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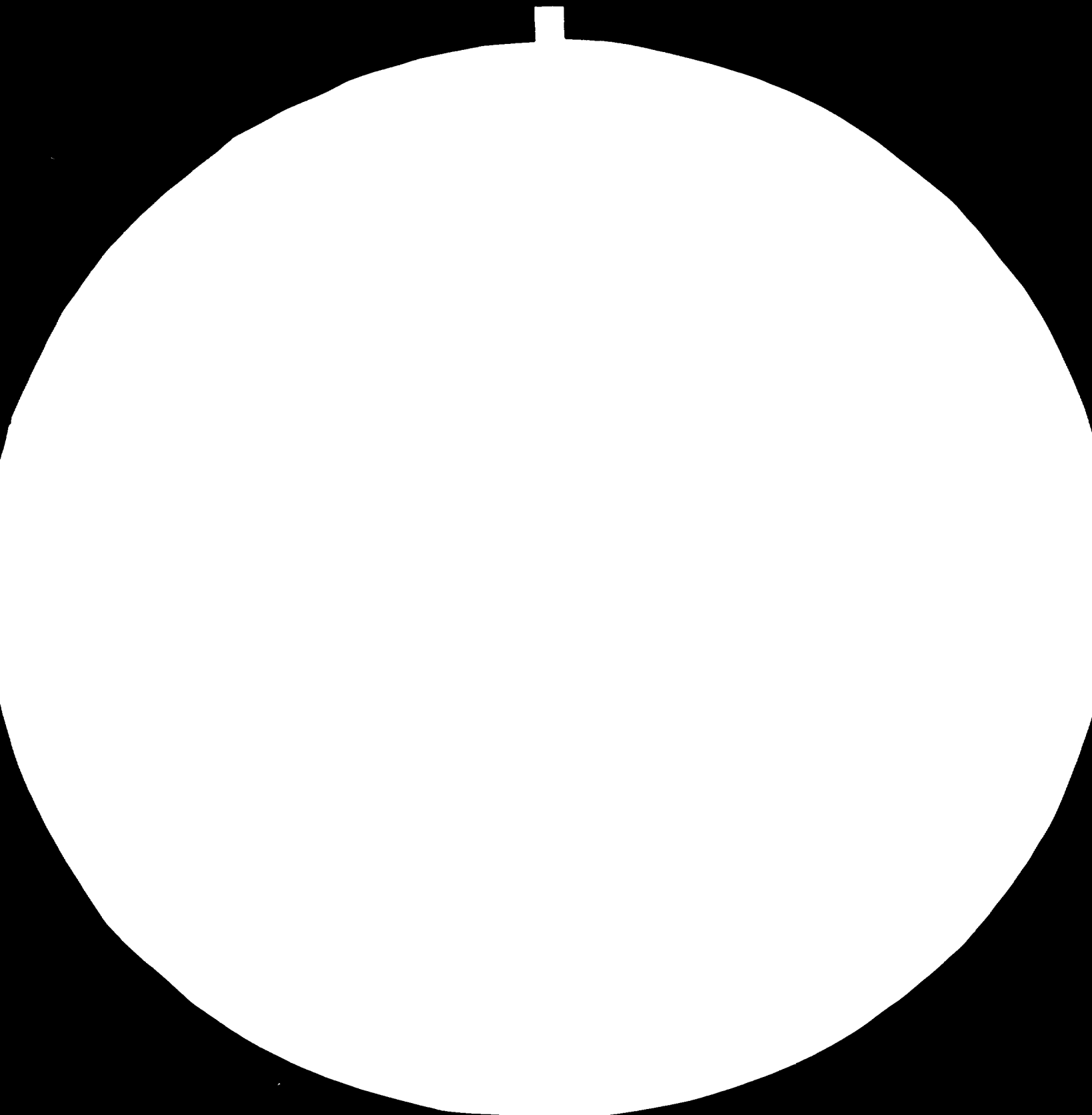

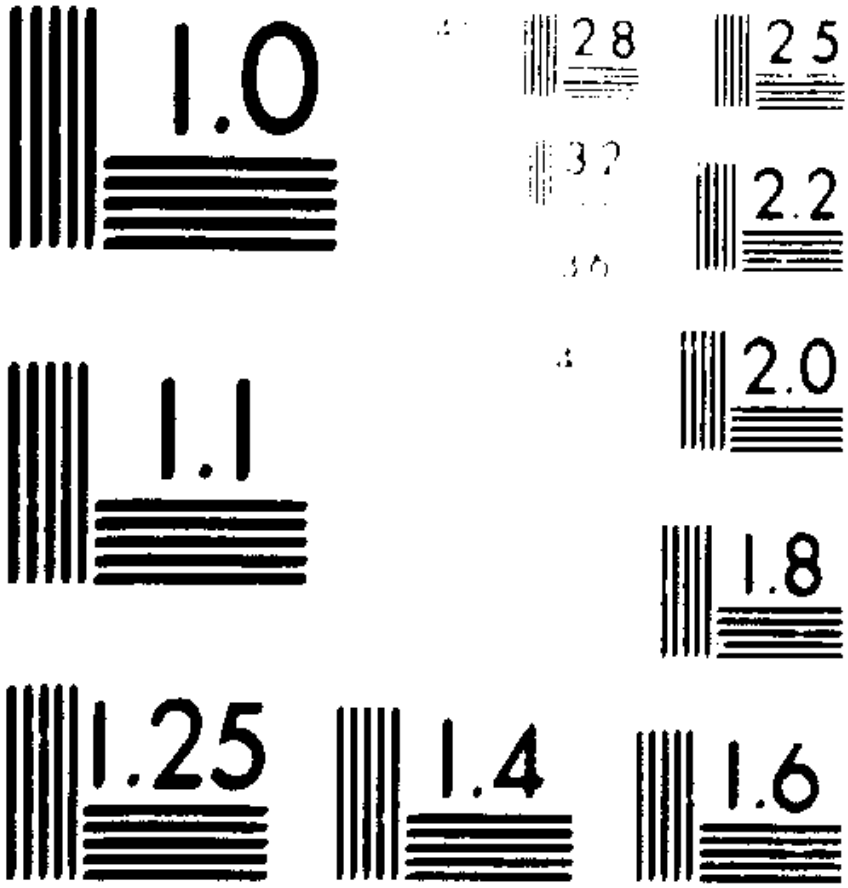

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PROJECT TO

STRENGTHEN THE MINISTRY OF INDUSTRY

DP/SOM/81/013

SOMALI DEMOCRATIC REPUBLIC

Somalia.

Technical Report: Provision of Industrial / Mechanical Engineering Support to the Ministry of Industry

Prepared for the Government of Somalia
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of J.A.M. Rutter, C.Eng. Chief Industrial Engineer

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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1.0. INTRODUCTION AND ACKNOWLEDGEMENT

Introduction

The Project provided for one year Consultancy assignment to support the improvement of manufacturing productivity by contributing to the operational performance of a number of publicly owned manufacturing enterprises.

The duration of the authors stay in Somalia was from July 3rd 1982 until June 12th, 1983. The location was primarily at the Ministry of Industry Offices in Mogadishu Somalia but with frequent site work.

The requirements of the position are summarized thus :

" Carry out diagnostic and advisory consulting assignments in factories and enterprizes relating to Industrial Engineering and all aspects of production management, with special emphasis on Mechanical workshops at factories, Participate in operational review meetings, Carry out on - the - job training of counterpart personnel and plan and conduct training courses ".

Early in the assignment it became clear that His Excellency the Minister of Industry, the Director General of the Ministry of Industry and the Director of Public Enterprizes had daily access to the service, and subsequently a significant portion of the time was absorbed in dealing with their technical requests.

Review of previous work carried out which reasonably related to the Engineering assignment demonstrated a lack of depth. Apart from the previous work at Somaltex the data was sketchy to a degree that new operational reviews of public sector enterprises was necessary before individual factory projects could be instituted to achieve this review. 10 Factories were selected for visit. Of these, five were then selected for a non detailed " Operational Audit ".

This audit entailed a review and appraisal of the effectiveness of factory operations and operating procedures. The questionairres developed for this surveys are reproduced in the annex to this report.

From these Surveys two factories were selected for intensive in-plant assistance. This final selection of these two factories was made jointly with staff of the Ministry. The Minister himself participated in the discussions and approved the selection of the following factories :-

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(1) The Cigarette and Match Factory. Mogadishu.

(2) The Somaltex Textile Factory Balcad.

The next phase entailed the training of 2 selected counterparts in production analysis techniques.

In particular the training on activity sampling and work simplification procedures proved very beneficial as the implementation proceeded. The fourth phase entailed working with these counterparts in the identification of specific areas of need, and the design of systems to overcome the problems.

The fifth, and final phase constituted the training of factory personnel in the systems, and the implementation of systems on the shop floor. During the course of the work active troubling shooting of production problems took place.

ACKNOWLEDGEMENTS

The author wishes to thank Dr. A.H. Eames, The Project Manager and members of the U.N.I.D.O. Project DP/SOM/81/ 013 for their support and assistance.

