frequency of each of these operations and an estimate of the time each will take.

Planned maintenance requires that the following must be organised for each item of plant :-

i) Cleaning
ii) Lubrication
iii) Inspection
iv) Adjustment
v) Replacement
vi) Overhaul.

The engineer responsible for technical planning will have to take each item of plant, or an identical group of items, and establish the requirement for each of the above classes of maintenance.

The planner will then carry out the following :-

i) List each part which requires cleaning, lubrication, or is subject to wear, fracture, distortion, corrosion etc.

ii) For each of these, decide on the frequency of servicing.

iii) State the <u>exact</u> work to be done in each case.

For the frequency of services, the requirements can be established on one of the following bases:-

a) Calendar basis, on which servicing is done on a strict time basis, regardless of running time.

b) Running basis, in which servicing is related to the extent of utilisation of the machine, measured by hours run, metre of kilos produced.

c) In a few cases a combination of the above may be used e.g. once a month or 10,000 kilos produced, whichever is the more frequent.

Servicing on a calendar basis is the normal method used for most plants. For plant running intermittently or subject to unpredictable use, like a vehicle, the running or combined basis is almost essential.

For the purpose of introducing planned maintenance throughout the divisions of GIHOC, the calendar basis of servicing will be used.

It is essential that the instructions for the tasks to be performed during servicing are positive and clearly defined, containing limits of wear, clearance etc.; not vague remarks like "check bearing for wear". This example could be "check that bearing wear does not exceed 0.25 mm".

However, unless there is detailed information on the servicing of items, either from past experience or from manufacturers' servicing manuals, initially the instructions will, of necessity, not be as positive and clearly defined as desirable. But, as a result of a build up of historical data and experience, the instructions should be up-dated and made more exact.

The technical planning data will be compiled into a Manual for each item, or group of identical items, which will give :-

a) The job required, and how to do it, with a suitable reference number.

b) The frequency of doing the job.

c) An estimate of the man hours required to do the job and the type of labour required.

For the purpose of developing the manuals, the manual sheet given as Appendix II will be used.

The data on the manual sheets must not be regarded as fixed, but must be consistently reviewed in the light of experience, especially from the point of view of :-

i) The tasks to be carried out

ii) The instructions given on how to carry out the task

iii) The frequency of doing each task.

An example of a part completed manual sheet is given as Appendix III.

8. Programming and Issue of Planned Maintenance Work

This section outlines the procedure to be followed for the programming of routine servicing and overhaul of items of plant and the procedures necessary for the issue of maintenance work.

The programming stage can only be completed after the technical planning stage, as described above, has been finalised.

The routine service programme in any section or department is developed from :-

a) The plant list, which states the plant in that section or department.

b) The manual sheets (as described above) which, for each item gives :-
   - what servicing tasks have to be done
   - the frequency of each task
   - an estimate of time for the completion of each task.

From the manual sheet, "Routine Service Schedules" can be produced. These schedules are simply an extract of the manual

sheets giving only the tasks to be performed on any particular service frequency. That is, only the monthly tasks will be listed on a monthly routine service schedule; for the 3-monthly routine service schedule, all tasks up to and including the 3-monthly tasks will be listed. The Routine Service Schedule sheet is given as Appendix IV.

The service programme can then be compiled by tabulating the items of plant and listing the various routine service schedules required and the estimated times for each schedule against each item. Once all items in a section or department have been listed, the various services can be arranged under the weeks that the service is due. By using the estimated time for completing a service, the services can be arranged to give as balanced a work load as possible for each week. It may be, in some cases, necessary to plan for an unbalanced work load where there is a plant shut-down for holidays etc.

Appendix V gives an example of the working sheet on which the programme is developed.

The working sheet, when complete, can be retained as the Master Programme or preferably be used as the basis for a wall-chart which will then be the Master Programme. The programme can be duplicated and issued to maintenance supervisors. For convenience, the programme can be broken down to cover smaller periods of time and, also, depending on the organisation of maintenance staff (i.e. if departmentalised), the programme may be sub-divided on a sectional basis.

Once this stage has been reached, the planned maintenance procedures are ready to be introduced in practical terms. However, it is essential that there are procedures for issuing the work to be done to the maintenance staff and to ensure proper reporting of work done and the condition of items of plant. In most divisions, it will be possible to work with one common document - a JOB CARD. Very large schemes may however require more complex paper-work.

Job Cards are needed for the following reasons :-

- to provide written instructions to maintenance staff.
- to produce a written record of what work has been done.
- to enable a picture to be built up of the forward workload.

Where the job to be done on an item of plant is a routine service, the job instruction will refer to the appropriate Routine Service Schedule, which should be attached to the job card. Where the job is not a routine service, the job instruction will have to be written in sufficient detail for the job to be carried out.

The simplest form of job card is given as Appendix VI. The job instruction and other details are completed on the front of the card; the job report being recorded on the back.

When a job card is returned after completion of the task, the information recorded will be used for the following :-

- updating of the plant history cards
- the issue of more job cards for tasks identified from the previous job cards
- labour control information
- manpower utilisation information.

To ensure that proper control of the maintenance labour force is kept, the following rule must be adhered to :-

- Only One man may work on one job card.

9. Maintenance Organisational Structure

The manager in charge of maintenance may be responsible directly to the General Manager, or responsible to the G.M. through the factory manager. If there is a chief engineer, he will be responsible to him.

Sometimes the functions of the chief engineer, and the maintenance manager are combined. Typical functions of the chief engineer may include :-

- Responsibility for maintenance department
- Responsibility for plant engineering
- Capital work
- Utilities
- Workshops
- Fire precautions, safety etc.

If the engineering functions are fragmented and spread across the organisation both geographically and in terms of responsibility, it may be necessary to centralise maintenance activities to obtain maximum benefit of the engineering planning functions. When considering the organisation in the context of planned maintenance the following points should be borne in mind.

- centralised control generally brings cheaper operation but may cause communication problems.
- each man should report to only one supervisor.
- the higher the functional status of the maintenance department the more effective its operation is likely to be.
- communication lines should be as short as possible.
- a new maintenance planning section to control planned maintenance should be fitted into the organisation to achieve maximum effectiveness.

However, in spite of what has been stated above, decentralisation is to be recommended if localised expertise is required on short notice in certain sections of the plant. Fibre Bag and Steelworks Divisions are examples of where decentralisation could be advantageous. Although control problems are slightly increased, this system has much to commend it, especially where trust and

understanding are developed locally between the operators and the maintenance staff in each section.

The implementation of properly controlled planned maintenance procedures obviously implies additional planning requirements in the maintenance department. It is therefore essential that an engineering planning department is established.

From the start it should be clear that the engineering planning department is a service, not an executive department. All administrative work connected with the planned maintenance scheme will be undertaken by the department but the action remains the responsibility of the engineering supervisors. The size of the engineering planning department will depend upon the extent of the planned maintenance scheme, the size of the plant, and the number of items in the inventory. It may only consist of a part-time clerk partially supervised by the engineer. On the other hand, it may consist of the two or three qualified engineers supervising a team of clerical workers.

The duties expected of an engineering planning department can be summarised as follows :-

- the maintenance of an up-to-date plant inventory.
- assisting in the preparation of maintenance schedules and ensuring that these are issued at correct intervals.
- the co-ordination of the requirements of the engineering and production departments.
- to liaise with production management and decide when plant should be stopped for maintenance work.
- to keep the available work force evenly loaded with work.
- the planning of major overhauls and shutdown maintenance.
- the investigation and recording of all breakdowns with the intention of eliminating the causes.

- the administration of systems to ensure that all engineering work is planned in advance, allocated systematically and followed up to completion.

- bringing any deviations from plan to the notice of the engineer or whoever is in a position to take remedial action.

- to provide management with regular meaningful indices of the performance of the engineering section.

- the maintenance of accurate and meaningful machine history records.

- the training of new engineering personnel in procedures and methods.

- ensuring the availability of spare parts as and when required.

- planning and control of the salvage and re-conditioning activities.

As a final point, it must be recognised that without a properly established section for the planning and control of maintenance, success in the implementation of planned maintenance system will be greatly impaired.

10. Implementation and Operational Problems

The major problem in implementing the new system has been a personnel one. In most divisions, there was a lack of suitably qualified, experienced engineers, particularly mechanical engineers, to write out the preventive maintenance routines.

The maintenance routines have, for the most part, had to be written from first principles. In no case were there suitable

manufacturers' manual which gave comprehensive maintenance instructions for the engineers to follow.

The preparation of the maintenance routines on the manual sheets represents approximately 80% of the time required before implementation can be carried out. Because of this, the preparation of the manual sheets has taken longer than it would have done if an engineer could have spent all his time on the preparation.

In the larger units of GIHOC, it has been necessary to set up Planned Maintenance Control sections to control and operate the new system. The small divisions have been able to implement and run the system with no increase in staff.

In all divisions and sites, the major problem in running an effective maintenance system is the lack of spare parts. No division has a sufficient stock of spares to enable the engineering departments to maintain the plant at a satisfactory level. In many cases in the event of breakdown, long delays are experienced while a new part is obtained or manufactured. Also, in a number of cases, major overhauls are being missed as the required replacement parts are not available. Until such time as a full stock of spares can be obtained, the full effect of the new system will not be seen. However, in many cases, the routine maintenance of equipment has shown an improvement in plant availability. For example, at Paper Conversion Division, machine downtime has improved by 40% since the introduction of the new system.

Experience with the implementations has shown that it is essential that close co-operation between the maintenance and production departments is maintained. It is recommended that regular meetings are held between the two to agree the release of plant according to the preventive maintenance programme. This is especially important in the case of major services and overhaul where the plant may be required by the engineers for a

day of two. Production departments must be given the chance to reorganise their programmes in advance. Failure to co-operate will only cause friction and discontent between the departments and adversely affect the effects of proper maintenance.

S. A. CRUICKSHANK
PRODUCTION CONSULTANT
U.N.D.P./GIHOC
JULY 1977

APPENDIX I

PLANT LIST FORM

PLANT LIST		SHEET OF
DEPARTMENT	DIVISION	
PLANT NO.	DESCRIPTION	SERIAL NO.

APPENDIX II

MANUAL SHEET

MANUAL SHEET		DEPT:	ITEM	COST CENTRE		PLANT NO.
Service Point No.	Service Point	INSTRUCTIONS		Frequency	Estimated Hours	Number of Operatives

P.M.4

AN EXAMPLE OF A PART COMPLETED MANUAL SHEET

APPENDIX III

MANUAL SHEET		DEPT: SOUTH SHOP	ITEM BRINE PUMP	COST CENTRE 086	PLANT NO. BP.21	
Service Point No.	Service Point	INSTRUCTIONS		Frequency	Estimated Hours	Number of Operatives
1	DRIVE	REMOVE TOP HALF OF GUARD AND CHECK SPROCKET KEYS FOR TIGHTNESS AND CHAIN FOR WEAR AND TENSION		Weekly	½	1 Fitter 1 Labourer
2	DRIVING SHAFT	REMOVE TOP COVERS ON BEARINGS AND EXAMINE FOR WEAR AND DAMAGE TO BALL RACES. CHECK PULLEY KEYS FOR TIGHTNESS		6 month	1	1 Fitter 1 Labourer

ROUTINE SERVICE SCHEDULE				
DEPT:		FREQY:	WK. NOS.	
ITEM:		PLANT NO.	COST CENTRE	
SERVICE POINT NO.	SERVICE POINT	SERVICE INSTRUCTIONS	ALLOWED MAN HRS.	OPERATIVES

MASTER PROGRAMME WORKING SHEET

APPENDIX V

ITEM	PLANT NUMBER	SERVICES*	MAN HOURS REQUIRED	SERVICE DATES AND MAN HOURS																	
				WK 1	WK 2	WK 3	WK 4	WK 5	WK 6	WK 7	WK 8	WK 9	WK 10	WK 11	WK 12	WK 13	WK 14	WK 15	WK 47	WK 48	WK 49	WK 50	WK 51	WK 52
MAINTENANCE MAN HOURS PER WEEK																								

* NOTE:- WEEKLY - MONTHLY - 3-MONTHLY ETC.

APPENDIX V

APPENDIX VI

EXAMPLE OF A JOB CARD

FRONT

MAINTENANCE JOB CARD			NO.
PLANT NO.	ITEM:	DATE OF SERVICE	WEEK NO.
MAINTENANCE REQUIRED:			
TRADE REQUIRED:	OPERATOR:	AUTHORISED BY:	

BACK

MAINTENANCE REPORT			
DETAILS OF WORK DONE, SPARE PARTS USED ETC:			
TIME ON:	TIME OFF:	DATE SERVICE COMPLETED	OPERATOR'S SIGNATURE

VOLUME 4

ANNEXE III

ELECTRONICS DIVISION

STOCK AND PRODUCTION CONTROL

GIHOC
ELECTRONICS DIVISION
STOCK AND PRODUCTION CONTROL

1. Introduction

This report is presented as a basis for discussion and agreement on the action to be taken to make further improvements in profitability in the Electronics Division through more effective stock and production control. It has been prepared against the background of a very successful year in 1975, in which production, sales and profits reached very satisfactory levels. Whilst not wishing in any way to minimise the considerable achievements which have been made by divisional management, it is considered that the findings and recommendations discussed below indicate clearly that still further progress can be made.

For convenience of the reader, the remainder of this report is set out under the following headings:-

2. Background

In our preliminary survey at the Division last year it was noticed that although the Division had in the past consistently operated with high levels of stocks this had not prevented shortages occurring with the resulting disruption to production. A significant part of the out of balance stock situation could be attributed to shortcomings in the stock control system which had been introduced some years earlier.

It was concluded that the procurement/stocking/production control functions could be revised with benefit subject to a more detailed investigation.

3. Summary of Findings and Recommendations

3.1 A very significant change in the level of raw material stock has taken place since our initial survey last year. The stock at the end of 1975 was equivalent to an average of about 6 months usage and even less at peak output. In total terms this is not excessive for imported materials.

3.2 The overall investment in stock arises from placing orders for sets of parts to meet the production programme rather than the operation of a stock control system. Also, this investment can be increased quite dramatically by the exercise of commercial judgement to procure quantities in excess of the current programme.

3.3 An out-of-balance stock situation exists with stock outs and shortages on a number of items.

3.4 One of the requirements for efficient production is an accurate knowledge of the number of complete kits of parts available in the store and which could be issued for assembly purposes. The present system does not provide this information which could only be obtained by the laborious process of checking a large number of individual pan or master cards.

3.5 Whilst the bulk of components are ordered in kit quantities, it is necessary to order quantities of individual components to meet additional usage arising for a variety of reasons. The present system does not indicate in a systematic way:

- when a component should be re-ordered
- how many should be re-ordered.

This difficiency in the system exacerbates the shortage situation, because of the delay in re-ordering components.

3.6 There is inadequate control over the issue of kits of components for normal production and this probably contributes to the shortage problem. As an example, the quantity of some components issued against supply lists can exceed the number of kits produced by as much as 15%.

3.7 Some parts of the present system are not being operated satisfactorily. Also, the system appears to require an excess amount of clerical effort.

Following on from these findings, our principal recommendations are that:

- a system of stock control should be introduced which would place the emphasis on controlling kits of components rather than individual components

- provision should be made for individual control of those components whose usage exceeds the number of kits assembled. For this to be effective, the excess usage of those components should be monitored, re-order levels and quantities determined and procedures established to minimise the risk of running out of stock, consistent with acceptable stock holding costs.

More discipline should be introduced to ensure that all aspects of the new systems are operated correctly. This should include stringent control over the quantities of individual components issued for kits and also an audit to ensure that records are accurate and up-to-date. Responsibilities for the various aspects should be clearly defined and delegated to the appropriate members of staff.

NOTE: The proposed systems should result in less clerical effort than would be required to operate the present system correctly.

4. Brief Description of Present System

Components are ordered in kit quantities to match the production programme. Additional quantities of some components are ordered separately to provide stock for excess usage, servicing, etc. For these, order quantities are decided on a judgment as to their likely usage. No formal analysis of historical consumption is attempted. Bulk supplies of locally available common use items such as paint, glue, labels may be ordered as and when required, again without the benefit of any usage analysis.

Imported items are received into the bonded warehouse on site and taken from there when required and put into the main store. When the items are despatched from the supplier, an advice note is received showing quantities despatched. These quantities are posted to bin cards and subsequently to the Master Cards. When the goods are taken into store from the bonded warehouse, quantities are checked against the advice notes and if there are discrepancies a discrepancy note is raised and the bin and Master Cards adjusted from this. When the components are physically put into their stores location, pan cards and updated.

It will be seen from the above that 3 separate records exist for each component. Pan cards are located with the components and they show actual receipts and issues and any adjustments as a result of stock checks.

Bin cards, which are identical to the pan cards, are filed in boxes in the store. Their prime purpose is to show the location of the component to which they refer. In addition, they are said to be used as a cross-check on the accuracy of the pan cards. On each occasion that an entry is made on a bin card, the clerk in charge is supposed to refer to the pan card to check that it is correct. In fact, however, this is done only when the bin card shows nil stock.

Finally, master cards exist for each component and they are designed to contain a considerable variety of information including customs tariff, supplier, standard price, minimum stock level, order quantity, details of orders placed, receipts into stock, deliveries (or issues), stock level and quantity committed to complete the programme. Unfortunately, in practice the only information on most cards is the component code number, description, set or sets used on, quantity per set, unit price and details of orders placed, receipts to store, issues and stock level. Even then, details of orders are posted to the cards only when the preliminary invoice or shipping advice note is received from the supplier. This could be some weeks after the order is placed. Also no indication is given of the total quantity ordered and delivery dates agreed. The preliminary invoice refers only to those components being despatched in one shipment.

Stores issues are initiated in one of two ways. The normal method for the production lines is by means of a supply list. A line supervisor is supposed to request approximately one week's supply of complete kits of components. However, he can specify quantities of individual components and may order more of some items than others. If there is a need for additional supplies of specific components to replace those which have been rejected or lost, the supervisor raises a Stores Requisition Note (SRN). Components required by the Repairs Department are also issued against SRNs. In this case, however, the SRN has to be approved by the Procurement Manager or the Production Controller before issue to ensure that there is sufficient stock available which is not likely to be required by the production lines.

When kits of components are issued, pan cards are updated and the issue quantities noted on the supply list. At the end of each month a new supply list is raised. The previous one is passed to the clerk

in charge of bin cards. He totals the quantities of each component issued during the month, updates the bin cards and records the quantity of each component left in stock. Similarly, quantities of components issued against SRNs are posted to bin cards, but on a daily basis.

When all postings have been completed the supply lists and SRNs are passed to the production controller to enable him to update the master cards.

5. Conclusion on the Present System

At present, postings to the master cards are in arrears by 4 months, the most recent ones being for September, 1975. This, of course, renders them ineffective as means of determining the need to re-order. Even if they were up-to-date, however, the cards do not contain the necessary control data i.e. re-order levels and order quantities, nor do they permit an analysis of consumption.

In other words, the master cards serve no useful purpose other than to indicate the set or sets in which the component is used and to show the unit price of the component. As a result, there is no effective way to control the level of stock and an imbalance has resulted which affects production.

The effect of this imbalance is clearly illustrated in the case of the Philips Mark II radio. There is said to be sufficient stock of components to produce 12,000 sets. At a production rate of 750 per week, this is equivalent to 16 weeks production. In fact, an examination of the pan cards for this radio, has confirmed that some components are already out of stock including handles, screws, and capacitors. Indeed, according to the pan cards, there is less than 10 weeks supply for almost a third of the components (32 out of a total of 103, excluding glue, grease and other common items) and less than 8 weeks supply for approximately 22% (22 out of 103). Details of the components involved are given in Appendix I. From this Appendix it also can be seen that there is more than 15 weeks stock of nearly 25% of components including one component, a washer, for which there is more than 10 years stock available.

One cause of shortages could be that certain components are issued against supply lists in greater quantities than others. It is not known why this occurs, but an examination of pan and bin cards for several components has shown that it does. In particular, it appears than excess quantities of telescopic aerials have been issued during 1975 as follows:-

Model	Issues Against Supply Lists	Radios Built in Year	Excess Issued	
			Qty.	%
Philips Mk II	29,500	26,333	3,167	12%
Sony Mk II	14,230	12,339	1,891	15%

Reference has been made earlier to the incorrect use being made of the master cards. In addition, there appear to be many errors or omissions on them. A 10% sample was anlaysed amounting to some 230 cards, in an attempt to get some measure of the extent of this problem. The more important findings are discussed below.

Out of a total of 232 cards, 69 did not show the result of a stock check although it has not been possible to determine the reason or reasons for this. Of the remaining 163 cards, the most recent stock check was shown to be more than 2 years ago in the case of 70 components. Half of these were subsequently examined and it was discovered by checking with bin cards, that physical stock existed for more than 50% of them. It would therefore appear that there has been some laxity in recording the result of stock checks on the master cards, or possibly even in carrying out the checks. In one particular case the last stock check was shown to be in January, 1971 although there are still 210 of the components in stock.

Whilst the accuracy of entries and subsequent additions or subtractions was not specifically checked on every card of the sample, at least 15 cards out of the total of 232 were seen to contain arithmetic errors.

One component for the Philips Mark II radio has been purchased consistently up to August, 1975. According to the master card however, no issues have been made. As a result the stock is now said to be 58,900. On investigation, it appears that this component is frequently used for other purposes but its issue has never been recorded on the master card.

All but one of the cards for the 7R-55 in the sample showed stocks varying from 219 to 930 out of a total order for 3,300 sets. The reason for this serious imbalance is not known. There was evidence of unusually high usage of at least 2 components for this set. In one case, an additional quantity of 800 were ordered and 600 remain.

Cards have been raised for the ITT Automatic telephone, but they contain only the component code number and description. No record exists of orders placed, items received or issued. No cards exist for the ITT CB telephone or for refrigerators, freezers etc.

All of the above raises serious doubt about the effectiveness of the whole stock control system and the way it is operated. In the next but one section of this report, an improved system is proposed which should provide a more appropriate framework for effective control. It should require less clerical effort to operate and therefore it should be possible to maintain it with great diligence than appears to have been possible in the past.

6. Financial Implications of Present System

There are 6 main areas where the stock and production control system, as presently operated, gives rise to excess costs or losses in profit. These are:

- excess clerical costs in operating

- cost of operators' non-productive time when shortages stop production

- excessive changeover costs if one product has to be stopped because of shortage and a different one started up

- loss of profit from reduced throughput

- excessive management time required to search for components, re-order them and adjust production schedules

- excess labour costs incurred by partly completing units and then subsequently finishing them when shortages are made up.

Unfortunately data are not available in the appropriate form to enable these excess costs to be quantified.

7. Proposed Stock Control System

The present system is based on the philosophy of controlling the stock levels of individual components. If it were operated as originally intended, but extended to permit an analysis of usage of each component, the risk of running out of stock of any component before the completion of the assembly programme could be reduced to an acceptable level. However, this would involve a disproportionately high clerical effort. Instead, it is recommended that a system be adopted that is more suited to the usage pattern of the components.

The prime objective of the system should be to ensure that complete kits are available to assemble the total numbers of each product that are planned. Superimposed on this should be a separate system to control the stock of individual components used to manufacture sub-assemblies

in-plant, finished sub-assemblies, components made in-plant such as cabinets, general use or bulk issue items such as glue, solder etc. and components where the usage is greater than the planned quantity of kits to be assembled. Such excess usage could arise in several ways such as:

- replacement of components rejected in production
- repairs
- sales to other repairers.

The need for a different system and individual component stock cards arises because the pattern of either receipt or issue is normally quite different from the majority of kit components e.g. sub-assemblies may be produced at a different rate from final product.

For each product there should be a simple kit stock card showing the number of kits on order, received into stock, issued to production and currently in stock. Additional information to be shown on the card should include the planned issue quantity, planned monthly usage rate, supplier or suppliers, delivery time, review or re-order level and details of order call-off quantities and delivery dates. Attached to the kit stock card will be a list of bulk items controlled by individual stock cards (i.e. solder, grease, etc.).

For each component to be used to produce a sub-assembly there should be a separate component stock card similar to that shown in Exhibit I. The same design of card should also be used to control finished sub-assemblies, components such as cabinets which are made in-plant, general use or bulk issue items such as glue, solder etc. and excess usage components. In the latter case, the component stock card would be used to control the stock to be held in excess of the kit quantities. Ideally, such stock should physically be located apart from the main kit components.

8. Procedures for Kits

8.1 Receipt into Stock

The present method of ordering kits, daciding call-off quantities and deliverias and receipt into the bonded warehouse appears to be satisfactory and need not, therefore, be changed. However, a copy of each order should be passed to the stock controller to enable him to enter details on the kit stock card.

Withdrawal from the bonded warehouse should be controlled and only complete kits transferred to the main store. When received at the store a Goods Received Note should be raised and one copy passed to the stock controller to enable him to record the quantity of kits received on the kit stock card. When the components are checked and placed in their stores location the pan cards should be updated.

8.2 Discrepancies

If any discrepancy is found between the quantity invoiced and the quantity received, a discrapancy note should be raised by the stores superintendent for each component which is short, or over-supplied, as at present. One copy of the discrepancy note should be sent to accounts, one to the stock controller and one to the Procurement Manager for information. In the event of a shortage, the stock controllar should check to see if the quantity in shortage is available from the excess usage component stock and if so, he should arrange for a transfer to the kit stock and file the discrepancy note as being satisfied. If such stock is not available the stock controller should raise a requisition and pass it to the Procurement Manager for him to arrange raplacement if possible. Until the replacement stock is received, the diacrepancy note should be filed with the kit stock card. Note: a separate note is required for aach component.

In the event of over-supply, only the ordered quantity should be placed in the kit store, the excess being directed to the excess usage component stock. The stock controller should update the appropriate excess usage component stock card and file the discrepancy note.

8.3 Issue from Stock

When a production supervisor requires a quantity of components for kit assembly he should raise a Stores Requisition Note (SRN). The storeman should sign this SRN and duplicates when the issue has been made and should then pass one copy to the stock controller to up-date the kit stock card, the other copy being sent to the cost office. The supply list is retained by the storeman for use at the next issue. As each component is removed from stock the pan card should also be updated. (Note: Pan cards should show the quantity of the component used on a set). When the stock controller has updated the kit stock card, he should file the SRN.

On each occasion that an issue is recorded on the kit stock card, the stock controller should compare the resulting stock balance with the re-order level. If the re-order level is reached, the stock controller should immediately inform the procurement manager and the production manager, who should then decide whether to re-order or not, depending on the forward production plan. Similarly, if the alarm level is reached the procurement manager should be informed to enable him to expedite outstanding orders.

Certain items listed on supply lists cannot readily be controlled by means of the kit stock card. These include items manufactured in-plant such as cabinets, components for sub-assemblies and general or bulk use items such as solder, paint, glue etc. The means of controlling these

items is discussed below. However, it should be noted that provision is made for a list of such items to be filed with the kit stock card. Separate requisitions should be raised by production supervisors when they require such items.

9. Procedures for Individual Components and Sub-Assemblies

9.1 Receipt into Stock

The method of ordering sub-assembly components and some bulk issues items such as drive cords, etc. can remain unchanged. However, since the usage of some of these items may be higher than planned, provision should be made to monitor usage and signal the need to re-order before it may be necessary to re-order kits. Control parameters for these components and for the excess stock of high usage components would require to be set. Whenever an order is placed a copy should be passed to the stock controller to enable him to enter details on the appropriate stock card.

When the items are received into the store either from the bonded warehouse, from local suppliers or from within the factory in the case of sub-assemblies and cabinets, a Goods Received Note should be raised and one copy passed to the stock controller to enable him to record the quantity received on the appropriate component stock card. In the case of sub-assemblies and components such as cabinets, the Finished Goods Transfer Note could be used instead of raising a Goods Received Note. When the components are checked and placed in their stores location, the pan cards should be updated as at present.

9.2 Discrepancies

The same procedure for over or under supply should be used as described earlier for kits except that the need should not arise for sub-assemblies or components made in-plant.

9.3 Issue from Stock

When a production supervisor requires a quantity of components for sub-assemblies, a quantity of sub-assemblies or a quantity of general or bulk issue components he should raise an SRN and give it to the storeman who should sign it when the issue has been made and then pass one copy to the stock controller for him to update the component stock card. The second copy should be passed to the cost office. As each component is removed from stock the pan card should also be updated. When the stock controller has updated the component stock card he should file the SRN.

When a production supervisor requires components to replace faulty or damaged ones already received or when the repair section or engineering require components, they should raise an SRN and pass it to the stock controller before going to the store. The stock controller should ascertain if the component is available from the excess usage stock and if so authorise issue. The authorised SRN should then be taken to the stores and the normal issue procedure followed. If however, there is no excess stock available, the production manager must agree before any component can be taken from the kit stock. If approval is given the stock controller should raise a shortage note and file it with the kit stock card. He should then check if there is an outstanding order for that component shown on the component stock card which will cover the shortage. If there is, he takes no further action until the order is received or until the alarm level is reached. He will then arrange for the appropriate quantity to be transferred to the kit stock to cancel the shortage note. If no such outstanding order exists, the stock controller should raise a requisition and pass it to the procurement manager for him to arrange replenishment.

On each occasion that an issue is recorded on a component stock card the stock controller should compare the resulting stock balance with the re-order level. If the re-order level is reached, the stock controller should raise a requisition for replacement stock and pass it to the procurement manager. If the alarm level is reached, the procurement manager should be informed to enable him to expedite outstanding orders.

10. Conclusion

Whilst the present stock control system could be revitalised and operated correctly, this would require considerably more effort than has been applied in the past. Even then, it is unlikely that it would bring about a reduction in stock-outs to an acceptable level without a corresponding increase in raw material stocks to an unduly high level.

The new system proposed in this report reflects more accurately the needs of the production methods in use. It should be simple and less expensive to operate. If it is diligently maintained it should ensure that there is a marked reduction in the number of kits which cannot be completed at present for lack of a few components. This can only result in better use of the division's resources of labour, capital and equipment with its consequent reflection in even higher levels of profitability.

(T. KENNETH PATERSON)
PRODUCTION CONSULTANT

DISTRIBUTION OF AVAILABLE STOCK FOR PHILIPS MK.II (22RL-008)

NOTE:

1. The following data exclude common items such as paint, glue, grease etc.

2. It is assumed that the consumption rate is 750 kits per week.

3. The data were derived from a check of all pan cards on 27th January, 1976.

WEEKS OF STOCK AVAILABLE	NO. OF COMPONENTS
NIL	5
NIL - 5	7
5.1 - 8.0	10
8.1 - 10	10
10.1 - 12	14
12.1 - 15	12
15.1 - 20	8
20.1 - 25	6
25.1 - 30	3
30.1 - 50	3
50.1 - 80	2
80.1 -120	2
120.1 -200	-
200.1 -650	1
	103

LIST OF COMPONENTS WHERE THERE IS LESS THAN 10 WEEKS OF STOCK

NIL STOCK

Item No.	Code No.	Description
213	2222-016-16101	Elco
503	2522-001-07776	Screw
515	3122-101-04011	Tension Spring
802	3122-118-70090	Handle
817	2422-257-24201	Loudspeaker

Item No.	Code No.	Description
NIL - 5 WEEKS		
219	9330-030-30000	Transistor
403	2522-609-02003	Washer
405	2522-634-04005	Retaining Ring
407	2222-807-10098	Varicap
506	2522-600-17017	Washer
814	3122-107-69900	Telescopic Aerial
821	3122-114-81070	Ornamental Strip
5.1 - 8 WEEKS		
216, 7 & 8	9330-300-80000	Transistors (3)
314	3122-138-21150	Aerial Coil
410	3122-101-56600	Pin
414	0722-105-00001	Frame Aerial
710	3122-103-12250	Plate
805	2522-600-16029	Washer
820	3122-115-00460	Scale, Printed
823	3122-114-81100	Text Plate
827	3122-114-01910	Disc
829	3122-114-01920	Disc
8.1 - 10 WEEKS		
101	3122-103-62290	P.C. Board
106	2322-101-33331	Carbon Resistor
220	3122-994-25610	Choke
223	2222-016-16151	Elco
302	2222-563-03392	Pin up
305	2222-563-02331	Pin up
313	3122-108-70380	Osc. Coil
318	9390-001-20002	Heat Sink
810	2422-015-01002	Solder Tag
816	2522-021-07009	Screw

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ANNEX IV

ELECTRONICS DIVISION

STOCK CONTROL OF PRODUCTION COMPONENTS

IMPLEMENTATION MANUAL AND PROGRAMME

GHANA INDUSTRIAL HOLDING CORPORATION

ELECTRONICS DIVISION

STOCK CONTROL OF PRODUCTION COMPONENTS IMPLEMENTATION MANUAL AND PROGRAMME

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GIHOC

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STOCK CONTROL OF PRODUCTION COMPONENTS

IMPLEMENTATION MANUAL AND PROGRAMME

PART A

GENERAL

Introduction

Following a depth study earlier this year, a report was prepared and submitted to Dr. Boye recommending a revised system of component stock control. The report was submitted early in March and discussed during April. At a meeting on 3rd May it was agreed with Dr. Boye and Mr. Tagoe that, subject to some minor changes, implementation should start right away.

Mr. Paterson, the UN production consultant who conducted the depth study, immediately proceeded with the first stage of implementation in the normal way, i.e. on the understanding that he would lead the work in consultation with divisional management, and with the assistance of divisional staff. Subsequently on the 17th May, it became clear that there had been a misunderstanding about the consultant's role. Rather than take advantage of his full-time availability to lead the project, Dr. Boye wished the implementation to be undertaken by his own staff in spite of the considerable additional burden this would place upon them. Accordingly, it was agreed that the consultant would prepare an operational manual and this implementation manual and programme for use by divisional staff. It was also agreed that although the full burden and responsibility of the implementation would fall upon the divisional staff, the consultant would be available for discussion and advice. He would also audit progress and report at approximately monthly intervals over the next few months.

This manual describes the various tasks which have to be undertaken to introduce the new system. It also contains an agreed programme of work against which progress can be monitored. The day-to-day running of the system is described in a separate manual.

Categories of Stock

In the new stock control system there are three main categories of stock for each kit or model to be assembled:

- kit stock items
- bulk or separate issue items
- excess usage items.

Kit stock comprises those components issued against a supply list in precise quantities for the number of kits to be built. Control of these is exercised in terms of number of complete kits available for assembly or being issued to the production belts. Thus for example, if the kit stock card shows a stock of 2,000 kits, this means that there are 2,000 of each component in stock where there is 1 of that component used per kit and 4,000 of each component where 2 are used per kit etc. Similarly, if 250 kits are issued, 250 of each component where there is 1 per kit will have been issued etc.

Bulk or separate issue items are those such as glue, paint, solder wire etc. which are issued in bulk quantities separately from supply list items OR items such as picture tubes, cabinets etc. which may be issued in small quantities because of storage space limitations on the production belt. Control of such items is by means of individual component stock cards and issue is initiated by a Stores Requisition Note (SRN).

Excess usage stock is the additional stock of kit components which has to be held for use as replacements on the belts or for engineering, servicing or sales. The usage of these components is not directly related to kit assembly and therefore they have to be controlled in exactly the same way as bulk issue items i.e. by individual stock cards. Issue is initiated by SRNs.

Sequence of Implementation

It has been agreed that the new stock control system will be introduced for 20" and 24" TV kits and components followed by the Philips Mark II radio. This is in line with the intended start-up of production following receipt of kits from suppliers. A decision has still to be made on the sequence for the remaining kits. However, the system should be extended as rapidly as possible to cover all products and components including SKD ones such as telephones, light fittings, deep freezers etc.

Each activity involved in implementing the system for TV kits is described below in the sequence in which they should take place. Some are one-off activities relating to the total system. Others, which relate specifically to TVs, should be repeated for each of the other kits to be applied.

PART B

IMPLEMENTATION ACTIVITIES

This part of the manual describes each activity involved in implementing the new stock control system. It is written in the sequence in which the activities should take place. Many of the activities are described as being undertaken by the stock controller. This should be taken to mean any of the staff in the stock control section.

Reference is made below to various documents. Examples of these are contained in the Component Stock Control Procedures Manual. Rather than repeat them in this implementation manual, therefore, the reader is referred to that document.

1. Prepare TV Supply Lists (Stock Controller)

At present radio and TV supply lists contain all components required to build a kit. Some of the components are issued separately and in bulk rather than as kit quantities. Since, for the purposes of the stock control system, a kit is defined as those components issued in kit quantities, the other components must be identified. The stock controller therefore should agree with the production supervisor, which are the separate issue items for which requisitions are required. He should then arrange for the words "Separate Requisition Required" to be typed on the master copy of the supply list immediately to the right of the column headed "QTY", opposite each such component.

All such components should then be summarised on to form SC.2 - Supply List Items Requiring Separate Requisitions. This form indicates the part number, description, code number, quantity per kit and stores location for each component. (Stores location should be left blank, to be filled in by the storekeeper in due course).

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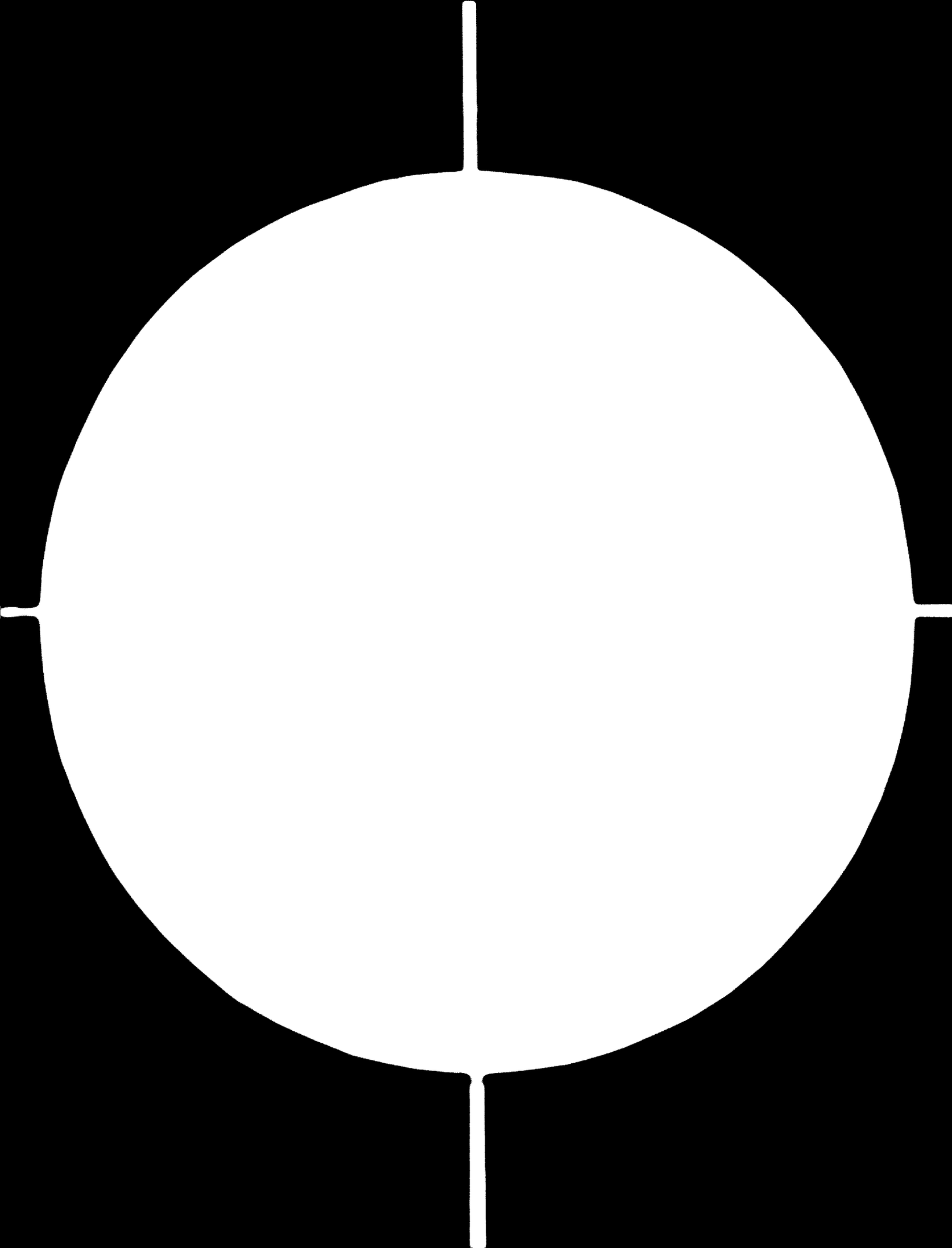


When a component appears more than once on the supply list, it will have a different position number on each occasion. These should be listed together on the form, bracketed and the total quantity per kit shown.

When the form has been completed it will form part of the supply list and also part of the kit stock card.

Finally, the planned issue quantity in terms of the number of kits to be issued per occasion, should be noted on the top line of the first page of the supply list master copy, immediately to the right of the word "QTY".

2. Instruct Staff and Issue TV Supply Lists (Procurement Manager)

Separate briefing meetings should be held with the different staff groups involved in the operation of the new system i.e. production supervisors, storekeepers, stock control staff and goods receipt storekeeper. At each meeting the objectives of the new system and the involvement of the various people should be explained. Each person should be given a copy of the appropriate part of the procedures manual and the intended programme for implementing the various activities should be indicated.

Those concerned should be instructed to start operating the revised goods receipt, requisitioning and issuing procedures immediately. Storekeepers should however continue to use existing supply lists as the basis for kit issues for all kits except TVs. They and production supervisors should be issued with revised copies of the TV lists and should operate the new procedures in relation to them immediately. A copy of the supply list should also be sent to the Divisional Accountant to enable him to prepare an aggregate cost for the kit issue items.