In particular the work of associate expert Engineer F. Fredericksen and Counterpart Engineers Ali Mohamed Muktar and Suleiman Abdullah Siama in the daily activities of the project is gratefully acknowledged.

Although it is not possible to acknowledge the assistance of all the members of the Ministry of Industry the support of Mr. Bana Mohammed Sayid Director of Public Enterprizes and His Excellency the Minister of Industry Major General Abdulla Mohammed Fadil was very encouraging.

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2.0. Abstract

This report reviews and details industrial and mechanical engineering service work carried out under U.N.I.D.O. Project, DP/SOM/81/013 to strengthen the Ministry of Industry in the Somali Democratic Republic.

The Programme was developed and supervised by Mr. John Rutter Ind. Eng. UNIDO from July 3rd 1982 until June 12th, 1983. The work is on going.

The report indicates support over a broad spectrum of production problems was provided and ranged from trouble shooting in factories to technical advice and assistance to the Ministry.

Substantive reviews of the situations being faced by the SNAI Sugar complex at Jowhar, and the new Urea Production facility at Gezira are included.

The preventive maintenance work at the Cigarette and Match factory in Mogadishu and the textile factory at Balad is described.

This report concludes that Somalia is experiencing acute problems of engineering, organizational, financial and management nature to an extent that implementation of systems engineering is handicapped.

Continuation of the work of this UNIDO Project is recommended. Strengthening of the Engineering Consulting capability of the Ministry of Industry is also recommended.

Three specific initiatives to enhance the effectiveness of future support work to improve manufacturing efficiency are recommended.

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3.0. Conclusions and Recommendations

The essential nature of the Industrial Engineering component of UNIDO's Project to strengthen the Ministry of Industry DP/SOM/81/013 is to transfer appropriate technology of a kind common in industrialized nations, to a nation with a weak and underdeveloped manufacturing sector.

Somalia is ill prepared for such a transfer at this stage of its development. It suffers from an acute shortage of management and personnel skilled in industrial management and engineering.

This condition is worsened by the existence of an economic climate characterized by constraints and scarcity. In its eagerness to improve, Somalia's industrial sector has attempted quantum leaps in the acquisition of technology, and because of this examples of inappropriate Project selection and poor design make the problems of productivity improvement more acute.

Problems of raw, semi finished and essential production supplies exist. The difficulty of foreign exchange and capital finance acquisition contributes to the difficulty. To this must be added an institutional infrastructure not yet fully developed. So much so that at times complicated and sometimes obscure reporting relationships between the Ministries, the factory General Managers and the manufacturing units inhibits decision making.

At the factory level where most of this project's work took place five problems are common:

1. Management and Control systems are inadequate.
2. Skilled and experienced personnel are in short supply.
3. Production equipment is too often obsolete and poorly maintained.
4. The supply of spares and support Services is inadequate.
5. A lack of market knowledge exists.

It became clear that the enterprizes themselves are in most cases prepared to make changes once they are aware of the opportunities in

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the transfer of the appropriate technology.

However the failure of so many factories to draw up a sufficiently long-term strategy is a great handicap. The aim of such strategy should be to set up within the enterprize, conditions for continuous rather than sporadic productivity improvement.

Recommendations

Technological Services Unit

1. We suggested that the Ministry of Industry builds on the work of this project by considering a department for the transfer of technology. The department would have as its main responsibilities:

a) Evaluation and preparation of technology

b) The adaption of technology

c) The guidance of the training of users of the transferred technology

d) A market research capability

Whatever route the Ministry adopts, better coordination of the support presently provided is warranted. For industrial engineering to take hold more needs to be done to prepare for such technical assistance. The chance for implementation is greatly improved when the host factories organization is sound, enough skills are at hand and management support is forthcoming.

2. An Organizational Improvement Study

Productivity improvement depends on sound organization and effective management. If the factory organization is not correct implementation is handicapped.

In Somalia, because of this, the work of previous experts has yet to be effective because the organizational structure connot accommodate the recommendations. In the two factories on which this project concentrated too much time was consumed in redesigning the organization to adopt the new technology. For example at the Somaltex Textile factory, because the engineering functions were split between two equal but separate managers, the Preventive Maintenance Programme could not be implemented in a way in

which it could function smoothly under one responsibility centre. At a consequence time was consumed in selling the idea of this change to management, to engineering personnel and to the Ministries. An Organizational Improvement study is proposed. A look at the functional organisation of all the public enterprises is needed. The objective would be to bring about a better degree of Standardization of the organisation structure, position classifications and job descriptions.

The present confusion makes staff transfers difficult and work simplification and standard procedures impossible to readily apply in more than one factory at a time.

2. A Technical Training Needs Inventory

The lack of trained factory personnel is perhaps the single greatest inhibitor to rapid production improvement. In particular better trades training is needed, and the present skill level of the majority of Mechanics, electricians etc is not adequate. We have had to run basic training courses to upgrade mechanics to enable them to carry out diagnostic and repair work on equipment covered in the Preventive Maintenance Scheme.

The survey proposed would therefore pin point the technical skills by person and their level of skill, at each factory. It would determine the training needs for the foreseeable future by factory. This data is fundamental to introducing more direct and specific training activities so necessary to supply Somalia's manufacturing skills requirements.

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4.0. INDUSTRIAL AND MECHANICAL ENGINEERING - THE GENERAL SITUATION

4.1. DATA BASE

A review of Industrial productivity on a industry scale, even with the relatively small public manufacturing sector found in Somalia was beyond the scope of the Industrial Engineering Project DP/SOM/81/013. However, determination of the casual relationships between productivity and inputs industry wide is recommended. By tracing the pattern of events officials can link the various performance criteria, with both controllable and uncontrollable variables in the system, so that conclusions can be drawn about the effectiveness or otherwise of Ministerial and Managerial decisions as they relate to productivity. A start on the development of the necessary data base has commenced with the design and introduction of the Uniform Reporting System (URS) by UNIDO Project DP/SOM/81/013. Until the URS is effective however difficulties in obtaining interpreting and extrapolating data in a meaningful manner will be experienced.

As expected data has been collected during the course of this work and the other parts of Project DP/SOM/81/013 will increasingly accumulate useful data. Mention should be made of the efforts of the Project to institute a Universal Reporting System in the factories. In particular the work of Mr. S. Noorani F.C.A. will bear fruit but it will require several years more of sustained effort for a reasonable data base to accumulate and a feed back system to operate smoothly.

4.2. Production Elements

The initial visits revealed a number of problems. Of interest was the discovery of a degree of commonality and correlation between the problems from plant to plant, and even industrial sector to industrial sector.

Production input-v-output

The influence of the product on production efficiency is always a significant one. Both fabrication, as found in utensil production, and in process production as is found in sugar cane refining have unit costs of manufacture influenced through line balancing a much neglected and misunderstood technique in Somalia.

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Improved use of raw materials and plant through improved supply and the conversion of them into efficient products and by-products manufacturing would also beneficially affect manufacturing costs.

The level of interest expressed by a number of managers in improved material utilisation and in moving out slow moving inventories of materials or semi finished goods indicated that the possibility for lower carrying costs exist. A review of inventory levels will lead to planned reductions without loss of production being incurred and the introduction of planned stock levels and of economic order quantities needs pursuing.

4.3 Organisation and Work Methods.

Layout

This element is so often symptomatic of inefficiencies. We found space utilisation in general was poor, particularly so in storage areas. There is much evidence of back-tracking of work-in-progress and confused material and manufacturing supplies delivery.

Congestion, poor lighting, poor ventilation and bad housekeeping was frequently observed.

4.4. Materials Handling

Improvements are possible but have capital cost implications. There is certainly too much manual handling, and this is further complicated by haphazard and disorderly storage practices.

4.5. Maintenance

Maintenance procedures and practices have been identified as a key area of attention in this particular project.

There should be installed at each factory :

a) Establishment of a sound inspection schedules.

b) Introduction of machinery maintenance records on key individuals of plant and equipment.

c) Development of a competent inventory of small toolds and equipment used in repair and maintenance.

d) Introduction of a Proventive maintenance schemes where justified .

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e) Development of cost estimates for key repairs and maintenance.

f) Skill upgrading of mechanics and their assistants.

In some instances, major planned overhaul programmes are required. Planning and detailed scheduling, and spares availabilit , and similar logistics should be put into place in advance of shutdown for such major works.

4.6. Job and Work Methods.

Evidence exists of poor work practices. Observations indicate that problems exist in all the enterprises visited. Most Somali production operations are quite elementary and the degree of mechanization and automation is low, a factor however which emphasises the need for sound work practices.

Random sampling indicated that most machine paced production lines are experiencing excessive delays, with an unusually high incidence of unit wait-for-work delays and breakdowns.

In relation to this particular problem considerable scope appears to exists for the a lication of performance standards. Such standards will be quite loose, and initially improved work methods will " defacto " be required.

Performance standards, when introduced, should materially assist in the determinatio and control of labour and material costs. It is probable that for the next 2 or 3 years industrial engineering work will be limited to observing work performed and recording time by a stop watch. The application of predetermined motion time standards (PMTS) may be applicable in shoe manufacture in due course but it is not a priority.

4.7 Production Planning and Inventory Control.

Examples of both inadequate, and no production planning have been noted and to a degree affects all companies. Scheduling is capable of introduction in most plants. In the case of the processing Factories application of line balancing techniques bowould be useful.

Inventory control needs improvement. There is little or no ordering strategy in most companies, and no pre-determinatio of economic order quantities exists.

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It was noted that even the petroleum refinery, an essential and strategic resource, although having a "Min control stock system" did not establish practical levels and had, as a result, ceased production at times because of absence of critical spares. The uncertainty of source of supply and reliable transportation, the shortage of foreign exchange, and the times for letters of Credit to be issued indicates that review of the level and type of buffer stocks should be pursued more vigorously.

4.8. Human Aspects

No discussion of productivity problems can be complete without comment on the human element.

In general, and considering the stage of industrial development, physical working conditions are fair, however there are several factories which should cleaned up. In nearly all factories safety aspects are neglected. The establishment and practice of recording and analysing industrial accidents is strongly recommended. Canteen facilities, sanitation facilities rest rooms etc, are woefully inadequate.

Little or no attention appears to have been given to the improvement of job satisfaction and working conditions, facilities, transportation and recreation. In this regard an attempt to heighten management awareness of the relationship of productivity to these factors is recommended.

The need for training is recognised throughout the public sector, and indeed some factories have a training component. Unfortunately there are no instructors of trade skills. This results in very poor plant engineering. As an outgrowth of this training need factories have moved into giving courses of a general nature, such as general education, English language training etc. Whilst this is not criticized it is fairly obvious that these efforts have no direct relationship to production line efficiency.

The exposure of Somalian management to industrialized nations work practices is still very inadequate. Major weakness is apparent at the General Managers level here. The exposure of production personnel to industral Engineering applications in Western industrialized nations would also have very beneficial spin-off effects.

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4.9 General conclusions

In all public enterprises Productivity is drastically lowered by down time. A weighted average for the Cigarette and Match factory indicated down time of 35.0 % of available machine time. For Somaltex down time averaged 50.0 %. The major cause of this high level of non-productive time is " breakdown ". The next most significant factor is " wait for work".

The former is related to the lack of Spares, tools and materials, to the latter, " wait for work ", relates to " stock-outs " mainly the result of poor planning and control of the logistics of production.

These situations are in general attributable to Somalia's dire shortage of foreign exchange and credit facilities, and occasionally, a lack of local currency in the loss making enterprizes. However, we found that in most cases the situation was worsened by very poor planning and by low skills at most levels in the organization. There is an absence of systematic efforts to improve production activities. In most enterprizes management appear only concerned with preserving the " Status Quo ", wherein as long as things don't worsen too much, the situation is acceptable.

Management in general do not appear to realize the impact that a balanced production programme based on pre-planned well researched Sales requirements has on production costs.

Although S.I.D.A.M. (Somali Institute of Industrial Development and Management) has, in conjunction with I.L.O. given courses in Industrial Management, in particular in Production, [illegible] and Control for a number of years it is training has not yet become effectively utilized at the senior / middle management levels in factories. Consequently there is at best a feeble and rudimentary Production Planning and Control activity. The majority of factories do not even know the product mix situations necessary to maximize efficiency. Although the level of factory operations appears to depend on some factors outside of the control of the management the absence of production planning and control can only lead to greater inefficiencies, lower quality and higher costs.

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In particular this project with its commitment to mechanical maintenance was affected by a very low level of skill among mechanics, fitters, and electricians, and service personnel.

Being concerned over this situation and its deleterious affect on maintenance We ran a series of tests at two factories and discovered that a high level of " trained " personnel were incompetent. as journeyman / tradesmen.

At the factory level productivity can be most improved in the short term by increased attention to :

- Planning and Control
- Skill training.

Productivity is also handicapped by a lack of iknowledge among management and The Ministry of Industry is not yet playing a fully supportive role in the transfer of technology. Its range of services to public enterprises is undoubtedly improving, and the Project DP/SOM/81/013 is playing its part to strengthen the services, but, The Ministry is still inadequate in the provision of technical / and Industrial Management Services to public companies.

At present the Ministry has too few trained Engineers / Accountants / Marketing Consultants to be of any significant consulting impact.

5.0. Industrial Engineering Implementation.

5.1. The Work Programme.
The following work has completed.

1. 10 Factory Production Survey.
2. 3 Factories received a detailed Production Engineering Reviews
(Refer Operational Audit Questionairres – Appendix 8.4)
3. Development of a rehabilitation Plan for SNAI Sugar Co. at Jowhar.
This included discussions with the following authorities :
   - SNAI Management
   - The Ministry of Planning
   - The Ministry of Agriculture
   - The Ministry of Industry.
   - G.T.Z.
   - K.F.W. Germany
   - U.S.A.I.D.
   - F.A.C.
   - Various Somalian Agencies.

   A report was published (Refer Section 6.1 of this t)
4. Assistance with the National Conference on Indu Development and Management.
5. Assessment/and assistance to annual major overhaul at SNAI Sugar Co. Jowhar.
6. Assessment of Engineering roblems at Somaltex which led to the re-organisation of the engineering functions.
7. Assessment of engineering problems at the Cigarette and Match Factory resulting in an approved and implemented organisational restructuring.
8. Development and implementation of an operational planned prevention maintenance programme at the Cigarette and Match Factory.
9. Completion of a 40 hour maintenance inspection procedures and mechanical and electrical inspection techniques training for 10 plant mechanics employed at the Cigarette and Match Factory.

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10. Training of the Technical Manager in management of the Maintenance system.

11. Seminar to management concerning preventi maintenance in practice at the Cigarette and Match Factory.

12. Revie of new equipment, proposals involving a capital budget of U.S. $ 2.0 million for Cigarette making and packing machinery and spares. (Refer Appendix 8.3 this report)

13. Development of appropriate layouts.

14. As in all factory assignments trouble shooting Services were continuous . We dealt with lubrication difficulties, mechanical/ Electrical failures, adjustments and timing, operator training, material handling and storage problems. Tool design, maintenance work practices and quality control.

15. Technical assistance to the Power and Energy Section of the National Development Plan - 1983.

16. Technical assistance to the Ministry of Planning Study and report on the proposals to increase the 1983 Ex Factory Sugar Price in Somalia.

17. Report dealing with the Technical Analysis and Economic outlook for a new 45,000 Tons / annum plant for the production of Urea using heavy fuel oil as feedstock (Refer Section 6.3 of this report).

18. Provision of Consulting engineering services to the Ministry in checking the mechanical completion certification of the 70170 Million dollar UREA facility. This work was ongoing for 1½ months. (Refer Section 6.3 . This report).

19. Completed Training, in Industrial / Production Engineering of 2 counterparts. These engineers are now working with minimal supervision in providing technical Consultative Services to Public Sector Factories.

20. Development and Implementation of an operational planned Preventive maintenance programme at Somaltex.

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21. Completion of a 40 hour maintenance ins ct on procedures and mechanical and electrical inspection techniques training for 10 mechanics employed at Somaltex.

22. Training of Maintenance Engineer in Management of the Maintenance system.

23. Work in checking technical specifications of major items of equipment and custom made spares being manufactured overseas for the SNI Sector and the Ministry of Industry.

24. Design and specifying of equipment and machine tools for an in-house continuous training / upgrading workshop at the Cigarette and Match Factory. (Ref. Appendix 8.3. This report.)

25. Development of a job description appropriate to the position of Chief Instructor at this facility.

5.2. Notes on Preventive Maintenance Systems.
Implemented at the Cigarette and Match Factory and Somaltex Textile

From the investigation and subsequent data analysis it was observed that the greatest single cause of low plant productivity was mechanical or electrical breakdowns. It was therefore decided that industrial engineering could have most impact by attacking the problem of down-time. A reduction in breakdown time was to be achieved by minimizing unplanned stoppages caused by mechanical/ electrical failures. The method chosen was to design and implement a programme at each of the factories. It was intended to have as much of a common approach as possible, although it was recognised that some individual situations would call for some customizing of the system between factories. Our approach therefore was to design the system, train the factory personnel, and, supervise the implementation and operation of systematic engineering inspection and and maintenance at each factory in a manner in which the factory staff would run the programme, but with technical advice and assistance provided on a specified time allocation basis by the trained engineering counterparts of DP/SOM/81/013.

We split the design, training and implementation stages between the

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two factories in order to keep it as practical as possible. Each Factory received a 3 months full time phase which dealt solely with their problems. e.g. January, February, March, 1983 at the Cigarette and Match Factory, and April, May and June, 1983, at Somaltex Textiles.

To drive the implementation still further we located a trained counterpart engineer at each factory on a full- time basis for 6 months. It is anticipated that at the conclusion of this the systems will be so ingrained in the operational environment of the factory that it would continue to exist as a viable system entirely operated by Somalian nationals after the specialists had departed.

During our work we found the level of engineering knowledge to be much lower than anyone expected, and consequently our training component was increased almost 3 fold over that was originally contemplated. However we can report some success. We have, with factory management, introduced and have operating a Preventive maintenance programme for 60 pieces of equipment at the factories. Their mechanics and their assistants have received practical on-the-job training and this work is now being expanded . A reasonable expectation is to reduce down time by 20 % which on present costing could result in a saving of 7 ½ million shillings in any one year. of full cover at the C. & M. Factory.
Savings at Somaltex could reach 6.0 million Shillings annually.