3. Prepared Kit Stock Records (Stock Controller)

Kit stock cards should be prepared for each different kit to be assembled, including SKD kits. Information under the headings of DESCRIPTION, MODEL NUMBER and SUPPLIER is self-evident.

The **PLANNED ISSUE QUANTITY** should be confirmed with the Production Manager and is the number of kits to be issued at any one time. The **PLANNED MONTHLY USAGE** is the number of kits planned to be assembled per month when in normal production. Order details relate to all outstanding orders for kits of components. The information required, which should be obtained from the Procurement Manager, is date of order, order number, number of kits ordered and details of call-off quantities and delivery dates requested. The date of order, order number and quantity ordered, for each outstanding order, should be repeated in the main part of the stock card in the columns headed **DATE**, **REFERENCE** and **ORDERS** respectively.

It is anticipated that the kit stock cards will be set up before any stock is received. Thus, the final entry in the main body of the card should be as follows:

- date of preparing the card - in the column headed DATE
- "Stock card initiated" - in the column headed REFERENCE
- NIL - in the column headed STOCK.

Each entry should be initialled by the stock controller, as it is made.

Finally, the stock controller should agree with the Procurement Manager how the **ALARM LEVEL** should be set and the figure calculated and written in the space at the top of the column headed STOCK. It is understood that for kits, this level should be equal to 6 months usage. Thus the figure to be put on the card would be equivalent to 6 times the planned monthly usage.

4. <u>Activate Kit Stock Records</u> (Stock Controller)

As soon as each kit stock card has been prepared, it should be brought into full use, as described in the appropriate part of the procedures manual.

5. Prepare TV Component Stock Cards (Stock Controller)

As soon as the stock controller has prepared the kit stock cards, he should proceed to prepare the new separate issue and excess usage stock cards for TV components. This will involve up to approximately 480 new stock cards (There are approximately 480 different components used between the 20" and 24" TV kits).

It has been suggested that the stock of existing master cards should be used up first. This, however, may take some time since there are approximately 7,000 unused cards. The rate of usage has been stated to be between 100 and 2,000 per year. It would therefore be between 3½ and 70 years before the stock would be exhausted. Rather than endanger the success of the new system by delaying, new cards, which are more appropriate to requirements, should be introduced at the outset. Standard cards, common to all divisions of GIHOC, should be used.

The stock cards should be stored in wooden boxes approximately 12 centimetres deep by 25 centimetres long.

The method of preparation of the new cards should be as follows:-

5.1 Take a batch of 20 new stock cards and mark ink SEPARATE ISSUE ITEMS on back and front of each at top centre.

5.2 Refer to the document "SUPPLY LIST ITEMS REQUIRING SEPARATE REQUISITIONS" for the 24" TV and select the master cards for the first 20 components listed.

5.3 Copy DESCRIPTION, PART NO. AND (Kits) USED ON in ink on new cards. Determine from supply list or production supervisor, the total quantity, length etc. used on each kit and note this in ink beside the kit used on.

5.4 Copy supplier's name (if known) on to the new card from each master card.

5.5 Calculate the monthly consumption for each month of previous 2 years and also this yaar and enter on to the new card, together with the totals for each of the last two years.

5.6 If the component is importad, anter the words "ASSUMED DELIVERY 8 MONTHS" on line 1, "DELIVERY TIME FOR ORDERS", this being the average delivary time as assassed by the Procurement Manager.

5.7 Replace OLD STOCK CARDS in original filing location and take batch of new cards to the purchasing office.

5.8 Entar name of suppliars if not previously recorded in stores.

5.9 For locally purchased components, obtain the Procurement Manager's astimate of the delivery times and enter the words "ESTIMATED DELIVERY ..... DAYS (OR WEEKS)" on line 1, "DELIVERY TIME FOR ORDERS".

5.10 Check for any outstanding orders either for the individual components or for kits containing the components. Enter on the card, with the longest dated ordar written first:

- Date
- Purchase order number - in column headed REFERENCE
- Unit Price - in column headed UNIT PRICE
- Quantity - in column headed ORDER QTY
- Initials - in column headed INITIAL.

NOTE: Columns headed TOTAL ON ORDER and TOTAL COVER will not be used.

5.11 Enter in pencil the REVIEW FREQUENCY, BUFFER STOCK, ALARM AT and RE-ORDER AT figures. The method of determining thesa is the subject of a separate paper.

5.12 Place **NEW STOCK CARDS** into file, take another batch of 20 cards and repeat the steps 5.1 to 5.12 until all supply list items requiring separate requisitions in the 24" TV kits have been covered.

5.13 Repeat for 20" TV bulk components, excluding those components common to the 24" TV kits.

5.14 Take a batch of 20 new stock cards and mark in ink **EXCESS ISSUE ITEMS** on back and front of each at top centre.

5.15 Refer to the supply list for the 24" TV and select master cards for the first 20 components issued against the list (i.e. excluding those already dealt with above).

5.16 Repeat steps 5.3 and 5.4.

5.17 Calculate the monthly consumption, excluding issues against supply lists, for each month of the previous 2 years and also this year and enter on to the new card, together with the totals for each of the last two years.

5.18 Repeat steps 5.6 to 5.11 inclusive.

5.19 Place **NEW STOCK CARDS** into file, take another batch of 20 cards and repeat steps 5.14 to 5.18 until all components have been covered.

5.20 Repeat for 20" TV components, excluding those common to the 24" TV kits.

6. Activate TV Component Stock Cards (Stock Controller)

Once all the TV component stock cards have been prepared, and assuming that supply lists have been issued and staff instructed, the TV cards should be brought into use. The various steps in doing this are:-

6.1 Take all of the separate issue items stock cards and select the corresponding master cards.

6.2 Refer to the pan cards and enter on to the NEW STOCK CARDS:

- the date
- the words "PAN CARD STOCK" in the column headed REFERENCE
- the quantity shown on the pan card in the column headed IN STOCK.

Enter the same information in the appropriate place on the master cards.

6.3 Place master cards into a "dead" file.

6.4 Compare the quantity in stock with the RE-ORDER AT and ALARM AT figures. IF THE ACTUAL STOCK IS BELOW EITHER FIGURE, INFORM THE PROCUREMENT MANAGER BY MEMO SO THAT HE CAN DECIDE WHAT ACTION SHOULD BE TAKEN TO PREVENT A FUTURE STOCK-OUT.

6.5 Place NEW STOCK CARDS into file.

6.6 Take 20 excess component stock cards and select the corresponding master cards.

6.7 Refer to the pan card AND kit stock cards for all kits on which the component is used. Calculate the total number of kits in stock from the kit stock cards and check with the pan card to determine if there have been any kit issues not yet recorded on the kit stock cards. If there have, deduct the quantity issued from the total number of kits calculated as above. Subtract the resulting figure from the quantity shown on the pan card as being in stock to determine the excess quantity. Enter on the NEW STOCK CARDS:

- the date

- the words "PAN CARD EXCESS ST." - in the column headed REFERENCES

- the excess quantity as calculated above - in the column headed IN STOCK.

Enter in the appropriate place on the master cards:

- date
- the words "PAN CARD STOCK"
- the quantity shown on the pan card.

6.8 Place the master cards into a "dead" file.

6.9 Repeat steps 6.6 to 6.8 inclusive until all NEW STOCK CARDS have been activated.

7. Prepare Philips MK II Supply List (Stock Controller)

Repeat activity 1.

8. Issue Philips MK II Supply List (Stock Controller)

The revised supply list accompanied by the completed form, "Supply List Items Requiring Separate Requisitions", should be issued to the appropriate storekeepers and production supervisors.

9. Prepare Philips MK II Component Stock Cards (Stock Controller)

Repeat activity 5.

10. Activate Philips MK II Component Stock Cards (Stock Controller)

Repeat activity 6.

11. Other Kits (Including SKD Kits)

Activities 7 to 10 should be repeated for all other kits, in a sequence to be agreed with the Production Manager. The sequence should be selected to try to ensure that all activities for a kit have been completed before the kit goes into production.

The activities described above are those most directly concerned with implementing the new stock control system. There are also a number of supporting activities, most of which should be started immediately. They ARE DESCRIBED BELOW.

12. Procure Summary Sheets (Procurement Manager)

The Procurement Manager should arrange the early supply of suitable quantities of the various summary sheets described in the procedures manual.

13. Activate Revised Order Procedure and Summary (Procurement Manager, Stock Controller)

The Procurement Manager should issue copies of all outstanding orders to the stock controller and the divisional accountant immediately. Copies of all future orders should also be issued to these people. Orders placed to relieve shortages should be clearly marked to indicate this.

The stock controller should enter details of all outstanding orders on to the ORDER SUMMARY and keep this document up-to-dste.

14. Procure Kit Requisition and Kit Shortage Note (Procurement Manager)

The design of these documents has been agreed by the Procurement Manager and as at 17th May, arrangements were in hand to procure supplies from printers.

15. Activate Monthly Summaries (Stock Controller)

The various monthly summaries described in the procedures manual should be brought into use as soon as the TV component stock cards have been activated.

16. Analyse Excess Stock (Stock Controller)

At a convenient time in the near future, as soon as possible after component stock cards have been activated, the excess stock for each kit should be analysed. The purpose of doing this is to establish the quantity of the various components in terms of likely months of usage and to decide what action if any, should be taken if large stocks exist. One course of action would be to retain the stocks and not replenish them for however long it took to run them down to the re-order level. Another possibility, however, would be to order appropriate quantities of the low stock items to make up additional kits. Should this be decided upon, there would be a need to transfer components, in multiples of kit quantities, from the component stock cards and credit the number of kits which were made up to the kit stock cards. This should be done whenever the GRN is received, showing that the additional components ordered have been received into stores.

17. Devise and Activate Monitoring Procedures (Procurement Manager)

The Procurement Manager should establish an audit procedure whereby he receives component and pan cards frequently and on a random basis to check on accuracy of recording. It is recommended that 25 component cards and their corresponding pan cards be examined each week. Any errors or discrepancies found should be drawn to the attention of the person responsible.

These procedures should be activated as soon as the Philips Mk II radio components have been applied.

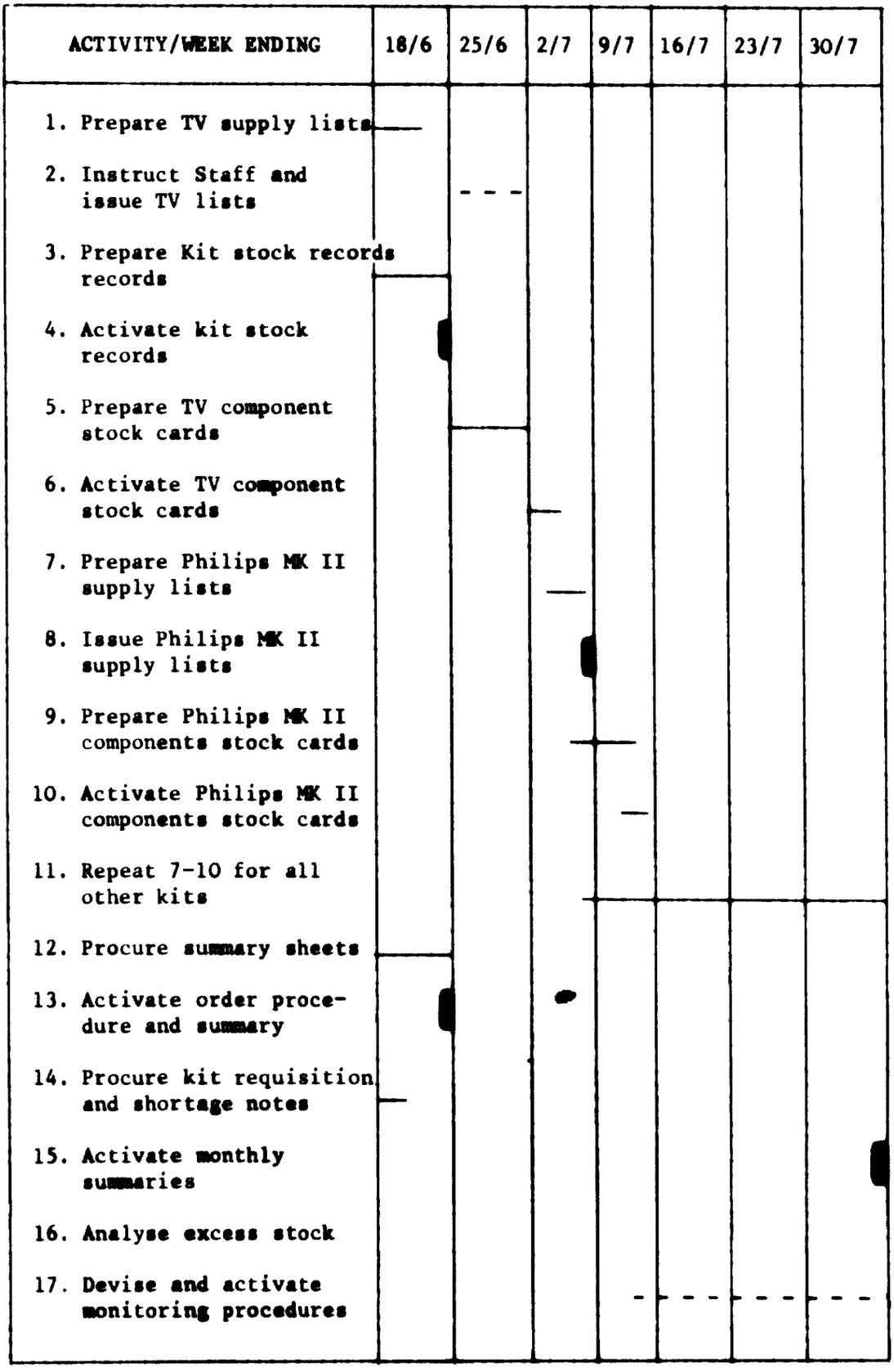
PART C

PROGRAMME

The programme for full implementation of the new stock control system is dependent upon the time which can be devoted to it. Once the application has started, however, and the personnel have gained experience, it is essential that momentum is maintained. The time table shown on the next page, which has been agreed with Mr. Tagoe assumes that Messrs. Howard Mills, Armah and Ofori will be able to devote all of the time to the implementation. This should be possible since there is no need to continue to update the existing master cards. They are so far in arrears that a few more weeks will not matter.

It should also be possible for Mr. Sackey to assist the others, although no allowance has been made for this in the programme. Mr. Sackey has until recently spent most of his time maintaining records of stock movement on bin cards. Since there is no further need to do this, Mr. Sackey will have time to devote to the new system.

IMPLEMENTATION PROGRAMME



VOLUME 4

ANNEX V

ELECTRONICS DIVISION

COMPONENT STOCK CONTROL

PROCEDURES

GHANA INDUSTRIAL HOLDING CORPORATION

ELECTRONICS DIVISION

COMPONENT STOCK CONTROL PROCEDURES

CONTENTS

ISSUE 1

ELECTRONICS DIVISION

COMPONENT STOCK CONTROL

PART A
INTRODUCTION

This paper sets out the main features of the revised component stock control system to be introduced into the Division, together with the duties and responsibilities of the persons concerned with operating the system.

A separate paper has been prepared which sets out the basic principles upon which the control parameters should be set for each component.

1. Purpose

The purpose of the revised stock control system is to place emphasis on controlling kits of components rather than individual components. Provision, however, is made for individual control of those components which are issued in bulk or whose usage exceeds the number of kits assembled.

The system indicates in a systematic way:

- when a component should be ordered
- how much should be ordered

with the object of:

- minimising the disruption to production which has occurred in the past when one or more components were out of stock, thus preventing the planned number of kits from being assembled

by maintaining:

- the integrity of kits of components i.e. sufficient quantities of <u>all</u> components are available to build the planned number of kits

- an adequate stock of components for use over and above those required to assemble kits.

2. Scope

The revised stock control system should be applied to ALL production components and raw materials including plastics and SKD kits.

3. Constraints

The system will be introduced during a period when most purchases are subject to annual import licencing. The system has been designed to cope with this constraint, but could be easily modified if licencing were abolished and components could be purchased as required.

4. Responsibility for the System

Although the stock control system is designed primarily to aid the work of the Production Manager, responsibility for implementation and subsequent operation will be vested in the Procurement Manager, at least at the outset. He must therefore thoroughly understand both the concepts and the details of the system.

This procedure manual has been drawn up at the request of Divisional management to enable their staff to undertake the implementation themselves. It is quite likely that some modifications may prove necessary as the system is introduced. These should, however, be carefully considered before finalisation and made only after agreement with the Head Office Production Control Consultant. This consultant will, of course, be available to give any assistance required and it is to him that any operating queries should be directed.

5. Pan Cards

Since both the kit stock and the excess stock of any component will be kept in the same pan, it has been suggested that a separate pan card be raised for each. Thus, issues and receipts of components for repairs, replacement or sales etc. would be recorded on one pan card whilst

issues and receipts for kits would be recorded on a second card. This is thought to be an unnecessary elaboration, and is not recommended. The stock controller will keep separate records and there is therefore no advantage in duplicating these by having two pan cards. Indeed, there is more likelihood of errors being made by the storekeeper through making entries on the wrong cards if two cards are maintained.

ISSUE 1

PART B

GOODS RECEIPT STOREKEEPER
DUTIES AND RESPONSIBILITIES

This procedure relates to the duties and responsibilities of the goods receipt storekeeper insofar as they are modified to meet the requirements of the new stock control system. Other functions of his job not referred to here should continue as presently laid out.

1. Transfer From Bonded Store

1.1 Components Ordered as Kits

Components which have been ordered as kits should not normally be transferred from the bonded store to the component store until it is established (subject to shortages being found later) that the complete order has been received into the bonded store.

When such components are brought from the bonded store, a Goods Received Note (GRN) should be raised as at present. The GRN should show the total number of kits concerned and should also show the order number or invoice number for reference purposes.

Should it be necessary to take individual components from kit stock in the bonded store to relieve shortages, this can be done only with the written authority of the procurement manager. The appropriate GRN should indicate that the component or components are being taken into store for that purpose and that they are being taken from kit stock.

1.2 Components Ordered as Individual Items

When components ordered as individual items are brought into store from the bonded store, existing GRN procedures should continue to operate, with only minor modifications as described below. Components will be ordered in this way for the following purposes:

- to replace damaged or lost components
- for repairs
- for engineering and development use
- for re-sale to repairers
- to relieve shortages in kits.

It is only for stock ordered to relieve kit shortages that any changes are required. In this case, the GRN should show on it that the components are for this purpose. This will enable the stock controller to remove the appropriate shortage note or discrepancy note from the kit stock card.

1.3 Discrepancies

There will be no change in the procedure for raising discrepancy notes.

2. Locally Purchased Items

There will be no change in the procedures for receiving locally purchased items into store.

3. Distribution of GRNs and Discrepancy Notes

Since it is intended to discontinue the use of bin cards as stock records, the stores clerk who updates them does not need to receive GRNs and Discrepancy Notes. In future, therefore, his copies of these documents should be passed directly to the stock controller who will then be able to update the master stock records immediately.

PART C

STOREKEEPERS
DUTIES AND RESPONSIBILITIES

Storekeepers are responsible for the safe keeping of components allocated to them. They are also responsible for issuing correct quantities and maintaining the accuracy of the appropriate component pan cards.

1. Issue Procedures

1.1 Definition of Kits

In most cases it will not be possible to define a kit as being all items listed on the supply list. Certainly in the case of radios and TVs, a number of items on the supply list are issued either in bulk, such as solder, wire, tape, glue or in small quantities to save space i.e. TV cabinets, picture tubes etc. All of these items are currently obtained by the production supervisor by means of an SRN. Although these items should be reviewed, most of them should still be issued in this way. Thus a kit can be defined as the supply list items excluding those issued against an SRN.

All supply lists will be marked up to indicate the item requiring an SRN and a list of those items attached to each copy of the supply list. A recommended form for this is shown in Appendix I.

1.2 Kits

The new stock control procedure is designed to ensure that the likelihood of shortage of components for kit assembly is reduced to an absolute minimum. It follows, therefore, that kits issued for production must contain precisely the correct quantity of each component.

Initially, production supervisors will raise a Stores Requisition Note (SRN) for kits of components stating the number of kits required. When available from the printers, a specially designed requisition will be introduced for kits as an aid to subsequent identification for stock control purposes (See Appendix II).

It will be the responsibility of storekeepers to ensure that only precise quantities are issued on each occasion. Thus, if the SRN calls for, say, 250 kits, exactly 250 of each component will be issued (or 500 if 2 components are used in a kit).

On receipt of an SRN or Kit Requisition the storekeeper will select the correct quantity of the appropriate components and deliver them to the production belt in the same way as at present. There will however be no need to enter the quantities on the Supply List, which can be held permanently in the store. As an aid, the storekeeper may place a tick opposite each component as he removes it from store, or at the same time as he posts the issue quantity to the pan card.

When the full kit quantity has been issued and accepted by the production supervisor, the storekeeper and the production supervisor should each sign the three copies of the requisition. One copy will be retained by the production supervisor. The storekeeper will take 2 copies, passing one to the stock controller and one to the cost office at the end of the day.

1.3 Kit Items Requiring an SRN

Issue of kit items requiring an SRN, as defined above, should take place in the normal way.

The production supervisor will present an SRN to the stores for the quantity required. Before making an issue, however, the storekeeper should ensure that the stock controller has approved the requisition. This approval is necessary to ensure that the quantity requested reflects the rate of production being achieved and to prevent the production supervisor over-ordering such components to replace any lost or damaged without giving the proper justification.

When the approved requisition quantity has been issued and accepted by the production supervisor the storekeeper and the production supervisor should each sign the three copies of the requisition. One copy will be retained by the production supervisor. The storekeeper will take two copies, passing one to the stock controller and one to the cost office at the end of the day.

1.4 Excess Items

Issue of excess items to production belts, repair workshop, engineering, or for external sale etc. should take place in the normal way. Before making an issue, however, the storekeeper should ensure that the stock controller has countersigned the requisition or sales order. This approval is necessary to ensure that there is sufficient free stock available to meet the requisition without reducing the number of kits that can be assembled.

When the storekeeper has ascertained that the stock controller has given approval, the procedure for issuing etc. should be as described above for kit items requiring an SRN.

2. Receipt Procedures

No changes will be made in the procedures for receiving components into store, except that documents such as Stores Return Notes will be passed directly to the stock controller. There will be no need to pass them to the stores clerk since there will be need to maintain a separate record of stock movements on bin cards.

3. Routine Posting of Pan Cards

Pan cards will continue to be posted with issues, receipts and stock balances exactly in the same way as at present.

ISSUE 1

PART D

PRODUCTION SUPERVISORS AND OTHERS REQUISITIONING COMPONENTS DUTIES AND RESPONSIBILITIES

This procedure relates to the duties and responsibilities of all staff who requisition components from the stores. This includes production supervisors, repair workshop supervisor, engineers and anyone authorising the sale of components. The procedure is written in terms of the production supervisor, but applies equally to all others already referred to.

1. Requisitioning of Kits

Production supervisors will raise requisitions in future when they require an issue of kits of components. Initially they should use the existing Stores Requisition Notes (SRN) but when Kit Requisition Notes become available, these should be used. (See Appendix II). Three copies should be prepared for each issue and both the storekeeper and production supervisor should sign each copy when they are satisfied that the correct quantity of components has been issued.

The production supervisor should retain one copy and pass two copies to the storekeeper who will, in turn, pass one copy to the stock controller and one to the cost office.

At present each production supervisor is aware of exactly which components from the supply list he should obtain when he asks for an issue of kits. The remaining componenets are obtained by means of an SRN, either because they are issued in bulk such as wire, solder, glue etc. or because the full quantity cannot be stored i.e. cabinets, picture tubes etc.

New copies of supply lists will be issued on which components requiring separate requisitions will be marked accordingly. These components will also be listed on a separate sheet attached to the supply list.

2. Requisitioning of Individual Components

Individual components, including the bulk issue items referred to above, will be requisitioned on an SRN as at present. However, to ensure that control is exercised over usage, each requisition will be passed to the stock controller for his approval before being presented to the stores. This requirement will also apply to sales orders for components.

In the case of items being requested for normal production, prior approval is necessary to ensure that the quantity requested reflects the rate of production being achieved. Where the components are required to replace lost or damaged items, for servicing or engineering or for sales, the approval is necessary to ensure that there is sufficient free stock available to meet the requisition, without reducing the number of kits that can be assembled.

ISSUE 1

PART E

STOCK CONTROLLER AND ASSISTANT DUTIES AND RESPONSIBILITIES

1. Introduction

The stock controller is responsible for the accuracy of the main stock control records - Kit and component stock cards (see Appendix III) and for ensuring that these records are kept up-to-date. He is also responsible for ensuring that components are not issued from stores against requisitions or sales orders unless these documents have been countersigned by himself or his assistant.

It is the duty of the stock controller or his assistant to compare the quantity in stock with the figures shown in the "REORDER AT" and "ALARM AT" boxes on stock cards, where appropriate, and to notify the Procurement Manager in all cases where the quantity in stock is equal to or less than these figures.

It is the duty of the stock controller or his assistant to compare the quantity of any component on requisitions or sales orders, with the available excess stock as shown on the appropriate component stock card. He should then take the appropriate action as described later in this procedure.

It is the duty of the stock controller to prepare and maintain the various summaries and analyses as described in this procedure.

2. Requisition and Sales Order Procedure

All requisitions and sales orders for components should be approved by the stock controller or his assistant before presentation to the stores. The stock controller or his assistant should compare the quantity required with the available excess stock as shown on the appropriate component stock card. When there is sufficient stock and the level exceeds the ALARM level, the requisition or sales order should be countersigned and passed to the stores for issue.

When there is sufficiant stock but the level is below the ALARM level, the issue should be pre-posted to the component stock card, the requisition or sales order noted accordingly and countersigned and then passed to the stores for issua. The objective of pre-posting is to ensure that subsequent issues are not authorised before the stock card is updated. Otherwise there would be a danger of authorising or issuing, when in fact there was no stock available.

When there is insufficient excess stock available, but there is enough kit stock to cover the requirement, the stock controller should first check whether a part-issue of the available excess stock would be acceptable as a temporary measure. If so, he should pre-post countersign the requisition for the part quantity and pass to stores. If, however, part-issue would be insufficient, the stock controller should get the agreement of the Production Manager and the Procurement Manager before allowing any of the kit stock to be issued. Having got this agreement, the transfer of the additional quantity from the kit stock should be noted on the component card and then the issue of the total quantity should be pre-posted to the component stock card. The requisition or sales order should be noted accordingly and countersigned and then passed to the stores for issue. At the same time a kit shortage note, as shown in Appendix IV, should be raised and one copy filed with the kit stock card. The shortage note should show the quantity of the particular component which has been transferred from the kit stock. The second copy of the shortage note should be sent to the Procurement Manager for him to decide on the action necessary to relieve the shortage.

3. Kit Shortage Procedures

3.1 Origination of Shortages

One of the main causas of shortage of components for kits will be the nead to transfer them for usa as replacements, for repairs or for sales as described above.

Occasionally, shortages may be due to under-supply of one or more components with a kit order. The normal discrepancy report procedure will operate and the copy of the discrepancy report received by the stock controller will be filed with the kit stock card. The Procurement Manager should also receive a copy so that he can decide on the action necessary to relieve the shortage.

It may also be necessary to take individual components from kit stock in the bonded store to relieve shortages for repairs, replacements or sales orders. In this event, the goods received note issued by the goods receipt storekeeper will indicate this. The stock controller should raise a kit shortage note, file it with the kit stock card and pass the second copy to the Procurement Manager.

3.2 Relief of Shortages

When components, ordered to relieve shortages, are received into store and the goods received note received by the stock controller, he should check that the quantities match the requirements shown on the kit shortage note. If they do, the shortage note should be removed from the kit stock card, signed and dated to show that the shortage has been relieved and filed away.

If the quantity received is less than required, the remaining quantity short should be noted on the shortage note. The note should then be re-filed with the kit stock card and the Procurement Manager advised by memo.

If the quantity received exceeds the shortage, the shortage note should be signed and dated to show that the shortage has been relieved and then filed away. The excess quantity should then be credited to the component stock card.

4. Receipt of Kits into Stock

Some components such as wire, tape, glue etc. require to be issued to production in bulk and therefore they must be controlled individually by means of component stock cards. It is imperative therefore, that this is taken into account when kits are taken into stock. Not only should the kit stock card be updated, but also each component stock card where appropriate. This is done by reference to the supply list which indicates those components which are controlled by component stock cards.

5. Routine Posting of Kit Stock Card

The following paragraphs describe the entries to be made on the kit stock cards on each occasion on which some movement occurs. Appendix III shows a sample of the kit stock card.

5.1 Kit Issues

Enter - date
- requisition reference in column headed REFERENCE
- quantity in column headed OUT
- new stock quantity in column headed STOCK
- signature in column headed INITIALS.

5.2 Order Receipts

Enter - date
- goods received note number in column headed REFERENCE
- quantity in column headed IN
- new stock quantity in column headed STOCK
- signature in column headed INITIALS.

5.3 Orders Placed

Enter - date
- purchase order number in column headed REFERENCE
- quantity in column headed ORDER
- purchase order number in column headed ORDER NO.

- quantity	in column headed QTY. ORDERED
- delivery requested	in column headed CALL OFF QTY. & DELIVERY DATES
- signature	in column headed INITIALS.

NOTE: The above information will be entered from a copy of the order, provided by the Procurement Manager.

5.4 Returns to Store

Enter - date

- RTS and document number	in column headed REFERENCE
- quantity	in column headed IN
- new stock quantity	in column headed STOCK
- signature	in column headed INITIALS.

NOTE: It would be unusual for complete kits to be returned to store. This part of the procedure, therefore, may never apply.

5.5 Stock Checks

Entries to be made in RED INK:

- date	
- STOCK CHECK	in column headed REFERENCE
- quantity in stock	in column headed STOCK
- signature	in column headed INITIALS.

5.6 Alarm Level

The stock controller will notify the Procurement Manager by memo, when the actual stock of kits reaches the alarm level, so that he may take whatever action is necessary to obtain delivery of an outstanding order or part of one, before a shortage occurs. The Procurement Manager should, in turn, inform the Stock Controller by memo of the action decided upon.

6. Routine Posting of Component Stock Card

The following paragraphs describe the entries to be made on the component stock cards on each occasion on which some movement occurs. Exhibit I shows a sample of the component stock card. It should be noted that this card is standard throughout GIHOC. For the meantime, it will not be necessary to use the columns headed "TOTAL ON ORDER" and "TOTAL COVER".

6.1 Stock Issues

Enter - date
- requisition or sales order reference — in column headed REFERENCE
- quantity — in column headed OUT
- new stock quantity — in column headed IN STOCK
- signature — in column headed INITIAL.

6.2 Order Receipts

Enter - date
- goods received note number — in column headed REFERENCE
- quantity — in column headed IN
- new stock quantity — in column headed IN STOCK
- signature — in column headed INITIAL.

6.3 Orders Placed

Enter - date
- purchase order number — in column headed REFERENCE
- quantity — in column headed ORDER QTY.
- signature — in column headed INITIAL.

NOTE: The above information will be entered from a copy of the order provided by the Procurement Manager.

6.4 Returns to Store

Enter - date
- RTS and document number in column headed REFERENCE
- quantity in column headed IN
- new stock quantity in column headed IN STOCK
- signature in column headed INITIAL.

6.5 Stock Checks

Entries to be made in RED INK:

- date
- STOCK CHECK in column headed REFERENCE
- quantity in stock in column headed IN STOCK
- signature in column headed INITIAL.

6.6 Shortages

Reference has already been made to the need for requisitions and sales orders to be checked by the stock controller for availability and approval before issue from stores. In the event that there is insufficient stock of a component available and the Production Manager and Procurement Manager agree to release the appropriate quantity from the kit stock, it will be necessary to record on the component stock card, the transfer of the stock from the kit stock before issue. In this event, the following entries will be made on the component stock card:

- date
- kit shortage note number in column headed REFERENCE
- quantity transferred in column headed IN
- new stock quantity in column headed IN STOCK
- signature in column headed INITIAL.

When the issue has been made by the stores the requisition or sales order will be returned to the stock controller in due course, wherupon he will file it, since he will have pre-posted the issue, as described in paragraph 2 above.

6.7 Monthly Consumption

Each time an entry is made on a stock card, enter the quantity going out during each of the previous months in the table headed MONTHLY CONSUMPTION. The quantities entered must include any adjustments that may have been made due to returns to store or stock checks.

During January of each year, or immediately prior to placing new orders, the monthly consumption and total for the previous year should be entered on all cards.

If there has been no stock movement in any month, enter NIL. DO NOT leave the space blank.

6.8 When Actual Stock Reaches Re-order Level

The stock controller will inform the Procurement Manager by memo that the stock of the component concerned has reached the re-order level, so that he can make a decision on placing the next order. The Procurement Manager will, in turn, inform the Stock Controller by memo of the action decided upon.

6.9 When Actual Stock Reaches Alarm Level

The stock controller will inform the Procurement Manager by memo so that he may take whatever action is necessary to obtain delivery of an outstanding order or part of one, before a shortage occurs. As above, the Procurement Manager will, in turn, inform the Stock Controller by memo of the action decided upon.

7. Summaries and Analyses

The stock controller should maintain up-to-date summary documents and analyses as follows:-

7.1 Order Summary

The order summary should be similar to the example shown in Appendix V, its purpose is to provide the stock controller with readily accessible information on the status of all outstanding orders. On each occasion that an order is placed and a copy received by the stock controller, he should enter:

- date
- supplier
- order number
- description (i.e. 008 kits or misc. TV components etc.)
- delivery due.

Where the order calls for call-off quantities at delivery times, the information should be entered separately for each delivery requested.

On receipt of a part delivery, the date (or dates) should be entered against the appropriate order number in the column headed PART DELY. When the complete order or call-off quantity has been delivered, the date of receipt should be entered in the column headed DEL. COMPL.

NOTE: The date of delivery should be taken as the date when the goods are received into the main store.

(In the case of imported items this will be the date on which they are received FROM the bonded warehouse).

7.2 Kit Shortage Summary

The kit shortage summary should be similar to the example shown in Appendix VI. Its purpose is to provide senior management with a brief summary of kits which are short of one or more components. They will then be able to decide on any action, and its timing, which should be taken to relieve the shortage.

On each occasion that a shortage note is raised or a discrepancy note received by the stock controller he should enter:

- date
- kit description
- description and code number of short items
- quantity short.

A separate line should be used for each component involved. When the shortage is relieved, the date should be entered in the appropriate line.

Copies of the kit shortage summary should be sent to the General Manager, Procurement Manager and Production Manager at the end of each month for decisions on any action to be taken to relieve the shortages.

7.3 Re-order Level and Alarm Level Summary

The re-order level and alarm level summary should be similar to the example shown in Appendix VII. It shows in concise form, details of all components whose stock has broken one or other for the levels and the action agreed. On each occasion that the stock of a component breaks the re-order level or the alarm level, the stock controller should enter:

- date
- code number
- kit or kits used on
- ROL or AL depending upon which level is broken
- Note of action decided upon by Procurement Manager in REMARKS column.

Whenever an order is received which restores the stock level to above the level broken, the date should be entered in the column headed LEVEL EXCEEDED.

Copies of this summary should be sent to the General Manager, Procurement Manager and Production Manager at the end of each month.

7.4 Excess Usage Summary

The excess usage summary should be similar to the example shown in Appendix VIII. On each occasion that a requisition is received from stores for the issue of a kit component normally issued from the supply list, for use of a production belt, the stock controller should enter:

- date
- component description
- code number
- quantity issued
- kit used on
- reason for requisition.

At the end of each month, the stock controller should summarise the issues during the month on to a fresh copy of the excess usage summary. He should list each component once only, showing the total quantity issued during the month. He should also enter the number of kits assembled and excess usage as a percentage of the number of kits assembled.

Copies of the monthly excess usage summary should be sent to the General Manager, Procurement Manager and Production Manager when it has been compiled. The Production Manager should investigate the excesses with a view to reducing them.

8. Annual Review

The stock controller should examine each stock card in January or prior to placing an annual order.

The purpose of this review is to assess:

- the likely import requirements for the year

- the need to adjust any of the control parameters on individual stock cards.

If the latter is required, it should be done from the tables provided in the paper on Control Parameters.

9. Stock-Taking

On each occasion that a stock check is done, the outcome will be a statement of the physical quantity of the various components in stock. It will not be possible, nor will it be necessary, for the stock checks to differentiate between kit stock and excess stock. However, the stock controller must do this to update his stock cards correctly.

On each occasion that he receives a stock check report, therefore, the stock controller should:

- determine the number of kits still in stock from the appropriate kit stock card

- deduct the quantity of each component required for that number of kits from the total quantity of each component in stock as per the stock check

- post the remaining quantity to each component stock card as described in paragraph 6.5 above.

Should the stock of any component be less than the quantity required for the kits still in stock, NIL STOCK should be posted to the component stock card. At the same time a kit shortage note should be raised for the quantity short of kit requirements and marked "STOCK CHECK".

One copy of the shortage note should be filed with the kit stock card and one copy passed to the Procurement Manager for a decision on the action to be taken.

10. Obsolete Stock

When new stock cards for all components of existing kits have been introduced and corresponding master cards filed away, the master cards which remain will be for obsolete stock. There is no need to prepare new stock cards for these components. However, the opportunity should be taken to review the need to retain the items. This should be done in conjunction with the Chief Engineer.

11. Retention of Documents

All the various documents discussed above should be carefully filed in the most suitable way after they have ceased to be referred to regularly. They should all be retained until the end of the calendar year, following the one during which they ceased to be "live". Thereafter they should be destroyed or otherwise disposed of.

ISSUE 1

PART F

PROCUREMENT MANAGER
DUTIES AND RESPONSIBILITIES

The Procurement Manager is responsible for ordering kits and components and for obtaining their delivery by the time required. He is also responsible for the stores function and proper operation of the component stock control system. This includes responsibility for the quantity of components held in store and therefore the service provided and the investment this involves.

1. Routine Re-ordering

The Procurement Manager will be informed by memo from the stock controller, when the stock of any kit or component reaches the re-order level. He must then decide when to place an order, bearing in mind the possibility of temporarily "borrowing" a component from the kit stock.

The quantity to be ordered will be indicated on the stock card and will be equivalent to one year's usage, so long as the policy is to order once per year only. In practice, it may be necessary to increase the order quantity to an economic purchase quantity, or if it was considered that the usage rate was increasing.

When an order has been placed for kits or individual components, the Procurement Manager will send one copy of the order to the Divisional Accountant and one copy to the stock controller. When the order has been placed to relieve shortages, this should be clearly shown on the order document.

2. Expediting Delivery

The Procurement Manager will take what action may be necessary to obtain early delivery of a component on being informed by the stock controller that the alarm level has been reached.

3. Monitoring Stores and Stock Control Functions

The Procurement Manager should establish an audit procedure whereby he receives stock and pan cards frequently and on a random basis to ensure accuracy of recording.

He should also evaluate the monthly kit shortage summary, the re-order level and alarm level summary and take whatever action is possible to prevent stock-outs occurring. He should inform the stock controller by memo of the action decided upon.

4. Management Information

The Procurement Manager will prepare control returns in the form agreed with the GIHOC Head Office, Production Control Consultant.

ISSUE 1

FORM SC 2

ELECTRONICS DIVISION OF GIMOC - TEMA

SUPPLY LIST ITEMS REQUIRING SEPARATE REQUISITIONS

MODEL: .....

PART NO.	DESCRIPTION	CODE NUMBER	QTY. PER KIT	STORES LOCN

SQD.....

STOCK CONTROLLER

DATE.....

APPENDIX II

COMPONENT STOCK CONTROL

KIT REQUISITION NOTE

ELECTRONICS DIVISION OF GIHOC - TEMA

KIT REQUISITION NOTE

No .....

DATE: .....

TO STORES:

Please issue [ ] Kits of [ ] on

[ ]

Sgd.....

PRODUCTION SUPERVISOR

ISSUED BY.....	KIT CARD UPDATED.....	PRICED BY.....
DATE ISSUED.....	UNIT PRICE.....	STORES LEDGER FOLIO....
RECEIVED BY.....	TOTAL PRICE.....	STORES USED SB FOLIO...

APPENDIX III

FORM SC 1

ELECTRONICS DIVISION OF GIHOC - TEMA

KIT STOCK CARD

CARD NO. [ ]

DESCRIPTION		MODEL NO.
SUPPLIER	1.	
	2.	
	3.	
	4.	
PLANNED ISSUE QTY:		PLANNED MONTHLY USAGE:
ORDER DETAILS:		

DATE	ORDER NO.	QTY. ORDERED	CALL-OFF QTY. & DELIVERY DATES

				ALARM AT		
DATE	REFERENCE	IN	OUT	STOCK	ORDERS	INITIALS

COMPONENT STOCK CONTROL

KIT SHORTAGE NOTE

ELECTRONICS DIVISION OF GIHOC - TEMA

KIT SHORTAGE NOTE

NO.....

DATE.....

Kits for model [ ] are short of the following component:

Description [ ] Code No. [ ]

Quantity short [ ]

x

Reason a) Transfer to excess stock

b) Stock check

x Delete as necessary

Sgd.....

STOCK CONTROLLER

SHORTAGE FILLED ON

Sgd.....

STOCK CONTROLLER

..... (Date)

APPENDIX V

FORM SC 3

ELECTRONICS DIVISION OF GIHOC - TEMA

ORDER SUMMARY

PAGE

DATE	ORDER NO.	DESCRIPTION	SUPPLIER	DELY. DUE	PART DELY.	[illegible] COMPL.