The C & M. Factory has agreed to set up a training workshop for the improvement of trade skills at the mechanic and assistant level. A review of their existing plant was carried out relevant to a training and new machine tools, cutting tools, hand tools and workshop material specific . Quotations have been received from a Machine tool / workshop equipment suppliers. A position description has been prepared for a workshop instructor and discussions on funding this concept are now underway.

Then our training completed 21 mechanics and assistants were trained in Preventive Maintenance at the Cigarette & Match Factory, and 15 more at Somaltex.

6.0 SUPPORT SERVICES TO THE MINISTRY OF INDUSTRY

6.0 During the progress of the assignment an increasing amount of professional time was taken up in dealing with technical enquiries for Ministry officials. As the knowledge of the Service spread officials would appear with blue prints for analysis, Specifications for explanation and even pieces of equipment or plant on which a problem was being experienced.

The SNAI Sugar Factory at Jowhar is being rehabilitated and DP/SOM/81/013 provided an in-house technical service dealing with requests from suppliers requests from management and requests from Government officials responsible for ordering, spares and other equipment.

Late in the assignment 2 man months was consumed in answer to a request of His Excellency The Minister of Industry that a " State of completion " review be made of the Project to build and Commission a ISO - M T S D Prilled Urea Production plant at Gezira Somalia.

The conclusion that must be drawn from this astonishing demand is that there is an obvious and real need for an Industrial Engineering office to be situated at the Ministry of Industry on a permanent basis.

7.1. SHAI SUGAR COMPANY

A production and Technical Review and a plan for its rehabilitation

1. INTRODUCTION.

As part of an examination of public enterprizes in Somalia undertaken in 1982 the production related operations of SIAI (Jowhar Sugar Estate) were reviewed.

The work, part of the UNIDO Project DP/SOM/81/013 to strengthen the Somali Ministry of Industry, was intended to determine where industrial engineering services would be most effective given the environment existing in the manufacturing plants.

The Survey at SIAI, and reported herein, concludes that the problems at SIAI are so fundamental and far reaching that they cannot be resolved by the provision of the short term small industrial engineering effort currently available through this project.

The far reaching problems may be appreciated by the following synopsis.

1. The sugar estate has at present a gross area of 10,000 ha of cane fields of which about 8,000 ha are cultivable. A further 1,500 ha of these are however out of use because of high soil salinity.
2. Overall yields have falled from 89 tons/ha in 1971 to 34 tonnes / ha in 1982.
3. In 1971, 460,000 tonnes of cane was harvested. In 1981 160,000 tonnes only were harvested.
4. In 1971 sugar production was 47,000 tonnes. In 1981 12,000 tonnes only was produced.
5. Expenses have escalated from 3,437/- per tonne in 1980 to an estimated 10,178/- per tonne in 1983.

No single problem can be isolated as the root cause of this continuing decline. It is a complex and complicated condition which we believe needs a well thought out, well funded, well managed strategy to improve.

This report reviews certain of the operational problems and suggests a " strategy " to deal with the decline.

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SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

1. SEAI at Jowhar is in a critical and worsening condition.
2. The plantation however is capable of profitable operation
3. An immediate assistance programme is required
4. We recommend immediate managerial and technical personnel be provided along with a budget of about $ 5,000,000 U.S. to cover a 2 year period commencing in January 1983.

We also recommend planning and study commence for a rehabilitation programme through to 1990 with a preliminary budget of about U.S.$ 15,000,000.

Conclusions

We have concluded that the company is in a condition of continuing deterioration which unless arrested will lead to its eventual collapse. We try to demonstrate this in this report. We believe that the general condition is such that the application of any single assistance measure, such as the provision of some spares, or a technical expert will at best be of marginal help and most likely will have little or no impact on the company.

A fundamental weakness is observed in the absence of strategy formulation and the inability to achieve any related coordinated and effective action. It is not unusual to discover in any enterprise that a gap exists between strategy formulation and action, but at SEAI there is a total void. There is no recognizable plan or strategy to pull the company around, nor is there the skills and resources to achieve any recognizable implementation effort should a strategy be developed.

Such findings clearly point to the lack of experienced, competent management. We acknowledge that there are, at Jowhar, competent individuals. Unfortunately they are too few to enable them to be effective, and gaps in many managerial / technical positions renders any action that they take largely ineffective. We suspect that recognition of the failing of senior management at SEAI over the past 10 years has been somewhat obfuscated by the impact of national scale problems such as delays in opening opening Letters of Credit and the " all pervasive " hard currency problem. MANAGEMENT however is clearly ineffective in almost all areas

The decline in agricultural productivity has had the greatest single impact on the rate of decline, and efforts to preserve good yielding cane land, to halt the yield decline on average to poor cane lands and the necessity to commence reclamation of abandoned lands have, as yet not been adequate.

Harvesting and transportation practices are grossly ineffecient, and lead to significant losses of cane and sugar.

Hand harvesting continues to be significant at Jowlar and with the available cutting personnel currently reduced to under 20 % of the required number insufficient cane harvesting remains a major problem.

To summarize the shortcomings in the agricultural area as

1. Poor Agricultural Management Practices.
2. Deteriorating soil productivity.
3. Poor equipment utilization
4. Sub optimal harvesting practices

Factory operations present another aspect in obvious decline. Two key problems are apparent in firstly, the relatively low extraction of sugar from available cane, and secondly, the relatively high moisture content of bagasse. Both of these can be traced to mechanical inefficiencies arising from inefficient mill process engineering. Efficient steam generation is essential in economic sugar refining yet S AI has no ater treatment facilities for boiler feed water and practically no working instrumentation so necessary to enable the performance of a steam generation and power generation equipment to be monitored and controlled.

Other critical aspects are cane yard inefficiences, the negative impact of lack of spares and supplies, and the lack of trained and skilled personnel.

It is our conclusion that to varying degrees all of these problems developed and exist because of unde skilled personnel at most levels in the organization. The lack of knowledge and experience at the General Management level is however the greatest single stumbling block to improvement. To demonstrate this inadequacy we compare " actual " general management activity with ten " standard " criterial considered essential

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in maintaining a well run enterprise. The lack of achievement of them indicates the weakness in general management at this time :-

	Required	Actual Situation
1.	The company policy and objectives understood, agreed and in writing	No
2.	The setting of key managerial objectives with appropriate responsibility centre managers	No
3.	The holding of regularly scheduled, working management meetings	No
4.	The involvement of factory and field management with the development of budgets	No
5.	Production Planning meetings	No
6.	Cost control system in place and in use	No
7.	Adequate technical and job training for personnel	No
8.	Use of standards for control purpose	No
9.	Distribution of production results among all management and technical personnel	No
10.	The identification of future personnel needs and a recruitment and promotion plan	No

Recommendations

The urgency of the situation requires that priority planning of a rescue plan for JTAI commence immediately. Such a plan, the elements of which we propose herein, requires skilled and authoritative direction and leadership.

We recommend that a project planning committee be formed within the Ministry of Industry to consider policy formulation, resource allocation and operational planning. This Committee would report to M.L. The Minister of Industry.

Finally it is not unlikely that any donor providing financial support to the project will wish to be assured of the probability of financial

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viability it must be recognized that it is unlikely that the enterprise can sustain its present losses until a detailed feasibility study is carried out. With this in mind we propose consideration of a phased programme designed along the following lines. The strategy would be to provide immediate managerial, technical and financial support, and yet allow study and careful planning of the major rehabilitation to proceed efficiently.

Phase I. The Immediate Phase (1 two year term)

1. Provision of Technical Assistance Personnel
2. Provision of Intermediate Operational funding
3. Development of Phase 2 plans and costs

Phase 2. The Mid Term Phase (A five year term)

1. Provision of a fully staffed Technical Assistance Team.
2. Provision of an onsite Technical / Managerial training team.
3. Provision of rehabilitation funds over the five year term.

Expanding on these we recommend the following :

1. The Immediate Phase (Commencing January 1983)

1.1 By early 1983 provision of the following experienced Technical Assistance Personnel.

1. General Manager.
2. Factory Engineer
3. Senior Agronomist
4. Transportation Equipment Eng.
5. Senior Electrician/Engineer.
6. Financial analyst /economist

} A proposed work programme for this team is included in the appendix.

1.2 Provision of the following budget funds totalling US $ 5,000,000 to be allocated in the following manner :

1.2.1. Immediate capital needs U.S.$ 2,000,000

1.2.2. Provision of an internal foreign exchange account for two years at level of U.S.$ 1,000,000 annually.

1.2.3. Development of feasibility of rehabilitation with associated costs and earnings expected during the mid-term phase. This to cost about U.S.$ 1,000,000 (Consultant and Study Costs).

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2. The Mid Term Phase

2.1 Expansion of the partial T.A. team outlined above to a fully manned management team. Make up of this team would result from findings over the short " term programme.
This team to be in place until 1990.

2.2 Provision of a specialist training team with the objective of up grading Somali Nationals in management and technical skills.
This team to be in place until 1988.

2.3 Provision of the rehabilitation funds. The precise level of funding for this would be established during the " Immediate Phase ". It is in our opinion unlikely that these funds would be less than U.S. $ 15,000.000.

2.4 Concurrent with the above initiatives it is expected the company would require restructuring financially and organizationally.

We therefore expect the budget for the immediate phase to be not less than U.S.$ 5,000,000.

The detailed requirements of the mid term phase would depend on the findings of the immediate term phase but would possible require a budget of not less than U.S.$ 15,000,000 for a total project budget of U.S. Dollars 20,000,000.

GENERAL MANAGEMENT

SSI is an enterprise in decline. A decline whose rate may be measured by falling sugar cane yields, falling sugar volume, increasing costs per unit of production and increasing financial losses. The specific data relating to such measures are contained inthe relevant sections of this report.

The losses experienced in recent years are continuing at this time and question the viability of sugar production at Jowhar. Although such a pertinent question fell outside the terms of reference for this " production operations " review, we have the following comment.

It is noticeable that Jowhar reached a peak of productive activity in 1970 - 1971 when 460,000 tonnes of cane at an average yield per hectare of 88.5 tonnes produced 47,500 tonnes of sugar. This according to the "

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relevant financial statements is an attractive sugar production level. Between 1976 and 1978 Sir M. MacDonald and Partners, under test conditions, showed that yields of about 100 tons/. hectare are possible. Their claim is further substantiated by Dary Agro of Australia in their report of September, 1980. This is generally supported by the agricultural Manager at Jowhar being feasible production.

A yield as reasonable as 75 tonnes per hectare would provide a very adequate 440,000 tonnes of cane for crushing.

We also note that the sugar content of the cane has remained, within limits reasonable for agricultural variances quite constant. E.G. the 1970-71 season recorded a cane sugar content of 12.9% 1976-77 recorded th the highest in the 12 year cycle at 13.1% whilest 1980-81 and 1981-82 recorded 12.5 % and 12.6% respectively. It should be noted though that the percentage of recovery of sugar/cane has declined from about 10.0 % to 7.5 % over the same period. This could have its cause in present and past sub-optimal agronomic practices.

If then there is evidence that there is no generic weakness in the agricultural potential of Jowhar estates then the intriguing question must be what is causing the decline ? Other better specialists have touched on inthe inhibitions brought about by government policies and practices. Policy's such as price control, and practices such as the Letter of Credit procedures have been highlighted. Specialists in agronomy have repeatedly recommended action to commence to reclaim land, improve drainage, improve harvesting and transportation. Other surveys have recommended the upgrading of the crushing and sugar manufacturing and t the steam supply system. Others point out that company reorganisation and financial restructuring is required. In other words everything can be upgraded. It isour conclusion however that the central and pervading shortcoming is the alarming weakness of general, administrative and technical managers.

The technical shortcomings are dealt with in other sections of this report. Our operations audit however discovered the enterprise to be almost devoid of sound and accepted " General Management Practices ".

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It is true that the problems of management and control have persistently beset public enterprises in most parts of the world and there is no reason to find Somalia different. Essentially these problems are encouraged by the difficulty of assessing public sector performance and of providing managers with adequate incentives to attain efficiency in their operations.

With regard to the former at SAMI we have found no objectives, no policy guidelines and no evidence that profitable operations is the criterion by which to judge.

The role of the General Manager under such circumstances becomes very difficult. No longer can it be to create the conditions which permit the company to meet its objectives.

At Jowhar the financial crisis is worsening. In judging the technical efficiency of the enterprise successful management of a manufacturing enterprise requires the adoption of a number of standard and proven practices. It is the adherance to such practices which is " Prima Facie " evidence of efficient management. Alternatively " inefficiency " is a " Prima facie " argument against a technique or style of management.

We list below ten criteria we consider essential in creating and maintaining a well run organization and compare the adoption of and adherance to these criteria by Senior Management at Jowhar.

1. The Company policy and objectives understood, agreed and in writing.
2. The setting of key managerial objectives with appropriate responsibility centre managers.
3. The holding of regularly scheduled, working management meetings.
4. The involvement of factory and field management with the development of budgets.
5. Production Planning meetings.
6. Cost control system in place and in use.
7. Adequate technical and job training for personnel.
8. Use of standards for control purposes.
9. Distribution of production results among all management and technical personnel.

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10. The identification of future personnel needs and a recruitment and promotion plan. None are followed.

AGRICULTURAL OPERATIONS

There is a saying that " Sugar is made in the field, not in the factory ". Although a somewhat over simplification of a complex mechanical chemical processing system involving inter-dependant variables it is true that cane quantity, quality and availability is at the heart of a sugar refineries productivity.

Review of the operations of the Agricultural Department emphasises this, and revealed the major influence that the decline in cane growing and harvesting performance is having on the production of sugar.

The operations audit was conducted in co-operation with Mr. Ahmed Ibrahim Hassan, head of Agricultural operations and these conclusions are based on discussion and considerable data provided by him.

Cane growing at Jowhar has been studied extensively by specialists. In particular Sir. I. MacDonald and Partners of the U.K. and Davy Agro Pty. of Australia have produced relevant and detailed reports. The reports reveal a noticeable level of agreement on the problems. Both indicate an attractive cane growing potential exists but this potential is not being realized. What then has gone wrong ? Two key factors have been identified :

1. Poor agricultural management practices and,
2. Deteriorating soil productivity.

to these we can add

3. Poor equipment utilization and
4. Sub optimal harvesting practices.

Profitable production levels have been reached in the past but the situation worsens. The deterioration may be observed in the following :-

1. In a 1980 report Davy Agro Pty stated that an Jowhar 5,833 ha should reasonably produce 437,500 tonnes of cane. We noted that in the 1971-72 crop year 5,633 ha produced 428,108 tonnes of cane (76 tonnes per ha). An achievement in keeping with the Davy Agro expectations. However since that time both volume and yield have

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deteriorated. In the 19th campaign 4,886 ha produced 166,124 tonnes of cane (34 tonnes per ha). T is represents a decline of 50 % from the achievements of 1971 - 72.

2. The influence of the numbe. of ratoons on cane sugar yield is widely recognized. The number of ratoons over about four sees a corresponding decline in yield.

e noted that in 1981-82 some 40 % of the area harvested comprized of 2nd ratoon cane. Average yield over the two campaigns however was only 40 tons / ha. This suggests that extremely poor yields were being achieved on some cane. Davy Agro Pty have suggested that at Jowhar 2nd ratoon cane should reasonably yield 75 tonnes/ha. The conclusion must therefore be that Jowhar must have production of cane of a high number of ratoons.

3. Another measure of crop productivity is " tons of sugar produced " or hectare harvested ". Over the period 1968-1970 yields of 9.91 tonnes per ha were recorded.

Over the five year period from 1977 to 1982 the average however has fallen to 5.13 tonnes / ha, a reduction of about 47 %. This of sugar per hectare also show consistent decline and by 1981-82 have fallen to about 35 % of the plantations 1977- 78 achievement. Cutting and harvesting of cane represent key areas with difficult problems. They are receiving close managerial attention.

Although three harvesting systems could be called on the agricultural department has abandoned the "whole stick " harvesting mechanical method. Their reason for this abandonment is because the method does not separate trash from cane, and in order to assure relatively clean cane, i.e. as clean as manually harvested cane, there is a requirement of 25 persons per 0.25 ha to separate cane from trash. Manual cutting is not " significantly " slow under good conditions with skilled cutters, and require about 30 persons per 0.25 ha harvested to produce clean cane.

Manual harvesting therefore remains an attractive method. At Jowhar it is handicapped by severe labour shortages. I.G. in order to cut 2,000 tonnes of cane over a 24 hour period, a volume necessary to satisfy plant requirements, it is estimated that 13,200 man hours of

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effort are needed. Assuming the 6 six hour cutting day to be the reasonable maximum time a cutter could work in the cane field then $\frac{13200}{6}$ = 2200 cane cutters are required. This in practice is reduced by the use of overtime for limited periods, but even so, it is unlikely that sufficient cane could be cut 100 % manually with less than 1,200 - 1,500 cutters.

At present the Agricultural Manager reports that he has at his disposal only about 350-400 cane cutters. This Season the " Toft " combine Harvesters" are operational. He estimated they are handling about 50 % of the cutting. This decreases the requirement for manual labour to about 600 to 750 persons. assuming thabout three hours overtime is worked by each cutter each day. This however still leaves the harvesting resources short by about 250-350 persons at any time. Management reported that in their opinion the main inhibiter to attracting cane cutters is the lack of financial reward for undertaking a hard, exhausting and dirty job. Overtime, a rpartial solution, is being used. About _ of the total crop is now being cut on " Overtime ". The availability of workers willing to put in overtime however is, at best, variable.

That " by regulation " workers may only receive two hours of overtime pay irrespective of how long or how productively they work is a dis-incentive. A cause of discontent which came to light during the survey is a rumour that Juba Sugar pays its cane cutters 15/- per task (normally 0.8 to 1.0 ton of cane) compared with 8/- at Jowhar. The Government, in 1977, instituted a " Volunteer cutters " programme in the hope that it would ease a situation recognised even then as critical. Subsequent arrival of the unskilled, but enthusiastic volunteers caused problems, the impact of which is still being felt five years later.