APPENDIX VI

FORM SC 4

ELECTRONICS DIVISION OF GIHOC - TEMA

KIT SHORTAGE SUMMARY

FOR MONTH OF............

DATE	KIT	COMPONENT IN SHORTAGE		QTY. SHORT	SHORTAGE RELIEVED
		DESCRIPTION	CODE NUMNER		

APPENDIX VII

FORM SC 5

ELECTRONICS DIVISION OF GIHOC - TEMA

RE-ORDER LEVEL AND ALARM LEVEL SUMMARY FOR

MONTH OF.....

DATE	DESCRIPTION	CODE NUMBER	KITS USED ON	LEVEL BROKEN (ROL/AL)	ACTION BEING TAKEN	LEVEL RESTORED

APPENDIX VIII

FORM SC 6

ELECTRONICS DIVISION OF GIHOC - TEMA

EXCESS USAGE SUMMARY FOR

MONTH OF.....

% EXCESS USAGE	
NO. OF KITS ASS.	
REASON	
KIT USED ON	
QTY.	
CODE NUMBER	
DESCRIPTION	
DATE	

The United Nations Industrial Development Organization
Government of Ghana

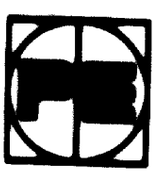
02599
(5 of 5)

Management Assistance to the Ghana Industrial Holding Corporation

Unido Contract No. 75/3
Project No. DP/GHA/74/002

Final Report

Volume 5 -Annexes
Production and Technical



The P-E Consulting Group

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

FINAL REPORT

VOLUME 5

ANNEXES

PRODUCTION AND TECHNICAL

OCTOBER, 1977

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THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

GOVERNMENT OF GHANA

MANAGEMENT ASSISTANCE TO THE GHANA INDUSTRIAL HOLDING CORPORATION

UNIDO CONTRACT NO. 75/3

PROJECT NO. DP/GHA/74/002

FINAL REPORT

VOLUME 5

ANNEXES

PRODUCTION AND TECHNICAL

VOLUME 5

ANNEXE I

FIBRE BAG MANUFACTURING DIVISION

CONTROL DURING MANUFACTURE

GHANA INDUSTRIAL HOLDING CORPORATION

FIBRE BAG MANUFACTURING DIVISION

CONTROL DURING MANUFACTURE

Background to the recommendations made for improving control of manufacture.

CONTENTS

January 1977

CONTROL DURING MANUFACTURE

1. INTRODUCTION

A factory's performance can be improved by achieving better control of the manufacturing process. However, it should be remembered that tests and reports do not control a factory. Action must be taken by management on the test results if control is to be improved. This report describes briefly some of the main points to be considered when introducing controls during manufacture.

2. FACTORS WHICH AFFECT PERFORMANCE

During the day to day operation of Fibre Bag Manufacturing Division there are a number of factors which can vary and affect performance. The main ones are summarised as follows:-

2.1 Selection of Fibres

2.2 Fibres during processing, maturing, oil content, moisture regain, emulsion application, emulsion quality, counts of slivers and yarns

2.3 Machinery and its capability

2.4 Performance of production and engineering personnel.

Items 2.1 and 2.2 are concerned with control of the process and the characteristics of the fibre before and during processing. These factors are described in detail in a further report entitled "Process and Quality Control - The Main Factors". Revised process and quality control procedures are contained in a separate appendix to this report, ref: "Process and Quality Control Procedures".

Items 2.3 and 2.4 are concerned with the performance of machines and personnel. These factors are described in more detail in a separate report entitled "Production Performance and Procedures" which contains the revised procedures for reporting machine and worker efficiencies.

The effects of any one of the factors summarised in 2.1 and 2.4 cannot be considered in isolation from the effects of the others. The performance of one production section can be influenced significantly by factors which occurred in an earlier section in the process, some hours or days previously. For example, spinning and weaving performances are dependent largly on the fibre maturity, oil content, moisture regain and sliver count during carding.

Process and quality control, machine capability and worker performance are inter-related throughout the factory.

3. BASIS FOR CONTROL DECISIONS

At Fibre Bag Manufacturing Division, control decisions stem from:-

- the results of tests before and during manufacture

AND - the opinions of managers and supervisors based on their own experience and knowledge.

Both these sources of information are essential. However, it is important that sufficient control measures are taken to ensure that, where possible, actions are based on fact and not opinion. There are two main advantages:-

1. The real effects of changes in the process are more easily judged if appropriate tests are done and facts recorded.

2. Test data can be analysed and records developed to assist management with their subsequent judgements and decisions. (By contrast, opinions, experience and knowledge are rarely recorded satisfactorily.)

At Fibre Bag Manufacturing Division, some procedures can be changed to provide more and better information; some procedures can be eliminated.

Overall, more meaningful information can be produced with less paperwork.

4. STANDARDS

Over the years, much operating data has been collected from the many jute mills around the world. Consequently, there are now generally accepted production, process and quality standards which can be used for monitoring Fibre Bag Manufacturing Division's performance at various stages of manufacture. Many of these standards are already used; some others should be added.

Every jute factory finds small variations to these standards best suited to their own operating circumstances. Fibre Bag Manufacturing Division should record and analyse appropriate data with the objective of establishing their own optimum operating conditions.

5. SUMMARY

5.1 Factory performance can be improved by achieving better control during manufacture.

5.2 Tests alone do not control. Action by management is the controlling factor.

5.3 Factory performance is affected by many factors which are inter-related and cannot be considered in isolation from the remainder.

5.4 Process and quality control at the early production stages is vital to overall factory performance.

5.5 Any improvement to quality and production records enables management to base decisions more on facts and less on opinion.

5.6 Some of the generally accepted performance standards are in use at Fibre Bag Manufacturing Division to help control production; some further standards can be introduced to good effect.

5.7 All data should be analysed and recorded with the objective of establishing optimum operating conditions.

5.8 More meaningful information can be produced with less paperwork.

D.J. WEEKS
U.N.D.P.

VOLUME 5

ANNEXE II

FIBRE BAG MANUFACTURING DIVISION

PROCESS AND QUALITY

- THE MAIN FACTORS

REPORT

PROCESS AND QUALITY

THE MAIN FACTORS

CONTENTS

REPORT
PROCESS AND QUALITY
THE MAIN FACTORS

INTRODUCTION

This report discusses the main factors which affect the characteristics and quality of the fibre for processing. The report recommends what procedures should be introduced to improve process and quality control.

These procedures are contained in a separate appendix to this report, Reference: "Process and Quality Control Procedures".

It should be noted that process and quality control will only be successful if :-

- test methods are sound
- record keeping is straightforward
- there is a genuine desire to achieve good control
- test results are correctly interpreted and appropriate action taken
- it is understood that it may be several years before good control is satisfactorily established.

The report is divided into three parts:

Part A - Selection of Fibres
Part B - Fibres during Processing
Part C - Current Situation and Recommendations.

R E P O R T

PROCESS AND QUALITY

THE MAIN FACTORS

P A R T A

SELECTION OF FIBRES

PROCESS AND QUALITY

THE MAIN FACTORS

PART A - SELECTION OF FIBRES

Clearly, the grades of fibres purchased and selected for blending affect the quality of the yarn produced. The main objective is that the cost of the blend should be as low as is consistent with the quality required for the product.

A.1 CURRENT SITUATION

The fibre processed at Fibre Bag Manufacturing Division is blended mainly from two imported fibres, namely B.W.D. long jute and B.W.C.B. jute cuttings. Kenaf, both imported and locally grown, makes up a small proportion, normally less than 10% of the total fibre used.

The selection of these grades for purchasing and subsequently for 'Batching' i.e. the blending of two or more qualities into one unit for processing, is based largely on the experience of senior mill management.

The quality of the fibres now in use compares favourably with materials used satisfactorily in other mills manufacturing similar products. However, since the mill was commissioned, there does not seem to have been a programme of tests designed to establish the optimum blend of fibres i.e. the blend for which the cost is as low as is consistent with the quality required.

A.2 CONSIDERING THE OPTIMUM BLEND

The optimum blend of fibres is influenced by the following:

Fibre Prices. Price fluctuations, as much as 20% within a year, may occur.

Guarantee of fibre quality. It is thought that the quality actually delivered is not always consistent with the quality ordered.

Factory operating conditions. which include machinery capability, worker performance, process control and weather conditions.

The first two, which are largely outside Fibre Bag Manufacturing Division's control, affect the decision at the purchasing stage. The third affects the decision at 'Batching'.

During the immediate one to 2 years a number of developments are taking place at Fibre Bag Manufacturing Division including the rehabilitation of machinery, training of personnel and introduction of revised control procedures. These will change the factory operating conditions. A programme of tests to establish the optimum blend is not a practical proposition with so many changes taking place. Only when these changes in the mill have taken place and the new operating conditions have become established, will a fibre blending test programme be justified.

In the meantime, the batching of fibres should continue, as at present, with management using their experience to choose the most suitable blends for specific conditions.

It is appreciated that Fibre Bag Manufacturing Division is anxious to study, in more depth, the effect of kenaf on factory performance. However, the recommendation to delay

blending tests should apply to all fibres until the changes are complete.

R E P O R T

PROCESS AND QUALITY

THE MAIN FACTORS

P A R T B

FIBRES DURING PROCESSING

PROCESS AND QUALITY
THE MAIN FACTORS

PART B - FIBRES DURING PROCESSING

It is the maturing of the fibres which largely determines the quality of the yarn produced. Both oil and water applied to the fibre as an emulsion, play an important part in the maturing process and in subsequent processing.

An understanding of the influence of these factors provides important background to the need for process and quality control procedures.

This part of the report discusses under separate headings the following:

B.1 - Maturing
B.2 - Oil Content
B.3 - Moisture and Relative Humidity
B.4 - Emulsion Application
B.5 - Emulsion Quality
B.6 - Weights and Counts of Slivers and Yarns.

B.1 MATURING

If jute fibre is processed direct from the bale, waste is high and the eventual yarn is weak. Fibre is therefore conditioned by adding oil and water, in the form of an emulsion, which softens the fibre, increases its extensibility and generally makes it more suitable for processing. This conditioning takes place during a maturing period.

Rolls of long jute, after emulsion has been added at the spreaders, are stacked, covered with canvas and left for 36 to 48 hours to mature. A minimum temperature of 130°F (55°C) should be reached before processing at the breaker cards.

Cuttings, after emulsion has been added at the softeners, are stored in bins for 5 to 7 days to mature. A temperature of 150°F (65°C) should be reached before processing at the teaser cards.

It should be understood that fibres are not necessarily well matured because a high temperature has been attained. It is the application of an emulsion which allows the oil to penetrate thoroughly into the fibre during the time bacterial action and subsequent heating takes place. Oil assists in the actual maturing, producing soft, pliable and slightly damp fibres.

B.2 OIL CONTENT

After the oil has assisted the maturing process, it helps to lubricate the pins as the fibres pass through the Carding and Drawing Systems, thus allowing splitting, levelling and cleaning to take place in a uniform manner. Oil also assists sliver cohesion.

Although the amount of oil is not critical to the strength of the yarn at spinning, there are other limitations. Too much oil (greater than approximately [illegible]%) will gum up the pins, conductors and rollers normally lubricated by the oil during processing. Too little oil (less than approximately 3%) will increase waste, particularly at the carding section, through excessive breaks and dust. An addition of [illegible]% or [illegible]% is normal. One important point is that jute spinning is not a commercial proposition without oil whose presence in the end product helps to increase profitability.

Approximately 10% of the oil applied at Batching is lost in the process.

3.3 MOISTURE AND RELATIVE HUMIDITY

The amount of moisture present in the fibre has a big influence on processing efficiency throughout the mill.

In its natural condition, jute takes in or gives out moisture to the surrounding atmosphere and the moisture present in the jute therefore depends on the relative humidity in the atmosphere and the fibres exposed to it.

For processing, the moisture is increased above its natural amount by the water contained in the emulsion application. Subsequently, moisture is lost during processing until after spinning, the moisture should be approximately at the same level as that naturally present before the emulsion application.

The amount of moisture present can be expressed in two ways, namely:-

$$\text{Moisture content (\%)} = \frac{\text{Weight of moisture present} \times 100}{\text{Total weight of sample}}$$

$$\text{or Moisture Regain (\%)} = \frac{\text{Weight of moisture present} \times 100}{\text{Weight of bone-dry fibre}}$$

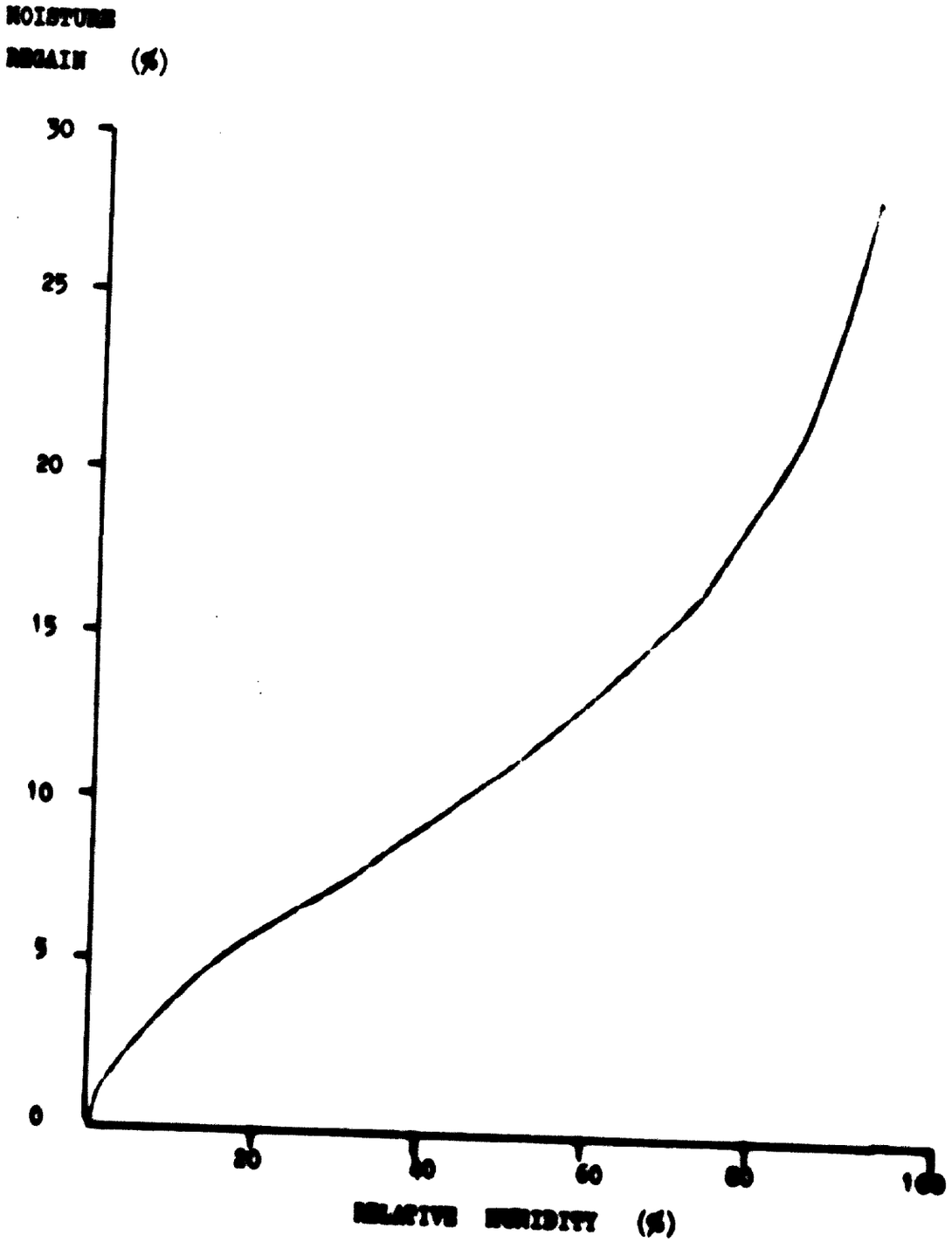
Moisture regain is normally preferred and is used in this report. Appendix B3-1 shows how moisture regain varies with relative humidity in a state of equilibrium, i.e. when the jute does not absorb water from or give water to the surrounding atmosphere.

Relative humidity is one important factor which cannot be controlled at Fibre Bag Manufacturing Division. During the fermentation, the relative humidity can change from 70% at the start of the morning shift, to 90% in mid-afternoon. At certain stages of the process, a fall of several percent in moisture regain could occur.

It is important sometimes to know to what extent any reduction in fibre weight is due to a fall in moisture regain. This is particularly so at spinning where the final adjustment is made to obtain the correct yarn count.

Clearly the extent to which jute is exposed affects the moisture regain. Spreader rolls and cuttings will lose moisture readily if covers are not used. The breese caused by spinning frames and card cylinders accelerates moisture loss and this could have a significant effect on moisture regain.

MOISTURE REGAIN OF JUTE AT VARIOUS HUMIDITIES



B.4 EMULSION APPLICATION

The quantities of oil and moisture present in jute are important and, consequently, so is the emulsion quantity applied. The calculation and application of the emulsion must be correct and there is only one combination of emulsion application and recipe which will give a specific moisture and oil addition.

Appendix B.4-I shows examples of emulsion calculations whilst Appendix B.4-II shows a chart of oil and water additions for a wide range of combinations of emulsion application and recipes.

At Fibre Bag Manufacturing Division the emulsion application should be approximately 20% to 25% at the spreaders and 30% to 35% at the softeners.

Emulsion is applied at the softeners and spreaders through spray jets which can be calibrated for specific jute feed rates using the pressure gauges in the emulsion supply system. An emulsion calibration procedure has already been documented. Ref. CAL/SPR/I. The following points should be noted regarding the measurement of an emulsion application:-

- any blockages which occur in the system downstream of the gauges, which includes blockages at the jets, cause back pressure. As a result, gauge readings will increase and thus imply that more liquid is passing, whereas, in fact, the flow has been restricted.

To avoid such a situation, filters, pipes and jets must be kept clear by regular maintenance.

- Calibrations must be done separately for each Spreader and Softener because there will be pressure drops in the ring main and consequently the same pressure gauge reading will not give the same application at different points.

Calibrations should be checked regularly,
(see Process and Quality Control Procedures).

Although gauges are liable to error if the emulsion viscosity changes significantly, this is unlikely to represent a problem at Fibre Bag Manufacturing Division since only small changes of viscosity will occur providing the batching oil viscosity is basically the same, and emulsion mixing procedures are consistent.

CALCULATION OF OIL AND WATER ADDED TO JUTE FOR DIFFERENT EMULSIONS

EXAMPLE 1 - Typical Application at the Spreader

Emulsion Application	=	22%
Oil Added to Jute	=	5%

CALCULATION:

Water Added	=	22 - 5 = 17%
% Water in Emulsion	=	$\frac{17}{22}$ x 100 = 77%

EXAMPLE 2 - Typical Application at the Softener

% Water in Emulsion	=	80%
Emulsion Application	=	35%

CALCULATION:

Water Added	=	0.80 x 35 = 28%
Oil Added	=	35 - 28 = 7%

NOTES:

1. The moisture regain will be the water added to the jute via the emulsion plus the natural moisture in the fibre prior to emulsion addition. Therefore, if the natural moisture regain for example 2 is 14%, the moisture regain immediately after application = (114 x 1.28) - 100 = 46%.

2. There is only one combination of emulsion application and recipe which will give a specific moisture and oil addition. Therefore the calculation and application must be correct.

TABLE OF OIL AND WATER ADDITIONS TO JUTE FOR A RANGE OF EMULSION APPLICATIONS AND RECIPES

PERCENTAGE EMULSION APPLICATION	WATER PROPORTIONS	PERCENTAGE OF OIL ADDED						
		3	4	5	6	7	8	9
18%	% Water Added	15	14	13	12	11	10	
	% Water in Emul.	83	78	72	67	61	56	
20%	% Water Added	17	16	15	14	13	12	
	% Water in Emul.	85	80	75	70	65	60	
22%	% Water Added	19	18	17	16	15	14	
	% Water in Emul.	86	82	77	73	68	64	
24%	% Water Added	21	20	19	18	17	16	
	% Water in Emul.	88	83	79	75	71	67	
26%	% Water Added	23	22	21	20	19	18	
	% Water in Emul.	88	85	81	77	73	69	
28%	% Water Added	25	24	23	22	21	20	
	% Water in Emul.	89	86	82	79	75	71	
30%	% Water Added	27	26	25	24	23	22	21
	% Water in Emul	90	87	83	80	77	73	70
32%	% Water Added	29	28	27	26	25	24	23
	% Water in Emul.	91	88	84	81	78	75	72
34%	% Water Added	31	30	29	28	27	26	25
	% Water in Emul.	91	88	85	82	79	76	74
36%	% Water Added	33	32	31	30	29	28	27
	% Water in Emul.	92	89	86	83	81	78	75
38%	% Water Added	35	34	33	32	31	30	29
	% Water in Emul.	92	89	87	84	82	79	76
40%	% Water Added	37	36	35	34	33	32	31
	% Water in Emul.	93	90	88	85	83	80	78

B.5 EMULSION QUALITY

The correct proportions of oil and water in an emulsion are the most important requirement. At Fibre Bag Manufacturing Division emulsion proportions are normally 20% oil and 80% water. These can be checked by a standard procedure suitable for all oil-in-water emulsions. This procedure is described in Appendix B.5 - I.

Apart from incorrect proportions of oil and water, there are only two other possible main emulsion defects.

Creaming: Whereby a number of comparatively large emulsified droplets rise to the top of the emulsion. It is not a serious fault and can be overcome by gentle stirring,

and

Breaking: whereby drops of free oil form on the surface indicating a broken emulsion. The process cannot be reversed once the emulsion has become unstable and the emulsion must be replaced.

PROCEDURE FOR TESTING THE PROPORTIONS OF AN OIL-IN-WATER EMULSION

Apparatus Required:

1 Bunsen Burner
1 Sample Bottle
1 Pipette
1 Test Tube
1 Measuring Cylinder
1 Glass Rod.
10% Sulphuric Acid (10 ml)
Anhydrous Sodium Sulphide (5g.)
Emulsion Sample (Approximately 110 ml.)

Method:

1. Draw an approximate 110 ml. sample of emulsion from the sprays.

2. Shake sample bottle well, measure 100 ml. into the measuring cylinder and transfer to the beaker. Heat to 90° to 95°C.

3. Add 10 ml. of 10% sulphuric acid and 5g. of anhydrous sodium sulphide to the measuring cylinder and pour back the heated emulsion.

4. Stir the contents well with the glass rod and allow to settle. The oil separates into the upper layer.
If there are 'x' ml. of oil in the top layer, the emulsion contains 'x'% oil and (100-x)% water.

Note After the hot emulsion has been put back into the measuring cylinder, never shake or invert the contents since the rapid evolution of gas may force some of the acidic solution out of the container.

B.6 - WEIGHTS AND COUNTS OF SLIVERS AND YARNS

Slivers and yarns include oil and water; their weights therefore are a function of moisture regain and oil content.

The oil content is determined by the emulsion recipe and emulsion application percentage. The amount of oil lost in waste fibre below machines is fairly consistent and providing the emulsion application and recipe are known, the oil content at spinning can be estimated fairly accurately.

Moisture regain is less easily estimated. It is determined not only by the emulsion recipe and application percentage but by the relative humidity and the amount of exposure of the fibre to the atmosphere during the process.

A sliver of yarn therefore may be above or below count simply because of moisture.

The theoretically correct way of checking the quantity of fibre in a yarn is to convert the count to that at 'standard' moisture regain (normally 14%). However, this procedure need not be followed at Fibre Bag Manufacturing Division.

Providing some checks are made of moisture regain during the process to see whether any significant change in sliver or yarn count is due to abnormal moisture regain, there is no need to convert all counts to standard moisture regain.

It is sufficient to establish over a period, limits for sliver and yarn counts within which, for particular processing conditions, a satisfactory end product will result.

If, in special circumstances, a comparison of count at standard moisture regain is required, the calculation can be done by reference to Appendix B.6-I.

Note: Abnormal moisture regain could be due to incorrect emulsion application, excessive loss of moisture due perhaps to the non-use of covers during maturing or a significant change in relative humidity.

YARN COUNT CONTROL

A CORRECTION CALCULATION FOR MOISTURE REGAIN

Calculation:

$$\text{Correct Count} = \frac{\text{Measured Count} \times (100 + \text{Standard Moisture} + \text{Oil Content})}{(100 + \text{Measured Moisture Regain} + \text{Oil Content})}$$

Example from Line 2 of the table below:

$$\text{Correct Count} = \frac{8.2 \times (100 + 14 + 5)}{(100 + 18 + 5)} = 7.9 \text{ lbs./spangle}$$

Count lb/Spangle (as measured)	Oil Content (%)	Moisture Regain (%)	Count lb/ Spangle (corrected)
8.0	5%	14%	8.0
8.2	5%	18%	7.9
8.4	5%	18%	8.1
8.6	5%	23%	8.0
8.8	5%	23%	8.1

NOTE:

Count corrected to 14% moisture retain which is the 'standard' accepted at 65% Relative Humidity and 68°F (20°C).

REPORT
PROCESS AND QUALITY
THE MAIN FACTORS

PART C

CURRENT SITUATION AND RECOMMENDATIONS

C.1 - General

Part A and Part B describe the most important factors influencing process and quality control. Not all these factors are of equal importance, but it is necessary to appreciate that they all affect the process, albeit to different extents, and that specific tests need to be done to enable some control to be established.

The choice of tests, and the frequency and accuracy of the measurements, to some extent depend upon the results obtained. That is, it is necessary to establish the effect on performance of a particular factor before deciding how carefully the same factor should be monitored. It is possible for one factor to be measured for months or even years without noticeably having much influence on the process, but at the same time, management may be reluctant to ignore totally its significance. At Fibre Bag Manufacturing Division, for example, the Harmattan dry weather period during the early part of each year creates conditions which do not recur during the same year. Tests may be required through a period covering several Harmattans before the real effects of such conditions are known. Only then, perhaps, will management feel justified in making changes in process with any certainty.

This example illustrates one of the main points referred to in the introduction to this report, i.e. that it may take several years for good control to be established.

C.2 - Existing Procedures

Some process and quality control procedures are carried out at Fibre Bag Manufacturing Division. However, the tests are confined mainly to the Preparation and Spinning Departments. Whilst these departments are important, Part B of this report has shown that maturing, oil content, moisture regain, emulsion quality and emulsion application have some significance in the process, and control of these factors should be established in the Batching Department.

Emulsion quality is checked infrequently although the emulsion mixing process seems well established. However, measurements concerned with maturing, moisture regain and emulsion application are done less effectively or not at all. In some instances the correct instrumentation has not been available but this situation should be improved shortly with the receipt of the relevant items now on order.

In the Preparation Department, the existing procedures include sliver checks for every machine. These checks are not carried out to plan, due probably to the vast amount of sampling required; as a result some misleading data is often presented.

Sliver checks are necessary but the sampling technique should be changed and made more effective.

The test results produced every day are forwarded to the Acting Mill Manager. Quality Control does not keep a copy of the results and does not therefore plot trends, chart performance or analyse in any way the data collected. Consequently it must be very difficult to assess the effects on performance of any of the factors measured.

In this situation it is not surprising that Quality Control is seen to be largely ineffective and that such work as is done is not appreciated.

Record keeping, analysis of data and trends, and the general interpretation of results are essential parts of process and quality control. Tests alone contribute little to process or quality control.

There are no formal written procedures for process and quality control.

C.3. - Recommendations

Clearly the comments in Section C.2 point the way for the recommendations in this section.

One of the most important activities is to improve the process and quality control in Batching by introducing tests for emulsion applications, maturing temperatures and moisture regain. It is appreciated that there are short term difficulties in establishing the appropriate procedures; the pressure gauges are unreliable and thermometers are not at this stage available. However, orders have been placed for these items and procedures should be introduced as soon as they are available.

Some calibrations will be required to establish relationships between pressure gauge reading, jet size and emulsion application for every softener and spreader. A calibration procedure has been written. Full calibrations should be done each year and the emulsion jet application should be checked, using the same procedure, each month.

In the Preparation Department, new sampling techniques are recommended. The emphasis is on the Tenser Cards and Light Side Breaker Cards because if the sliver count is satisfactory at this stage the sliver counts throughout the remaining cards and drawing frames will not require so much attention.

By introducing the revised sampling techniques the workload of quality control personnel in Preparation will be reduced by over 50%.

The small changes recommended in the Spinning Department affect only the manner in which the yarn is sampled. The actual yarn tests should remain the same as at present.

For all departments, new record forms have been designed and detailed procedures written.

These procedures and sample record forms are contained separately under 'Process and Quality Control Procedures'.

The procedures also include recommendations for establishing specific control charts. These charts will provide the basis for monitoring trends and creating operating 'standards'. As this data is built up, quality control personnel must continue to analyse and interpret results, always looking for relationships between the variable factors in the process and the performance. Clearly, the initial list recommended for control charts is likely to be extended.

The main objectives of these recommendations are two fold. Firstly, to provide meaningful test results which enable management to take any necessary corrective action on a day-to-day basis. Secondly, to build up records and control charts over a prolonged period so that trends can be established for different operating conditions. In time management will have 'standards' against which all test results can be judged. The wide variation in fibre conditions which can occur means that valid conclusions cannot be drawn in every instance from small samples or short tests. The development of 'standards' and variations to be expected in 'normal' processing should greatly assist management in their decision making.

D.J. [redacted]
U.M.D.P.

February 19[illegible]

C.W/2

[redacted]
[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

PROCESS AND QUALITY CONTROL PROCEDURE

DEPARTMENT: BATCHING

FREQUENCY: EACH SHIFT

Prepare the BATCHING DEPARTMENT SHIFT QUALITY CONTROL RECORD, Ref. QCR/BAT/S, as follows:

1. Enter shift and date

2. Weigh 6 stricks chosen at random and record

3. Record pressure gauge readings and jet sizes for every spreader and softener which is operating. Use latest calibration charts to calculate emulsion application percentage and record.

4. 4(a) Take 3 sliver samples of 10 metres length each, from one roll, from one spreader; weigh and record samples separately. Measure the moisture regain of the same roll in 3 places and record separately. Record time at which the test is done.

   4(b) Calculate the average sliver weight, average count and the ratio $\frac{\text{average sliver count}}{\text{standard sliver count}}$ as a percentage, and record.

   4(c) Calculate the average moisture regain and the ratio, $\frac{\text{average moisture regain}}{\text{standard moisture regain}}$ as a percentage and record.

NOTE: Test one roll from a different spreader each shift in turn.

5. Record temperature of 3 sample rolls allocated for carding on the same shift. Record the dates each of the rolls were processed by the spreaders.

6. Record temperatures of cuttings allocated for carding on the same shift; take temperature in bins. Record the number of days the cuttings have been in their respective maturing bins.

   Note: This data can be taken direct from the individual bin charts maintained daily.

7. Sign form.

BATCHLINE DEPARTMENT Ref: QCR/BAT/S

SHIFT QUALITY CONTROL RECORD IX

To be prepared each shift: Shift A / B Dated:

1. STRICK WTS.

Strick Wts (Kgms)						

Standard No. 1.1 to 1.6 Kgms.

2. EMULSION DETAILS Tests:- Spot observations to be taken of the pressure gauge reading.

Time of Test

MACHINE TYPE	SPREADER			SOFTENER		
MACHINE NO.	SR1	SR2	SR3	SF1	SF2	SF3
PRESSURE GAUGE (P.S.I)						
JET SIZE						
APPLICATION %						

3. SPREADER SAMPLES Tests:- 3 samples of 10 metres from one roll, from one spreader. Check each spreader in turn.

Time of tests:-

ALIVER WEIGHT (KGS)			AVERAGE COUNT (Fibres)	STD COUNT (Fibres)	AVERAGE STD
AVERAGE WEIGHT					

MOISTURE REGAIN %			STD MOISTURE REGAIN	AVERAGE STD
AVERAGE REGAIN				

4. BATCHLINE TEMPERATURES (a) SPREADER ROLLS

Date Produced		
Temperature °C		

Sample 3 rolls per shift.
Std. Returned Temp. - 95°C.

(b) CUTTERS BLADE

BIN NO.	DATE FILLED	TEMP. ON DAY OF USE °C	NO. OF DAYS BATCHLINE

Record, from bin chart, temperature of cuttings on day of use.
Std. Returned Temp. - 65°C.

SIGNED

[redacted]

[redacted]

[redacted]

1. [redacted]
   [redacted]

2. [redacted]
   [redacted]

[redacted]

[redacted]

[redacted]

Check the emulsion spray jet application for each spreader and reflector at the normal setting for production.

[redacted]

[redacted]

[redacted]

[redacted]

Calibrate the emulsion spray jets for each agreader and softener and draw a separate calibration chart for each machine.

[redacted]

NOTE:

[redacted]: Ranges of jet sizes and emulsion pressures should cover emulsion applications between approximately [redacted] and [redacted].

[redacted]: Ranges of jet sizes and emulsion pressures should cover emulsion applications between approximately [redacted] and [redacted].

[redacted]

[redacted]

[redacted]

The full emulsion spray jet calibration procedures or the intermediate checks cannot successfully be completed unless:

1. Faulty pressure gauges are repaired or replaced; this affects spreaders and softeners.

2. The hopper feed units are repaired; this affects the softeners.

The appropriate spares have been ordered.

In the meantime, spot checks should be done, each week, on emulsion applications.

[redacted]: The former calibration procedures should be followed (Ref. CAL/SPR/1).

[redacted]: Weigh 5 bales of cuttings before the emulsion application. Calculate the difference in weight (i.e. the emulsion application) as a percentage.

During tests, the sprays should be set for normal production. Jet sizes and pressure gauge readings should not be recorded when the gauges are faulty.

[redacted]

[redacted]

[redacted]

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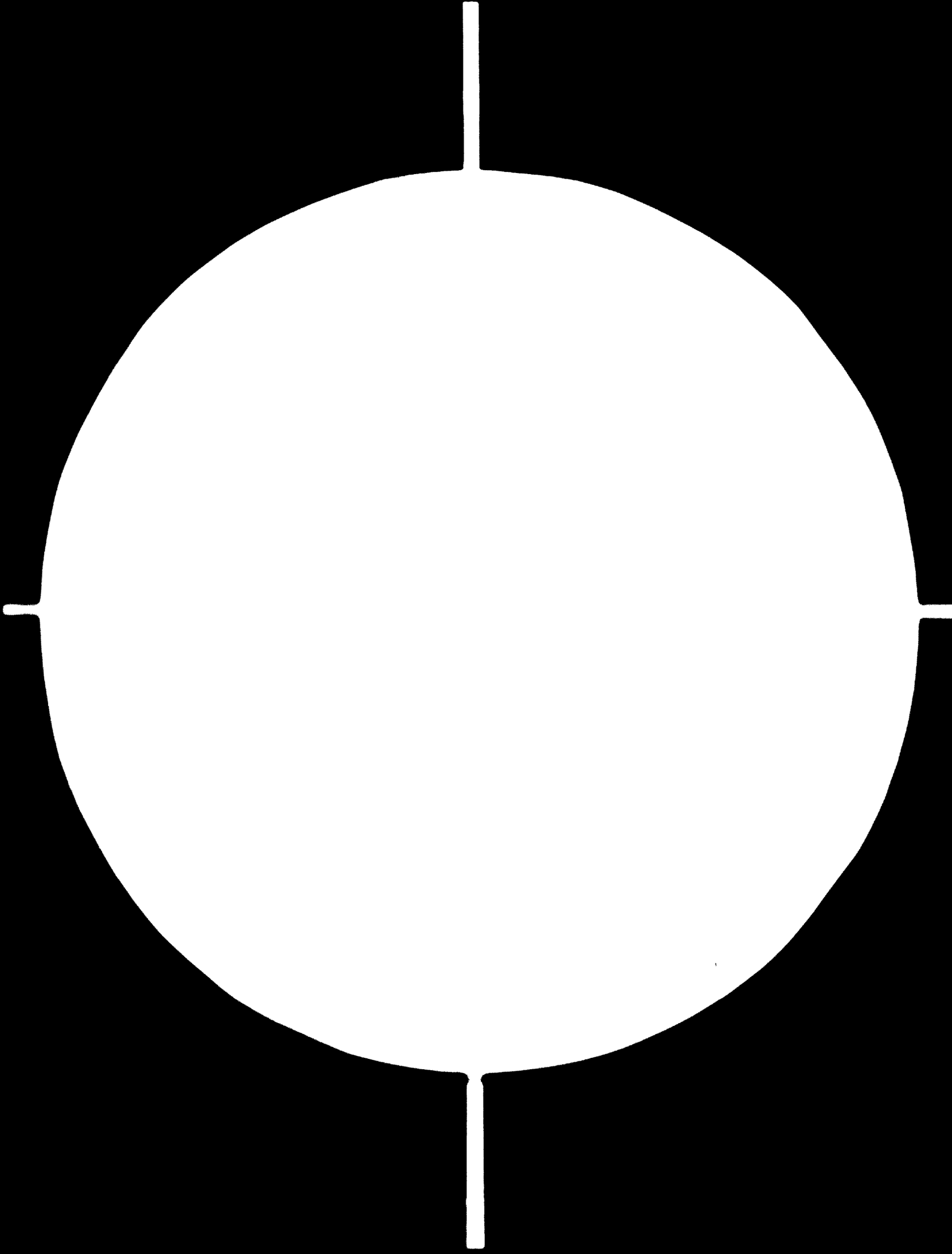

PROCESS AND QUALITY CONTROL PROCEDURES

DEPARTMENT: PREPARATION

FREQUENCY: EVERY 2 HOURS

1. Measure and record the relative humidity within the factory.

PROCESS AND QUALITY CONTROL PROCEDURES

DEPARTMENT: PREPARATION

FREQUENCY: EACH SHIFT

Prepare the PREPARATION DEPARTMENT Shift Quality Control Record, Ref. QCR/PREP/S, as follows:

1. Enter shift and date.

2. TEASER CARDS AND LIGHT SIDE BREAKER CARDS ONLY.

   2(a) For <u>each</u> card, take 2 sliver samples of 10 metres length each, from one roll; weigh and record samples separately. Measure the moisture regain of the same roll in 2 places and record separately.
   Record the times at which tests are done for teaser cards and light side breaker cards respectively.

   2(b) Calculate the average sliver weight and average moisture regain for all teaser cards and record.

   2(c) Calculate the average sliver weight and average moisture regain for all light side breaker cards and record.

<u>Note</u>: It is important that sliver weights from the teaser cards and light side breaker cards are correct. Tests should be carried out within the first 2 hours of each shift so that any corrective action can be taken early by shift supervision.

3. <u>FINISHER CARDS AND 4½ PAIR INTERCARDS</u>

   3(a) For <u>every other card</u>, take 2 sliver samples of 10 metres length each, from one roll;

weigh and record samples separately. Measure the moisture regain of the same roll in 2 places and record separately. Record all test data with the card number from which the relevant test slivers are taken. Record the times at which the tests are done for heavy finisher cards, light finisher cards and 4½ pair intercards respectively.

3(b) Calculate the average sliver weight and average moisture regain for all heavy side finisher cards and record.

3(c) Calculate the average sliver weight and average moisture regain for all light side finisher cards and record.

Note:

Test rolls from different cards on successive shifts.

4. Sign form.

PREPARATION DEPARTMENT

Ref: QCR/PREP/S
X

SHIFT QUALITY CONTROL RECORD

To be prepared each shift.

Date:..... Shift A / B

1. TEASER CARDS AND LIGHT SIDE BREAKER CARDS

1 test per shift from each card. Two samples from one roll.

TEASER CARD	TH1		TH2		TH3		TH4		TH5		TH6	
SLIVER WT. (KG)												
MOISTURE REGAIN												

AVERAGE SLIVER WT.= _____ AVERAGE MOISTURE REGAIN= _____

TIME OF TEST: _____

BREAKER CARD	BL1		BL2		BL3		BL4		BL5		BL6	
SLIVER Wt. (KG)												
MOISTURE REGAIN												

AVERAGE SLIVER WT. = _____ AVERAGE MOISTURE REGAIN = _____

TIME OF TEST: _____

2. FINISHER CARDS AND 4½ PAIR INTERCARDS

1 test per shift from every other cards. Two samples from one roll.

Test different cards on successive shifts.

HEAVY FINISH										
SLIVER WT.										
MOISTURE REGAIN										

AVERAGE SLIVER WT. = _____ AVERAGE MOISTURE REGAIN = _____

TIME OF TEST: _____

LIGHT FINISH										
SLIVER WT.										
MOISTURE REGAIN										

AVERAGE SLIVER WT. = _____ AVERAGE MOISTURE REGAIN = _____

TIME OF TEST: _____

4½ PAIR		
SLIVER WT.		
MOISTURE REGAIN		

SIGNED: _____

PROCESS AND QUALITY CONTROL PROCEDURES

DEPARTMENT: PREPARATION

FREQUENCY: EACH WEEK

Prepare the PREPARATION DEPARTMENT WEEKLY QUALITY CONTROL RECORD, Ref. QCR/PREP/W, as follows:

1. Enter shift and date.

2. 1ST DRAWING FRAMES AND FINISHER DRAWING FRAMES ONLY

   2(a) For one drawing frame in each line, take 3 sliver samples of 25 metres length each, from one can; weigh and record samples separately. Measure the moisture regain from the same can in 3 places and record separately.
   Record all test data with the drawing frame number from which the relevant test slivers are taken.
   Record the times at which the tests are done.