Estate management believe that such " self-help initiatives are of little help in relieving " skilled " worker shortages, a d point out that unskilled harvesting is in fact damaging to the root system etc.

Other inhibitors to the productivity of manual cane cutting are incorrect row width, poor implement design and poorly supervised gangs. Poor scheduling of cutting operations also is a key inhibitor.

The increasing utilization of the combine harvesters has been forced, by circumstances, on Jowhar. The ratio of delays to operational

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running appears to be too high.

Random observations in the cane fields indicated delays accounted for 57 % of all scheduled operating time.

Productivity of this equipment is affected by poor cane field layout. When shape and size is not optimal for the combines operational characteristics. Uneven surfaces increase problems, and trash contamination is a major problem. The agricultural Manager reported using to up to 150 persons per hectare in sorting trash from mechanically harvested cane. Poor standards of soil tilth and inter row cultivation exacerbate machine difficulties and encourage to equipment failure. Davy Agro Pty summarized this in September 1980. In September 1982 our survey found the situation unchanged. In 1980 Davy Agro stated that :

" Whatever the causes which underlie the poor growth of crop, there are significant losses of cane and sugar from inefficient harvesting practices ".

" The ground cut is of poor standard, with wastage of cane. The stool in the row is spread so wid in ratoons that an effective swing of the knive is restricted.

" " The knives themselves are not of optimum design and are often blunt. Topping is inconsistent andin some cases not performed at all. This has serious implications for sugar recovery ".

The transportation of cane from the fields to the factory is achieved by a combination of three methods.

We compare these methods below :

Campaign	Railway	Higdoma	Thompson
15.1	94.90 %	NIL	51.10 %
15.2	62.50	34.00 %	3.50
16.1	70.30	23.85	5.42
16.2	72.79	20.91	6.30
17.1	76.25	18.20	5.50
17.2	87.69	11.50	0.81
18.1	73.53	22.02	4.45
18.2	73.52	22.02	4.45

If the 1st season of the 15th campaign is removed from consideration then the railway moves about 74 % of all cane. The Hidema equipment moves about 18 % and Thompson equipment accounts for the remainder.

The most pressing problem facing cane transportation from field to the factory is the poor state of maintenance and repair of the rail system. Of the 63 kms of rail in use we estimate that 50 % is in need of replacement. Although orders for 5 km of rail was placed in 1980, along with an additional 15 km earlier this year, as of September 30th 1982, none has arrived at the site. Management is endeavouring to increase the use of the Hiedema equipment so as to minimize the load on the rail system.

Utilization of alternative equipment is itself unfortunately seriously handicapped by equipment breakdowns. Examination of the availability of equipment revealed the following .

Type	Stock	Usuable	Not Usable	
Locomotive HF 72	19	8	11	57 %
Deutz Tractor HP 72	58	42	16	28 %
MF Tractor 290 HP 80	4	2	2	50 %
Railwagons 4 T	474	200	274	58 %
Heidemas 9 T	22	12	8	36 %
Caneloader HF 100	8	6	2	25 %
D 6 HP 140	8	3	5	62 %
D 4 HP 100	8	6	2	25 %
Fiat AD 14 HP 145	2	1	1	50 %
Motograder HP 140	2	0	2	100 %
Scraper HP 140	4	3	1	25 %
Excavator HP 105	7	4	3	43 %
Linkbelt H 105	6	4	2	33 %

In summary of the 622 pieces of mechanized transportation in stock 292 pieces (53 %) were out of commission.

Investigation revealed a low level of maintenance management, complicated by a lack of critical spares. Although a simple maintenance procedure is available, it is only partially installed. There is no

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detailed and [illegible] preventive maintenance procedures. There is no useful breakdown analysis data. Maintenance activities are severely handicapped by the shortage of spares, of both hand and special purpose tools, of engineering supplies and most critically, by the absence of experienced maintenance supervisors and related technical and trade skills. We noted an absence of any relevant training to overcome these problems. One or two key personnel have from time to time been sent to original equipment suppliers for training. This effort is, however, too small to have much impact on the overall situation. In completing we must comment on the control exercised. Whilst agricultural operations are not necessarily recognized for observances of sound management techniques some control criteria is essential. We list below key criteria absent in Jouhar's agricultural management practices:

- No evidence of a coherent agricultural policy or related practices.
- Budgets do not exist.
- Whilst some "general and informal" planning discussion takes place no formal consultation with the factory or other department takes place.
- Management reporting is minimal. At best it is casual.
- No formal periodic reporting system exists.
- Manpower planning is practically unknown. An ommission which is particularly critical because of the high vacancy rate is manpower planning. Concern must also be expressed over the failure of Jouhar to keep skilled personnel over the years.

FACTORY OPERATIONS

The output of sugar at SMAI has been declining during the past 10 years. The problems in the sugar factory are closely linked with those of the Agricultural operations. As the state of the complex is poor, it is difficult to specify the contribution that each "weak point" in the factory gives to the total weakness.

In this report we have separated the production department, into five sections. Each is treated separately :-

1. Cane yard and milling station
2. Boiler Station
3. Electrical Section
4. Juice Treatment.
5. Civil works.

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In general the grave situation can be seen from examination of Table 1:

	Camp 14 1976/77	Camp 15 1977/78	Camp 16 1978/79	Camp 17 1979/80	Camp 18 1980/81	Camp 19 1981/82
Tons cane harvested	360,000	260,000	360,00	280,000	230,000	166,000
Tons Sugar produced	36,200	22,200	27,400	23,000	16,700	12,520
Recover Sugar/Cane %	10	8.4	8.1	8.1	7.3	7.5
Sugar Cont. of cane %	13.1	12.5	12.4	12.5	12.6	n/a

As the sugar content of cane does not vary with more than 0.5% we conclude that the factory extraction performance has deteriorated between 20 and 25 % over this period (from 10 % recovery in Camp 14 to 7.5 % recovery in Camp 19.) Expansion of the table to cover the campaigns from 1970/71 emphasizes an even more significant decline and indicates that signs of decline appeared as early as 1972. At present major constraints to good productivity performance in the factory are as follows :

1. No buffer stock in Cane Yard.
2. Dirty Cane - too much trash.
3. No speed control of cane carrier
4. Control panel for milling tandem not fully operational.
5. Cane Knife No. 1 Missing.
6. Tramp Iron in Mill Rollers.
7. Poor extraction
8. High moisture content of bagasse.

Point I, is, at this time, of little relative importance as the delivery of cane to the factory is so unstable. e.g. refer to table II down-time analysis :

	1977	1978	1979	1980	1981
Lack of Cane (% of total down-time)	43.43	43.45	30.01	11.68	41.0

This table shows quite clearly that out of the total down-time, lack of cane, except for 1980, is the most significant lost-time factor. The rest of the down time is :-

	1977	1978	1979	1980	1981
Normal overhaul	5.61	5.19	4.44	4.35	2.75
Electrical faults	6.41	6.88	11.22	10.05	5.88
Mechanical faults	16.85	17.58	16.20	24.62	12.26
Boiler Faults	10.53	11.06	17.78	23.46	17.55
Other	17.17	15.84	20.35	25.84	20.56

As the objective is to bring about improvements in production performance however, the problems of the Cane Yard and Capacity of the mills are critical because these will become key problems as soon as the cane supply stabilizes.

In order to maintain reasonable buffer stock, a detailed review of the incoming rail feed loop is a necessity. This study should however take into consideration the fact that approximately 30 % of the incoming cane now is transported by trailers.

The design capacity of the milling tandem is 100 t cane/h. Management in order to try to improve the extraction from the mills has made mechanical alterations, e.g. change in the pitch from 40 ° to 30°, with the result that the present capacity is said now to be 70 t/h.

Table III shows no. of tons cane actually crushed, and the total theoretical crushing capacity of 70 t/h for a working day of 18 hours and - 20 hours crushing. The figures cover 1980/81 (crushing days = 163)and 1981/82 (crushing days 163).

Tons of Cane	Crushing 18 h/d		Crushing 20 h/d	
	1980/81	1981/82	1980/81	1981/82
Total of Capacity at 70 t/h	230,580	205,380	256,200	228,200
Actually harvested	230,546	165,880	230,346	165,880

It is not unreasonable to expect the number of crushing hours/day to be approximately 20, but even at 18 h/d the table still shows milling over capacity, and as such, the managements complaints of too little capacity seem hard to justify. It is possible though, that should the cane supply situation improve one can expect the appearance of occasional capacity problems with the milling equipment as currently set up.

The problems caused by dirty cane and trash are known at sugar estates where the better part of the cane harvesting and loading is done mechanically. The alternative is either to improve agricultural practices, to hand harvest, or to install a cane washing arrangement, or some combination. The cane washing arrangement will not solve the trash problems. The present situation at SMI where the cane carrier pit has to be cleaned every day is not satisfactory as this both time and labour consuming.

Much of the trash consists of unburnt leaves and the problem starts in the field. Solutions cannot be introduced in the factory, but should be resolved on the agricultural side.

Much down-time is lost due to choking of mills, particularly mill No. 1. The lack of speed control contributes to the problem of mill choking. Poor cane knife performance is another critical factor. It is therefore important that speed regulation of the cane carrier is introduced. Another important factor is that the cane knife No. 1 is missing. Proper cane treatment just is not possible when a cane knife or leveller is missing. This single item reflects the very grave spare parts situation facing SMI in general. The electric motor was removed to replace a burnt-out boiler fan motor. It is also evidence of extremely poor electrical maintenance. According to management as much as two hours down-time is lost daily due to mill choking.

An average of about another two hours down-time a day is incurred due to tramp iron problems. This in practice causes not only down-time but has a potential for damage to expensive cane knifes and valuable mill rollers. Such problems could actually be reduced if the tipper and mill operators, paid closer attention when operating. However one cannot

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completely disregard the possibility of sabotage. A metal detector may be beneficial at this point.

The extraction from the mill has declined, see Table IV below :

	1977	1978	1979	1980	1981	1982
Mill Extraction	90.65	89.5	90.2	87.8	89.1	86.8

The Milling tandem was installed in 1963 with a design capacity of 100 tons cane/ hour. Evidence of decline in capacity is somewhat difficult to establish as this of course is linked with the falling amount of cane being harvested. However, as shown in Table III, there should be no reason for concern for milling under capacity, at least for the next year or so.

In spite of many attempts to adjust the setting and thereby improve the extraction performance of the milling tandem, no improvements have so far been achieved. Many foreign experts have been involved, but not even Engineers from the mill manufacturing company from France appear to have had success. The milling tandem should for long term improvement and ease of operation be replaced. The poor setting of the mills causes, besides poor extraction, and thereby significant losses in sugar produced, a too high moisture content in the bagasse. The moisture content of the bagasse would in a properly running mill be approximately 47-48 %. 49 % could be accepted with 50 % being the maximum. Table V shows the average figures for moisture contents in the bagasse during the last five years:

	1977	1978	1979	1980	1981	1982
Moisture in bagasse %	51.8	51.4	54.7	55.9	55.8	54.6

The problems of the high moisture content will be further reviewed in this report.

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The fuel consumption during recent years has been fluctuating noticeably and appears to be increasing at a disturbing rate. Table VI provides the last five years consumption of furnace oil :

1977	1978	1979	1980	1981
n/a	n/a	1,202,500	3,920,100	n/a

Lack of instrumentation does not permit analysis of boiler efficiency but by experienced observations efficiency appears low. Poor boiler performance is due largely to :

1. Feeding of too wet bagasse
2. No combustion control
3. No water treatment
4. No soot blowing

It is very difficult to give these factors priority, they could in fact be equally important. In any well run boiler plant none of these shortcomings would be allowed. As the instrumentation at the vboiler station is poor, it is not possible to make any steam - or energy balance or to determine the efficiency of each individual boiler. Combustion is obviously extremely poor and all factors, as mentioned above, will contribute to this. It cannot be emphasized too much that these factors are all of the utmost importance and should be brought to normal standard as a priority. In and around the factory there is a serious problem from fly-ash contamination. The fly-ash separator is out of order and the feeding of wet bagasse and in-operative soot-blowers are key-contributing factors. As mentioned, the instrumentation is extremely poor, and proper combustion control is just not possible. The fact that there is no water treatment plant is a significant contributing factor to poor boiler performance. The boilers are presently de-scaled at the end of each campaign, but the building-up of scale inside the boiler tubes and the effect of soot on thermal efficiency, will of course have a serious effect on energy performance. The lack of water treatment will endanger through scaling-up the steam turbines, increasing the possibility of damage.

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The total installed electrical generating capacity is presently 7780 KVA and the number of generators are following :

1	Steam Turbine of 3,000 KVA
1	Steam Turbine of 2,500 KVA
2	Diesel Generators of 690 KVA
1	Diesel Generator of 900 KVA

The condition of the entire electrical system is shocking. It is quite surprising that not more than 5 to 11 % down-time is allocated to electrical faults, although down-time alone however does not clearly show the true costs of poor performance of the electrical service. A substantial number of electrical motors are burnt-out each campaign (last campaign 21 motors). One of the reasons for continuing poor milling performance is due to the in-operation of cane knife No. 1, whose drive was used to serve as a fan motor for the Marie Benzotti boiler. This had burnt-out and had to be replaced by canabalization of the cane knifes motor system. Where ever one goes in the factory, in the power house, on the entire state, switch gear, overhead lines etc. and the entire electrical system is in extremely poor condition. Open busbars, power cubicles and fuse boxes, and even high tension conductors, seem to be the rule rather than the exception. The management complains about fly-ash problems, but allows the doors on the busbars etc. to be open. Safety standards are totally unacceptable and corrective measures should be taken immediately.

The juice treatment plant including clarifiers, evaporators, crystallizers, centrifugals etc. seems to be operating satisfactorily. The equipment appears to be in a fair mechanical state, and for the time being no capacity problems are apparent. The main problems during last campaign were worn-out pumps and lack of spare parts, both electrical and mechanical. However, the performance of this section has been reasonably good. This comment has to be reviewed however, the performance of this section has been reasonably good. This comment has to be reviewed however in the light of high factory down-time and the staleness and poor quality of the Jowhar cane. Remarks in the Production Managers report concerning

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the sugar house performance in campaign 19/2 like : " The trouble here is the implementation of (pan boiling) procedures. The workers don't like the extra effort it involves and the shift supervisors don't understand its importance ", indicate that even juice treatment equipment efficiency is capable of improvement. The purity of the mixed juice is given in table VII.

	1977	1978	1979	1980	1981
Mixed Juice Purity	80.7	78.9	78.1	76.8	76.6

These figures are rather shocking and show a depressing trend. Because of them it is surprising that the Factory is producing any reasonable sugar quantity. The key reason for poor mixed juice purity is poor quality of cane. It must be emphasized however once again that sugar production is a continuous process and as such no one part is independent from its predecessors. Poor performance at one point leads to loss at another .

Civil Works.

The structure of SMI-BIASA Sugar Factory is generally sound. Settlement of the milling floor was minimal and within acceptable limits. A civil engineering expert who examined the plant confirmed this verbally to the UNIDO team during this survey. His report is awaited. The Civil works needed consists mainly of roofing, flooring and drainage. No major needs concerning building structure, foundations etc are necessary.

Conclusions

The state of the Sugar Factory is far from acceptable. Considering the overall performance it is quite clear that grave technical mismanagement has taken place over the years. It is not reasonable to blame the present or previous management at SMI - BIASA. Responsible ministries should have seen the clear indication of deterioration. Without bringing political questions into focus, the present state of SMI-BIASA clearly shows that the government guidance of the public sector enterprize has

failed significantly in this case. A major aspect noticeable in the present situation is the poor manpower situation. Many suggestions regarding training, recruitment of skilled manpower etc. can, and have, been made but with the present policy regarding salaries, all suggested improvements will probably have minimal impact.

The Factory management has proposed a new organizational structure for the Production Department, but the advantage of this is dubious, as most positions on medium levels are still unmanned, and as there is little hope of getting these positions filled as long as the wages offered are at the present low level. Another aspect to be considered is that sugar processing is a relatively sophisticated manufacturing process, and in order to be able to produce the sugar with minimum costs, experienced and skilled personnel are required. It is doubtful whether Somalia presently has the skilled manpower capacity to manage a relatively large industrial enterprize like SNAI - BIISA. The Government seems to have recognised this at the Juba Sugar Project and it is reasonable to contemplate that similar measures be taken for SNAI-BIISA. To emphasize that solving man power problems is just one step however in the right direction. Other changes regarding industrial policy must be made. Proposals on pricing policy, labour code, financial management, etc. have been given many times and the responsible government officials will have to face such decisions if SNAI-BIISA is to be once again an economically sound enterprize. Only two figures are necessary to show the urgent need for action :

TONS SUGAR PRODUCED:	1971	1981
	44,052	12,519

These figures not only indicates the decline in production performance but gives a clue to the poor financial matters which is not in the terms of reference for this Survey, but have been reported previously by a UNIDO team in June, 1972.

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TECHNICAL BACKGROUND

Sugar manufacturing may be classified as comprising of an Agriculture and a Manufacturing element. The field management of sugar cane is a complicated Agro/mechanical activity. An estate needs sound, experimental control and ongoing developmental farming in order to obtain results such as high sucrose, good juice quality, low fibre content, high tonnage, either or no flowering, good growth habits, good ratooning qualities, resistance to disease and freedom from pests. The bulk of cane harvested at Jowhar is beat by hand with the cane knife, although labour scarcity is leading to an increasing use of mechanical means of cane cutting.

Various types of cane loaders have been tried and are operational. Incorporation of such mechanization has accelerated in recent years because of a growing labour shortages. Present transportation of cane at Jowhar is a combination of a portable tracek system and tractor drawn carts.

As is common on sugar estables the transportation system itself consists of two aspects. " Infield " transportation, and " Outfield " transportation. These are linked through " transfer sections " to the cane unloading system at the mill.