   2(b) Calculate and record for each drawing frame tested
   - average sliver weight (gms)
   - average sliver count (ktex)
   - $\frac{\text{average sliver count}}{\text{standard sliver count}}$ (%)
   - Average moisture regain (%)
   - $\frac{\text{average moisture regain}}{\text{standard moisture regain}}$ (%)

3. WEEKLY SUMMARY - CARD TESTS

   To be completed at the end of each week using all the PREPARATION DEPARTMENT SHIFT QUALITY CONTROL RECORDS for the week just completed.

Calculate and record for each type of tested card.

3(a) Average sliver weight (kilograms)

3(b) Average sliver count (kilotex)

3(c) $\frac{\text{Average sliver count}}{\text{Standard sliver count}}$ (%)

3(d) Average moisture regain (%)

3(e) $\frac{\text{Average moisture regain}}{\text{Standard moisture regain}}$ (%)

4. Sign form.

PREPARATION DEPARTMENT Ref: QC/PREP/W X1

WEEKLY QUALITY CONTROL RECORD

To be prepared each week for each shift. Date:.....

Shift A / B

SLIVER WEIGHTS FOR 25 METRES (IN GRAMS)

1. 1ST DRAWING FRAMES AND FINISHER DRAWING FRAMES

One test per shift, per week. Each test:- Three samples from one can from one Drawing Frame in each line. Each Drawing Frame to be tested in turn.

DRAWING FRAME	M/C NO.	SLIVER WEIGHTS (GMS)			AVGE SLIVER COUNT (Ktex)	STD COUNT (Ktex)	AVERAGE STANDARD
LIGHTSIDE 1ST D.F.						40	
LIGHTSIDE FINISHER D.F.						6	
HEAVYSIDE 1ST D.F.						40	
HEAVYSIDE FINISHER D.F.						9	

Time of tests _____

Moisture Regain to be for the Sliver tested above

DRAWING FRAME	M/C No.	MOISTURE REGAIN %	AVERAGE REGAIN	STANDARD REGAIN	AVERAGE STANDARD
LIGHT SIDE 1ST D.F.				27%	
LIGHTSIDE FINISHER D.F.				26%	
HEAVYSIDE 1ST D.F.				26%	
HEAVYSIDE FINISHER D.F.				25%	

Time of Tests _____

WEEKLY SUMMARY - CARD TESTS

TYPE OF CARD	AVERAGE SLIVER WEIGHT (KGS)	SLIVER COUNT (Ktex)			MOISTURE REGAIN (%)		
		AVERAGE	STANDARD	AVERAGE STANDARD	AVER-AGE	STAN-DARD	AVERAGE STANDARD
TEASER			110			32%	
LIGHTSIDE BREAKER			100			29%	
HEAVYSIDE FINISHER			78			27%	
LIGHTSIDE FINISHER			75			27%	
4½ PAIR INTER			78			30%	

Figures calculated from
all Shift reports (Form QCR/PREP/S)

Signed: _____

PROCESS AND QUALITY CONTROL PROCEDURES

S P I N N I N G

P R E P A R A T I O N

PROCESS AND QUALITY CONTROL PROCEDURES

DEPARTMENT: SPINNING

FREQUENCY: TWICE PER SHIFT

Prepare the SPINNING DEPARTMENT SHIFT QUALITY CONTROL RECORD, Ref. QCR/SPIN/S, as follows:

1. Enter shift and date

2. Select 10 bobbins at random from each of 2 Warp spinning frames and 3 Weft spinning frames.

3. Measure 100 metres length of yarn from each bobbin and weigh separately. Record individual weights against the relevant spinning frame number.

4. Using the same pieces of yarn, complete tests for twist and breaking strength and record twist (twist per inch) and breaking strength (kilograms) against the relevant spinning frame number.

5. Calculate and record for each spinning frame,
   - average weight per 100 metres (kilograms)
   - average count (tex)
   - average twist (twists per inch)
   - average breaking strength (kilograms)
   - average of the lowest 5 breaking strengths (kilograms).

6. Calculate and record, for the same parameters as paragraph 5, the averages for the warp spinning frames (average 2 sets of results) and weft spinning frames (average 3 sets of results).

7. Calculate and record the 'Dundee' Quality Ratio (%) and 'Mackie' Quality Ratio (%) for each spinning frame and for the warp spinning frames (average 2 results) and weft spinning frames (average 3 results). See calculation procedure attached, Ref. SP/CI.

8. Enter time of test and sign form.

PROCESS AND QUALITY CONTROL PROCEDURES

CALCULATION PROCEDURE SP/C I

Calculation for 'Dundee' and 'Mackie' Quality Ratios

Definitions

$$\text{'Dundee' Quality Ratio} = \frac{\text{Average Breaking Strength}}{\text{Average Yarn weight per spindle}} \times 100\ (\%)$$

$$\text{'Mackie' Quality Ratio} = \frac{\text{Average Breaking strength of lowest 5 breaks}}{\text{Average Yarn weight per spindle}} \times 100\ (\%)$$

The 'Dundee' method is used in most mills but the 'Mackie' method does give simple measurement of the deviation of the yarns from the average strength and therefore the inconsistencies in the process. Consequently both calculations are recommended.

Calculation

Because the breaking strength is measured in kilograms and the yarn weight per spindle is measured in tex the calculation is most conveniently done using a conversion factor as follows:

$$\text{Tex} = 76 \times \text{Kgs/spindle.}$$

Example:

	Breaking strength (Kg)	
1.	3.9	
2.	4.2	
3.	3.5	Assume average yarn count = 400 tex.
4.	4.1	
5.	3.4	
6.	4.1	Average Breaking strength = $\frac{39.0}{10}$ = 3.9 kg.
7.	3.7	
8.	3.9	Average Breaking strength of the lowest
9.	4.0	5 breaks = $\frac{3.9 + 3.5 + 3.4 + 3.7 + 3.9}{5}$
10.	4.2	
Total	39.0	= $\frac{18.4}{5}$ = 3.68 kg.

'Dundee' Quality Ratio = $\frac{3.9 \times 76}{400} \times 100 = 74.1\%$

'Mackie' Quality Ratio = $\frac{3.68 \times 76}{400} \times 100 = 69.9\%$

SPINNING DEPARTMENT Ref: QCR/SPIN/:

SHIFT QUALITY CONTROL RECORD

To be prepared twice per Shift. Date: _____

Shift A / B

Test 2 Warp and 3 Weft Spinning Frames.

Select 10 bobbins per frame.

WT PER 100 METRES (KGS)					
M/C NO.	WARP		WEFT		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
AVGE					
COUNT (TEX)					
AVERAGE COUNT (TEX)	WARP		WEFT		

BREAKING STRENGTH (KGS)					
M/C NO.	WARP		WEFT		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
AVGE					
OVERALL AVERAGE (KGS)	WARP		WEFT		
AVERAGE LOWEST 5 (KGS)	WARP		WEFT		

TWIST (T.P.I.)					
M/C NO.	WARP		WEFT		
D.P.					
T.P.					
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
AVGE					
AVERAGE TWIST (T.P.I.)	WARP		WEFT		

QUALITY RATIOS (%)					
M/C No.	WARP		WEFT		
DUNDEE					
MACKIE					
AVERAGE DUNDEE	WARP		WEFT		
AVERAGE MACKIE	WARP		WEFT		

TIME OF TEST: _____

SIGNED: _____

SOM:

PROCESS AND QUALITY CONTROL PROCEDURES

MAINTENANCE OF CONTROL CHARTS

The following charts should be maintained.

BATCHING EACH DAY

Spreader — Average sliver count
Average moisture regain

PREPARATION EACH DAY

Teaser card
Lightside Breaker card
Heavyside Finisher card
4½ Pair Inter card

1. Average, highest and lowest sliver count.
2. Average, highest and lowest moisture regain.

EACH WEEK

FROM FROM ONCE PER WEEK TESTS:

Lightside 1st Drawing Frame
Lightside Finisher Drawing Frame
Heavyside 1st Drawing Frame
Heavyside Finisher Drawing Frame

$$\frac{\text{Average sliver count}}{\text{standard sliver count}}(\%)$$

FROM WEEKLY SUMMARY OF TESTS EACH SHIFT:

Spreader
Teaser Card
Lightside Breaker card
Heavyside Finisher card
Lightside Finisher card
4½ Pair Inter card

1. $\frac{\text{Average sliver count}}{\text{Standard sliver count}}$ (%)
2. $\frac{\text{Average moisture regain}}{\text{Standard moisture regain}}$ (%)

SPINNING EACH DAY

For Warp and Weft

Average, highest and lowest count
Average twist
Dundee Quality Ratio
Mackie Quality Ratio

PROCESS AND QUALITY CONTROL PROCEDURES

DISTRIBUTION OF RECORDS

1 copy of each completed record should be forwarded to the Mill Manager.

1 copy of each completed record should be retained and filed in the Quality Control Department.

VOLUME 5

ANNEXE IV

FIBRE BAG MANUFACTURING DIVISION

PRODUCTION PERFORMANCE AND PROCEDURES

REPORT

PRODUCTION PERFORMANCE AND PROCEDURES

CONTENTS

PART B - GOOD OPERATING PRACTICE

B.1 - Batching Department

B.2 - Preparation Department

B.3 - Spinning Department

B.4 - Winding and Beaming Department

B.5 - Weaving Department

PRODUCTION PERFORMANCE AND PROCEDURES

INTRODUCTION

A separate U.N.D.P. report entitled 'Control During Manufacture' summarises the most important points regarding improvement in control and performance. One of the main comments is that more meaningful information can be obtained at F.B.M.D. with less paperwork. This comment applies particularly to the recording of production performance in terms of machine and worker efficiencies.

Part A of this report describes the current situation and recommends the use of several new forms and the elimination of many existing forms. Forms which should be retained with little or no modification are also included in this report for completeness.

Part B refers to another important aspect of factory performance. The various process, quality and production tests help management to plan and control, but there are a number of matters, not necessarily reported in such tests which require frequent, sometime almost continuous attention if the factory is to operate satisfactorily. Operators, engineers, supervisors and managers should be made aware of the more important points which could be said to make up 'Good Operating Practice' which is described in Part B of this report.

Many of the points listed should be covered by routine maintenance planning but all of them can be checked on a regular operating basis by production personnel to ensure good operating practice.

PRODUCTION PERFORMANCE AND PROCEDURES

PART A PRODUCTION AND MACHINE EFFICIENCIES

A.1 CURRENT SITUATION

The current procedures are based on a report entitled "Production Control and Recording System" dated April 1970. Since that date some modifications have taken place to simplify the reporting procedure but over 40 different forms are currently in use; half of these require completion each shift. There are also numerous pieces of paper on which junior supervisors provide data required for some of these reports, notably those which record electrical and mechanical efficiencies and breakdowns.

A considerable amount of work and effort is required to maintain all these procedures. Both the Mill Manager and the Chief Engineer, together with their senior staff, find little or no use for many of the reports issued.

There are two types of report.

A.1.1 Production Reports

These record outputs from machines and groups of machines. In some sections, notably between spinning and finishing, detailed records of individual operator performances are used for calculating incentive payments which encourage higher efficiencies.

For many of the machines in the batching and preparation departments, the nature of the work makes it impractical to record accurate individual operator performances; consequently records are relatively simple.

A.1.2 Machine Efficiency Reports

These record machine efficiencies mainly in terms of the machine processing time relative to the time available. Such factors as time lost due to mechanical faults, electrical faults or routine maintenance are recorded from information supplied by operators and supervisors.

The main disadvantages of these reports are firstly, they are not based on continuous observation and the times given to the recording clerks by other personnel are subject to error, even bias; secondly, the reports issued the following day or even later, provide historical information only, and are not a good basis for any management action.

The doubts expressed about the accuracy of some of these reports - due to the way the information is collected - has prompted the situation whereby as many as 6 clerks, supervisors or superintendents sign and/or authorise many of the reports prior to issue, so that there is seen to be agreement between production and engineering personnel.

Procedures in certain sections have the objective of letting operators and engineers know that their work is being checked. This acts as a form of motivation to such personnel who would not work so hard if no records were taken. This is always an important aspect when considering a recording system and is particularly applicable to the batching and preparation departments where detailed recording of individual operators efficiency is so impracticable.

One final comment is that little attempt is made to collate and analyse the data made available by all these records to assist management in their decision making.

A.2 CONCLUSIONS AND RECOMMENDATIONS

There is too much paper work providing too much unnecessary data. The factory can be managed at least as effectively with considerably reduced paperwork. The effort spent by personnel at the various levels can be used more effectively by maintaining simpler procedures; any resources made available by reducing the workload can be allocated to the collation and analysis of the data obtained.

The main recommendations are listed below:-

3.1 Eliminate all unnecessary forms and paperwork to reduce the workload involved in maintaining a production recording system.

3.2 Modify the remaining production reports, where necessary, to provide only the data required.

3.3 Redesign the procedures and forms for recording machine efficiencies with two objectives in mind:-

- to provide data which can be used by management as a guide to immediate corrective action

and

- to provide data in such a form that it can be analysed to help identify the main reasons for unsatisfactory machine efficiencies.

Note: One form - "Machine Activity Report" (Appendix M.1) can be used to replace approximately 10 forms, each of different design, currently in use throughout the factory. This proposed form is designed to focus management's attention on reasons for stoppages and the action being taken. This has the advantage also of directing attention to the personnel involved and motivating them to complete the work required.

3.4 Reduce the number of personnel signing and/or authorising the various forms.

The recommended forms for the production and machine efficiency reporting are shown in the appendices attached to this section of the report.

Form No. P.1

BATCHING AND CARDING
ROLL PRODUCTION REPORT

Date: _____ SPREADERS Shift A/B

M/C NO.	SR1	SR2	SR3	TOTAL
NO. OF ROLLS				

TEASER CARDS

CARD NO.	TH1	TH2	TH3	TH4	TH5	TH6	TOTAL

LIGHT SIDE BREAKER CARDS

CARD NO.	BL1	BL2	BL3	BL4	BL5	BL6	TOTAL
NO. OF ROLLS							

HEAVY SIDE BREAKER CARDS

CARD NO.	BH1	BH2	BH3	BH4	BH5	BH6	TOTAL
NO. OF ROLLS							

LETHER-BREAKER CARDS

CARD NO.	1BH1	1BH2	TOTAL
NO. OF ROLLS			

Form P.1

LIGHT SIDE FINISHER CARDS

CARD NO.	FL1	FL2	FL3	FL4	FL5	FL6	FL7	TOTAL
NO. OF ROLLS								

HEAVY SIDE FINISHER CARDS

CARDS NO.	FH1	FH2	FH3	FH4	FH5	FH6	FH7	FH8	FH9	TOTAL
NO. OF ROLLS										

Signed: _____ Authorised: _____

(FORM P.2)

DRAWING FRAMES - MONTHLY PRODUCTION RECORDS

NOTE:

If operator is <u>not</u> paid bonus on production then it is sufficient to spot check the production efficiency of one frame per week in conjunction with the Sliver Weights recorded on the relevant quality control form Ref: QCR/PREP/W.

If operator is paid bonus on his production then the form must be modified to include the efficiency calculation.

FORM NO. P.2

DRAWING FRAMES

MONTHLY PRODUCTION RECORDS

SHIFT A/B HEAVY/LIGHT/HESSIAN 1ST 2ND FIN.

MONTH

DATE	DRAWING FRAME NO.		DRAWING FRAME NO.		DRAWING FRAME NO.	
	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)
1						
2						
3.						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						

Form P.2

MONTH

DATE	DRAWING FRAME NO.		DRAWING FRAME NO.		DRAWING FRAME NO.	
	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)	COUNTER AT END OF SHIFT	PRODUCTION (YARDS)
27						
28						
29						
30						
31						
TOTAL						

Signed: _____ Authorised: _____

(FORM P.3)

SPINNING/TWISTING/WINDING CARD

NOTE:

The same basic form can be used for Spinning, Twisting and Winding.

This means that the time of Weighment is recorded also for Winding. Previously the time of Weighment has been recorded for Spinning and Twisting only.

Form No. P.3

SPINNING/TWISTING/WINDING CARD

FRAME/MACHINE NO. _____ DATE _____ NAME _____

QUALITY _____ COUNT _____ SHIFT _____

Time of Weigh-ment	Lbs	Time of Weigh-ment	Lbs	Time of Weigh-ment	Lbs	Time of Weigh-ment	Lbs	Time of Weigh-ment	Lbs

SIGNED: _____ AUTHORISED: _____

Form No. P.4

R E E L I N G

SHIFT PRODUCTION RECORDS

Name _____ Date _____ Shift _____

TYPE OF YARN	NO. OF HANKS	NET WEIGHT (LBS)	EFFICIENCY (%)

SIGNED: _____ AUTHORISED: _____

(FORM P.5)

SPINNING FRAMES - MONTHLY PRODUCTION RECORD

NOTE:

The form has been modified to include the counter reading at the beginning and end of each shift. This enables spot checks to be carried out on production figures (recorded in lbs.) and the calculated operator efficiencies. Production, measured in yards, could eventually prove more accurate and if more easily recorded than the current weighing procedures.

FORM NO. P.5

SPINNING FRAMES

MONTHLY PRODUCTION RECORD

HEAVY/LIGHT/HESSIAN

FRAME NO. _____ NAME _____ SHIFT _____

MONTH _____

DATE	PROD-UCTION (LBS)	EFF. (%)	COUNTER AT START OF SHIFT	COUNTER AT END OF SHIFT	PROD-UCTION (YARDS)	EFF. (%)	COMMENTS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

FORM NO. P.5

DATE	PROD-UCTION (LBS)	EFF. (%)	COUNTER AT START OF SHIFT	COUNTER AT END OF SHIFT	PROD-UCTION (YARDS)	EFF. (%)	COMMENTS
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
TOTAL							

SIGNED: _____ AUTHORISED: _____

Form No. P.6

TWISTER AND REELING MONTHLY PRODUCTION RECORD

Month .....

Shift .....

	TWISTER						REELING				
DATE	2 PLY		3 PLY		5 PLY		NO,OF HANKS				REMARKS
	WT (LBS)	EFF. %	WT (LBS)	EFF. %	WT (LBS)	EFF. %		EFF. %			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Form No. P.6

DATE	TWISTER						REELING				REMARKS
	2 PLY		3 PLY		5 PLY		NO.OF HANKS				
	WT (LBS)	EFF. %	WT (LBS)	EFF. %	WT (LBS)	EFF. %		EFF. %			
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
TOTAL											

SIGNED: _____ AUTHORISED: _____

Form No. P.7

WINDING MONTHLY PRODUCTION RECORDS

LIGHT SIDE/HEAVY SIDE

MONTH: _____

SHIFT: _____

NAME M/C NO													
DATE	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Checked By
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Form No. P.7

NAME M/C NO													
DATE	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Wt. lbs	Eff %	Checked By
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
TOTAL													

SIGNED: _____ AUTHORISED: _____

Form No. P.8

B E A M I N G

SHIFT RECORD OF LOOM BEAMS MADE

M/C No: _____ Shift _____ Name _____ Date _____

TIME COMPLETED	KIND OF YARN	GROSS WEIGHT	NET WEIGHT	YARDS
TOTAL				

SIGNED: _____ AUTHORISED: _____

Form No. P.9

B E A M I N G

MONTHLY PRODUCTION RECORD

MONTH .....

SHIFT .....

NAME M/C NO.													
DATE	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	Remarks
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Form No. P.9.

NAME M/C NO.													
DATE	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	No of Beams	Wt. lbs	Eff %	Remarks
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
TOTAL													

SIGNED: _____ AUTHORISED: _____

(Form P.10)

W E A V I N G

DAILY LOOM PICKS

Individual daily weaving and efficiencies are calculated and recorded in a production book retained by the production clerk at the Weaving Section. These figures are taken to maintain the 'Monthly Weaving Efficiency/Product Report' Ref. P.12.

W E A V I N G Form No. P.10

Date: _____ Shift _____

DAILY LOOM PICKS

No.	Picks	No.	Picks	No.	Picks	No.	Picks	No.	Picks	No.	Picks
1		35		69		103		137		171	
2		36		70		104		138		172	
3		37		71		105		139		173	
4		38		72		106		140		174	
5		39		73		107		141		175	
6		40		74		108		142		176	
7		41		75		109		143		177	
8		42		76		110		144		178	
9		43		77		111		145		179	
10		44		78		112		146		180	
11		45		79		113		147		181	
12		46		80		114		148		182	
13		47		81		115		149		183	
14		48		82		116		150		184	
15		49		83		117		151		185	
16		50		84		118		152		186	
17		51		85		119		153		187	
18		52		86		120		154		188	
19		53		87		121		155		189	
20		54		88		122		156		190	
21		55		89		123		157		191	
22		56		90		134		158		192	
23		57		91		125		159		193	
24		58		92		126		160		194	
25		59		93		127		161		195	
26		60		94		128		162		196	
27		61		95		129		163		197	
28		62		96		130		164		198	
29		63		97		131		165		199	
30		64		98		132		166		200	
31		65		99		133		167			
32		66		100		134		168			
33		67		101		135		169			
34		68		102		136		170			

SIGNED: _____ AUTHORISED: _____

Form No. P.11

W E A V I N G

DAILY CUTS PRODUCTION AND WEIGHT

Shift _____ Date: _____

SER. NO.	LOOM NO.	WT	LOOM NO.	WT	LOOM NO.	WT	LOOM NO.	WT	LOOM NO.	WT	LOOM NO.	WT	LOOM NO.	WT
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
TOTAL														

SIGNED: _____ AUTHORISED: _____

Form No. P.12

MONTHLY WEAVING EFFICIENCY/PRODUCTION REPORT

SACKING HESSIAN

Month: _____

Shift: _____

LOOM NO.												Checked By
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
AVE TOTAL												

SIGNED: _____ AUTHORISED: _____

FORM NO. P.13

Sacking/Hessian

CLOTH INSPECTION REPORT

Date: _____

Shift A/B

Loom No.	Wt. lbs	Leng. Yds.	Miss Ends	Weft Break	Def't Selv.	Frame Tie Bar		Loom No.	Wt. lbs	Leng. Yds.	Miss Ends	Weft Break	Def't Selv	Frame Tie Bar

SIGNED: _____ AUTHORISED: _____

FORM NO. P.14

WEAVING

MONTHLY PRODUCTION REPORT

SACKING
HESSIAN

MONTH:.....
SHIFT:.....

Date	No. of Cuts	Total Yards	Weight Lbs.	REMARKS	Checked By
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

FORM NO. P.14

Date	No. of Cuts	Total Yards	Weight Lbs	Remarks	Checked By
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
TOTAL					

SIGNED: _____ AUTHORISED: _____

FORM NO. P.15

FINISHED GOODS DAILY BALING REPORT

Date	TOTAL BALES		B A L E S					
	Serial Number	Weight	Received Daily	Total B/F Received	Sold Daily	Total B/F Sold	Stock Bal	Remks
B/F								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

FORM NO. P.15

Date	TOTAL BALES		B A L E S						
	Serial Number	Weight	Received Daily	Total B/F Received	Sold Daily	Total Sold	B/F	Stock Bal.	Remks
B/F									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
T O T A L									

SIGNED: _____ AUTHORISED: _____

COCOA BAGS - STOCK MOVEMENTS

LAST BALE NO. IN .... 19....

DATE	ADVICE NOTE No.	QTY DAILY RECEIVED	CUMU-LATIVE DAILY TOTALS		QTY ISSUE DAILY	CUMU-LATIVE DAILY ISSUES	STOCK BALANCE	BALES TAKEN DAILY BY SCMB	TOTAL BALES TAKEN BY SCMB
				B/F					

SIGNED: _____ AUTHORISED: _____

DAILY PRODUCTION REPORT

S A C K I N G

REMARKS

	TWISTER			REELING		WINDING		BRAKING	BRAKING
	2 PLY lbs	3 PLY lbs	5 PLY lbs	Hanks	Weight lbs	H. S. lbs	L. S. lbs	No. WEIGHT lbs	Cuts Weight lbs
MACHINE WORKING									
L A B O U R									
PRODUCTION									
EFFICIENCY %									

	INSPECTION BOARD		REELING		SEALING		PRINTING		BALING	
	Cuts	Weight lbs	Bags	Bales	Bags	Bales	Bags	Bales	Bales	Weight lbs
MACHINE WORKING										
L A B O U R										
PRODUCTION										
EFFICIENCY %										

FORM NO. P.17

DAILY PRODUCTION REPORT

H E S S I A N

	WINDING		BEAMING		WEAVING		INSPECTION BOARD		BALING	REMARKS
	H. S.	L.S. lbs	No.	Weight lbs	Cuts	Weight lbs	Cuts	Weight lbs	Bales	
MACHINE WORKING										
L A B O U R										
PRODUCTION										
EFFICIENCY %										

FORM NO. P.17

FORM NO. P.18

DAILY RECORD FOR PRODUCTION PARTICULARS

TO: GENERAL MANAGER

Date: .....
(6 a.m. - 2.00 p.m.)

Emulsion on:
Short Fibre ..... % Bin Nos ..... Filled
Long Libre ..... % Bin Nos ..... Filled
Spreader Rolls produced .....

FIBRE USED IN TEASER CARDS ARE TAKEN FROM:
Bin No ..... Filled on ..... with BWCB
Bin No ..... Filled on ..... with BWCB
Bin No..... Filled on ..... with BWCB
Bin No ..... Filled on ..... with BWCB

Yarn:
Heavy Yarn, Count .....Tex Twist ..... TPI, Strength .... Kg
Light Yarn, Count .....Tex Twist ..... TPI, Strength .... Kg
Heavy Yarn Spool Stock ..... B L E N D I N G
Light Yarn Spool Stock .....
Selvedge Spool Stock .....
Beam Stock (Sacking) .....
Beam Stock (Hessian) .....

Weaving:	B. TWILL	HESSIAN
Looms Running	.....	.....
Looms Waiting on Warp	.....	.....
Looms Waiting on Weft	.....	.....
Looms Without Spare Parts	.....	.....
Looms Under Repair)	Electrical.....	.....
or Other Reasons:)	Mechanical	.....
)	Labour Shortage	.....
)	Others	.....

Production:
Grade I Cocoa Bags ..... bales from serial No ..... to .....
Grade II Cocoa Bags ..... bales from serial No ..... to .....
Sugar Bags ( ) ..... bales from serial No ..... to .....
Food Bags ..... bales from serial No ..... to .....
Twine (Light/Heavy).....bales/Hank from serial No ..... to .....
Others .....

Hessians:
Hessian Cloth-Shorts 7 ..... bales/metres from serial No ..... to .....
" " " 9 ..... bales/metres from serial No ..... to .....
" " " 12 ..... bales/metres from serial No ..... to .....
" " " ( ) ..... bales/metres from serial No ..... to .....

Twine:
2 Ply produced ..... stock ..... spools
3 Ply produced ..... stock ..... spools
5 Ply produced .....bales/Hanks from serial No ..... to .....
Others .....bales/Hanks from serial No ..... to .....

CHECKED AND CONFIRMED BY:

....
SENIOR MILL SUPERINTENDENT MILL MANAGER

FORM NO. M1

MACHINE ACTIVITY REPORT

SHIFT A/B

DAILY/WEEKLY/MONTHLY

SECTION(S) _____

TIME: _____

DESCRIPTION	MACHINE NO:															
MACHINE PROCESSING																
	NO MATERIAL															
IF	OPERATOR ABSENT															
NOT	ROUTINE MAINTENANCE															
PROC.	MACHINE BREAKDOWN															
	OTHER (E.G. JAMMING, DOFFING															
IF THERE IS A BREAKDOWN:- - ENGINEERS ALERTED																
- ENGINEERS WORKING ON MACHINE																
IF THERE IS A DELAY:- - WAITING TOOLS																
- WAITING INSTRUCTIONS																
- WAITING STORES, MATERIALS																
- WAITING WORKSHOP																
- WAITING OTHER PERSONNEL																
- ANY OTHER REASON (STATE ON SEPARATE NOTE)																

SIGNED: _____ AUTHORISED: _____

PRODUCTION PERFORMANCE AND PROCEDURES

PART B GOOD OPERATING PRACTICE

1. SPREADERS

Maintaining Correct Emulsion Gauge Reading

(a) Wild fluctuations in the gauge reading, accompanied by uneven spray usually indicate a dirty or partially blocked jet.

(b) If frequent gauge adjustment is required to maintain the correct pressure, the gauge may be faulty.
For both (a) and (b), Engineers must be advised immediately. Unless these faults are eliminated, the emulsion application will be incorrect.

Spray of Emulsion

The sprays should always be directed evenly across the jute and always within the limits of the shute.

Feed of Stricks

The Operator must feed to the speed indicated by the automatic pointer and stricks must be laid evenly.

Flex-Drive

The flex-drive to the gearbox of the feed-indicating mechanism should operate with as smooth a line from the spreader to the weigh-bridge as possible. Kinks and bends will cause the pointer to jerk, making it more difficult for the operator to maintain the proper feedrate.

Good operating practice at the spreaders will help to avoid variations in yarn count.

2. SOFTENERS

Cutting Irregularities

Ropes, clumps and long jute (greater than 12" to 15") should be eliminated. If these irregularities remain, significant jamming problems will occur at the auto-hoppers and/or teaser cards.

Emulsion Application

Gauges, Jets and Sprays; comments as for the Spreaders.

3. MATURING

Covers

Covers should always be in place for maturing bins and rolls and for trolleys loaded with cuttings but not in use. If this is not done, excessive moisture loss can affect both maturing and processing.

4. BREAKER AND FINISHER CARDS

Missing Doublings

Missing doublings must be avoided if the cards are to achieve one of their main objectives of providing even slivers. Uneven slivers cause variations in yarn count.

5. DRAWING FRAMES

Sliver Dividers

Sliver dividers must always be set to provide parallel slivers. Overlapping slivers overload the drawing frame at the entry rolls and may cause jamming.

Gill Pins

Missing, blunt or hooked gill pins must be replaced immediately otherwise the sliver will rise over the pinning or the pins will not penetrate the sliver to provide good control of the short fibre. Pick clean regularly.

Rubber Press Rollers

Ensure that all worn rollers are reground.

B.2 PREPARATION DEPARTMENT

1. HOPPER FEEDS FOR TEASER CARDS

Cutting Irregularities

A double check is required for the irregularities referred to previously for Softeners. This can be done as the operator loads the hopper.

Excessive jamming causes long delays and low machine efficiency.

Loading

An overloaded hopper places excessive strain on the hopper feed mechanism. An underloaded hopper may lead to inadequate pick-ups, insufficient cuttings to feed the weigh pan and, therefore, a lower than required feedrate to the teaser card. The hopper should always be loaded to the correct level.

Cleanliness

Although cleanliness is a high priority throughout the Mill, it is particularly important to keep clean the weigh mechanism and pan assemblies. If these are dirty or loaded with jute and/or fluff, the weighed cuttings, and therefore the feedrate to the teaser card, will be incorrect.

2. TEASER CARDS

Cutting Irregularities

For handfed teaser cards, the comments made for Softeners, and hoppers are applicable. Irregularities may cause 'gulping' whereby a heavy or bulky part of a cutting is held back and then suddenly released. As a result, the material does not get the full drafting treatment.

Feed Rate

The feedrate for handfed teaser cards must be regular and at the correct weight for the required sliver count. Irregular feeding will give an uneven sliver and cause 'thick and thins' which will be carried right through the process to spinning.

NOTE: The problems referred to above should largely be eliminated with the use of auto-hopper feed units.

Waste

Excessive waste can occur at the teaser cards. Operators should be particularly careful when starting a new roll and when re-establishing a sliver after any jamming at the exit rollers. Build up of fluff and dirt at the exit rollers must be avoided.

B.3 SPINNING DEPARTMENT

Bobbins

Bobbins should be free from rough or jagged edges that might catch the yarn and cause a yarn break. Spindles must be exactly centred to the flyers.

Rubber Covers

The rubber covers and the drafting press rollers should be turned to their rollers for if they buckle there is a tendency for the fibres to work out of the nip and cause a yarn break.

Builder Slide

The slide carrying the builder should be clean and the builder should move easily up and down. Jerky movements cause irregular tensions which will increase the end breakage rate.

Speed

Excessively high speeds result in greater numbers of yarn breaks and cause the yarn to be 'hairier' than normal.

B.4 WINDING AND BEAMING DEPARTMENT

WINDING MACHINES

Setting

Set for 10" diameter maximum on the cones.

BEAMING

Tag Ending

Ensure that tag ending is clear to enable beam to be wound to completion.

Tension Rings

Use tension rings. Loose beam tension triggers off the stop motion on the looms thus leading to less production.

Stop Motion

If several ends are missing on the beams at weaving, reintroduce the stop motion at beaming. This can be observed easily by checking the number of bobbins needed to 'support' the beam at each loom (one of two bobbins is acceptable).

Flanges

Keep tight all beam flanges.

B.5 WEAVING DEPARTMENT

LOOMS

Cloth Tension

Maintain correct tension on the cloth by setting pointers correctly and working to them. Too much tension packs selvedge end, makes the cloth too narrow.

Cam Setting

Ensure correct cam setting on Spear Weft grips.

[redacted]

[redacted]

[redacted]

[redacted]

GHANA INDUSTRIAL HOLDING CORPORATION

UN/PR/BL/1

P.O. Box 2784
Accra

13 February 1976

Mr. J. A. Obeng-Boampong
General Manager
Metal Industries Division
Accra

Dear Sir,

METAL INDUSTRIES DIVISION
INTRODUCTION OF SPARE PARTS STOCK CONTROL

Mr. L. A. Odotei and I have now completed the introduction of the system of spare parts stock control for your Division. It is therefore appropriate that we record for you what has been done and our findings as a result of the project.

1. PURPOSE

The purpose of the spares stock control system is to indicate in a systematic way:

- when an item should be ordered
- how much should be ordered

The object is to minimise the disruption to production which can occur when a machine or piece of equipment fails. This is to be achieved by maintaining an adequate, well balanced stock of spare parts. It should be noted that it is not intended to provide a level of spares sufficient to cater for every eventuality as this would require an excessively high investment in stock.

2. SCOPE

The stock control system has been applied to mechanical and electrical parts. Tools, consumables and vehicle spares which are kept in the same stores have not been covered but could be done so by your own staff at a later date.

3. METHODOLOGY

A stock card was created for each spares item. On this was recorded the correct part number and description as far as we were able to determine. The item of plant on which the part was used, the name and location of supplier together with the likely delivery time were also entered.

A physical stock check was taken of each part and the quantity recorded on the card. In the few cases where the description or quantity recorded on the bin cards did not conform with the facts the bin cards were changed to suit.

The control parameters, that is, buffer stock, re-order level, alarm level and minimum order quantity were set out on the card and have been related to the usage during 1975.

The system involves small additions to the administrative procedures and these were developed and agreed with the personnel responsible in the accounts, production, procurement and stores departments.

Instruction in the procedures has been given to each person involved. Further, a joint discussion was held to describe the system in total, the part played by each department and to resolve any queries. The detailed instructions and responsibilities for operating the system are set out in a separate paper.

The stock cards are being maintained by the storekeeper and we have suggested that he should also continue to record stock movements on the bin cards until the end of this year.

4. OBSOLETE PARTS

Of the 296 mechanical and electrical spares held in stock, 105 are for machines which have been withdrawn from service. The value of these items based on their original purchase price is £22,805.

At some date a firm decision will be required on the future of these parts. In the meantime they have not been placed under the stock control system although they are of course recorded on the bin cards.

5. SHEETING MACHINE

We notice that no spare parts had been obtained for the new roof sheeting machine. Whilst this machine is of robust construction there will undoubtedly be some parts which are liable to excessive wear or failure. Should this occur the Division could lose the output from this machine for a considerable period of time.

We strongly advise that a suitable number of spare parts are obtained based on the recommendations of the manufacturer.

6. CURRENT STOCK SITUATION

There are 191 items currently held as spares and which have now been covered by stocks control. Costed at their last purchase price these items have a value of £29,700.

Issues were made of 61 items (32%) during 1975, the value of these issues being £4,677.

At the time of making the stock control application there were 20 items (10%) which had reached their re-order levels and needed an immediate decision on re-ordering. Indeed 17 of the 20 items were completely out of stock. The most important of the 20 are 9 which will need to be imported. Because of factors such as inflation it is not possible to estimate precisely the value of the items which should now be ordered from overseas, but the quantities required at their previous purchase price would involve a cost of £1,327. The stock cards for all 20 items were passed to the Production Manager for his decision on re-ordering.

For this above it is clear that the Division has an out-of-balance spares stock situation with excessive quantities of some items and insufficient stocks of others. This situation is quite normal at the time of making a stock control study.

7. FUTURE STOCK POSITION

The stock control system, if operated properly, will ensure that the correct quantity of spares is ordered at the right time and therefore go some way towards bringing the stock into balance.

We have tried to estimate what the value of the stock would be if it were in balance as this figure can be used as a yardstick for the future. Such a value can only be approximate however as it must be based on the consumption of the 191 items during 1975. However, within these limitations the likely investment in spares which will be required is ¢13,700, a reduction of ¢16,000 on the current items.

In practice, the stock will not automatically reduce with time down to this sort of level, because of the excessive stocks of a few items, which have probably been in stores for a number of years and do not get consumed at any appreciable rate. The only alternative is disposal. Here again action may be limited but is worth considering on a selective basis. For example, the two types of castor held in store would provide a reduction of over ¢1,000. It might therefore be worth considering the sale of items such as these.

8. MONITORING

During the coming months we will visit the Division from time to time for the purpose of monitoring the operation of the system and resolving any queries which might arise. Of course we would always make ourselves available for any urgent query.

It is also intended to introduce a simple control return to show the movement and value of spares stock for Head Office. The actual form of this return has yet to be finalised but is likely to contain the sort of information contained in this letter. The content and frequency of this return will be discussed with yourself and the Divisional Accountant in due course.

9. FUTURE DEVELOPMENTS

The spares stock control system is a standard one which is being introduced across all Divisions of GIHOC. It is conceivable that in time the system may be developed further, perhaps with reference to the forecasting of requirements. These further developments will be the responsibility of the GIHOC Production Control consultant at Head Office.

In the more immediate future, it may be necessary to revise some of the control parameters in January next year, when the usage figures for this year are known. The Production Manager has been shown how to do this but a revision session will be held towards the end of the year.

10. MISCELLANEOUS

During our work we noticed a number of points of which you are undoubtedly well aware but are worth recording. These are:

- within the constraints of limited space the stores are well kept and the bin cards are clean and legible.

- the disposal of obsolete and excessive stock would considerably ease the space problem and improve appearance.

- a shortage of secure storage facilities in the departments is resulting in the spares store holding in safe keeping items already issued and this in turn adds to the congestion.

11. CONCLUSION

In conclusion we would like to record our appreciation of the co-operation given to us by various members of your staff during the project.

(A.M. MARSHALL)
PRINCIPAL PRODUCTION CONSULTANT

c.c. Deputy Managing Director, GINOC
Director of Development, GINOC

FEBRUARY 1976

GHANA INDUSTRIAL HOLDING CORPORATION
METAL INDUSTRIES DIVISION

SPARES STOCK CONTROL PROCEDURES

CONTENTS

FEBRUARY 1976

METAL INDUSTRIES DIVISION
SPARES STOCK CONTROL PROCEDURES

PART A
INTRODUCTION

This paper sets out the main features of the spares stock control system recently introduced into the Division, together with the duties and responsibilities of the persons concerned with operating the system.

PURPOSE

The purpose of the spares stock control system is to indicate in a systematic way:

- when an item should be ordered
- how much should be ordered

with the object of:

- minimising the disruption to production which can occur when a machine or piece of equipment fails

by:

- maintaining an adequate, well-balanced stock of spare parts.

It should be noted that it is NOT intended to maintain a level of spares stock sufficient to cater for every breakdown. To do so would require an excessively high investment.

SCOPE

Spares stock control has been applied to mechanical and electrical items only.

Tools, consumables and vehicle spares which are stored in the same location have not been covered.

CONSTRAINTS

The system has been introduced during a period when purchases of materials, including spares, are subject to annual import licencing. The system has been designed to cope with this constraint but could be easily modified if licencing were abolished and spares could be purchased as required.

RESPONSIBILITY FOR SYSTEM

The spares stock control system is designed primarily to aid the work of the Production Department, which includes the engineering maintenance function. The Production Manager is therefore responsible for the complete operation of the system across all departments within the Division.

The Production Control Consultant from GIHOC Head Office is responsible for the future development of the system and it is to him that any operating queries should be directed.

METAL INDUSTRIES DIVISION

SPARES STOCK CONTROL

PART B

STOREKEEPER

DUTIES AND RESPONSIBILITIES

The storekeeper is responsible for the safe keeping of the goods in his store. He is also responsible for the accuracy of the two main records - the bin card and spares stock card.

It is the duty of the storekeeper to compare:

- quantity in stock (a) with figure shown in ALARM AT
- total cover (a + b) with figure shown in REORDER AT

and notify the Production Manager in all cases where quantity in stock or total cover is equal to or less than the figures in the box.

1. ROUTINE POSTING OF STOCK CARD

Bin cards will continue to be posted with issues, receipts and stock balances for at least the remainder of 1976. The following paragraphs describe the entries to be made on the spares stock card on each occasion on which some movement occurs.

1.1 Stock Issue

Enter - date

- requisition reference - in column headed REFERENCE
- quantity - in column headed OUT
- new stock quantity - in column headed IN STOCK
- DEDUCT quantity issued from quantity shown as TOTAL COVER and enter in column headed TOTAL COVER new total.

1.2 Order Receipts

Enter - date
- goods receipt number - in column headed REFERENCE
- quantity - in column headed IN
- new stock quantity - in column headed IN STOCK
- DEDUCT quantity received
  from total on order and enter in column headed TOTAL ON ORDER
  enter new total.

1.3 Orders Placed

Enter - date
- purchase order number - in column headed REFERENCE
- quantity - in column headed ORDER QUANTITY
- ADD quantity ordered - in column headed TOTAL COVER
  to total cover and
  enter new total.

NOTE: This information will be entered from a copy of the Local Purchase Order (L.P.O.) or a GIHOC Pro-forma invoice sheet as follows:

1.3.1. For Items Bought in Ghana

The storekeeper will receive a copy of the L.P.O. from the Divisional Accountant.

1.3.2. For Imported Items

The storekeeper will receive details of the order from the Procurement Officer using a GIHOC pro-forma invoice for the purpose.

The L.P.O. or pro-forma invoice will be clipped to the stock card until the goods have been received and the quantity entered on the stock card, when the document will be attached to the goods received note and sent to the Divisional Accountant.

1.4 Returns to Store

Enter - date
- R.T.S. - in column headed REFERENCE
- quantity - in column headed IN
- new stock quantity - in column headed IN STOCK
- ADD quantity received - in column headed TOTAL
  to total cover and
  enter new quantity.

1.5 Stock Checks

Entries to be made in RED INK
- date
- STOCK CHECK - in column headed REFERENCE
- quantity in stock - in column headed IN STOCK
- INCREASE OR DECREASE - in column headed TOTAL COVER
  total cover by amount
  physical stock has
  been adjusted (if any)
- put signature - in column headed INITIAL.

1.6. Monthly Consumption

Each time an entry is made on a stock card, enter the quantity going out during each of the previous months in the table headed MONTHLY CONSUMPTION. The quantities entered must include any adjustments that may have been made due to returns to store or stock checks.

During January of each year, the monthly consumption and total for the previous year will be entered on all cards. If there has been no stock movement enter NIL.

2. NEW PARTS TO BE STOCKED

When new parts are to be stocked the storekeeper will make out the stock cards. It is his duty to ensure that the Production Manager gives the correct specification of DESCRIPTION, PART NO. and USED ON and that the ALARM AT and RE-ORDER AT quantities are set. He must also ensure that the Procurement Officer specifies the name of supplier and delivery time.

3. OLD PARTS TO BE REMOVED FROM STOCK

When old parts are removed from stores for disposal or scrapping the storekeeper will pass the relevant stock cards to the Divisional Accountant.

4. WHEN ACTUAL STOCK REACHES ALARM LEVEL

The storekeeper will notify the Procurement Officer so that he may take whatever action necessary to obtain delivery of an outstanding order before a shortage occurs.

5. WHEN TOTAL COVER REACHES RE-ORDER LEVEL

The storekeeper will show the Production Manager the stock card for him to make a decision on placing the next order.

METAL INDUSTRIES DIVISION

SPARES STOCK CONTROL

PART C

PRODUCTION MANAGER

DUTIES AND RESPONSIBILITIES

The spares stock control system has been established to assist the Production Manager maintain an efficient manufacturing and engineering operation. He is therefore responsible for the total operation of the system across all departments. He is also responsible for the type and quantity of items held in store and therefore the service provided and the investment this involves.

1. ROUTINE RE-ORDERING

The Production Manager will receive the stock cards from the storekeeper as they reach their re-order level. Normally he will re-order the parts required but not do so if he knows a machine is to be withdrawn from service in the near future.

The quantity to be ordered will be the minimum shown on the card any difference between the total cover and the re-order level. In practice it might be necessary to increase the minimum quantity to an economic purchase quantity or if it was planned to undertake a programme of machine rehabilitation in the future.

2. NEW PARTS TO BE STOCKED

The Production Manager will specify all new parts to be held in stock and the initial quantities to be purchased. This should normally be done as new items of plant and equipment are purchased.

3. OLD PARTS TO BE REMOVED FROM STOCK

The Production Manager is responsible for removing from stock all parts for machines which are permanently withdrawn from service.

4. ANNUAL REVIEW

The Production Manager will examine each stock card in January after the storekeeper has entered the usage for the previous year.

The purpose of this annual review will be :

- assess the likely import requirements for the year
- assess the need to adjust any of control parameters on individual stock cards.

If this is required it can be done from the tables provided and in conjunction with the CIMOC Headquarters Production Consultant.

METAL INDUSTRIES DIVISION
SPARES STOCK CONTROL

PART D

DIVISIONAL ACCOUNTANT
DUTIES AND RESPONSIBILITIES

The Divisional Accountant is responsible for the stores function and therefore for the proper operation of the spares stock control system within the stores.

1. PURCHASE OF ITEMS IN GHANA

The Divisional Accountant issues a Local Purchase Order (L.P.O.) for each item purchased within Ghana. The second copy of the L.P.O., which has previously been retained in the book, will be issued to the storekeeper.

2. PRICE NOTIFICATION

The Divisional Accountant will notify the storekeeper of the current prices paid for imported spares items.

3. MANAGEMENT INFORMATION

The Divisional Accountant will prepare control returns in the form agreed with the GIHOC Head Office Production Control Consultant.

METAL INDUSTRIES DIVISION

SPARES STOCK CONTROL

PART 3

PROCUREMENT OFFICER

DUTIES AND RESPONSIBILITIES

The Procurement Officer is responsible for ordering the spares and obtaining their delivery by the time required.

1. ORDERING IMPORTED SPARES

When the Procurement Officer obtains the letters of credit he will record the details of the order using a CIMOC Pro-Forma Invoice pad for the purpose. One copy will be sent to the Divisional Accountant, the second copy to the storekeeper and the third to the Production Manager.

2. EXPEDITING DELIVERY

The Procurement Officer will take what action may be necessary to obtain early delivery of an item on being informed by the storekeeper that the alarm level has been reached.

[redacted]

[redacted]

[redacted]

GIHOC HEAD OFFICE
P.O. BOX 2784
ACCRA

UH/PH/WL.28

9th June 1977

Mr. J. A. Obeng-Boampong
General Manager
Metal Industries Division
P.O. Box 7009
Accra - North

Dear Sir,

METAL INDUSTRIES DIVISION - AUDIT
OF [redacted]

This report summarises the major points of the audit recently undertaken and which have been discussed with yourself and some of the officers concerned.

The audit shows that there has been a complete breakdown of the system, which has clearly not operated for several months. The serious shortcomings can best be illustrated by describing the state of affairs in each of the three major areas of responsibility as follows:

a) Accounting

The Accountant is responsible for the spare parts store. Earlier this year the storekeeper, Mr. Tachie-Menseh, who was trained by us, was transferred. The new female storekeeper was not given any instruction in the operation of the stock cards. As a result no entries were made on the cards until just recently. Indeed the audit was postponed by a week, because the cards could not be found when I visited the factory last week. Incidentally I noticed the cards were filed in a haphazard manner, whereas all the cards for a particular machine should be filed together with the miscellaneous items procured locally forming another group.

The Accountant was on leave during the period of the audit but the various matters were discussed with his assistant, Mr. C. Brefo-Mimo, who was very helpful.

(b) Production

Production ordered spare parts in January of this year. In this context I was pleased to see that spares have now been ordered for the corrugating machine, though stock records cards have still to be created. More seriously, however, the parts ordered for the other machines have been specified by reference to shop supervision and without any reference at all to the stock cards. The result of this action will be to perpetuate the out-of-balance situation which the system was set up to avoid. It also means of course that the foreign exchange is not being used in the most appropriate manner.

To illustrate the point, reference can be made to the attached list of parts which are at or below re-order level, but which have not yet been ordered. It can be seen that for the Wafioe and Wikechtrom machines many of these items were required in February 197? when the stock control system was introduced. The items were listed in the audit report of 18th November 1976 but were not ordered in January. To take the opposite case, there are items now on order whose quantities have been specified without any reference to the stock card and therefore the record of actual usage.

To quote two examples:-

i) 50/35 Needle bearing on Wikechtrom.

1975 usage was NIL
1976 usage was 3, and there are 3 still in stock.

Quantity ordered is 100 = 33 years usage.

ii) 65/35 Needle bearing on Wikachtrom.

1976 usage was 22 until it ran out of stock in October and is equivalent to an annual usage of about 26 per year.

Quantity ordered is 300 = 11.5 years usage.

In summary, the items ordered in January bear little relation to the real needs.

(c) Procurement

In February 1976 it was clear that action should be taken as soon as possible to obtain a number of items then out of stock but which the Division had decided to hold in stores. Although there may well have been problems in importing some of these items, there were others that we were assured could be obtained in Ghana. We were therefore somewhat surprised at the November audit to find that no action had been taken, and we attached a list to the audit report in the hope that some progress would result. As you will see from the list attached to this report the position is unchanged. I find this very surprising but was unable to discuss the situation with the officer concerned because of his duties at Tema.

The stock control system should now be reinstated as quickly as possible. We agreed that as the Production Manager is responsible for the system he should have the task of getting everything working smoothly. To help him in this he has a copy of the procedure manual which specified the duties and responsibilities of each officer. Six copies of this manual were issued to the Division in February of last year. He may also, if he feel it necessary, call upon the services of the Production Co-ordinator, Mr. L. A. Odotei. In addition Mr. Odotei will introduce a document

to be submitted to yourself whenever parts are to be ordered, which will, hopefully, provide a check that the system is being operated properly and prevent some of the problems which are now apparent.

The summary stock situation is shown in the following table:

DATE	ON STOCK CONTROL	AT OR BELOW RE-ORDER LEVEL				OUT OF STOCK	
		STILL TO BE REQUISITIONED		HAVE BEEN REQUISITIONED			
		No.	%	No.	%	No.	%
FEBRUARY 197-	191	20	10.5	-	-	17	8.9
NOVEMBER 197-	191	35	18.3	-	-	23	12.0
JUNE 197-	191	34	18.8	9	4.7	32	16.7
		45 = 23.5%					

From the table it can be seen there is a steady deterioration in the spares stocking position which reflects what has happened to the system.

(A.N. MARSHALL)
SENIOR PRODUCTION CONSULTANT

c.c. Deputy Managing Director (Ops.)
Director of Development
Production Co-ordinator

PART NO.	DESCRIPTION	DATE RE-ORDER LEVEL WAS REACHED	RE-ORDER LEVEL	PRESENT STOCK
LOCAL ITEMS	Grinding stone	28.1.7[illegible]	0	NIL
	Garden tap	30.1.7[illegible]	0	NIL
	[illegible] amp fuse	[illegible].2.7[illegible]	0	NIL
	[illegible] m.m. sleeving	[illegible].2.7[illegible]	[illegible]	NIL
	[illegible] amp 5 pin plug	[illegible].2.7[illegible]	[illegible]	NIL
	[illegible]30 amp fuse	[illegible]..7[illegible]	[illegible]	NIL
TNR 204-41	Main switch	[illegible]..7[illegible]	[illegible]	NIL
	[illegible]30 amp TPN main switch	[illegible]..7[illegible]	[illegible]	NIL
	Starter brushes	[illegible]..7[illegible]	[illegible]	NIL
	[illegible]30 amp [illegible] way switch	[illegible]..7[illegible]		NIL
	[illegible] way consumer unit	[illegible]..7[illegible]	[illegible]	NIL
	[illegible]5 amp main switch	[illegible].8.7[illegible]		NIL
	Water pipe connection	[illegible].[illegible]..7[illegible]		NIL
	[illegible] m.m. sleeving	[illegible]..[illegible]7		NIL
[illegible]	[illegible]" water pipe connection	[illegible]1.5.[illegible]		NIL
[illegible]	[illegible]" water pipe connection	[illegible].[illegible]..[illegible]	[illegible]	NIL
[illegible] ITEMS [illegible] ELECTRICITY				
[illegible]1[illegible]0	Grinding stone	28.1.7[illegible]	[illegible]	NIL
[illegible]	Holder for wire stop	28.1.7[illegible]	[illegible]	[illegible]
[illegible]99[illegible]	[illegible]ressure gauge	28.1.7[illegible]	[illegible]	[illegible]
	[illegible]liding box plate	[illegible]9.2.7[illegible]	[illegible]	[illegible]
[illegible]20 x 4500	[illegible] Belt	20.2.7[illegible]	[illegible]	[illegible]
[illegible]13 x 1400	[illegible] Belt	21.10.7[illegible]	0	NIL
	Circlip	30.5.77	0	NIL
[illegible] 28/20	Needle bearing	25.5.77	[illegible]	[illegible]
	[illegible]ressure lever for [illegible]utters lift	[illegible].[illegible].77	0	NIL
	[illegible]nuggle joint	[illegible].[illegible].77	0	NIL

PART NO.	DESCRIPTION	DATE RE-ORDER LEVEL WAS REACHED	RE-ORDER LEVEL	PRESENT STOCK
PAPER CLIP MACHINE				
DN 3 TA [illegible]	2-4 amps Contact Starter	[illegible].2.7[illegible]	[illegible]	NIL
JMR 341	10 amp fuse	22.7.7[illegible]	1[illegible]	1
LM 0/110				
230[illegible]	Ball bearing	[illegible].2.7[illegible]	5	NIL
MAPLIN MACHINES				
F 4815	Rollers	28.1.7[illegible]	10	NIL
205 [illegible]9	A.C. Air contactor	[illegible].2.7[illegible]	1	NIL
TWR 204 [illegible]19	A.C. Air pump contactor	9.2.7[illegible]	1	NIL
[illegible]D 325	n-off switch	9.2.7[illegible]	1	NIL
0905	Connecting rod	2[illegible].3.7[illegible]	2	1
	Rollers (straightening)	30.9.7[illegible]	0	NIL
	[illegible] a.m. Allen screw	28.2.[illegible]		NIL

VOLUME 5

ANNEX VII

METAL FABRICATING DIVISION

PRODUCTION PLANNING AND CONTROL

BALL PRODUCTION

August 1976

METAL INDUSTRIES DIVISION

PRODUCTION PLANNING AND CONTROL

(RAIL PRODUCTION)

CONTENTS

GIHOC

METAL INDUSTRIES DIVISION

PRODUCTION PLANNING AND CONTROL

(NAIL PRODUCTION)

PART A

INTRODUCTION

This paper sets out the main features of an improved, comprehensive production planning and control system for the division. The system is designed primarily for the main manufacturing activity of nail production. The duties and responsibilities of the persons concerned with operating the different parts of the system are also described.

1. Purpose

The system serves a number of important purposes viz:

- to enable the annual capacity of the nail presses to be readily calculated for a variety of product sizes. This, in turn, permits the reconciliation of productive capacity with sales forecasts and raw material availability.

- to enable the work load to be allocated to the various machines in the most economical way and potential over and under-load situations identified at an early stage.

- to provide the means of determining weekly production targets and advising supervisors of them.

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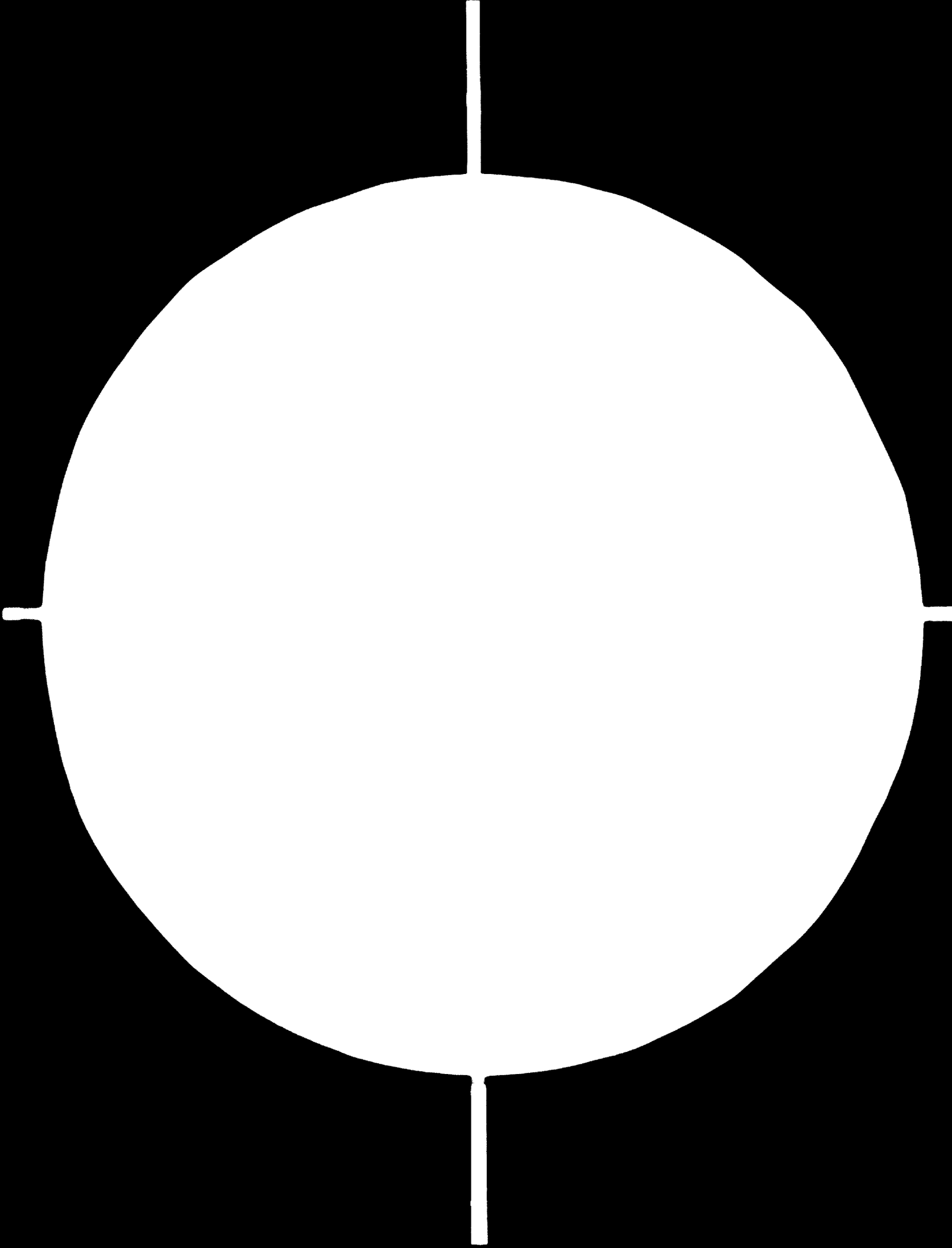

- to provide the means of recording daily and weekly outputs and comparing them with targets. The resultant efficiencies, which would be calculated weekly, are an essential guide to management as they seek to improve manufacturing performance.

2. Scope

The improved planning and control system has been designed for the main manufacturing activity of nail production. Provision can easily be made to include the production of roofing sheets and paper clips in some parts of the systems where appropriate. However, all the other production activities such as manufacturing clothes hangers, wheelbarrows, playground equipment etc. cannot be included. These are largely manual activities in which a series of different operations are performed to make each product. A quite different planning and control system would be required. However, since such products represent no more than about 7½% of turnover at present, the development of an appropriate system is not considered necessary at this stage.

3. Constraints

The system is being introduced during a period when the availability of raw materials is restricted below the level needed to maintain full production throughout the year. This has no effect on the operation of the system. However, there may on occasion be a need to prepare the annual programme before knowing what raw materials can be purchased. This means that the programme may have to be revised when the amount of the import licence, and thus the availability of raw material, is known.

4. Responsibility for the System

The planning and control system is designed primarily to assist the production manager to make the optimum use of the nail presses to produce nails to meet sales requirements. Accordingly

responsibility for its emplementation and subsequent operation should be vested in him.

The Production Control Consultant from Head Office is responsible for the future development of the system and it is to him that any operating queries or suggestions should be directed.

5. Description of the Proposed System

In order to make the description of the various parts of the proposed system more meaningful, it is illustrated using the 1976 sales budget figures. To make these figures more appropriate to future operations, however, quantities of certain gauges which are likely to be discontinued have been consolidated with the next nearest gauges.

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METAL INDUSTRIES DIVISION

PRODUCTION PLANNING AND CONTROL

PART B

PROGRAMMING

Introduction

The purpose of programming is to derive a production plan for a fixed period of time ahead which will, as far as possible, reconcile the load imposed by the sales requirements with the capacity available per period of time in the most economical way. The plan must, of course, take account of raw material availability as far as possible.

The programme should be prepared annually and should, in fact, be part of the procedures involved in preparing the divisional budget. Under present circumstances the amount of the import licence for raw materials may not be known when the budget is being prepared. Therefore, some judgement will have to be used to assess the likely amount of raw material to be available and its timing. As soon as the value of the import licence is confirmed and deliveries known, the programme may have to be revised.

The process of revision, however, is no different from the original preparation of the programme and therefore it will not be described separately.

Preparing the Programme - Nails

Under the present system of preparing annual budgets, a production budget is drawn up in conjunction with the sales budget. This shows the planned output of each nail size in each calendar month in terms of numbers of cases (of 50kg. each). However, no reconciliation is made with individual machine capacities and

there is no attempt to ensure that there is a balanced workload across the machines. If this were done, as proposed and described below, the result would, in effect, be a realistic production programme which could then be readily extended into a detailed production schedule for each machine month by month. The production programme may or may not indicate a need to modify the sales budget either in timing or total quantities available.

Responsibility for preparing the production programme should rest with the production manager. The various steps involved are now described in detail, starting from receipt of the initial sales budget by the production manager. The 1976 sales budget is shown as Appendix I. Quantities are given in cases of 50kg and it will be noted that, as mentioned above, certain gauges have been eliminated and quantities consolidated with the next nearest sizes.

The first step in preparing the production programme is to allocate the total quantities for each nail size from the sales budget to the various nail presses in sequence, selecting the most suitable machine for any particular size first and then the next suitable. This process is continued until either all suitable machines have been allocated or the total sales quantity of a particular size has been allocated. In doing this, the capacity of each machine for a particular nail size must be known. This comprises two elements - the number of shifts, and therefore hours, to be worked and the average rate of production per hour, or target output, on a continuous basis.

Target outputs for most combinations of machine and nail size have already been established from analysis of past production records. Only a small amount of work remains to be done to complete the compilation of this information which should then be tabulated in the form shown as Appendix II for easy reference in future.

It should be noted that target outputs are based on the assumption that wire is of normal commercial quality. Unfortunately occasions arise when it is of a higher quality and greater hardness, although its specification, in terms of carbon content, is within

the normally accepted range. This harder wire requires more frequent tool changes on machines and production rates can be significantly lower than with the softer, commercial quality wire.

It is considered to be an unnecessary complication to derive separate sets of target outputs for different qualities of wire. It must therefore be accepted that target levels of output may not be achieved when harder wire is being used. However, every effort should be made to procure wire of a consistent quality and hardness.

The number of shifts to be worked should be assessed from knowledge of the total output required for the year and, in the case of 1976 figures, 2 shifts have been assumed. As the allocation of quantities to machines is worked through the need for a 3rd shift will be highlighted and this can then be planned for.

Detailed Description of the Programming Steps

The detailed steps in preparing the programme are now described with reference to Appendix III - Calculation of Nail Production Programme.

1. Select first nail size to be allocated and enter in column 1 - Nail Size. In the example, this is 13 x 1.3 ($\frac{1}{2}$" x 18).

2. Enter total number of cases required by sales budget in column 2 - Number of Cases.

3. Calculate the total weight of cases in kgs. and enter in column 3 - Total Wt. (kgs).

4. Select most appropriate machine and enter number and type in column 4 - Machine.

5. Enter the target output per week for the selected machine when producing the size of nail concerned in column 5. This figure is taken from Appendix II - Table of Nail Press Capacities for the assumed number of shifts to be worked (i.e. 2 in the case illustrated).

6. Assess by inspection if the machine can produce the total quantity required in less than a year (assumed to be 48 weeks). If it can, divide the total weight to be produced (column 3) by the target output per week (column 5) to determine the number of weeks of production required. Enter that number (rounding up to the nearest whole week) in column 6 - Weeks of Production. If more than a year is required, enter 48 weeks in column 6.

7. If 48 is entered in column 6, calculate the available production capacity for the year by multiplying the target output per week (column 5)by 48 weeks and enter in column 7.

8. If less than 48 weeks are required, subtract the actual number of weeks from 48 and enter the resulting figure in column 9 - Excess Weeks. This shows the number of weeks available to produce other nail sizes. There is no need to enter any figure in column 7 - Available Capacity, since the figure should be approximately equal to the total weight to be produced (column 3).

9. If 48 is entered in column 6, subtract the available production capacity (column 7) from the total weight required (column 3) and enter

the resulting figure in column 8 - kgs to Carry Forward. In the first line of the example, this figure is 6238 which represents the weight of 13 x 1.3 ($\frac{1}{2}$" x 18) nails still to be produced after the first machine has been loaded for a full year, working on 2 shifts. 6238 kgs have to be allocated to another machine.

10. When there is a quantity of a particular nail size to be carried forward to another machine the nail size and quantity (13 x 1.3 and 6238 kgs in the example) are entered in columns 1 and 3 on the following line. Steps 4 to 9 are then repeated as necessary. In the case of the example, the second machine is not fully loaded and steps 4, 5, 6 and 8 only are repeated.

11. Having repeated the steps above until either the total quantity has been allocated to machines or all suitable machines have been fully loaded, the process is repeated for the next nail size. This is shown in Appendix II and it will be seen that, for example, only machines 5, 7, 11, 20 and 24 (i.e. THA/14/25/1, THA/22/50, UDX/1536, S/40/1 and S/50/3) have been allocated to produce 25 x 1.7 (1" x 16) nails. When these have been fully loaded there still remains 120,784 kgs to be produced.

12. When all nail sizes have been allocated to the most suitable machine, quantities still to be produced are allocated to remaining machines where possible. If necessary, an additional shift is allowed for and this can be seen in the case of S/110 producing 64 x 4.2 ($2\frac{1}{2}$" x 9) roofing nails and also several machines producing 25 x 1.7 (1" x 16) nails. In spite of allocating

a 3rd shift for S/110, the only machine able to produce 64 x 4.2 ($2\frac{1}{2}$" x 9) roofing nails, it is not possible to produce the full sales requirement. The shortfall is 25,810 kilos or 516 cases out of a total requirement of 2705 cases. All other nails can be produced in the quantities required with the exception of 76 x 4.6 (3" x 7) where there is a small shortfall of 1600 kilos or 32 cases out of a requirement of 6560 cases.

13. If, having completed the calculations described above it is found that a significant quantity of one or more nail sizes (excluding roofing nails) cannot be produced, the sales manager should be consulted. He may consider that it would be preferable to produce the full quantity of one or more of these nails at the expense of some other size. If this were agreed, the production manager should then revise the calculation of the production programme accordingly.

14. Once all the calculations have been completed, column 10 - Cases per Week is filled in for each nail size and machine. The figures are arrived at by dividing the target production per week (column 5) by 50 kilo to convert to cases per week. The resulting figures should be rounded up or down to the nearest whole number for simplicity.

15. Finally, as shown in Appendix III, indicate these weeks of production when machines are run on 3rd shift and underline quantities which cannot be produced. When all of the above steps have been completed, as shown in Appendix III, the result is a 12 month production programme showing how the various quantities of nails are to be

produced on the different machines.

The above calculations may require to be done during the course of a year, to take account of actual raw material availability, for example. Then the total availability of each machine will of course not be 48 weeks but some lesser period up to the end of the calendar year.

When the programme has been completed, the next stage is to convert it into a period or monthly schedule and this is described in the following part of the report.

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METAL INDUSTRIES DIVISION

PRODUCTION PLANNING AND CONTROL

PART C

SCHEDULING

The production programme described in Part B shows the extent to which the production facilities allow the annual sales budget to be met in total terms. The next stage is to plan the production on a time-scale throughout the year to find out how nearly the sales budget can be met on a month-by-month or period-by-period bases. This is done in two stages. Firstly, a period or monthly machine schedule is prepared. This is arranged on a machine basis and when finalised, becomes the key document from which weekly production requirements are derived and controlled. In order to compare this schedule with sales requirements however, it is then necessary to re-arrange the data by nail sizes.

Note on Accounting Periods

At present accounting periods are calendar months with each period ending on the last day of the month. It is planned, however, to change over to a different system whereby each period will end on the last day of a week. There will still be 12 periods per year but some will have 4 weeks and some 5 as follows: 4, 4, 5, 4, 4, 5, 4, 4, 5, 4, 4, 5.

When the change over is introduced, all budgets will be prepared on the basis of the above periods. Thus, the sales budget will show requirements per period, some of which will be 5 weeks, but most of 4 weeks. Similarly, the periods for production scheduling will be based on the new 4 or 5 week periods.

All documents illustrated in this manual have been prepared on the basis of the present calendar periods and this show the months of the year. However, the procedures for preparing schedules,

programmes and control documents describes the methods to be used both now and after changing to the new periods.

Preparation of Period of Monthly Machine Schedule (Appendix IV)

The period or monthly machine schedule is primarily a breakdown of the production programme on a time scale basis, machine by machine. The various steps involved in producing this are as follows:

1. Write the identity of machine No. 1 in column headed M/C.

2. Select one of the nail sizes to be produced by this machine and enter in column headed Nail Size.

3. Refer to Calculation of Nail Production Programme (Appendix III) to establish the number of weeks production planned for the relevant nail size.

4. If the number of weeks is 48, refer to column 10 - Cases per Week and multiply this figure by 4 for each month in the Period or Monthly Machine Schedule. When new accounting periods are introduced, the figure should be multiplied by 4 or 5 as appropriate, making allowance for shut down periods.

5. If the number of weeks is less than 48, refer to the Sales Budget (Appendix I) to determine the sales pattern and allocate the weeks of production to the appropriate periods or months in the year that will ensure that, as far as possible, production is available to meet expected sales demand.

6. If, as in the case of machine No. 1 making 102 x 5.2 (4" x 6) nails, the machine is

required to produce for 48 weeks on 2 shifts plus an additional 4 weeks on the third shift, decide when to allocate the 3rd shift and add the cases per week on that shift to the cases per week to be produced on 2 shifts. In the example, the 3rd shift has been allocated to February.

7. Repeat steps 3 to 6 for each nail size to be produced by machine No. 1 and then continue for all other machines in numerical order.

8. When scheduling of all machines has been completed, add together the period or monthly figures for each nail size and show the annual total in the last column.

9. Finally, indicate as shown in Appendix IV, these periods or months in which machines produce on either 3 shifts or on the 3rd shift only.

Preparation of Period or Monthly Nail Production Schedule (Appendix V)

As stated above, this schedule is a re-arrangement of the date in the Period or Monthly Schedule (Appendix IV).

It is prepared as follows:

1. Write the smallest nail size (i.e. 13 x 1.3 or ½" x 18) on the first line of the column headed Nail Size.

2. Calculate the total number of cases of this nail size planned to be made on the various machines in each period or month of the year

and insert these total in the appropriate columns for each period or month on the line headed "Planned".

3. Add together the total number of cases of this nail size to be produced each period or month and insert in column headed "Total".

4. Repeat steps 1 to 3 for all other nail sizes.

NOTE Space is left on the document to record actual production achieved month by month or period by period.

Preparation of Cumulative Period or Monthly Nail Production Schedule (Appendix VI)

Preparation of this document is self-evident. It is a re-casting of the data in Appendix V, showing the cumulative planned production at the end of each period or month. As with the monthly schedule, space is left to record actual cumulative production achieved month by month or period by period.

Reconciliation of Production Schedule with Sales Budget

The next step in scheduling is to compare the production schedule with the sales budget and adjust one or other as neceeeary. To do this it is neceseary to draw up a Cumulative Period or Monthly Sales Budget (Appendix VII). This is done in the same way as for the Cumulative Period or Monthly Nail Production Schedule.

The figuree on the two above documents are then compared. In any period or month, the cumulative planned production for any nail size may be less than the cumulative sales budget by a significant amount. If eo, the period or monthly machine schedule ie examined to determine if machine allocations can be changed to bring forward the produotion of the nail sizes in question to matoh eales needs. If this can be done, the appropriate amendments are made to the period or monthly machine schedule, and the nail production schedule.

If it cannot be done, the sales manager should be informed so that he can amend his sales budget accordingly.

Preparation of Weekly Production Programme

A weekly production programme should be prepared for each week and issued to production supervisors on the Friday of the previous week. The programme is shown in Appendix VIII and is drawn up for the 3rd week in July (See Monthly Machine Schedule). It will be noted that the nail press numbers and machine numbers are pre-printed. Additional space is left to repeat those machine numbers where it is planned to change from one nail size to another during the week if required.

The nail size to be produced by each machine is found by reference to the appropriate column of the period or monthly machine schedule (Appendix IV). The planned shifts to be operated are also found from that schedule, although material availability, changed sales demands etc., may justify a change. If it is planned to operate any of the machines on the Saturday or Sunday, the number of shifts should be shown in addition to the week-day shifts. The target output in kgs/shift for each machine and nail size is found from the Table of Nail Press Capacities (Appendix II).

The total target output in kgs per week is calculated by multiplying the target output per shift by the total number of shifts to be worked in the week (or taken from Appendix II). Finally, the appropriate number of coils of wire to be issued each day to each machine is assessed and shown as a guide to the supervisors.

The completed production programme, when issued to production supervisors becomes the instructions as to what has to be produced in the following week. It also provides the basis against which production performance will be measured and controlled. The various control procedures are the subject of the next part of this manual.

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METAL INDUSTRIES DIVISION

PRODUCTION PLANNING AND CONTROL

PART D

CONTROL OF PRODUCTION

Introduction

The previous parts of this manual describe the various planning stages. This part is concerned with providing means of control by recording output and comparing it with what was planned. Deviations from the plan will indicate areas where control should be exercised to enable the overall plan to be met as far as possible.

At present, output is recorded in terms of the number of coils of wire consumed by each machine. This is not very satisfactory, however, since coil weights can vary. Also, no account is taken of unused portions of coils. It is recommended that some means be provided to accurately weigh the production from each machine. This means that the weighing should have to be done before tumbling since after that stage it is not easy to identify output to a particular nail press.

Until it is possible to weigh the output from each nail press, the present method of recording the number of coils used should continue. However, an average coil weight for each gauge of wire should be determined and thus the output in terms of weight of nails calculated as described below.

Three main documents are used for control purposes, the Weekly Production Summary and the two Nail Production Schedules. The latter documents have already been described. Reference was made to the provision of space to record actual period or monthly production against that scheduled. When this is done as described below, the need to alter future weekly production programmes to

make up shortfalls of particular nail sizes can be readily assessed.

The preparation of the control documents will be facilitated by daily production records and work sheets. The method of preparing each of these is described in sequence below.

Daily Production Record

The daily Production Record (Appendix IX) should be completed each day by the production department clerk from the previous days output and submitted to the Production Manager. The basic data should be taken from the daily machine records. Initially these latter will show the number of coils consumed to produce a particular size of nail. Eventually, they should show the weight of nails produced in kilograms.

The daily production record should have all the nail press numbers pre-printed with space to add those machines which have produced more than one nail size during the day concerned.

The steps in compiling the record are:

1. Sort the daily machine records into nail press number order.

2. Examine the machine record for nail press Number 1 and determine the nail size produced. Insert this in the appropriate column of the daily production record. If two sizes were produced, add the nail press number and second nail size on one of the spare lines at the bottom of the sheet.

3. When it becomes possible to weigh the output from each machine, refer to the Weekly Production Programme for the Target Output per shift and enter it in the appropriate column of the Daily Production Record.

While it is not possible to weigh output, it should be recorded as quantities of coils consumed (see step 4 below). The weight of each coil can vary widely and it would be an unnecessary complication to calculate the average weight of each coil daily. This should, however, be done for the Weekly Production Summary, as explained latter. Since daily output is not known in terms of weight, therefore, it is unnecessary to record the Target Output on the Daily Production Record.

4. From the machine record, find the actual output per shift and insert this in the appropriate columns. Initially this will be in terms of coils consumed but latterly in kilogrammes. Add together the outputs from each shift and insert the total.

5. Refer to stores requisitions for the total number of coils issued to the machine and the total weight in lbs and kgs and insert these in the appropriate columns.

6. Repeat the above steps for all machines.

7. When the output from each machine is weighed and therefore the target outputs for each machine are shown on the daily production record (see step 3) the production manager should ascertain how effectively each machine is being operated on a daily basis. When the actual output is significantly below the target, he should investigate the reasons and attempt to have an improvement made. The appropriate production supervisor should be informed of the shortfall and be held responsible for remedying the situation, if it is within his power to do so.

Weekly Production Summary

The Weekly Production Summary (Appendix X) should be prepared after the end of each week by the Production department clerk. One copy should be submitted to the production manager and one copy to the divisional accountant.

Until it is possible to weigh the production from each machine it will be necessary to calculate the average weight of each different gauge of coil issued and use this figure to calculate the weight of coils consumed. A work sheet (Appendix XI) is given which will facilitate this. This work sheet should not be necessary when production can be weighed directly. For simplicity, procedures to be used in each case to prepare the Weekly Production Summary are described separately.

The steps in preparing the weekly summary when output cannot be weighed directly are :-

1. Sort the appropriate daily production records into date order.

2. Refer to the first production record and copy the number of coils issued to each machine on to the work sheet for the appropriate day of the week. Copy also weight of coils issued (in kgs) and the number of coils used.

3. Repeat Step 2 for each successive production record.

4. Add together the number of coils issued to each machine throughout the week and insert the total in the appropriate column of the work sheet.

5. Repeat Step 4 for the weights of coils issued.

6. Divide the total weight of coils issued by the total number issued for each machine to calculate the average weight of coil issued. It will be assumed that this is equal to the average weight of coils used.

7. Repeat Step 4 for the number of coils used.

8. Multiply the total number of coils used by the average weight per coil for each machine and insert the resulting figure in the final column of the work sheet (total wt.).

9. Refer to the daily production records to find the nail sizes produced by each machine and insert these in the appropriate column of the weekly production summary. When more than one nail size has been produced on a machine, insert one of the sizes against the pre-printed machine number and repeat the machine number on the spare lines at the foot of the summary for the other nail sizes.

10. Refer to the daily production records to find the total shifts worked, total shifts lost and target output per shift for each machine and insert in the weekly summary. Shifts worked are defined to be those shifts during which some production, no matter how little, was achieved. Shifts during which there was no production, because of machine breakdown, should be totalled separately and inserted in the column headed Total Shifts Lost.
N.B. It will be appreciated that the above definitions are arbitrary and that some inaccuracies in calculating efficiencies will arise, particularly if say, a machine breaks down just after the start of a shift. However, it is judged to be more practical to accept

this rather than either include all shifts as productive or attempt to record the precise proportion of a shift which was available for production. In the first case it would not be easy to differentiate between losses of efficiency due to breakdown and those losses which were due to a reduced pace of operation. In the second case, it would be difficult to achieve the necessary degree of accuracy in recording the times and durations of breakdowns.

11. Multiply the total shifts worked by the target output per shift for each machine and insert the answer in the column headed Total Target Output.

12. Refer to the work sheet to find the total actual output from each machine and insert in the appropriate column.

13. Calculate the efficiency for each machine as follows and insert in the appropriate column :

$$\text{Efficiency} = \frac{\text{Total Actual Output}}{\text{Total Target Output}} \times 100\%$$

This efficiency is one of the key pieces of control information. The production manager should try to ensure that it is equal to or greater than but never less than 100%. For normal commercial quality wire it should never be significantly less than 100% because the target output is a practical, not a theoretical, figure. It has been derived from an analysis of actual rates of production achieved per shift allowing for inherent inefficiencies, short breakdowns and change-over losses.

NOTE: The production manager should also scrutinise the number of shifts lost compared

with the shifts worked. The extent to which the former arise is an indication either of bad setting and operation or of inadequate maintenance. The causes should be examined and action taken to remove them as far as possible.

14. Refer to the work sheet and copy the total weight of coils issued to each machine into the last column of the production summary.

15. Finally, when the production summary has been completed, one copy should be given to the production manager. One copy should also be given to the divisional accountant for costing purposes.

When it becomes possible to weigh the output of each machine, the steps in preparing the weekly production summary will be simplified as follows :

1. Sort the appropriate daily production records into date order.

2. Refer to the daily production records to find the nail sizes produced by each machine and insert these in the appropriate column of the weekly production summary. When more than one nail size has been produced on a machine, insert one of the sizes against the pre-printed machine number and repeat the machine number on the spare lines at the foot of the summary for the other nail sizes.

3. Refer to the daily production records to find the total shifts worked, total shifts lost, target output per shift, total actual output and total wire issued for each machine and insert in the appropriate columns of the weekly summary. See note to step 10 above concerning the definition of shifts worked.

4. Multiply the total shifts worked by the total output per shift for each machine and insert the answer in the column headed Total Target Output.

5. Calculate the efficiency for each machine as described in step 13 above. See also step 13 for note on shifts lost.

6. Finally, when the production summary has been completed, one copy should be given to the production manager. One copy should also be given to the divisional accountant for costing purposes.

NOTE: Until the new accounting periods are introduced it will be necessary to prepare two Weekly Production Summaries (using two work sheets) for those weeks during which the calendar month ends. This is to enable the accountant to collect information for costing purposes on the basis of a calender month. Thus one of the summaries will cover the days from the start of the week up to and including the last day of the month. The other will cover the days from the first day of the month up to the end of the week.

Period or Monthly Analysis of Production

The Weekly Production Summary, described above, provides the means of controlling efficiency of production. It is also necessary to control the volume and mix of nails produced relative to planned requirements. The planned requirements have been indicated on the period or monthly and the cumulative nail production schedules (Appendices V and VI). It is desirable to compare what has actually been produced with the requirements shown on the schedule and this

should be done on a period or monthly basis. The procedure for this should be as follows :-

1. At the end of each month or period, the appropriate weekly production summaries should be brought together by the production clerk.

2. The actual output of each nail size in kgs during the period should be totalled from the weekly summaries, converted to case quantities, and the figures inserted in the appropriate column of the nail production schedule on the line headed "Actual". The cumulative production of each nail size since the starting period should also be calculated and inserted in the appropriate column of the cumulative schedule, again on the line headed "Actual".

3. On completion, the two schedules should be returned to the production manager. He should examine them and if there are any significant differences between planned and actual quantities, he should consult the sales manager and decide if there is a need to modify future production programmes.

APPENDIX 1

GIHOC

METAL INDUSTRIES DIVISION

1976 NAIL SALES BUDGET (CASES)

(Certain Gauges have been eliminated and Quantities consolidated)

NAIL SIZE	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
½ x 18	30	30	40	50	40	40	40	40	40	40	40	25	455
¾ x 16	45	65	65	60	60	75	65	65	60	80	60	45	745
1 x 16	200	400	450	470	520	570	540	580	530	520	500	500	5780
1½ x 14	-	-	-	700	350	350	360	400	450	460	450	400	3920
2 x 11	450	800	1050	900	1060	1040	1000	950	980	1140	1000	710	11080
2½ x 10	-	-	-	450	450	450	450	450	450	590	590	880	4260
3 x 9	-	-	-	200	200	200	200	100	100	100	90	70	1260
3 x 7	-	-	-	700	800	800	800	800	650	690	660	660	6360
4 x 7	120	160	185	155	200	250	225	220	215	235	205	210	2380
4 x 6	1200	1020	1140	1020	1010	975	1015	1010	950	1035	960	890	12223
6 x 4	100	130	130	100	100	130	100	100	130	125	110	100	1355
2½ x 9 BM	220	240	240	240	200	230	240	240	240	235	200	180	2705

APPENDIX II

GIHOC

METAL INDUSTRIES DIVISION

TABLE OF NAIL PRESS CAPACITIES
(TARGET OUTPUTS)

N/P NO.	MACHINE	NAIL SIZE	TARGET OUTPUTS			
			KG/HR	KG/WK 1.SH	KG/WK 2.SH	KG/WK 3.SH
1.	SO/70	4 x 6 6 x 4				
2.	11/60/1	4 x 7 4 x 6				
3.	THA/40	2 x 11 2½ x 10 6 x 9				
4.	THA/40	2½ x 10 3 x 9				
5.	THA/14	1 x 16 1½ x 14				
6.	THA/14	1 x 16 1½ x 14				
7.	THA/22	1 x 16				
8.	111/46	3 x 7				
9.	11/60	4 x 7 4 x 6				
10.	-	-				
11.	UDX/1536	1 x 16				
12.	III/46	3 x 7 4 x 7				
13.	S/50	¾ x 16 1 x 16 1½ x 14				
14.	S/40	¾ x 16 1 x 16				
15.	S/25	¾ x 18				

N/P NO.	MACHINE	NAIL SIZE	TARGET OUTPUTS			
			KG/HR	KG/WK 1.SH	KG/WK 2.SH	KG/WK 3.SH
16.	S/75	2 x 11				
17.	S/110	2½ x 9 RN				
18.	LHO/110	2 x 11 3 x 7				
19.	S/50	¾ x 16 1 x 16 1½ x 14				
20.	S/40	¾ x 16 1 x 16				
21.	N/S	2 x 11				
22.	S/25	½ x 18 1 x 16				
23.	S/50	¾ x 16 1 x 16 1½ x 14				
24.	S/50	¾ x 16 1 x 16 1½ x 14				
25.	N/3	1½ x 14 2 x 11				
26.	S/75	2 x 11				

NOTE: 1. Nail Sizes underlined are preferred sizes for each Machine.

2. Target outputs are those which should be achievable on continuous basis over a full shift. They have been derived from an analysis of actual numbers of coils consumed over a reasonably large number of shifts. The average weight of each gauge of coil has been derived from an analysis of coil weights, again taking reasonably large samples.

APPENDIX III

GIHOC

METAL INDUSTRIES DIVISION

CALCULATION OF NAIL PRODUCTION PROGRAMME

1	2	3	4		5	6	7	8	9	10
NAIL SIZE	NO. OF CASES	TOTAL WT. (KGS)	MACHINE NO.	TYPE	TARGET KG/WK	WEEKS OF PROD.	AVAIL. PROD. CAP.	KGS TO C/FWD	EXCESS WEEKS	CASES PER WK
½ x 18	455	22750	15	S/25	344	48	16512	6238	--	7
½ x 18	-	6238	22	S/25	320	20	-	-	28	7
¾ x 16	745	37250	14	S/40	664	48	31872	5378	--	13
¾ x 16	-	5378	20	S/40	620	9	-	-	39	13
1 x 16	5780	289000	24	S/50	840	48	40320	248680	--	17
1 x 16	-	248680	20	S/40	808	39	31512	217168	--	16
1 x 16	-	217168	5	THA/14	736	48	35328	181840	--	15
1 x 16	-	181840	7	THA/22	640	48	30720	151120	--	13
1 x 16	-	151120	11	UDX/1536	632	48	30336	120784	--	13
1½ x 14	3920	196000	13	S/50	1520	48	72960	123040	--	31
1½ x 14	-	123040	19	S/50	1440	48	69120	53920	--	29
1½ x 14	-	553920	25	N/3	1200	45	-	-	3	24
2 x 11	11080	554000	16	S/75	3512	48	168576	385424	--	70
2 x 11	-	385424	26	S/75	3096	48	148608	236816	--	62
2 x 11	-	236816	21	N/3	2328	48	111744	125072	--	47
2 x 11	-	125072	18	LHO/110	1264	48	60672	64400	--	25
2½ x 10	4260	213000	4	THA/40	5120	42	-	-	666	103
3 x 9	1260	63000	3	THA/40	5200	13	-	-	35	104
3 x 7	6560	328000	12	III/46	3840	48	184320	143680	--	77
3 x 7	-	143680	8	III/46	2960	48	142080	1600	--	59
4 x 7	2380	119000	2	II/60	3920	31	-	-	17	79

1	2	3	4		5	6	7	8	9	10
NAIL SIZE	NO. OF CASES	TOTAL WT. (KGS)	MACHINE NO.	TYPE	TARGET KG/WK	WEEKS OF PROD.	AVAIL. PROD. CAP.	KGS TO C/FWD	EXCESS WEEKS	CASES PER WK
4 x 6	12225	11250	2	II/60	5200	17	88400	522850	--	104
4 x 6	-	522850	9	II/60	5680	48	272640	250210	--	114
4 x 6	-	250210	1	SO/70	5040	48	241920	8290	--	101
4 x 6	-	8290	1	SO/70	2520	4+	-	-	44	51
6 x 4	355	67750	1	SO/70	4400	16+	-	-	28	88
2½ x 9 RN	2705	135250	17	S/110	1520	48	72960	62290	--	31
2½ x 9 RN	-	62290	17	S/110	760	48+	36480	25810	--	15
2 x 11	-	64400	3	THA/40	3600	18	-	-	17	72
1 x 16	-	120784	6	THA/14	432	48	20736	100048	--	9
1 x 16	-	100048	22	S/25	552	28	15456	84592	--	11
1 x 16	-	84592	23	S/50	736	48	35328	49264	--	15
1 x 16	-	49264	24	S/50	420	48+	20160	29104	--	9
1 x 16	-	29104	20	S/40	404	48+	19392	9712	--	8
1 x 16	-	9712	23	S/50	368	27+	-	-	--	7

+ Denotes Machines to be run on 3rd shift for indicated number of weeks.

___ Underlined figures indicate quantities which cannot be produced.

GIHOC

APPENDIX IV

METAL INDUSTRIES DIVISION

PERIOD OR MONTHLY MACHINE SCHEDULE TO MEET NAIL SALES BUDGET

(CASES)

NO.	M/C	NAIL	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1.	SO/70	4 x 6	403	+605	403	403	403	403	403	403	403	403	403	403	5038
	SO/70	6 x 4	°352	-	-	°352	-	°352	-	-	-	°352	-	-	1408
2.	II/60	4 x 7	-	314	314	-	314	314	-	314	314	-	314	236	2434
	II/60	4 x 6	416	-	-	416	-	-	416	-	-	416	-	104	1768
3.	THA/40	2 x 11	288	288	288	-	288	-	288	-	288	288	288	216	2520
	THA/40	3 x 9	-	-	-	416	-	416	-	416	-	-	-	104	1352
4.	THA/40	2½ x 10	-	205	410	410	410	410	410	410	410	410	410	410	4305
5.	THA/14	1 x 16	59	59	59	59	59	59	59	59	59	59	59	59	708
6.	THA/14	1 x 16	35	35	35	35	35	35	35	35	35	35	35	35	4400
7.	THA/22	1 x 16	51	51	51	51	51	51	51	51	51	51	51	51	612
8.	III/46	3 x 7	237	237	237	237	237	237	237	237	237	237	237	237	2844
9.	II/60	4 x 6	455	455	455	455	455	455	455	455	455	455	455	455	5460
10.	III/46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11.	UDX/1536	1 x 16	51	51	51	51	51	51	51	51	51	51	51	51	612
12.	III/46	3 x 7	307	307	307	307	307	307	307	307	307	307	307	307	3684
13.	S/50	1¼ x 14	122	122	122	122	122	122	122	122	122	122	122	122	1464
14.	S/40	¾ x 16	53	53	53	53	53	53	53	53	53	53	53	53	636
15.	S/25	½ x 18	28	28	28	28	28	28	28	28	28	28	28	28	336
16.	S/75	2 x 11	281	281	281	281	281	281	281	281	281	281	281	281	3372
17.	S/110	2½ x 9RB	+183	+183	+183	+183	+183	+183	+183	+183	+183	+183	+183	+183	2196
18.	LHO/110	2 x 11	101	101	101	101	101	101	101	101	101	101	101	101	1212
19.	S/50	1½ x 14	115	115	115	115	115	115	115	115	115	115	115	115	1380

NO.	M/C	NAIL	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
20.	S/40	¾ x 16	-	-	-	-	-	50	-	-	-	50	13	-	113
	S/40	1 x 16	+ 97	+ 97	+ 97	+ 97	+ 97	o 92	+ 97	+ 97	+ 97	o 32	+ 80	+ 97	1017
21.	N/3	2 x 11	186	186	186	186	186	186	186	186	186	186	186	186	2232
22.	S/25	½ x 18	-	26	-	26	-	-	-	26	-	26	-	26	130
	S/25	1 x 16	44	-	44	-	44	44	44	-	44	-	44	-	308
23.	S/50	1 x 16	59	59	+ 88	59	+ 88	+ 88	59	+ 88	+ 88	59	+ 88	+ 80	903
24.	S/50	1 x 16	+101	+101	+101	+101	+101	+101	+101	+101	+101	+101	+101	+101	1212
25.	N/3	1½ x 14	96	96	96	96	96	96	96	96	96	96	96	24	1080
26.	S/75	2 x 11	248	248	248	248	248	248	248	248	248	248	248	248	2976

+ Denotes 3 - shifts

o Denotes 3rd shift only

APPENDIX A

GLHOC
METAL INDUSTRIES DIVISION

PERIOD OR MONTHLY NAIL PRODUCTION SCHEDULE
TO MEET SALES BUDGET
(CASES)

NAIL SIZE		J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
½ x 18	PLAN	28	54	28	54	28	28	28	54	28	54	28	54	466
	ACTUAL													
¾ x 16	PLAN	53	53	53	53	53	103	53	53	53	103	66	53	749
	ACTUAL													
1 x 16	PLAN	497	453	526	453	526	461	497	482	526	388	509	474	5792
	ACTUAL													
1½ x 14	PLAN	333	333	333	333	333	333	333	333	333	333	333	261	3924
	ACTUAL													
2 x 11	PLAN	1104	1104	1104	816	1104	816	1104	816	1104	1104	1104	1032	12312
	ACTUAL													
2½ x 10	PLAN	-	205	410	410	410	410	410	410	410	410	410	410	4305
	ACTUAL													
3 x 9	PLAN	-	-	-	416	-	416	-	416	-	-	-	104	1352
	ACTUAL													
3 x 7	PLAN	544	544	544	544	544	544	544	544	544	544	544	544	6528
	ACTUAL													

MAIL SIZE		J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
4 x 7	PLAN	-	314	314	-	314	314	-	314	314	-	314	236	2434
	ACTUAL													
4 x 6	PLAN	1274	1060	858	1274	858	858	1274	858	858	1274	858	962	12266
	ACTUAL													
6 x 4	PLAN	352	-	-	352	-	-	352	-	-	352	-	-	1408
	ACTUAL													
2½ x 9RN	PLAN	183	183	183	183	183	183	183	183	183	183	183	183	2196
	ACTUAL													
												TOTAL FOR THE YEAR		53732

GIHOC

APPENDIX VI

METAL INDUSTRIES DIVISION

CUMULATIVE NAIL PRODUCTION SCHEDULE

(CASES)

NAIL SIZE		J	F	M	A	M	J	J	A	S	O	N	D
½ x 18	PLAN	28	82	110	164	192	220	248	302	330	384	412	466
	ACTUAL												
¾ x 16	PLAN	53	106	159	212	265	368	421	474	527	630	696	749
	ACTUAL												
1 x 16	PLAN	497	950	1476	1929	2455	2916	3413	3895	4421	4809	5318	5792
	ACTUAL												
1½ x 14	PLAN	333	666	999	1332	1665	1998	2331	2664	2997	3330	3663	3924
	ACTUAL												
2 x 11	PLAN	1104	2208	3312	4128	5232	6048	7152	7968	9072	10176	11280	12312
	ACTUAL												
2½ x 10	PLAN	-	205	615	1025	1435	1845	2255	2665	3075	3485	3895	4305
	ACTUAL												
3 x 9	PLAN	-	-	-	416	416	832	832	1248	1248	1248	1248	1352
	ACTUAL												
3 x 7	PLAN	544	1088	1632	2176	2720	3264	3808	4352	4896	5440	5984	6528
	ACTUAL												
4 x 7	PLAN	-	314	628	628	942	1256	1256	1570	1884	1884	2198	2434
	ACTUAL												
4 x 6	PLAN	1274	2334	3192	4466	5324	6182	7456	8314	9172	10446	11304	12266
	ACTUAL												
6 x 4	PLAN	352	352	352	704	704	704	1056	1056	1056	1408	1408	1408
	ACTUAL												
2½ x 9RN	PLAN	183	366	549	732	915	1098	1281	1464	1647	1830	2013	2196
	ACTUAL												

GIHOC

APPENDIX VII

METAL INDUSTRIES DIVISION

1976 SALES BUDGET (CUMULATIVE)

(CASES)

NAIL SIZE	J	F	M	A	M	J	J	A	S	O	N	D
½ x 18	30	60	100	150	190	230	270	310	350	390	430	455
¾ x 16	45	110	175	235	295	370	435	500	560	640	700	745
1 x 16	200	600	1050	1520	2040	2610	3150	3730	4260	4780	5280	5780
1½ x 14	-	-	-	700	1050	1400	1760	2160	2610	3070	3520	3920
2 x 11	450	1250	2300	3200	4260	5300	6300	7250	8230	9370	10370	11080
2½ x 10	-	-	-	450	900	1350	1800	2250	2700	3290	3880	4260
3 x 9	-	-	-	200	400	600	800	900	1000	1100	1190	1260
3 x 7	-	-	-	700	1500	2300	3100	3900	4550	5240	5900	6560
4 x 7	120	280	465	620	820	1070	1295	1515	1730	1965	2170	2380
4 x 6	1200	2220	3360	4380	5390	6365	7380	8390	9340	10375	11335	12225
6 x 4	100	230	360	460	560	690	790	890	1020	1145	1255	1355
2½ x 9RN	220	460	700	940	1140	1370	1610	1850	2090	2325	2525	2705

APPENDIX VIII

GIHOC

METAL INDUSTRIES DIVISION

WEEKLY PRODUCTION PROGRAMME W/E

N/P NO.	MACHINE NO.	NAIL SIZE (INS X SWG)	PLANNED SHIFT PER DAY	TARGET OUTPUT (KG/SH)	TARGET OUTPUT (KG/WK)	APPROX. NO. OF COILS PER DAY
1.	SO/70	4 x 6	2	504	5040	13
2.	II/60/1	4 x 6	2	520	5200	13
3.	THA/40/120	2 x 11	2	360	3600	9
4.	THA/40/120	2½ x 10	2	512	5120	13
5.	THA/14/25/1	1 x 16	2	74	736	2
6.	THA/14/25/2	1 x 16	2	43	432	1
7.	THA/22	1 x 16	2	64	640	2
8.	III/46/1	3 x 7	2	296	2960	8
9.	II/60/2	4 x 6	2	568	5680	14
10.	III/46/2	-	-	-	-	-
11.	UDX/1536	1 x 16	2	63	632	2
12.	III/46/3	3 x 7	2	384	2840	10
13.	S/50/4	1½ x 14	2	152	1520	4
14.	S/40/2	¾ x 16	2	66	664	2
15.	S/25/2	½ x 18	2	34	344	2
16.	S/75/1	2 x 11	2	351	3512	9
17.	S/110	2½ x 9RN	3	152	2280	6
18.	IHO/110	2 x 11	2	126	1264	4
19.	S/50/1	1½ x 14	2	144	1440	4
20.	S/40/1	1 x 16	3	80	1212	3
21.	N/3/1	2 x 11	2	233	2328	6
22.	S/25/1	1 x 16	2	55	552	2
23.	S/50/2	1 x 16	2	74	736	2
24.	S/50/3	1 x 16	3	84	1260	3
25.	N/3/2	1½ x 14	2	120	1200	3
26.	S/75/2	2 x 11	2	310	3096	8
1.	SO/70	6 x 4	1	880	4400	11

GIHOC

APPENDIX IX

METAL INDUSTRIES DIVISION

DAILY PRODUCTION RECORD

DATE:

N/P NO.	MACHINE NO.	NAIL SIZE	TARGET OUTPUT (Kg/SH)	ACTUAL OUTPUT(KG) PER SHIFT 1	2	3	TOTAL	WIRE ISSUED NO.OF COILS	WEIGHT lb	Kg
1.	SO/70									
2.	II/60/1									
3.	THA/40/120/1									
4.	THA/40/120/2									
5.	THA/14/25/1									
6.	THA/14/25/2									
7.	THA/22									
8.	III/46/1									
9.	II/60/2									
10.	III/46/2									
11.	UDX/1536									
12.	III/46/3									
13.	S/50/4									
14.	S/40/2									
15.	S/25/2									
16.	S/75/1									
17.	S/110									
18.	LHO/110									
19.	S/50/1									
20.	S/40/1									
21.	N/3/1									
22.	S/25/1									
23.	S/50/2									
24.	S/50/3									
25.	N/3/2									
26.	S/75/2									

APPENDIX A

METAL INDUSTRIES DIVISION
GIHOC
WEEKLY PRODUCTION SUMMARY

W/E _____

N/P NO.	MACHINE NO.	NAIL SIZE	TOTAL SHIFTS WORKED	TOTAL SHIFTS LOST	TARGET OUTPUT (KG/SH)	TOTAL TARGET OUTPUT(KG)	TOTAL ACTUAL OUTPUT(KG)	EFF. %	TOTAL WIRE ISSUED (KG)
1.	SO/70								
2.	II/60/1								
3.	THA/40/120/1								
4.	THA/40/120/2								
5.	THA/40/25/1								
6.	THA/14/25/2								
7.	THA/22								
8.	III/46/1								
9.	II/60/2								
10.	III/46/2								
11.	UDX/1536								
12.	III/46/3								
13.	S/50/4								
14.	S/40/2								
15.	S/25/2								
16.	S/75/1								
17.	S/110								
18.	LHO/110								
19.	S/50/1								
20.	S/40/1								

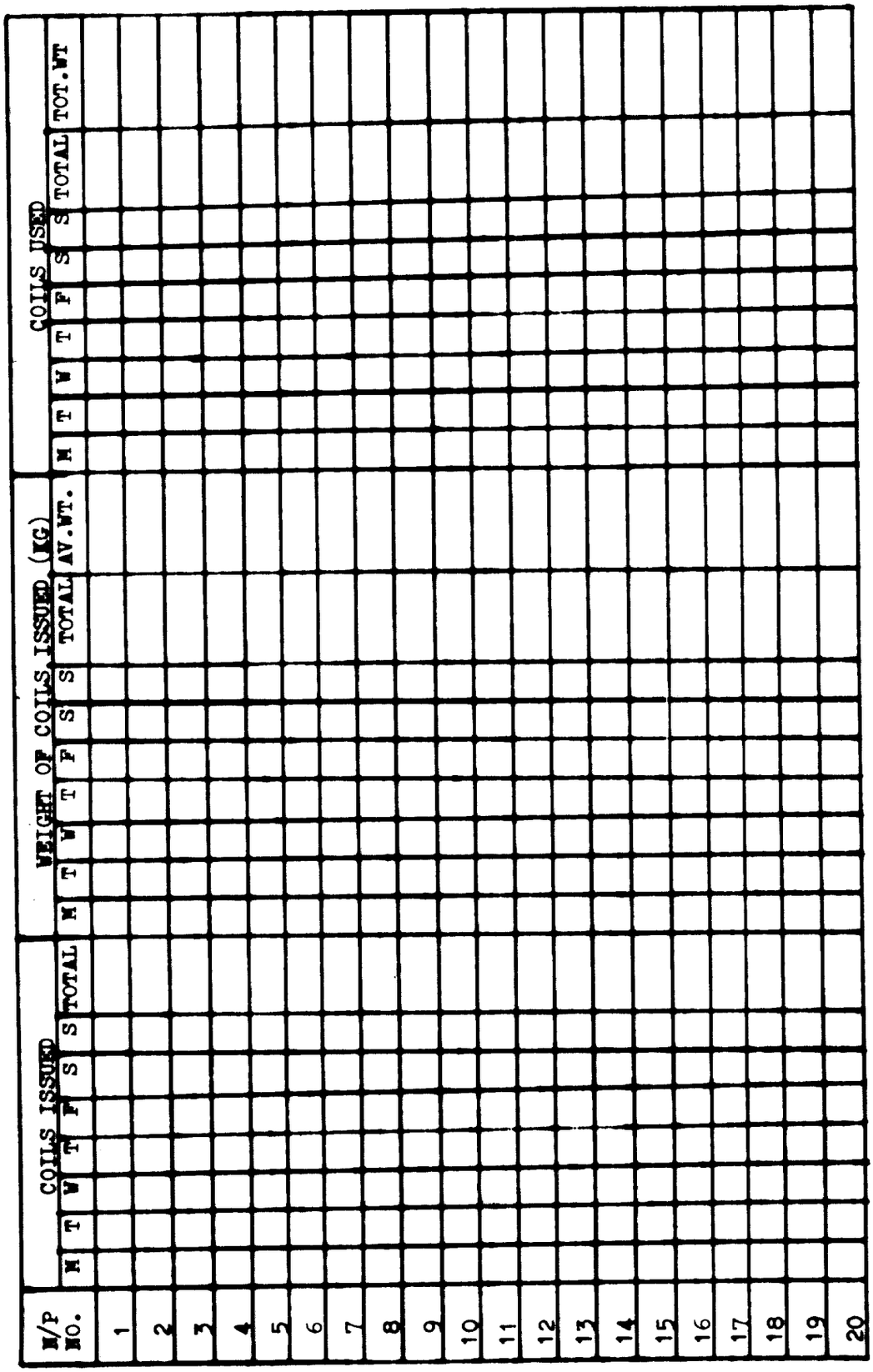
M/P NO.	MACHINE NO.	NAIL SIZE	TOTAL SHIFTS WORKED	TOTAL SHIFTS LOST	TARGET OUTPUT (KG/SH)	TOTAL TARGET OUTPUT(KG)	TOTAL ACTUAL OUTPUT(KG)	EFF. %	TOTAL WIRE ISSUED (KG)
21.	N/3/1								
22.	S/25/1								
23.	S/50/2								
24.	S/50/3								
25.	N/3/2								
26.	S/75/2								

GIHOC APPENDIX XI

METAL INDUSTRIES DIVISION

WORK SHEET FOR WEEKLY PRODUCTION SUMMARY

W/E



APPENDIX XI
(continued)

M/P NO.	COILS ISSUED								WEIGHT OF COILS ISSUED (KG)									COILS USED								
	M	T	W	T	F	S	S	TOTAL	M	T	W	T	F	S	S	TOTAL	AV.WT.	M	T	W	T	F	S	S	TOTAL	TOT.WT.
21																										
22																										
23																										
24																										
25																										
26																										

VOLUME 5

ANNEXE VIII

PAINTS DIVISION

REPORT ON PAINT PRODUCTION CAPACITY

AND BALANCE

GIHOC

PAINTS DIVISION

REPORT ON PAINT PRODUCTION CAPACITY AND PLANT BALANCE

CONTENTS

APPENDICES

GIHOC
PAINTS DIVISION
REPORT ON PAINT PRODUCTION CAPACITY AND PLANT BALANCE

Introduction

This report discusses briefly the production capacity of the division. Each stage in the paint production process has been examined in relation to times to process batches of the various product types. Estimated times which have been provided by the production manager and his staff have been used as the basis.

The capacity of many items of plant, in terms of batches in a given time, depends on the type of product being processed. Therefore it has been necessary to make assumptions about the mix. The load imposed on the plant by the 1977 production budget has been used for this (see Appendix I) and spare capacity has been expressed in quantities of specified products which could be processed after the 1977 budget requirements have been satisfied.

A considerable load is imposed on milling machines by pigment pastes. It is therefore vital to estimate the quantity of these pastes which is required for any given volume of production. In the recent past it has not been possible to make sufficient quantities to meet the demand for many of the colours. Thus historical information does not give an accurate guide as to the proportion of the various paints which should be tinted and thus the quantity of pastes required in the future. In an attempt to prepare a more reliable forecast, outstanding orders have been analysed. These have been for the 12 largest customers covering more than 87,000 gallons on enamel, autospray and undercoat. The orders have been analysed by colour and percentages of the totals to be tinted have been calculated as shown in Appendix II.

These percentages have then been applied to budget quantities. It has been assumed, on the advice of the production manager, that a batch of pigment paste is required for every 200 gallons of paint to be tinted. Thus the total number of batches of pigment paste required for the 1977 budget quantities has been derived. This is shown in Appendix III.

Calculation of Load and Capacity

The starting point for calculating the load imposed on the plant by the 1977 budgets, is the quantity in gallons, of each type of paint to be produced or tinted.

The calculations themselves are shown in Appendices IV (a), (b), (c) and (d) for the main processes of mixing, milling, letting down and tinting respectively. Appendix IV (e) contains notes on the calculations. Quantities have to be converted into batches by dividing total quantities to be produced by the quantities of finished product per batch. It is then necessary to establish the time taken to process each batch and thus the number of batches which can be prepared each day on the appropriate machines. Quantities per batch, times per batch and numbers of batches per day have been estimated by divisional staff.

It should be noted that although some machines may process batches more quickly than others they may not necessarily be able to produce more batches per day. This is presumably because of the differing lengths of time to prepare the machines between batches.

Dividing the number of batches to be prepared by the number of batches which the appropriate machine can produce per day, will indicate the total number of days required. Each machine has been assumed to be available for 220 days per year. This is 10% less than the figure of 245 days normally worked and allows for breakdowns and other contingencies. If therefore the total number of days needed to produce the required number of batches of a product is less than 220, there will be some days available to re-allocate to other

products. When this occurs the re-allocation is indicated by an arrow in the appendices.

Similarly, when there are not sufficient days available on a machine to process all the batches, it is necessary to re-allocate the outstanding batches to another machine. This has been done until either all the batches have been allocated or all the suitable available machines have been allocated. Where, after all batches have been allocated, spare machine time exists, the spare days have been underlined. The total spare time at each process has then been summarised and the equivalent quantities of product types which could be processed have been calculated, as shown in Appendix V.

In the case of milling, there is a shortage of capacity to produce pigment pastes (see Appendix IV (b)). The required quantity, as calculated in Appendix III, can be produced only if a new machine is acquired. On the assumption that this would be a PERL mill, the number of days of production which would be needed has been calculated and the spare capacity also shown.

Conclusion

There is a severe shortage of milling capacity to handle pigment pastes. Existing machines frequently take several days to process a batch. If all other production planned for 1977 is milled on the most appropriate machine, there is very little capacity to produce any pigment pastes. Even now, it is not possible to produce sufficient pastes to provide the range and quantities of tinted oil paints which the market requires.

The problem will be solved if the PERL mill, for which Head Office approval has been granted, can be obtained. That machine and the new high-speed dissolver which is on order will enable the division to produce the 1977 budget quantities in the required

range of colours. There will still be some spare capacity to allow for future expansion. An attempt has been made to quantity this in Appendix V. As a broad indication, it would appear that emulsion production could be increased to a total of about 264,000 gallons per year (39% above 1977 budget quantities). Enamel, autospray and undercoat could be increased to about 169,800 gallons (15% above 1977 budget) if the 1977 budget quantities of all other paints were produced (i.e. 86,680 gallons) OR all other paint production could be increased to 126,900 gallons (46% above 1977 budget) if 1977 budget quantities of enamel, autospray and undercoat were produced (i.e. 148,280 gallons). Beesham production could be increased to a total of 24,150 bags per year (137% above 1977 budget).

It is strongly recommended that the capacity balance calculations contained in this report should not be considered to be a once-off exercise but rather as an integral part of the preparation of the annual production budget. Only in this way can management assess if the planned production quantities are achieveable and, if not, what additional processing capacity would be needed. It would be most appropriate for the production manager to carry out the calculations since he is most familiar with the capabilities of the various machines and would be able to modify any of the assumptions contained in this report should it prove to be necessary. It would also be desirable that the Head Office Production Co-ordinator be able to perform the calculations. Accordingly, both these people will be given the necessary instructions.

T. K. PATERSON
Production Consultant

APPENDIX I

GIHOC

PAINTS DIVISION

1977 PRODUCTION BUDGET

PRODUCT		QUANTITY	
Emulsion		190,212	Gallons
Enamel		125,764	Gallons
Autospray		15,911	Gallons
Undercoat		6,605	Gallons
Floor Paint		15,252	Gallons
Primers		20,381	Gallons
Thinners		15,631	Gallons
Others		35,422	Gallons
	Total	425,178	Gallons
Beesham		10,183	bags of 50 Kilo

APPENDIX II

GIHOC

PAINTS DIVISION

ANALYSIS OF OUTSTANDING ORDERS AS AT 1.11.76 FROM 12 LARGEST CUSTOMERS

(Enamel, Autospray and Undercoat Only)

DESCRIPTION		ENAMEL	AUTOSPRAY	UNDERCOAT
Total Quantity (Gallons)		73,266	10,970	3,166
White	Gallons	4,660	2,698	535
	%	6	25	17
Tinted	Gallons	54,768	3,731	2,591
	%	75	34	82
Ready Mixed	Gallons	13,838	4,451	40
	%	19	41	1
White and Tinted	Gallons	59,428	6,429	3,126
	%	81	59	99

APPENDIX III

GIHOC

PAINTS DIVISION

DETERMINATION OF QUANTITY OF PIGMENT PASTES

FOR 1977 BUDGET

(Enamel, Autospray and Undercoat)

	ENAMEL	AUTOSPRAY	UNDERCOAT
Budget Quantity (Gallons)	125,764	15,911	6,605
% to be tinted	75	34	82
Gallons to be tinted	94,323	5,410	5,416
% to be white	6	25	17
Gallons to be white	7,546	3,977	1,123
% White and Tint	81	59	99
Gallons White and Tint	101,869	9,387	6,539

From above, total quantity to tint

= 94,323 + 5,410 + 5,416

= 105,149 gallons

Assuming 1 batch of paste required for every 200 gallons

Total number of paste batches = $\frac{105,149}{200}$

= 526

or, say, 500 batches

GIHOC
PAINTS DIVISION
COMPARISON OF LOAD WITH CAPACITY FOR 1977 PRODUCTION BUDGET

MIXING

PRODUCT	TOTAL QTY TO PROCESS (GALLS)	QUANTITY PER BATCH (GALLS)	NO. OF BATCHES	TIME PER BATCH	BATCHES PER DAY	TOTAL NO. OF DAYS	MACHINE	TOTAL DAYS AVAIL	DAYS TO RE-ALLOC-ATE	BATCHES PRODUCE	BATCHES TO RE-ALLOC-ATE
Emulsion	190,212	100	1902	7½ hrs	6	317	MX9,10,14	220	-	1320	582
Emulsion	-	100	582	40 mins	6	97	MX6	220	123	-	-
Enamel	125,764	100	1258	¾ hr.	8	157	New H.S.D.	220	63	-	-
Autospray	15,911	80	199	¾ hr.	8	25	New H.S.D.	63	38	-	-
Undercoat	6,605	100	66	¾ hr.	8	8	New H.S.D.	38	30	-	-
Floor Paint	15,252	80	191	40 mins	6	32	MX3	220	188	-	-
Primers	20,381	Say 60	340	Say 1hr	6	57	MX3	188	131	-	-
Thinners	15,631		Assume no mixing								
Other Products	35,422	Say 60	590	Say 1hr	6	98	MX3	131	33		
Pigment Pastes	-	-	500	Say 1hr	6	83	MX3	33	-	198	302
Pigment Pastes	-	-	302	Say 1hr	6	50	MX2	220	170	-	-
Beesham	10,183 bags	11 bags	926	1½ hrs	10	93	MX4 & 5	220	127		

See Appendix IV(e) for notes

APPENDIX IV(a)

GIHOC

PAINTS DIVISION

COMPARISON OF LOAD WITH CAPACITY FOR 1977 PRODUCTION BUDGET

MILLING

PRODUCT	TOTAL QTY TO PROCESS (GALLS)	QUANTITY PER BATCH (GALLS)	NO. OF BATCHES	TIME PER BATCH	BATCHES PER DAY	TOTAL NO. OF DAYS	MACHINE	TOTAL DAYS AVAIL	DAYS TO RE-ALLOC-ATE	BATCHES PRODUCE	BATCHES TO RE-ALLOC-ATE
Emulsion(From MX 6)	58,200	100	582	½ hr	14	42	MS17A	220	178	-	-
Enamel (White and Tinted)	101,869	100	1019	1½ hrs	4	255	MS15	220	-	880	139
" "	-	-	139	2½ hrs	3	46	MS4	220	174	-	-
Autospray (White & Tinted)	9,387	80	117	1½ hrs	4	29	MS4	174	145	-	-
Undercoat (White & Tinted)	6,539	100	65	2½ hrs	3	22	MS4	145	123	-	-
Enamel & U/Coat (R/Mixed)	23,961	100	240	2½ hrs	3	80	MS2	220	140	-	-
Autospray (R/Mixed)	6,524	80	82	1½ hrs	4	21	MS2	140	119	-	-
Floor Paint	15,252	80	191	6 hrs	1	191	MS2	119	-	119	72
Floor Paint	-	-	72	6 hrs	1	72	MS3	220	148	-	-
Primers	20,381	Say 60	340	Say 4hrs	2	170	MS3	148	-	296	44
Primers	-	-	44	Say 4hrs	2	22	MS5	220	198	-	-

PRODUCT	TOTAL QTY TO PROCESS (GALLS)	QUANTITY PER BATCH (GALLS)	NO. OF BATCHES	TIME PER BATCH	BATCHES PER DAY	TOTAL NO. OF DAYS	MACHINE	TOTAL DAYS AVAIL	DAYS TO RE-ALLOC-ATE	BATCHES PRODUCE	BATCHES TO RE-ALLOC-ATE
Thinners			Assume no milling								
Others (Say 50% Milled)	17,711	Say 60	295	4½ hrs	1	295	MS5	198	-	198	97
Others (Say 50% Milled)	-		97	4½ hrs	1	97	MS1	220	123	-	-
Pigment Pastes	-		500	1½ hrs	4	125	NEW PERL MILL	220	95	-	-

See Appendix IV(e) for notes

GIHOC
PAINTS DIVISION
COMPARISON OF LOAD WITH CAPACITY FOR 1977 PRODUCTION BUDGET
LET DOWN

PRODUCT	TOTAL QTY TO PROCESS	QUANTITY PER BATCH (GALLS)	NO. OF BATCHES	TIME PER BATCH	BATCHES PER DAY	TOTAL NO.OF DAYS	MACHINE	TOTAL DAYS AVAIL	DAYS TO RE-ALLOC.	BATCHES PRODUCE	BATCHES TO RE-ALLOC.
Emulsion	190,212	100	1902	20mins	15	127	MS 12	220	93	-	-
Enamel	125,764	100	1258	20mins	15	84	MS 11	220	136	-	-
Autospray	13,911	80	199	20mins	15	14	MS 11	136	122	-	-
Undercoat	6,605	100	66	20mins	15	5	MS 11	122	117	-	-
Floor Paint	15,252	80	191	20mins	15	13	MS 11	117	104	-	-
Primers	20,381	Say 60	340	20mins	15	23	MS 11	104	81	-	-
Thinners	15,631	Say 80	195	Say 2hrs	3	65	MS 11	81	16	-	-
Other Products	35,422	Say 60	590	20mins	15	40	MS 11	16	-	240	350
Other Products	-	-	350	20mins	15	24	MS 13	220	196	-	-

APPENDIX IV(c)

GIHOC
PAINT DIVISION

COMPARISON OF LOAD WITH CAPACITY FOR 1977 PRODUCTION BUDGET

TINTING

PRODUCT	TOTAL QTY TO PROCESS (GALLS)	QTY PER BATCH (GALLS)	NO.OF BATCHES	TIME PER BATCH	BATCHES PER DAY	TOTAL NO.OF DAYS	MACHINE	TOTAL DAYS AVAIL.	DAYS TO RE-ALLOC.	BATCHES PRODUCE	BATCHES TO RE-ALLOC
Emulsion (67% of total)	127,442	100	1274	2hrs	9	142	TS1,2,3	220	78	-	-
Enamel (75% of total)	94,323	100	943	2½hrs	9	105	TS1,2,3	78	-	702	241
Enamel (75% of total)	-	-	241	2½hrs	3	80	Ms.13	196	116	-	-
Autospray(34% of total)	5,410	80	68	2½hrs	3	23	Ms.13	116	93	-	-
Undercoat(82% of total)	5,416	100	54	2hrs	3	18	Ms.13	93	75	-	-

See Appendix IV(e) for notes

GIHOC APPENDIX IV(e)

PAINTS DIVISION

COMPARISON OF LOAD WITH CAPACITY
FOR 1977 PRODUCTION BUDGET

NOTES ON CALCULATIONS

General

1. Quantity per batch is the final quantity of paint which will be produced from a batch. Quantities have been assessed by production management.

2. Number of batches = $\frac{\text{Total Quantity to Process}}{\text{Quantity per Batch}}$

3. Time per batch has been assessed by production management.

4. Number of batches per day has been assessed by the consultant as being the probable number of batches which could be processed in a normal 8 hour working day.

5. Total number of days = $\frac{\text{Number of Batches}}{\text{Batches per day}}$

6. The machine to be used for the different products has been indicated by production management.

7. Total days available has been assumed to be 220 per year. The figure of 245 is normally used but an allowance of 10% for breakdown and other contingencies has been assumed.

8. The total days available will, of course, be reduced by the time when a machine has previously been allocated to another product.

9. Unallocated days (i.e. spare capacity) have been underlined. The quantity of paint of a particular type or types which could be processed in the spare days has been calculated as shown in Appendix V.

10. Spare days which have been allocated to other products are shown by arrows.

Mixing:

1. Although each batch of emulsion mixed in the ball mill (MX 9, 10 and 14) takes 7½ hours, it is the practice to continue mixing into the evening. Thus each machine normally produces 2 batches every 24 hours giving an effective daily capacity of 6 batches.

2. It has been assumed that enamel, autospray and undercoat will be mixed on the new high speed dissolver (H.S.D.) which is on order.

Milling:

1. Only that quantity of emulsion which has been mixed on the existing high speed dissolver (MX 6) requires to be milled (i.e. 58,200 gallons as calculated from the second line of Appendix IV(a)).

2. Enamel, autospray and undercoat which has had pigment added at the mixing stage, (referred to as ready-mixed) is milled on a different machine from the enamel, autospray or undercoat which is sold as white or is subsequently tinted.

3. It has been assumed that MS 1, the three-roller mill that is currently awaiting spares, will be available for at least 97 days.

4. The three single roller mills MS 6,7 and 8 have not been considered. They are mainly used for dark pigment pastes and red oxide paint. However, they are so slow that they could only produce a small proportion of requirement. It has therefore been necesseary to assume that a new mill (PERL mill) will be acquired. This type of machine will mill pigment pastes in around 1½ hours compared to severak days on three or single-roller mills.

Let Down: 1. See tinting note 1 below about re-allocating of wall stirrer MS 13.

Tinting: 1. Capacity of the three wall stirrers (TS 1, 2 and 3) normally used for tinting is insufficient to meet requirements. However, one of the wall stirrers (MS.13) used for letting down is under-utilised to the extent of 196 days (see Appendix IV(c)) and this time has been allocated to tinting.

2. The quantities which have to be tinted have been derived in Appendices II and III.

APPENDIX V

GIHOC

PAINTS DIVISION

ANALYSIS OF CAPACITY IN EXCESS OF REQUIREMENTS FOR 1977 BUDGET

A. MIXING

		(a)	(b)	(c)	(axbxc)
M/C	PRODUCT NORMALLY PROCESSED	SPARE DAYS AVAIL	BATCHES PER DAY	GALLS PER BATCH	ADDITIONAL QTY. WHICH COULD BE PROCESSED (gallons)
MX6	Emulsion	123	6	100	73,800
New HSD	Enamel, Autospray and Undercoat	30	8	90 (say)	21,600
MX2	Other Paints	170	6	60 (say)	61,200
			OR		
MX2	Pigment Pastes	170	6	-	1,020 batches
MX4 & 5	Beesham	127	10	11	13,970 bags

B. MILLING

		(a)	(b)	(c)	(axbxc)
M/C	PRODUCT NORMALLY PROCESSED	SPARE DAYS AVAIL	BATCHES PER DAY	GALLS PER BATCH	ADDITIONAL QTY. WHICH COULD BE PROCESSED (gallons)
Ms4	White & Tinted enamel, autospray and undercoat	123	3	100	36,900
Ms1	Other Paints	123	1 (say)	80	9,840
New PERL MILL	Pigment Pastes	95	4	-	380 batches
			OR		
New PERL MILL	Other Paints	95	4	80	30,400
Ms17[A]	Emulsion	178	14	100	249,200

C. LET DOWN

		(a)	(b)	(c)	(axbxc)
M/C	PRODUCT NORMALLY PRODUCED	SPARE DAYS AVAIL.	BATCHES PER DAY	GALLS PER BATCH	ADDITIONAL QTY WHICH COULD BE PROCESSED (Gallons)
Ms12	Emulsion	93	15	100	139,500
Ms13	All Other Paints	75	15	100	112,500 if no tinting

D. TINTING

		(a)	(b)	(c)	(axbxc)
M/C	PRODUCT NORMALLY PRODUCED	SPARE DAYS AVAIL.	BATCHES PER DAY	GALLS PER BATCH	ADDITIONAL QTY WHICH COULD BE PROCESSED
Ms13	Emulsion, Enamel, Autospray and Undercoat	75	3	100	22,500 if no let down

E. SUMMARY

The following table indicates very approximately the additional production which could be achieved with existing equipment plus a new high-speed dissolver and a PEEL mill. It can be only approximate because different products require different machines in varying proportions and there is an infinite range of different mixes of product which could be processed. The table therefore should be used as a rough guide only.

PRODUCT	ADDITIONAL QUANTITY WHICH COULD BE PROCESSED (GALLONS)	PROCESS WHICH CONSTRAINTS
Emulsion	73,800	Mixing
Enamel, Autospray or Undercoat	21,600	Mixing
	OR	
All Other Paints	40,240	Milling - Ms1 and PERL Mill
Beesham	13,970 bags	Mixing

NOTE: It is not possible to produce 21,600 gallons of enamel etc., AND 40,240 gallons of all other paints because there would be a constraint at let down/tinting.

From the above, total capacities are of the order shown below:

GALLONS

PRODUCT	1977 BUDGET	ADDITIONAL CAPACITIES	APPROXIMATE TOTALS
Emulsion	190,212	73,800	264,012
Enamel, Autospray, and Undercoat	148,280	21,600	148,280 AND 126,926 OR (169,880 AND 86,686)
All Other Paints	86,686	40,240	
Beesham	10,183	13,970	24,153

VOLUME 5

ANNEXE IX

STEELWORKS DIVISION

ROLLING MILL OPERATION

TECHNICAL REPORT

GHANA INDUSTRIAL HOLDING CORPORATION

STEELWORKS DIVISION

ROLLING MILL OPERATION
TECHNICAL REPORT

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EXHIBITS

GHANA INDUSTRIAL HOLDING CORPORATION

STEELWORKS DIVISION

ROLLING MILL OPERATION
TECHNICAL REPORT

1. Introduction

During Stage I a review was made of this division but, at the time, the mill was undergoing rehabilitation and the plant was at a standstill. We were able to identify several areas where future development would contribute to improving performance and we recorded these in the Stage I Final Report.

However, without being able to conduct studiss and measurements in live production conditions, there was insufficient data available to assess the practical capacity level of the plant or to identify specific actions rsquired to bring actual output closer to the potential capacity.

The plant resumed operation in October 1975 and it was subsequently agreed with the General Manager that a technical study should be mads of the rolling mill operation and maintenance. This study was undertaken in the three weeks 8th - 28th June 1976 and this report describes the results. The conclusions and recommendations have been discussed with the General Manager and many of the detailed engineering changes proposed have been explained in more detail to his senior staff. The survey reinforces the earlier findings particularly as regards the importance of maintenance engineering and sparss.

For convenience, the next section gives a summary of ths principal findings and recommendations and the report then deals with the layout and condition of the plant, the analysis of the effects on output of present maintenance and operating practices and the assessment of plant capacity. The subsequent recommendations for improvements in maintenance and operation are grouped into those independent of material purchase restrictions and those whsre authorisation of essential equipment and spares will be involved.

2. Summary of Findings and Recommendations

2.1 Present output is much lower than the design capacity of the plant which is assessed at 22,500 tonnes per year for the existing pattern of shift working, given an adequate supply of ingots.

2.2 There is a particularly serious problem in the continuous breakdown of major items of plant and equipment which results in:

- frequent production stoppages and loss of output
- extended production times with consequent reduction in rate of output
- hazards to safety.

2.3 There is no systematic approach to maintenance involving regular inspection, lubrication and servicing to prevent stoppages. As a result, these are common and, when repairs are carried out, the engineering practices are of a low standard.

2.4 There are insufficient stocks of spare parts, said to be due to the financial problems of the Division and difficulties of importation.

2.5 When the mill is rolling, output is lower than should be expected due to the operating practices in use.

2.6 There is no visual or audible alarm system; ingots are often ejected from the re-heat furnace when there is a stoppage in the mill.

2.7 On a few items of plant some modification of design is required to prevent stoppages or reduced rates of rolling.

2.8 In general, the Division should not require any additional major capital expenditure in the rolling mill to increase tonnage. There are, however, one or two minor items which it would be beneficial to purchase and these have been specified in the report.

2.9 The Division should be given all financial aid and administrative backing necessary to obtain and maintain a balanced stock of spare parts. This stock should be controlled by a spares stock control system which would indicate the volume and timing of stock replacement.

2.10 Given an adequate supply of spares and maintenance materials, all items of plant should be refurbished.

2.11 Planned maintenance should be introduced throughout the Division. All maintenance personnel should be trained to carry out specific maintenance tasks at pre-determined intervals and their activities should be supervised continuously until they can be relied upon to carry out the work to a consistent standard of reliability.

2.12 Operating personnel should be re-trained to use revised methods designed to give increased output.

2.13 The many detailed recommendations contained in this report should be implemented so as to obtain substantial improvements in quality and output which the mill is capable of achieving.

3. Plant - Layout of Plant - Exhibit 1

This section of the report describes the various items of plant in the rolling mill, together with the problems observed and gives recommendations for overcoming these problems.

3.1 Furnace Feed Equipment

A fork lift truck deposits ingots in random formation into an ingot sorter, which automatically ejects them, one at a time on to an indexing, dog type, chain conveyor. There is an ingot turner at an intermediate position in the conveyor whose function is to correctly orientate the ingots for feeding into the furnace, that is, alternate large and small ends. The ingots are discharged from the conveyor onto an individually driven roller table which transports them to the front of the furnace. They are then hydraulically pushed into and through the furnace.

Observations

The sorter and indexing conveyor functions satisfactorily, however, the ingot turner is erratic in operation and requires attention. The problem could be electrical or hydraulic, probably the former.

The individually driven rollers are in a severe state of neglect, that is, motors are missing, couplings damaged and there is a poor guiding arrangement which together are giving rise to unnecessary manual operation and delays in feeding the furnace. The furnace pusher appears to operate satisfactorily and to be reasonably well maintained.

3.2 Re-heat Furnace

This is an oil fired furnace with an output of eight tonnes per hour. It was originally an end charge and end discharge furnace, but has been modified to an end charge, side discharge type.

The ingots are pushed through the furnace in two streams, each supported on a track of rails formed by refractory bricks.

Observations

Due to low mill production, only one stream of ingots is passing through the furnace. Also a rail of the left hand track (the stream not in use) is badly buckled and the track is covered in scale. The right hand track has a slight twist in the refractory rails, which together with a heavy build up of scale is causing ingots to lift and fall on top of each other, giving rise to multi-tier formation in the furnace. When this occurs, the ingots have to be manually manipulated into the discharge position, giving rise to considerable delays. In extreme cases, several ingots have to be withdrawn through the inspection doors and either dragged on to the mill table or allowed to cool and be recharged into the furnace. The automatic temperature control at the furnace is not functioning, which could be a contributory cause of the heavy scaling. The excessive scaling could also be caused by incorrect combustion and/or the fuel oil. It would be beneficial to get the fuel suppliers to check that the burners are correctly set up for the type of fuel being used. Some method of removing the scale at the discharge end should be investigated.

3.3 Furnace Discharge Equipment

This is an electrically driven pusher which traverses across the furnace to eject an ingot on to the mill table feed mechanism.

Observations

This equipment is frequently out of service, due to the limit switch relays not functioning correctly, and distortion of the pusher head. The drive chain adjusters have not been used since installation, causing the chain to jump on the sprockets, due to excessive slack. Regular changing of the pusher head, the servicing of limit switch relays in the control cabinet and the correct tensioning of the chains, would eliminate these problems.

3.4 Roller Table Feed Equipment

The ingot is ejected from the furnace on to a hinged platform incorporating an ingot turner. Alternate ingots are turned to present the small end to the mill. The table is then hydraulically tilted causing the ingots to drop on to the No. 1 stand approach table.

Observations

This turning equipment is not in use due to hydraulic failure. The ingots are dropped on to the No. 1 stand approach table and then turned manually causing delays. The ingot turner should be immediately serviced and brought into use.

3.5 3-High Roughing Mill Train

This is a three-stand train with open top housings driven by a 1500 h.p. A.C. motor, flywheel equipped gearbox and pinion housing. The rolls which run at 120 r.p.m. are driven by universal type spindles and couplings. All the rolls are nominally 530 mm dia x 1160 mm barrel length and rotate on tapered bore spherical roller bearings directly mounted onto the roll necks by oil injection hydraulics. The couplings are similarly mounted on the rolls but incorporating an intermediate mounting sleeve with tapered outside diameter. This mill train has recently been altered from the original 400 mm dia. nominal roll using all the existing mill stands, screw-down and screw-up gear. Also the mill speed has been increased from 95 r.p.m. to the present 120 r.p.m. The pass design has been changed from diamond/square to oval/square.

Observations

The alterations to this mill have resulted in an increase in the roll neck bending stress due to the increase in the r.p.m. and roll diameter, which in conjunction with the stress raisers in the roll neck profile, makes the roll assembly more susceptible to breakage. A study of possible alternative roll neck profiles should be undertaken making

use of the existing parts. The change in the pass design is an improvement in that for given reductions, the roll contact angle is kept to a minimum. However, passes 2, 5 and 7, in No. 1 stand are just about on the limit for entry. This causes difficulty in getting the ingot to enter at these passes as the resistance to entering is nearly as great as the force taking it through the mill. By reducing the work in stand 1 and increasing the work in stands 2 and 3, a decrease in the contact angles should be achievable thereby making entry into passes 2, 5 and 7 more positive. A reduction in the mill speed to 95 r.p.m. would improve the pass entry. See Appendix I and Exhibits 2,3,4,5,6 and 7.

3.6 No. 1 Stand Approach Table

This is a hydraulically driven roller table which conveys the ingots from the furnace to the mill.

Observations

For the length of ingots used, the rollers are too widely spaced and the apron plates are prone to damage by the rolled stock falling from the top passes. To improve the passage of the rolled stock down the roller table, idle rollers should be installed to alternate with the driven rolls. The whole of the construction is too light for this type of duty but short of replacement there is little that can be done.

3.7 No. 1 Stand Tilt Table

This is a table pivotted at the end remote from the mill which receives the rolled stock from the bottom roll passes Nos. 1, 3, 5 and 7. It is hydraulically tilted to present the stock to passes 2, 4, 6 and 8 and is of similar construction to the approach table.

Observations

Again, this is too light in construction, but again there is little that can be done to make any improvement. The table is showing signs of wear at the tilt cylinder connections and one of the pivot pins has worked loose and has been operating in a partly exposed position.

The table rollers are too widely spaced and to improve the passage of the rolled stock should have idle rollers installed to alternate with the driven ones for the first 3 pitches adjacent to the mill. The tilt table does not lift high enough to give the best conditions of entry into the top passes. A reduction in the mill speed would effect a slight improvement to the entry into the top passes. To obtain the best conditions of entry would require a re-design of the tilt table lift mechanism to incorporate an adjusting device between the tilt table structure and the lift cylinders.

3.8 Guides and Strippers at Stand 1

All the guides are open topped, also the strippers at passes 5 and 7 with top and bottom half strippers on passes 1, 2, 3, 4, 6 and 8. On the mill approach table there is a simple arrangement of falling chutes and there are guide plates attached to the tilt table. Both the chutes and the guide plates are arranged to position the rolled stock in line with the subsequent pass.

Observations

The rolled stock is manually turned at passes 2, 3, 5 and 7 and has to be manually held up and guided into passes 5 and 7. A saving in time with an increase in production could be made by using static twist guides. It is recommended that this can best be done by getting a supplier such as Morgardshammar to supply a complete set of guides and strippers. The patterns for these should also be obtained so that Steelworks Division can cast their own replacements in the future.

3.9 Crop Shear

This is a hydraulic shear located in line with pass 7 on the furnace side of the mill and is used to end crop the rolled stock after pass 6, in order to present a clean front end when entering pass 8 and subsequent passes.

Observations

The shear functions satisfactorily when it is in use, but is used only intermittently, apparently because of incorrect shear blade material being available.

3.10 Burner

After pass 7, the tail end is manually burnt off to avoid cold and split ends and to dispose of the ingot pipe etc.

Observations

Because the crop shear is not operating the burner has to burn off both ends of rolled stock. The provision of only one man and one set of equipment to do this work, causes an additional delay.

3.11 Repeaters

Repeaters are used to transfer and guide rolled stock from pass 8 (stand 1) to pass 9 (stand 2), from pass 9 to pass 10 (stand 2), from pass 10 to pass 11 (stand 3), from pass 11 to pass 12 (stand 3) and from pass 12 to No. 1 pinch roll. All the repeaters are of fabricated steel construction, with bolted on cast iron segmented outer walls. Provision is made for pass-to-pass adjustment.

Observations

All the repeaters function satisfactorily, but due to deflection in the repeater floor, some segments have had to be packed and others form ridges and steps from one segment to the next. Also, due to the wide gap between the inner and outer walls of the repeaters at the entry end, a long straight length of stock is initially formed which could cause cobbles on entering the following guide tube. The

break-out on the top lip of the outer wall is too short, causing a dog-leg to be formed. The repeater floor requires stiffening to give better support to the repeater outer wall and a simple modification to the inner wall at the entry to the repeater would improve the shape of the nose of the rolled stock. The dog-leg formed on break-out would be less severe if the top lip on the outer wall was cut back for a greater distance or alternatively the existing outer wall, which has a vertical channel section, could be replaced with an 'L' shaped section, the vertical leg leaning inwards to form an angle of say 65/70°.

3.12 Pinch Rolls and Guide Troughs

The rolled stock after leaving the repeater from pass 12 (stand 3) is driven through an automatically controlled vertical pinch roll into one of three troughs leading to stand 4, 6 or 8, depending on the product being rolled. Towards the discharge end of each trough, there is a further vertical pinch roll to drive the rolled stock into the first pass in the finishing mill train.

Observations

During the period of observation, this equipment functioned satisfactorily.

3.13 Finishing Mill Train

This is a 5 stand alternate top and bottom 2-high mill train with open top housings driven by a 900 h.p. 720 r.p.m. A.C. motor through a combined gearbox and pinion housing giving an output speed of 232 r.p.m. The 300 mm dia. x 760 mm rolls rotate on phosphor bronze bearings and are driven by wobbler spindles and boxes.

Observations

The wobbler boxes are cast phosphor bronze and are being shaved by the steel spindles giving rise to excessive wear and backlash resulting in a hammering action on the roll bearings, chocks and housings. This increases the tendency to form knuckle ends and badly shaped and finished bars. To achieve consistent performance and a better quality finished product, it is essential that the present mill spindles and roll neck bearings should be replaced with universal type spindles and roll necks with roller bearings as soon as possible.

3.14 Repeaters

Repeaters are used from stand 4 to stand 5 and from stand 6 to stand 7.

From stand 5 to stand 6 and from stand 7 to stand 8 the rolled stock is manually manipulated.

Observations

Because of the size being rolled, only one repeater from stand 6 to stand 7 was in use and working satisfactorily. As the rolled stock issued from stand 7, a wave formation on the mill floor was manually induced and when the tail end left the mill, it was manually transferred to stand 8. This technique is time consuming, allows a considerable drop in temperature and causes an unsheared end to be fed into the last pass, all of which contribute to a poor finished product. Repeaters between stands 5 and 6 and stands 7 and 8, would eliminate these disadvantages.

3.15 Flying Dividing Shear

This shear and an individually driven run-in roller table has just been installed in line with the run-out from stand 8 and is not commissioned. See observations on the cooling bed.

3.16 Cooling Bed Run-in Table

This roller table conveys the finished bar from the flying shear to the cooling bed; all the rollers are individually driven. The first six rollers have parallel barrels, the remainder have conical barrels with their small ends adjacent to the cooling bed. Between each conical roller (at the small end) is a braking/ejecting arm all interconnected to lift simultaneously when a bar is detected. There is a deflector at the beginning of the conical section which deflects the nose of the following bar clear of the raised braking/ejecting arms. When the braking arms lift, they stop and eject a bar into the straightening pocket for transferring on to the cooling bed.

Observations

Out of a total of 36 rollers, 17 are without motors, including the last 8 and the lubrication system is in a poor condition. The braking/ejection arms operate efficiently but the bars are too long for the bed, therefore the tail ends have to be manually lifted into the straightening pocket. Before the flying dividing shear is commissioned and the smaller bar sizes rolled, the roller table should be brought back to its original condition, complete with automatic control and be correctly maintained. In its present condition, particularly when rolling small diameter bars, the outcome would be a high percentage of cobbles at the cooling bed.

3.17 Cooling Bed

The cooling bed is a dog-chain type which lifts the bars out of the straightening pocket and then indexes them across the cooling bed and deposits them on to a double shuffle bar transfer mechanism, to form packs of bars. These packs are then transferred to and deposited on to the cold shear approach table.

Observations

The dog chain transfer functions efficiently at the prevailing rolling rate but due to chain wear, could be suspect at a faster frequency of operation, causing a chain to snatch and possibly jump a tooth on its sprocket. This actually occurred on one occasion during observation. Regular inspection and maintenance is essential. The shuffle bars are in a very bad condition. Out of a total 52 pairs, 22 have only one bar and the last pair, remote from the cold shear, is completely missing. Of those in use, a high proportion is bent or not sitting correctly on the shuffle bar lift rollers. In this condition, the shuffle bars cannot work efficiently under normal mill operating conditions, due to different rates of transfer. That is, a double shuffle bar will traverse the pack of bars twice the distance of a single shuffle bar, for each revolution of the eccentrics, therefore, slip and/or bunching of the pack will occur, particularly on the smaller diameter bars. It is obvious that urgent replacements are required and thereafter proper service and maintenance.

3.18 Shear Approach Table

This is an individually driven roller table which conveys the pack of bars to the cold shear.

Observations

Out of 18 driven rollers, 7 were without motors which on maximum length bars overloads the remaining 11 driven rollers and causes skidding between the rollers and the pack of bars. The roller table must be brought back to its original state for it to function correctly.

3.19 Cold Shear

This is a 200 ton shear, capable of cutting 9 or 10 x ¾" dia. bars simultaneously, based on a 60 ton UTS.

Observations

At no time during the period of observation, when only ¾" dia. bars were produced, was the shear fully loaded, therefore its present shearing capacity cannot be commented on. The shear including the stop and measuring equipment appears by visual inspection to be in good working condition, except for the shear blades. These are in need of regrinding and possibly replacement. The conditions around the end of the measuring beam are dangerous to personnel, due to piled up bars which also precluded the use of the maximum cut length. There are bar ends between the measuring beam web and the stop carriage which could damage the carriage if it were traversed away from the shear. This area must be tidied up immediately before personnel are injured or machinery damaged.

3.20 Back Shear Table

This table has nine individually driven rollers and nine reversible transfer chains to discharge sheared lengths into collecting pockets on either side of the roller table.

Observations

This equipment operates satisfactorily under present rolling conditions but has 3 roller drives missing and the last two transfer chains (remote from the shear) missing. These missing parts should be replaced to avoid overloading the table roller motors and the chains under normal operating conditions.

4. Maintenance

There is no systematic inspection, lubrication or servicing of equipment at regular intervals to ensure prompt attention to defects before they develop sufficiently to result in a plant stoppage. As a result, plant stoppages do occur frequently and are the major reason for the considerable loss of output from the mill. The repair work done during stoppages and breakdowns is not of a high standard and many maintenance problems exist.

The major ones have been noted in section 3 but others are:

4.1 The protective gaiters are adrift on the roughing mill spindles which will permit ingress of foreign matter to this precision equipment.

4.2 At least one top roll carrier bearing is missing in the finishing train; as a result, the rolls are sitting on each other. There is, therefore, no roll gap and this creates difficulty for the bar to enter the rolls.

4.3 Lubrication systems on the cooling bed are loose or disconnected, with feed pipes left hanging loosely.

4.4 Where electric motors have been removed, loose connections lie on the floor and therefore represent an obvious safety hazard.

4.5 Covers have been left off the junction boxes on some electric motors and again this presents a safety hazard.

4.6 The method of removing coupling heads from roughing mill rolls by welding an extractor bridge to the coupling head is to be deplored. It is dangerous to personnel and creates thermal stresses and distortion which will weaken the coupling and result in early failure. Indeed, it should not be necessary if the tapered sleeves are manufactured correctly with the designed finish and care taken to ensure that they are not damaged. The sleeves, couplings and bearings could then be removed easily and quickly by the designed method of oil injection. One instance was observed when it took about ten hours to remove sleeves and couplings using welded bridges. This method was used because the component surfaces were in such bad condition, that oil pressure could not be built up. It so happened that there were no spare sleeves available and the parts, which were being removed from a broken roll, were required for the replacement roll. On this occasion, at least twenty ingot tonnes of production were lost, primarily because spares were not available, but also because of the length of time it took to remove the components from the broken roll. In the event, the lost contribution was about ten times the cost of two spare oil injection mounting sleeves.

4.7 On a more general note, there is no facility for the correct storage of large items such as roll chocks, bearings, couplings and the associated parts. These are left, in most cases, unprotected on the mill floor scattered in random fashion open to a humid, dust laden atmosphere. A separate area remote from the mill should be provided for correct and orderly storage of all spares and to provide a maintenance assembly facility. Spares stock should be built up to enable service and planned maintenance to be carried out with the minimum of downtime.

For example, with the roughing mill, in addition to the roll assemblies in use, there should be one complete set of 3-roll assemblies built up ready for an emergency. Also, a further spare set of bearings, chocks, fittings and couplings with tapered sleeves should be awaiting assembly.

4.8 The setting of the guides and strippers requires more care in initial setting up and securing. On occasions, bad guide and stripper setting has resulted in cobbles. Incorrect contact of the strippers on the rolls gives rise to deformed bars, therefore the strippers should be profiled so that a small area of contact on the roll is obtained.

5. Operating Practice

In the two previous sections there has been discussion of the very many faults which exist with the plant, due to lack of preventive maintenance and an adequate supply of the appropriate spare parts. However, we were also concerned to establish whether there was scope for raising output through the adoption of better operating practices. Accordingly, three random checks were made, each with a duration of approximately half an hour. The average cycle time per ingot during these periods were 100, 151 and 98 seconds. The high value for the second period was due to furnace delays and difficulty in entering pass 8. However, this apart, the teams were averaging 100 seconds per ingot. This compares with a time of 80 to 85 seconds, which could be expectsd from a mill of this type.

There is a considerable loss of output due to inefficient operating practices. The main faults which were observed are:

5.1 Delays are occurring in ejecting ingots from the reheat furnace on to the No. 1 stand approach table so that passes 1 and 7 are not rolling simultaneously. The delays are caused by piled ingots and scale in the furnace and also because the ingot turner at the furnace discharge position is not operating.

5.2 When entering the ingot into pass 2, the crew-man too often turns his back on the mill before the ingot has entered the pass. If the ingot does not enter first time this causes a delay which on one occasion was timed at five seconds.

5.3 The bar should always be turned 90^{o} before entering pass 3. If it is not, then passes 2, 3 and 4 will be rolled on the same faces, giving rise to surface defects such as ripples, rupture and bulges, or overfill at the roll parting. In many cases these defects cannot be rolled out during the subsequent stages of rolling, the outcome being a sub-standard finish.

5.4 Delays occur on entry to passes 4 and 6 due to the excessive run-out distance from passes 3 and 5. This could be minimised by more careful observation on the part of the pulpit operators.

5.5 Entry to passes 5 and 7 is difficult because the oval shaped bar has to be held vertical to enter a square pass. Due to the high speed of the mill, this requires good visual and physical co-ordination on the part of the crew men to avoid delays. There is clearly a need for some crew members to improve their operating techniques. The installation of static twist guides on these two passes would provide automatic entry and lead to improved output.

5.6 Because the crop shear is not always working, the burner has to remove both the nose and tail ends of the bar after pass 7, thus creating a delay prior to entering pass 8. A further delay sometimes occurs due to the burner having to cut up cobbles etc., at the finishing mill. The provision of a second burner would reduce the time delay.

5.7 Further time savings could be made by more precise operation of the tilt table; that is, as soon as the bars are clear of the mill on the bottom passes, the table should be lifted. Similarly, as soon as the bars have entered the top passes, the tilt table should be lowered in readiness for receiving the bars returned on the bottom passes.

5.8 It is normal practice to nose crop after every six or seven passes in order to have a clean, hot nose, free of defects and minimise the possibility of cobbles. It would be advantageous therefore, to install a flying crop shear immediately after No. 1 pinch roll. By nose and tail cropping with this shear, it would be possible to dispense with the burner at pass 8, provided the stationary crop shear is working.

5.9 On the finishing mill, the practice of taking the tail end from stands 5 and 7 and manually entering it into stands 6 and 8, leads to time delays and a temperature drop, which can and will affect the dimensional accuracy of the finished product. Repeaters in these positions would lead to improvement.

5.10 More care is required in the setting of the pairs of mill rolls, to ensure that the grooves are in line with each other and are of exactly the same profile, particularly in the last pass. This shortcoming is at present causing too many bars to be mis-shapen.

With attention to operating practices as mentioned above, it should be possible to obtain an increase in output of the order of 15-20% above the average of 100 seconds per ingot which was observed.

6. Mill Capacity

6.1 During the three weeks when the consultant was at the steelworks, it was clear that the mill was operating only intermittently, for reasons already discussed. Actual output was therefore lower than the potential capacity of the plant; a state which appears to be normal, judging by past performance. Nevertheless, it is of value to know what the capacity of the mill should be, given of course, an adequate supply of ingots. For this purpose, three spot time checks were made, each of about half an hour duration, as follows:

6.2 On Thursday the 10th June at 3.15 p.m. eighteen ingots were rolled in thirty minutes with no unexpected delays. This rate is equivalent to 19,400 ingot tonnes per year.

6.3 On Friday the 11th June at 3.00 p.m. fourteen ingots were rolled in 35.2 minutes. This rate is equivalent to 12,885 ingot tonnes per year. During this study, unexpected delays were experienced at the re-heat furnace amounting to twelve minutes. Allowing for this delay, the revised rate is equivalent to 19,550 ingot tonnes per year.

6.4 On Monday 11th June, nineteen ingots were rolled in thirty one minutes with no unexpected delays. This is equivalent to 19,870 ingot tonnes per year.

6.5 In addition to these checks, a production study was carried out covering three days, Thursday, Friday and Monday, the 17th 18th and 21st of June. The purpose of this longer study, the details of which are given in Appendix II, was to establish the minimum mill capacity and to determine the reasons for, and extent of, plant disruptions.

6.6 Because of hydraulic failure on the tilt table and the pile up of ingots in the re-heat furnace, there were no ingots rolled during the six hours of observation on the Thursday.

On the Friday, a time check was made over a period of 5.66 hours, which included delays totalling 2.16 hours. One hundred and twenty ingots were rolled during the period of which twenty four were scrapped in the mill. On the Monday, no ingots were rolled during the 5.75 hours of observation, due to the top roll breaking in stand No. 1.

On the basis of the study during Friday 18th June, one hundred and twenty ingots were rolled in two hundred and ten minutes. This rate is equivalent to 18,500 tonnes per year.

6.7 Under the present intermittent pattern of operation caused by a succession of stoppages, the mill performance is at a rate varying upwards from 4,000 tonnes per year. The four checks that were taken show that when the mill is free from maintenance problems, it is not difficult to achieve a rate of 18,500 tonnes per year. Given attention to the problems mentioned in the previous two sections, it should be possible to roll at least 22,500 tonnes of ingots per year from the same shift pattern and without further major capital expenditure.

7. Recommendations

7.1 The major findings contained in this report have been discussed with the General Manager, who has been able to elaborate on some of the fundamental problems underlying the weaknesses of plant and shortcomings of personnel.

It has been agreed with the General Manager that there is an urgent need to introduce planned maintenance. In this division the problem is more difficult than normal, because there is a lack of knowledge of what should be done and also an unusual degree of unreliability below the level of the Works Managers. There is therefore a requirement for an experienced steelworks engineer to work in this division. He will specify the work to be done, instruct the engineers and then check that the work has in fact been done, and is of a suitably high standard. It has been agreed that an immediate start should be made to identify a suitable engineer who could come to Ghana at the earliest opportunity.

A major problem is said to be that this Division is having great difficulty in obtaining letters of credit and therefore the procurement of urgently needed materials and spare parts is being delayed. It was, therefore, agreed that in submitting recommendations these should be grouped into two categories; those requiring materials and those which do not. This categorisation has therefore been used in the listing below, which are also given in a suggested order of priority.

7.2 Recommendations Not Requiring Material Purchase

7.2.1 Re-heat Furnace

It is essential to prevent the build-up of scale and this can be done by frequent manual raking. Careful observation is required by the operator at the furnace charge control pulpit, so that when an ingot starts to lift, the pusher is retracted to allow the ingot to return on to the rails before further pushing strokes are made. This action should prevent ingots from piling on each other and lead to a consequent increase in output.

7.2.2 Operating Practice

Implement Section 5 above, which recommends improving the manual manipulation and timing at the furnace discharge, No. 1 stand and the tilt table.

7.2.3 Planned Maintenance

It is essential that all items of plant are kept in proper working order and are not subject to unforeseen breakdowns. This requires that there should be a systematic approach to plant maintenance involving inspection, lubrication and servicing at regular intervals. The introduction of planned maintenance is therefore most important. It is, however, essential to build into the system, a supervisory check to ensure that maintenance work claimed to have been done, has in fact been carried out.

All existing spare parts currently lying around the mill and which are serviceable should be put back into service. Where this cannot be done at the present time, they should be thoroughly cleaned, coated with a preservative where necessary and put in a clean store. In the case of geared motor units used on roller tables, it may be possible to build a number of good units by inter-changing parts, provided that they are of the same make and from the same part of the plant.

In order to prevent accidents, all covers over trenches should be replaced correctly. This particularly applies to the steel cover plates in the area of the No. 1 stand approach table and the re-heat furnace.

7.3 Recommendations Which Require Material Purchase Set Out in Order of Priority

7.3.1 Re-heat Furnace

The automatic temperature control should be put back into working order. Overheated ingots have a lower rolling friction and when the contact angle is high, it can give rise to difficult entry and stickers in the rolls.

7.3.2 Roughing Mill Drive

A major cause of difficult pass entry on stand 1 is the high speed of the mill. It is a fact that the higher the speed, the lower the contact angle becomes to ensure positive entry. This mill has high contact angles, therefore the speed should be reduced to provide better entry into the passes. It is strongly recommended that the roll speed should be reduced to 95 r.p.m. Theoratically, this would lengthen the time cycle, but with better entry into the passes an overall improvement should be made. The best method of reducing the speed would be to increase the ratio of the reduction gearbox, as by doing so the stored energy of the flywheels would remain unaltered.

7.3.3 Guides and Strippers

A complete set of guides should be obtained, incorporating static twister guides where necessary, also top and bottom half strippers. These items would provide automatic entry, better stripping and improve production.

7.3.4 Modifications to the Approach and Tilt Tables

Re-design of the tilt table mechanism to incorporate an adjusting device to vary the tilt table position relative to the top passes. On both tables idle rollers

should be installed to provide better traction to and from the mill for the short length ingot and rolled stock. An alternative scheme would be to replace the hydraulic cylinders and use pneumatic cylinders for lifting the tilt table and electrically driven rollers through chains or 'vee' belts.

7.3.5 Crop Shear

Fit new shear blades of the correct material.

7.3.6 Repeaters

Stiffen up the roughing mill repeater floors and modify the inner walls at the entry end.

7.3.7 Flying Crop Shear

A shear of this type positioned immediately after No. 1 pinch roll would ensure clean, hot ends entering into the finishing train.

7.3.8 Finishing Mill

This mill should be converted to incorporate universal spindles and couplings and roller bearing equipped roll necks. This would bring the mill more in line with the production capability of the roughing mill and provide a better finished product.

7.3.9 Cooling Bed Area

The whole of this equipment should be brought back to its original condition to cope with the increased production.

7.3.10 Pass Design

A complete study of the pass deeign should be made to reduce the work in stand 1 and to improve the surface finish and shape, particularly from the finishing train.

8. Concluaion

Steelworks Division is a vital element in the economy of the country but, sadly to say, the rolling mill does not fulfil the expected requirements. During the three weeks of the study, there was a succession of plant stoppages causing a substantial reduction in output. Most items of equipment are in a serious state of neglect so that they either do not work at all or do so, but with a low efficiency.

There is a clear need to provide and maintain a well balanced stock of spare parts and maintenance materials. However, spares will not be sufficient of themselves to change the situation. It is of vital importance to raise the standard of maintenance engineering. This will require the introduction of planned maintenance to reduce the frequency of stoppages and the heavy losses which result. It will also require the attitude of engineers at most levels to be changed, so that they can be relied upon to carry out maintenance tasks to a high standard without continuous supervision.

In this report we have detailed a number of modifications to the plant and operating practices, which can all contribute to raising output to over 20,000 tonnes per year. Basically, the mill has the equipment it needs to produce the level of output quoted. What is now required is that the machinery is put back into good condition and that it is kept that way and operated properly.

A.M. MARSHALL

TECHNICAL APPRECIATION OF THE ROUGHING MILL TRAIN

Introduction

This Appendix covers the assessment of linear speeds, rolling loads, torques, roll neck stresses and contact angles, principally on No. 1 stand of the roughing mill. The calculations are based on the present roll pass design for the production of ⅝" dia. bar, at 120 r.p.m. of the rolls. For details, see Exhibits 2, 3, 4 and 5. These figures are compared with calculations for a roll speed of 95 r.p.m., see Exhibits 4, 5, 6 and 7. Stress concentration factors have been used for calculating the roll neck stresses and the equivalent rectangle method for the calculation of the rolling loads, torques and horsepower figures.

Comparison of Exhibits for 120 and 95 r.p.m.

1. **Pass Progression** - Exhibits 2 and 6.

   The reduction in speed to approximately 2.5 metres/sec. brings the angle of contact within acceptable limits as defined in Exhibits 5 and 5 - 1.

2. **Horsepower** - Exhibits 3 and 7.

   There is approximately a reduction of 19% in power when rolling at 95 r.p.m.

3. **Roll Neck Profile** - Exhibit 4.

   The existing profile is too highly stressed, due to the sharp corners in the labyrinth seal arrangement. A modified profile as shown on Exhibit 4 reduces the maximum stress by approximately 40%.

4. Production

Reducing the speed to within the limits shown on Exhibit 5 - 1 for the contact angle, would result in considerable saving of manipulating time, due to improved entry into the rolls.

Pass Design

The existing pass design has a number of unusual characteristics, amongst which are the low reductions in passes 9 and 11; the high reductions in 10 and 12; and the cross sectional area from pass 12 which is approximately the same as the ⅝" dia. finished bar in pass 15, giving rise to surface defects and poor shape. These, and the effects of the heavy drafting in stand 1, could be overcome by a complete re-design of the passes but retaining the oval/square sequence.

Conclusions

The advantages of a reduction in the roughing mill speed to 95 r.p.m. together with a complete study of the pass design, are clearly beneficial to the Steelworks Division and immediate action should be taken to enable this modification to be undertaken.

FINDINGS OF PRODUCTION STUDY

Introduction

This Appendix contains an analysis of the findings of a production study carried out over 3 days; Thursday and Friday the 17th and 18th June and Monday 21st June. The study covered the key operations of the rolling mill.

It was originally planned that the study would cover two days, starting on Thursday, 17th June. However, no saleable ingots were rolled on the first day, due to hydraulic failure on the tilt table and the problems of removing ingots from the re-heat furnace. It is understood that the tilt table problem arose because of a sticking relief valve caused by the ingress of foreign matter. The furnace problem was caused by ingots piling on top of each other to a height of 3 ingots.

Although the total production time lost through the above delays is not known, it was at least 6 hours during which observations were made.

Ingots were successfully rolled on the Friday and the findings during the study period are discussed below. It was also decided to continue the study on Monday, 21st June to compensate for the abortive Thursday. However it had to be abandoned after 5½ hours since no production was possible. The top roll in stand 1 had broken at approximately 8.00 a.m. and by 5.00 p.m. the replacement was still not in place.

The problem arose, apparently, because there were no spare coupling sleeves available for the replacement roll. As a result it was necessary to remove couplings and sleeves from the broken roll to fit them on the new roll. Normally this should not take long. However, because of the condition of both sleeves they could not be removed hydraulically as designed. Instead, bridges had to be welded to the couplings, heat applied and then the couplings and sleeves jacked from the necks of the broken roll. By 5.00 p.m. only one coupling and sleeve had been removed by this method. At present production rates this would represent a production loss of at least 20 ingot tonnes, with a sales value of approximately $10,000. Against this, the cost of the two sleeves might be around $1,000.

Analysis of Production Study

The total duration of the production study over the three days was 17.41 hours. During this time 120 ingots were rolled. Thus:-

$$\text{Ingots per hour} = \frac{120}{17.41} = 6.89 \text{ ingots/hr.}$$

Assuming the nominal weight per ingot to be 100 kg.

$$\text{Tonnes/hr} = \frac{6.89 \times 100}{1,000} = 0.69 \text{ tonnes/hr.}$$

Assuming 7½ hrs/shift, 15 shifts/week and 48 week/yr.

$$\text{Annual Tonnage} = 0.69 \times 7\tfrac{1}{2} \times 15 \times 48$$
$$= 3,721 \text{ tonnes/year.}$$

As discussed above, it was possible to time operations only on the Friday over an elapsed time of 5.66 hours. During this period 120 ingots were rolled. Thus the rate of production was equivalent to an annual output as follows:-

$$\text{Annual production rate} = \frac{120 \times 7\tfrac{1}{2}}{5.66 \times 10} \times 15 \times 48$$
$$= 11,450 \text{ tonnes per year.}$$

Of the 120 ingots rolled, 24 were scrapped at some stage of production, giving 96 saleable ingots converted to rod.

Thus, the annual production rate of saleable output = <u>9,158 tonnes</u>

During the time study, numerous delays arose. It was possible to time some of these as follows:-

Timed Delays

1. Delay in feed from furnace - 16 occasions for a total duration of 1 hour 5 mins. 33 secs.

   Note: a total of 39 ingots (33% of production) were not available from furnace in time to enter pass 1 whilst previous ingot entered pass 7.

2. Clearing ingot stuck in pass 8, stand 1 - 4 mins 50 secs.

3. Adjusting stand 1, due to a packer under the middle roll chock falling out - 16 mins.

4. Replacing packer in stand 1 and adjusting - 25 mins. 52 secs.

5. Clearing cobble at flying shear - 5 mins 30 secs.

6. Replacing guide at stand 8 (Damaged when overfilled rod jammed in tube between stand No. 8 and flying shear) - 12 mins. 6 secs.

   Total of above delays = 2.16 hours
   = 38% of study time.

Untimed Delays

The following delays were observed but not timed:-

1. Burner not available to burn ingot ends before entry to pass 8, stand 1.

2. Sticking ingots in stand 1 - 28 occasions.

3. Turning ingot lengthwise to enter pass 2 - 11 occasions.

If timed delays are excluded, the total rolling time for 120 ingots was 3.50 hours, giving an equivalent annual tonnage rate as follows:-

$$\text{Annual tonnage} = \frac{120 \times 7\frac{1}{2}}{3.50 \times 10} \times 15 \times 48$$

$$= \underline{18,500 \text{ tonnes/yr.}}$$

However, only 96 ingots resulted in saleable product.

$$\text{Thus saleable annual tonnage} = \frac{96}{3.5 \times 10} \times 7\frac{1}{2} \times 15 \times 48$$

$$= \underline{14,800 \text{ tonnes/yr.}}$$

If 18,500 tonnes is taken as the practical capacity of the mill, under present operating methods, losses in rolling should not exceed 5%.

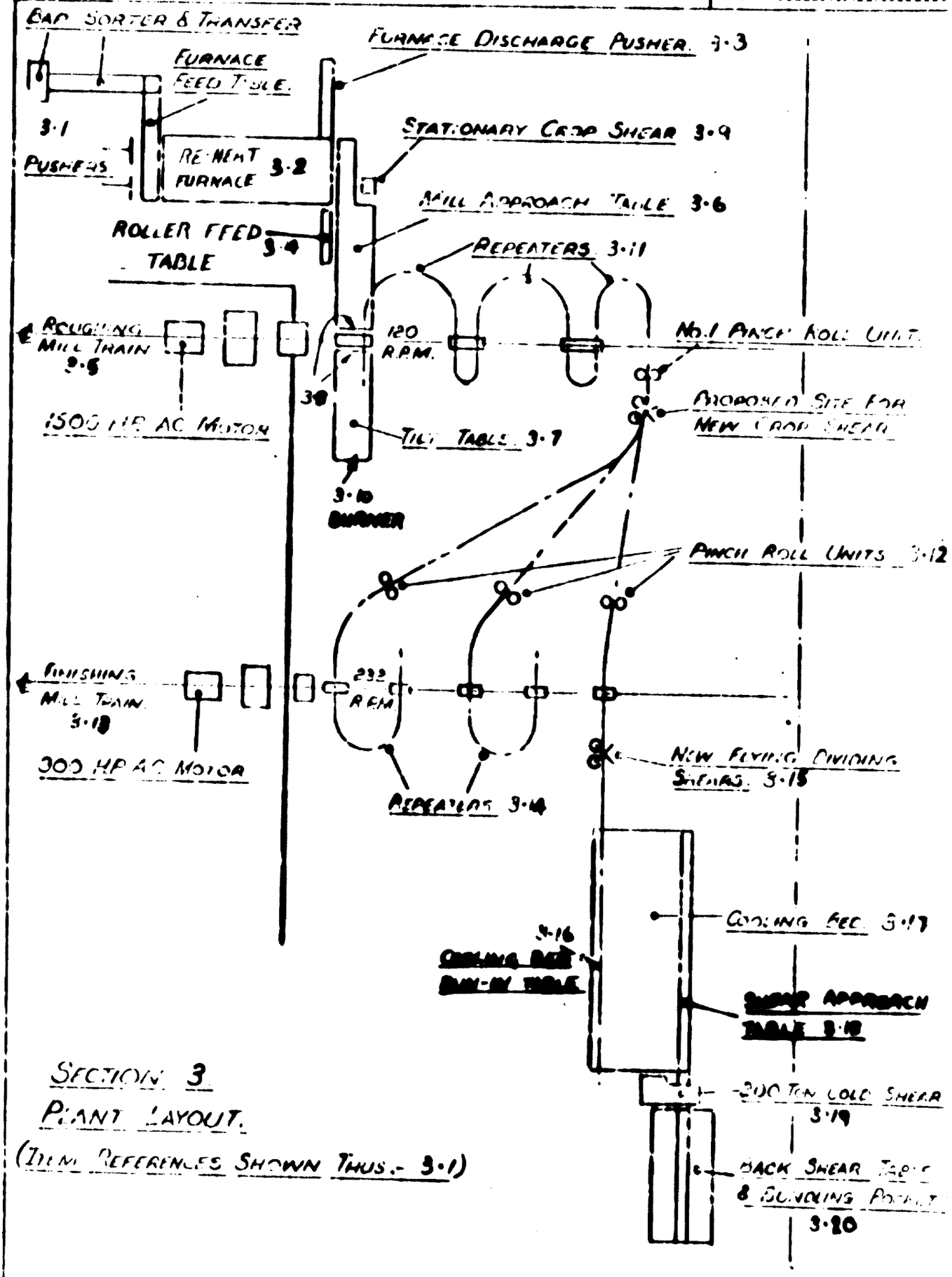
Thus saleable tonnage should be 17,570 tonnes.

The observed saleable tonnage rate of 14,800 tonnes represents losses in production of 20%.

PLANT LAYOUT

EXHIBIT 1
Job No 1466
Sheet No EXHIBIT 1
Date 6-7-76

F.R JENKS & PARTNERS CONSULTING ENGINEERS
447 GLOSSOP ROAD SHEFFIELD S10 2PR TELEPHONE 667221



SECTION 3
PLANT LAYOUT.
(ITEM REFERENCES SHOWN THUS:- 3·1)

PASS PROGRESSION 120 R.P.M.

EXHIBIT 2

MILL 530 MM x 1160 MM ROUGHING MILL TRAIN	F R JENKS AND PARTNERS SHEFFIELD	EXHIBIT Nº 2 DATE 9 7 76 PRODUCT 3/4" DIA

PASS PROGRESSION AND MANIPULATING TIMES
UNDER PRESENT CONDITIONS OF ROLLING.
100% ANNUAL PRODUCTION TIME (ALLOWING ½ HR / SHIFT FOR FREQUENT CHANGING OF MILL CREWS)
= 7½ HRS x 15 SHIFTS x 48 WEEKS = 5400 HRS

MILL	STAND Nº	PASS Nº	SIZE & SHAPE	AREA SQ MM	RED %	LENGTH M	W D MM	SPEED R.P.M	SPEED M/SEC	TIME IN PASS SECS	MANIP TIME SECS	TOTAL TIME SECS	REMARKS
		—	□ 110	12000	—	1 3	—	—					
		1	▭	10017	16 5	1 552	438	120	2 752	0 56	15	15 56	USING TILT TABLE WITH MANUAL ENTRY
		2	○ 60	8116	19 24	1 968	448	120	2 815	0 68	10	26 24	
		3	▭	6500	19 7	2 4	476	120	2 991	0 60	10	37 04	
		4	⬭	4963	28 26	3 345	483	120	3 035	1 10	6	44 14	
		5	◇ 61	3897	22 86	4 337	477	120	2 997	1 45	8	53 59	
		6	⬭	2786	22 84	5 6	491 5	120	3 094	1 81	6	61 4	
		7	◇ 44	1881	32 48	8 29	490	120	3 018	2 [illegible]	10	74 09	
		8	⬭	1210	36 67	12 898	501	120	3 148	4 09	20	98 18	
		9	◇ 30	1067	11 82	14 67	524 5	120	3 295	4 44			
		10	⬭	590	44 7	26 44	532 7	120	3 347	7 9			
		11	◇ 18	521	11 6	29 94	530 5	120	3 333	8 98			
		12	⬭	286	45 0	54 55	536 3	120	3 37	16 19			

CYCLE TIME (Nº 1 STAND) = 98 18 SECS
WT OF INGOT = 100 KG
100% PRODUCTION = $\frac{3600}{98\ 18}$ x 0 1 x 5400 = 19,800 TONNES
80% PRODUCTION = 0 8 x 19,800 = 15,840 TONNES

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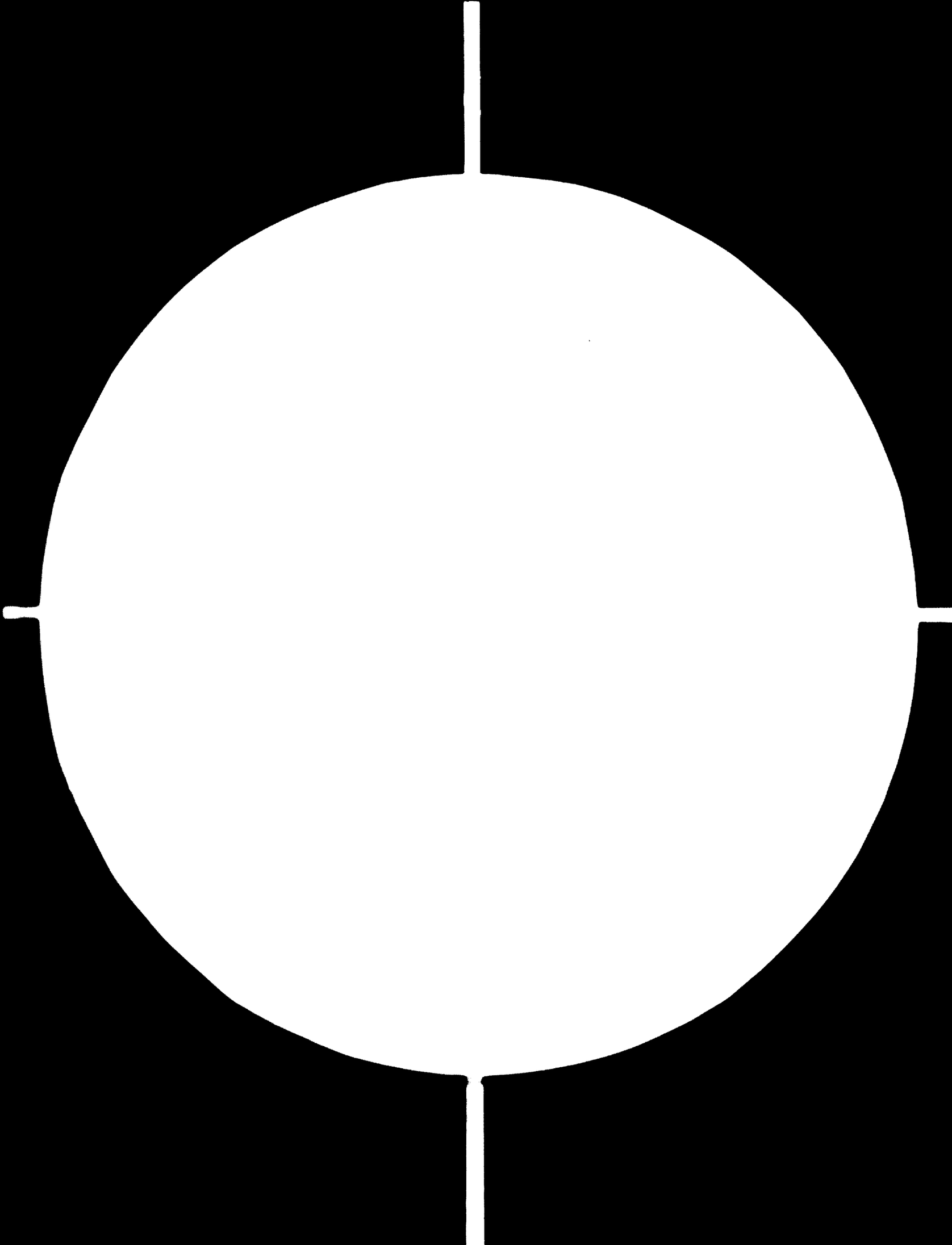


[illegible] POWER ESTIMATIONS 120 RPM

F.R. JONES & PARTNERS CONSULTING ENGINEERS
447 GLOSSOP ROAD, SHEFFIELD S10 2PR TEL: 667221

FINISHED SECTION	ROLLED FROM - INGOT	TEMA STEELWORKS	EXHIBIT NO. 3
FINISHING SPEED	MATERIAL MEDIUM CARBON		

	PASS NO.	ROLLING SPEED RPM	FT/MIN	FT/SEC	ROLL R	D	SECTION (INS) H	L	b1	DRAFT (H-h)	R/h	B/h	H-h/H →	λ	λ_m	C_p	J_p	TONS P/IN	C_g	J_g	TONS INS G/IN	T°C	TOTAL P TONS	TOTAL G TONS INS	HP	PASS NO.
STAND 1	1	120	542	9.026	8.62	17.24	4.331	3.583	4.331	0.718	2.406	0.827	0.173	0.06	7.2	0.22	11.3	21.43	0.034	10.7	54.06	1000	92.81	234.15	1199	1
	2	120	554	9.233	8.62	17.64	4.646	3.74	3.346	0.906	2.358	0.805	0.195	0.07	8.4	0.24	12.1	25.6	0.039	11.5	69.78		87.7	233.42	1195	2
	3	120	588	9.81	9.37	18.74	3.386	2.716	3.701	0.67	3.45	0.802	0.198	0.08	9.6	0.215	12.4	25.0	0.029	11.7	59.58		92.53	220.51	1129	3
	4	120	597	9.95	9.5	19.00	2.559	1.836	3.937	0.123	5.174	0.717	0.283	0.12	14.4	0.21	15.0	29.93	0.029	14.3	74.85		117.8	294.7	1509	4
	5	120	590	9.83	9.39	18.78	3.46	2.68	2.09	0.78	3.5	0.774	0.225	0.09	10.8	0.22	13.4	27.68	0.032	12.6	71.1		57.85	148.6	761	5
	6	120	609	10.148	9.7	19.4	2.32	1.79	2.4	0.53	5.42	0.771	0.228	0.114	13.68	0.19	13.8	25.43	0.023	13.0	56.266		61.04	175.04	691	6
	7	120	608	10.096	9.64	19.29	2.56	1.73	1.69	0.83	5.57	0.676	0.324	0.135	16.2	0.22	16.4	34.78	0.034	15.5	97.95		58.78	165.53	847	7
	8	120	620	10.325	9.86	19.72	1.69	1.08	1.73	0.61	9.13	0.64	0.361	0.185	22.2	0.2	18.2	35.89	0.025	17.3	84.1		62.1	145.48	745	8
STAND 2	9	120	648	10.8	10.32	20.65	1.76	1.55	1.063	0.21	10.32	0.88	0.12	0.11	13.2	0.11	10.9	12.37	0.0065	10.6	14.68		13.15	15.6	80	9
	10	120	659	10.98	10.5	21.00	1.3	0.7	1.3	0.6	15.0	0.54	0.46	0.27	32.2	0.195	22.0	45.05	0.023	20.9	106.0		58.56	137.8	706	10
STAND 3	11	120	656	10.93	10.44	20.88	1.16	1.024	0.79	0.136	10.67	0.88	0.12	0.12	14.4	0.11	11.0	12.63	0.0062	10.7	14.46		10.0	11.42	59	11
	12	120	663	11.05	10.55	21.1	0.91	0.49	0.91	0.42	21.53	0.54	0.46	0.33	39.6	0.185	22.5	43.91	0.017	21.4	81.0		40.0	73.7	374	12

$P/INS = RJ_p C_p$ TONS

$G/INS = 2R^2 J_g C_g$ TONS INS

MECHANICAL POWER LOSS FACTOR = 1.2 HP = 0.042 G (TOTAL) x RPM

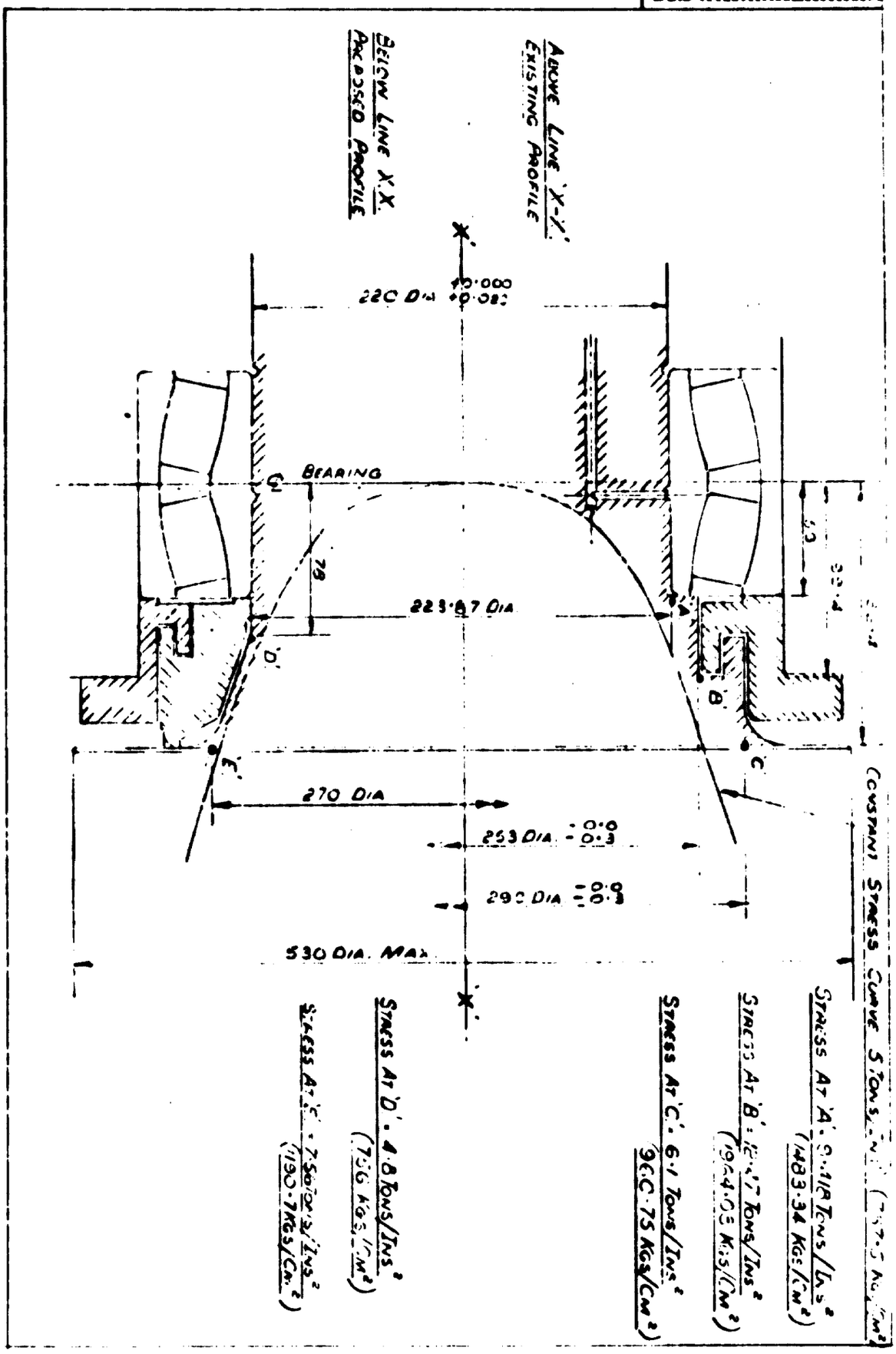
EXHIBIT 4

ROLL NECK PROFILE

REDESIGN AVOIDING STRESS CONCENTRATIONS

F R JENKS & PARTNERS CONSULTING ENGINEERS
447 GLOSSOP ROAD SHEFFIELD S10 2PR TELEPHONE 667221

Job No. 1166
Exhibit No. 4
Date 3-7-76



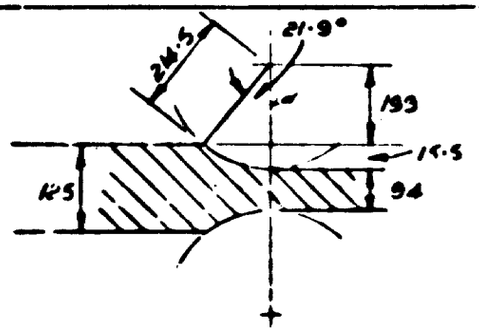
PASS ENTRY DATA

EXHIBIT 5

F. R. JENKS & PARTNERS CONSULTING ENGINEERS
447 GLOSSOP ROAD, SHEFFIELD S10 2PR. TELEPHONE 667221

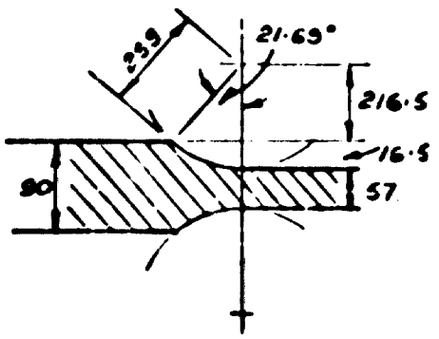
Exhibit No. 5
Date 14-7-76

PASS (2) ENTRY.

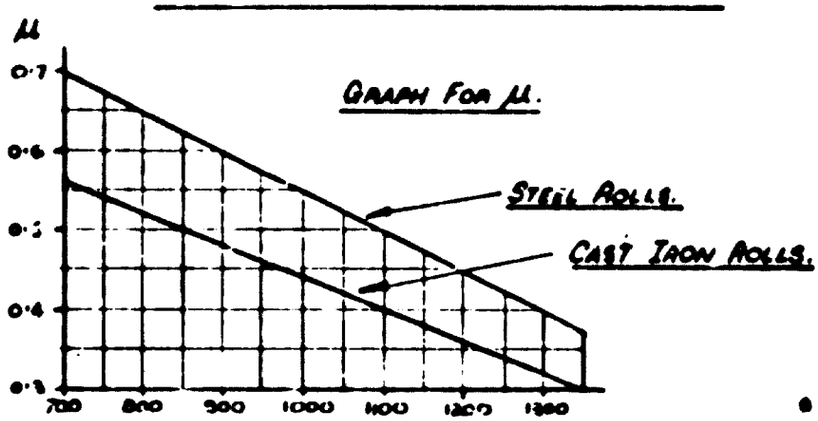


CONTACT ANGLE = 21°-54'
μ = TAN 21°-54' = 0·4.

PASS (7) ENTRY.



CONTACT ANGLE = 21°-42'
μ = TAN 21°-42' = 0·398.



GRAPH FOR μ.

AT A ROLLING TEMPERATURE OF 1100°C, AND CAST IRON ROLLS, THE VALUE OF μ FROM THE ABOVE GRAPH IS 0·4, BOTH THE ABOVE BITE ANGLES ARE ON THE LIMIT FOR POSITIVE ENTRY, AT THIS TEMPERATURE.

GRAPH SHOWING RELATIONSHIP OF CONTACT ANGLE & ROLLING SPEED

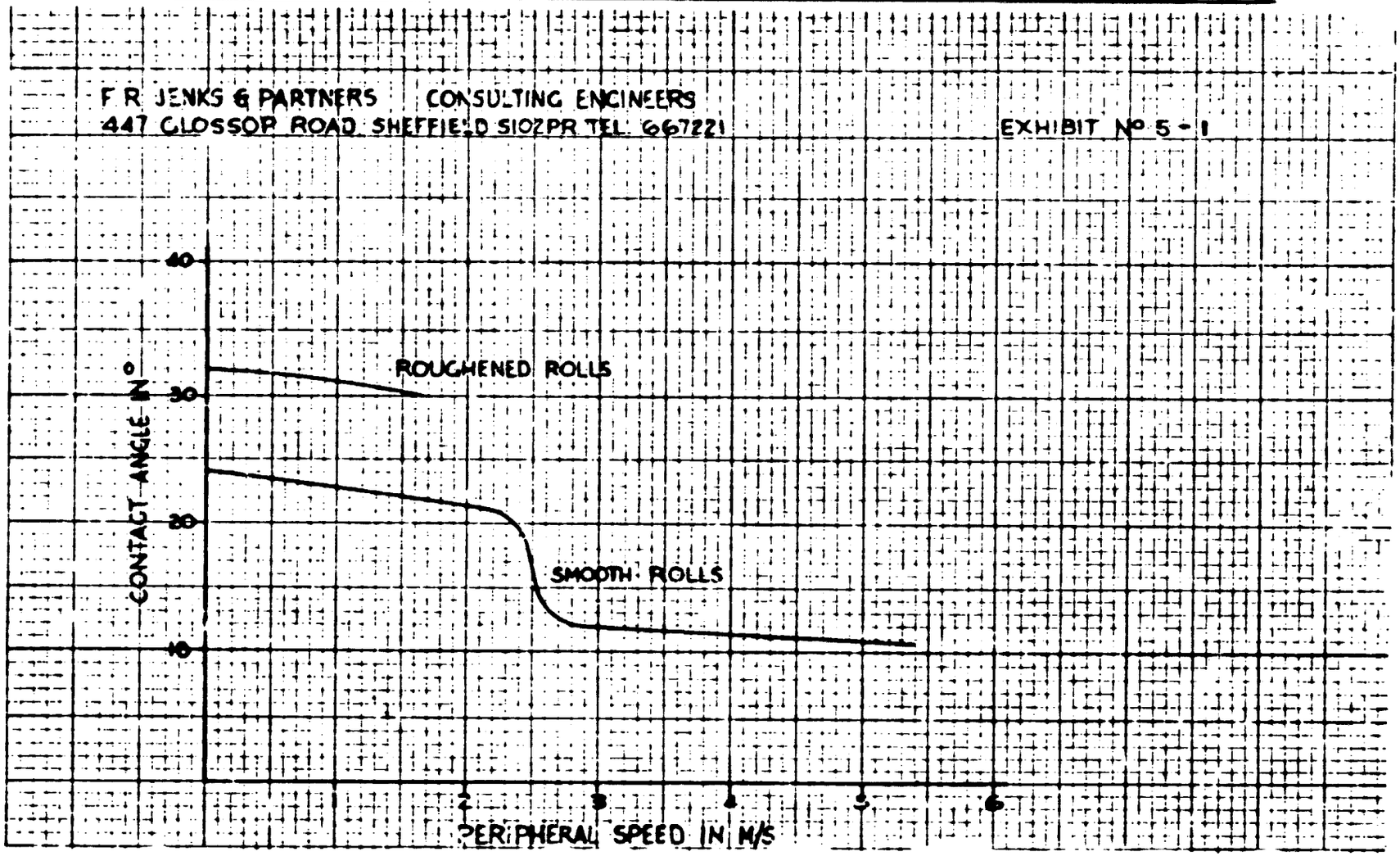


EXHIBIT 5 - 1

PASS PROGRESSION 95 R.P.M.

EXHIBIT 6

MILL 530MM x 1160MM	F R JENKS AND PARTNERS SHEFFIELD	EXHIBIT Nº 6 DATE 9·7·76
ROUGHING MILL TRAIN		PRODUCT 3/4" DIA

PASS PROGRESSION AND MANIPULATING TIMES
WITH AUTOMATIC FEED INTO STAND Nº 1
USING STATIC TWIST GUIDES
MILL SPEED REDUCED TO 95 P.P.M.
100% ANNUAL PRODUCTION TIME = 8 × 15 × 48 = 5760 HRS.

MILL	STD Nº	PASS Nº	SIZE & SHAPE	AREA SQ MM	RED %	LENGTH M	W.D.	SPEED R.P.M	SPEED M/SEC	TIME IN PASS SECS	MANIP TIME SECS	TOTAL TIME SECS	REMARKS
		—	□ 115	12000	—	1·3	—	—	—	—	10		
		1		10047	16·5	1·552	438	95	2·178	0·71		10·71	
		2	O 96	8114	19·24	1·922	448	95	2·229	0·86	8	19·57	
		3		6500	19·7	2·4	476	95	2·368	1·01	7	27·58	
		4		4663	28·26	3·345	483	95	2·403	1·39	7	35·97	
		5	◇ 81	3597	22·86	4·337	477	95	2·373	1·83	8	44·8	
		6		2786	22·54	5·6	492·5	95	2·449	2·29	7	54·09	
		7	◇ 64	1881	32·48	8·29	490	95	2·437	3·40	8	65·49	
		8		1210	35·67	12·892	501	95	2·492	5·17	7	77·66	
		9	◇ 33	1067	11·82	14·62	524·5	95	2·608	5·60			
		10		590	44·7	26·44	532·7	95	2·65	9·98			
		11	◇ 33	521	11·6	29·94	510·5	95	2·639	11·35			
		12		286	45·0	54·55	536·3	95	2·668	20·65			

CYCLE TIME (Nº1 STAND) = 77·66 SECS
WT. OF INGOT = 100 KG. (0·1 TONNES)
100% PRODUCTION = $\frac{3600}{77·66}$ × 0·1 × 5760 = 26,700 TONNES
80% PRODUCTION = 0·8 × 26 700 = 21,360 TONNES

[illegible] POWER [illegible] 95 RPM

F.R. JONES & PARTNERS   CONSULTING ENGINEERS
447 GLOSSOP ROAD, SHEFFIELD S10 2PR TEL: 667281

[illegible] SECTION	ROLLED FROM - INGOT	[illegible]	EXHIBIT NO. 7
[illegible]	[illegible]		

	PASS NO.	ROLLING SPEED RPM	ROLLING SPEED FT/MIN	ROLLING SPEED FT/SEC	ROLL R	ROLL D	SECTION (INS) H	SECTION (INS) L	SECTION (INS) h1	DRAFT (H-h)	R/h	h/H	H-h/H	λ	λ_N	C_p	J_p	TONS P/IN	C_g	J_g	TONS INS G/IN	T°C	TOTAL P TONS	TOTAL G TONS INS	HP	PASS NO.
STAND 1	1	95	429	7.146	8.62	17.24	4.331	3.585	4.331	0.7[illegible]	2.4[illegible]	0.8[illegible]7	0.175	0.06	5.7	0.22	10.9	20.67	0.054	10.4	52.55	1000	89.53	227.59	9[illegible]	1
	2	95	439	7.31	8.82	17.64	4.646	3.74	3.346	0.9[illegible]6	3.5[illegible]	0.8[illegible]5	0.195	0.07	6.65	0.25	11.7	25.8	0.059	11.1	67.35		86.33	225.35	513	2
	3	95	466	7.77	9.37	18.74	3.386	2.716	3.701	0.67	3.45	0.802	0.198	0.08	7.6	0.215	11.9	25.97	0.029	11.25	57.29		88.7	212.03	859	3
	4	95	475	7.88	9.5	19.00	2.559	1.856	3.937	0.723	5.174	0.717	0.2[illegible]5	0.12	11.4	0.21	14.5	28.95	0.029	13.8	72.24		113.9	284.41	12[illegible]	4
	5	95	467	7.78	9.39	18.78	3.46	2.68	2.09	0.78	3.5	0.774	0.225	0.09	8.55	0.22	12.8	26.44	0.052	12.0	67.716		55.26	141.53	637	5
	6	95	482	8.03	9.7	19.4	2.32	1.79	2.4	0.53	5.42	0.771	0.228	0.114	10.85	0.19	13.2	24.33	0.025	12.5	54.1		58.4	129.84	585	6
	7	95	480	7.99	9.64	19.29	2.56	1.75	1.69	0.85	5.97	0.676	0.324	0.135	12.85	0.22	15.8	33.51	0.054	15.0	94.8		56.63	160.21	721	7
	8	95	490	8.17	9.86	19.73	1.69	1.08	1.73	0.61	9.13	0.64	0.361	0.185	17.58	0.2	17.5	34.51	0.025	16.6	80.68		59.7	139.6	629	8
STAND 2	9	95	513	8.55	10.52	20.05	1.76	1.95	1.063	0.21	10.32	0.88	0.12	0.11	10.45	0.11	10.7	12.15	0.005	10.2	14.12		12.98	15.08	70	9
	10	95	522	8.69	10.5	21.00	1.3	0.7	1.3	0.6	15.0	0.54	0.46	0.27	25.65	0.195	21.3	43.61	0.025	20.2	108.44		56.7	133.17	600	10
STAND 3	11	95	519	8.65	10.44	20.88	1.16	1.004	0.79	0.136	10.67	0.88	0.12	0.12	11.4	0.11	10.8	12.4	0.0062	10.3	13.92		9.8	11.08	58	12
	12	95	525	8.75	10.55	21.1	0.98	0.49	0.98	0.42	21.53	0.54	0.46	0.33	31.35	0.185	22.0	42.94	0.027	20.8	78.71		38.1	71.3	325	12

P/IN = $2J_p C_p$ TONS

G/IN = $2R^2 J_g C_g$ TONS INS

[illegible] POWER LOSS FACTOR = 1.2   HP = 0.042 G (TOTAL) x RPM

VOLUME 5

ANNEXE X

DIVISIONAL RESULTS

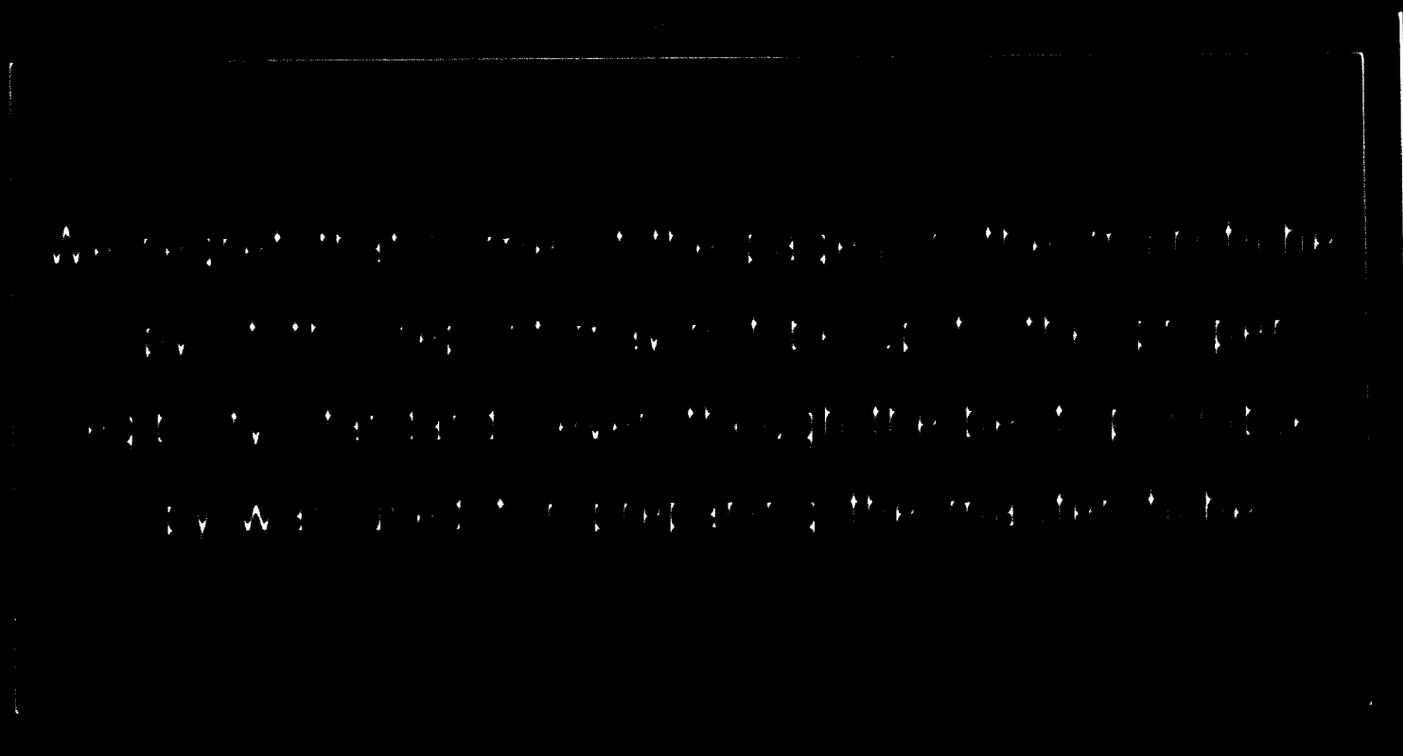
1972 - 1976

GHANA INDUSTRIAL HOLDING CORPORATION

Divisional Results 1972 - 1976

Division	Year	Net Capital ¢000	Sales Turnover ¢000	Pre-Tax Profit ¢000
Boatyards	1972	623	467	(111)
	1973	278	1,157	(131)
	1974	(85)	659	(321)
	1975	1,129	748	(411)
	1976	609	1,950	(328)
Brick and Tile	1972	46	73	(67)
	1973	(77)	54	(122)
	1974	(231)	31	(152)
	1975	(476)	58	(210)
	1976	(678)	110	(184)
Cannery	1972	1,891	1,527	198
	1973	2,771	2,010	140
	1974	3,110	3,439	47
	1975	3,364	3,559	197
	1976	4,930	6,401	1,709
Distilleries	1972	4,614	3,166	445
	1973	5,324	3,930	677
	1974	6,172	6,906	851
	1975	7,953	5,847	1,636
	1976	9,294	8,294	1,756
Electronics	1972	1,252	1,450	68
	1973	1,417	2,130	3
	1974	2,158	2,840	460
	1975	3,175	4,275	858
	1976	3,370	3,426	442
Fibre Bag	1972	10,241	3,679	439
	1973	10,276	3,808	94
	1974	10,437	4,932	119
	1975	9,752	4,811	(695)
	1976	10,270	7,098	519
Footwear	1972	4,802	1,100	(362)
	1973	4,465	1,487	(328)
	1974	3,822	1,832	(670)
	1975	2,649	2,007	(1,147)
	1976	4,793	3,137	114
Glass Manufacturing	1972	3,597	1,978	(835)
	1973	3,105	2,454	(494)
	1974	2,029	2,715	(1,581)
	1975	2,901	2,863	(1,552)
	1976	1,463	2,297	(1,788)
Marble Works	1972	212	66	(26)
	1973	205	103	(6)
	1974	189	141	(21)
	1975	184	288	2
	1976	220	557	45

Division	Year	Net Capital ¢000	Sales Turnover ¢000	Pre-Tax Profit ¢000
Meat Products	1972	(27)	1,033	(525)
	1973	(700)	980	(670)
	1974	(1,572)	1,090	(872)
	1975	(1,642)	559	(363)
	1976	(2,427)	2,954	152
Metal Industries	1972	263	778	18
	1973	302	1,217	44
	1974	301	1,605	(4)
	1975	590	2,083	278
	1976	1,222	3,102	639
Paints	1972	2,063	1,816	364
	1973	2,485	3,103	447
	1974	3,019	3,998	533
	1975	3,558	3,996	592
	1976	5,587	5,626	2,048
Paper Conversion	1972	5,098	4,246	1,054
	1973	5,565	5,335	861
	1974	5,827	7,450	303
	1975	5,916	9,460	80
	1976	8,141	10,470	2,153
Pharmaceuticals	1972	2,088	1,996	-
	1973	3,041	3,999	951
	1974	5,189	7,240	2,181
	1975	8,297	9,092	3,108
	1976	11,125	10,386	2,831
Steelworks	1972	1,712	1,652	(614)
	1973	2,025	3,402	147
	1974	2,952	4,847	913
	1975	3,269	2,799	(676)
	1976	7,062	6,908	159
Vegetable Oil Mills	1972	(570)	3,035	(126)
	1973	(1,297)	2,531	(779)
	1974	(640)	4,678	(165)
	1975	2	6,407	(754)
	1976	(356)	7,956	(354)



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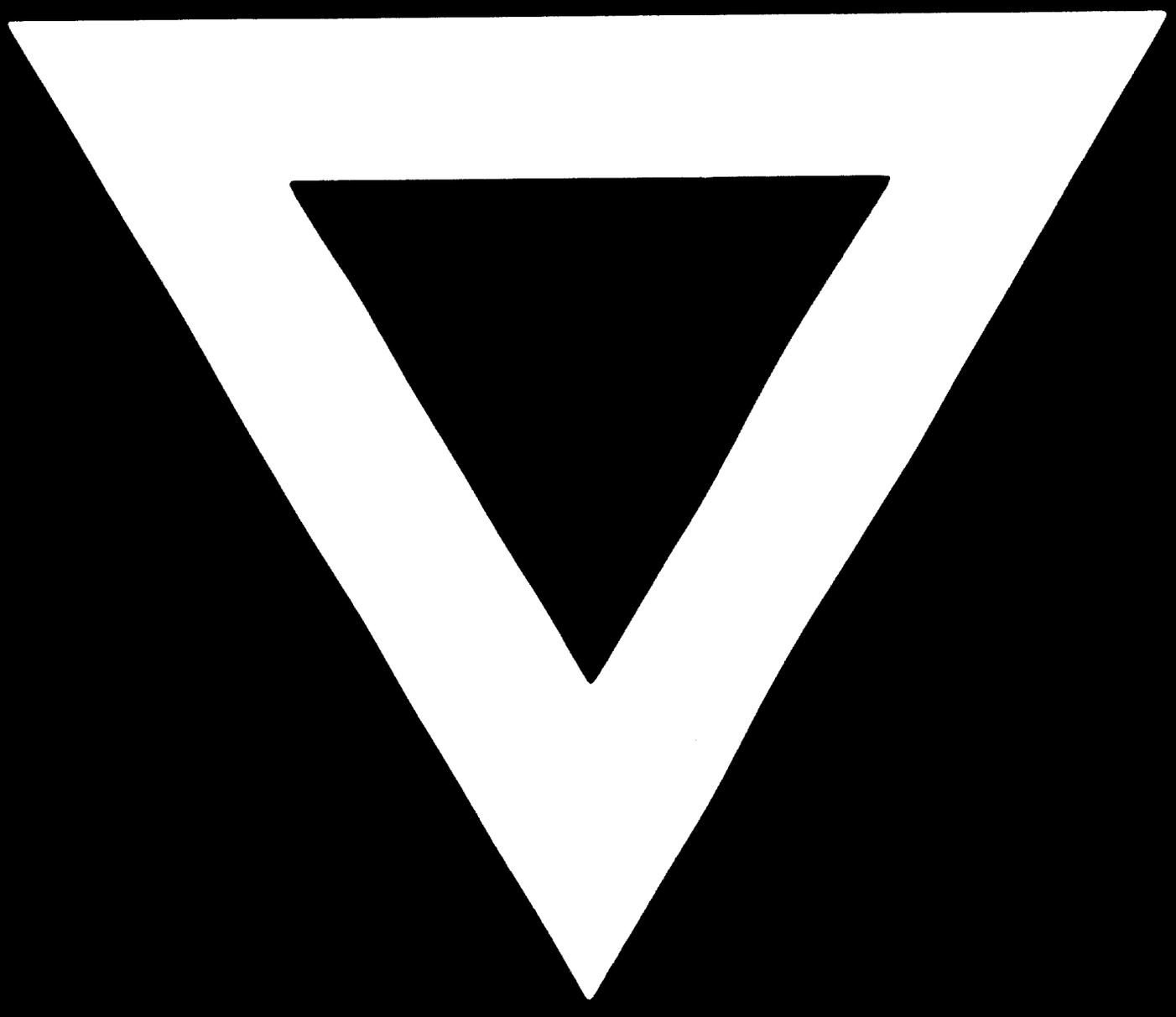

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