The " manufacturing element " consists of the weighing/ unloading of cane the extraction of juice from the cane and its transportation to the " crystal state. In this stage technical data becomes of paramount importance for sound control and high productivity. For example, the peripheral speed of the mills is critical. Consequently it should be carefully regulated according to the size of the mill, the diameter of the rolls, and amount of cane to be ground. Efficient surcrose extraction is directly related to the careful control of such factors. The moisture content of bagasse is directly related to the roll opening and it is generally recognized that a well operated sugar factory with varieties of sugar cane not having less than 10 % fibre should not need any other fuel than the bagasse provided from the tandem. [1] It should be

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1 Farral Sugar Mills . Bulletin 312 A.

noted that for the calculation of boiler house efficiency (BHE), a step essential for maintaining high mill performance, the standard practice is to weight or measure the raw cane juice.

Subsequent steps involve liming (of the mixed juices). Good clarification is essential for the production of quality sugar. The move to mechanical harvesting and loading has a relationship with, and an impact on the performance of the clarifiers, e.g. dirty cane leads to excessive retention of hot juices in the clarifiers. The filtration of mud from the clarifiers indeed is a critical part of the mechanical system. Evaporation permits the concentration of clarified juice to a syrupy consistency in a multiple effect, and the vacuum pans result in the crystallization of raw sugar. Both aspects require careful and continuous monitoring and control. Steam economy is a factor of great cost importance. Heat balance is critical. The efficient withdrawal of vapours can result in big steam savings, because exhaust steam, after being used for the evaporation of water in the multiple effect system is transformed into vapours which are used in the heaters and vacuum pans.

Thus the factory system is totally interdependent with changes in one part affecting the performance of another part, yet instances of discreet changes and individual alterations are frequent at SMAI.

For maximum plant efficiency all sugar must be accounted for, through the whole manufacturing process, from whole cane to raw (or refined) crystals. Technical, Chemical and physical control are of paramount importance. e.g. sugar content analysis monitors chemical and physical losses. Mechanical losses from entrainment, leakage and spillage must be known, and controlled, and so called " paper losses " due to incorrect weighing or measuring can have serious implications on productivity. Finally we point out that more frequent stock checks should be taken throughout the factory if the optimum production costs are to be achieved.

The technical management at Jouhar, produces factory white sugar of recognised quality. However from the foregoing it may be seen that the achievement of attractive costs requires the immediate and on-going control

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of a range of factors. Such control systems are not adequate at SNJ. There is an alarming lack of instrumentation and process control devices. The absence of labour, material, and energy standards only leads to the conclusion that unless the company is unusually lucky the absence of such controls is permitting un-acceptable high costs to occur. The absence of cost data however leaves this conclusion firmly in the area of an assumption.

PERSONNEL PLANNING POLICY IMPLICATIONS

Personnel management at the Estate has a broad mandate. It is responsible for manpower planning, recruitment, training and transfer of personnel. It is responsible for a range of social programmes for staff, ranging from housing, medical services and meals, to working conditions.

At no time however has it been possible to find the related company objectives spelled out in the context of a personnel policy applicable to SNJ. This report is concerned with productivity and perhaps the most significant concern in this regard is in the area of manpower.

A critical lack of skilled workers exists. Recruitment is not conducted by the company management, but is personally conducted by the Ministry of Industry, albeit on a " requisition " for personnel from the company, however, criteria for selection is not based on experience, aptitude or trade skill, although criminal and health records are scrutinized. This policy is apparently established by government. Any changes to the policy is passed on to the plant management by government and it appears that the policy is designed to meet the social criteria of the government even if this leads to an inefficient situation developing at the factory. Once recruited however, skill and job training is not even given at Jorhar. Workers tdo receive briefings of a general nature on the general goals and objectives of the company these are mainly of a social responsibility nature and take place weekly at a political orientation centre on the estate.

The critical and alarming lack of skills at all levels appears to

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have had its roots in the historical development of the estate. Once privately owned and profitable, it was purchased by the Somali Democratic Republic in May 1970. On this purchase all of the expatriate skilled Artisans, Technicians and Managers left. Efforts to recruit in their place have consistently failed.

As a consequence the estate is entirely in indigenous Somalian hands. Unfortunately these personnel lack many skills and experience and so the problem grows.

Management today has expressed a qualified view (may be a hope !) that suitable staff could be attracted if the salary and amenities were much improved but point out their inability to make such adjustments to their personnel policy. In the meantime the deterioration in Plant, Equipment and resources continues to exacerbate the decline of the enterprise.

APPENDIX - 1

1. PROPOSED WORK PROGRAMME FOR THE INTERIM MANAGEMENT TEAM

Introduction

It is proposed that an interim management team be installed for a two year period. The work will be carried out by a team who will manage the daily operations with Somalian counterparts. In addition the team will carry responsibilities for planning the 5 year (1985-1990) rehabilitation programme.

The Management team

It is difficult to define the exact work programmefor this group. but from our review the following team will be probably be required. It is intended that one member of the team will act as the general manager of Jowhar.

It is envisaged that a work team of six will be required for this with their responsibilities defined below :-

1. General Manager and Team Leader.

- General co-ordination of all work and the conceptual control;
- Policy decisions ;
- Administrative and financial cost control;

2. Factory Engineer

- Proposing and implementing where possible improvements to factory operations;
- Assessment of factory manpower needs;
- Assessment of factory equipment requirements;
- Assessment of factory maintenance requirements;
- Detailed study of power generation at the factory.

3. Sugar Cane Agronomist

- Assess the yield potential of the estate to determine the possible cane production;
- Review and propose and implement improvements to land preparation and cultivation methods ;

/...

- Review and propose and implement improvements to current cane research programmes and field trails at the estate ;

- Recommend changes in cane varieties and in means of increasing the number of varieties under test.

Study the disease incidence on the estate and recommend suitable phytosanitary measures.

4. Agricultural and transportation engineer.

- Review, propose and implement where possible improvements in land forming, preparation and cultivation practices ;

- Review, propose and implement where possible improvements to present cane harvesting and transport systems ;

- Review, propose and implement where possible improvements to machinery maintenance, and maintenance manpower training ;

- Review machinery and equipment requirements of both field and workshop, and workshop facilities and make changes where necessary.

5. Process Technologist.

- Review, propose and implement where possible improvements to present factories process operations.

6. Financial Analyst / Economist

- Co-ordinating the preparation of capital and operating cost estimates for the implementation of the proposed rehabilitation programme;

- Identifying foreign and local currency requirements ;

- Preparing the economic and financial appraisals of the rehabilitation proposals, including cash flows and estimates of return on investment.

- Assessing until costs of cane and sugar production, with and without the rehabilitation project.

2. SCOPE OF THE CONSULTANT'S WORK

2.1. Factory Plant and Equipment

Examine in detail all processes currently used at the factory and carry out the following :

2.1.1. Existing Factory Plant Rehabilitation.

1. To verify and, if necessary, expand the factory equipment lists.

/...

2. Prepare layout drawings and flow diagrams where applicable for the existing process.

3. Verify the condition of all plant and establish what rehabilitation work is required.

4. Prepare material, steam and fuel balances for the existing processes.

5. Verify the existing plant capacities for rated throughputs and recommend changes where applicable.

6. Prepare outline specifications for all replacement equipment.

7. All Project components for this item will be prepared and will include man-power, equipment and other needs, and detailed estimates of capital and operating costs. Appropriate schedules will be compiled.

2.1.2. Factory Process Changes.

Recommend changes to processes where these would assist in the following :-

(a) improving factory efficiency ;

(b) Improving reliability ;

(c) reducing down time ;

(d) reducing operating costs ;

(e) improving sugar quality ;

(f) increasing capacity (as applicable).

2.1.3. Factory Maintenance and Records.

Examine Factory records, spare parts ordering and maintenance systems and recommend changes where it is felt these would benefit the smooth running of the factory. In particular, improved plant records systems should be given close attention.

2.1.4 Factory Workshops

1. Examine the present function of the factory workshops and recommend and implement changes where applicable :-to :-

(a) Increase the output of locally manufactured spare parts for the factory and equipment to reduce dependance on overseas supplies of Spare parts.

/...

(b) improve operational efficiency ;

2. Examine the viability of a central workshop to carry out work which is too large for the existing workshops of the four production units.

2.1.5. Factory Organisation and Training

Examine the present factory staff structure and manpower availability and advise on the following:-

(a) any desirable changes to the tstructure ;

(b) training short comings and requirements ;

(c) manpower requirements and availability.

Prepare a plan of implementation which will include man-power, equipment and other needs, and detailed estimates of capital and operating costs.

(d) Prepare an annual factory budget and a five year forecast.

2.1.6 Electric Power Generation.

Examine in detail the possibilities of power generaation at the factory and establish the economics and feasibility. All project components for this item should be prepared and include man-power, equipment and other needs, and detailed estimates of capital and operating costs. Appropriate schedules to be compiled.

2.2. Agriculture, Irrigation and Drainage.

2.2.1. Irrigation and Drainage.

Examine the irrigation practices currently in operation paying particular attention to the water requirements of cane, the supply of irrigation water and the in-field water application methods. In conjunction with the agriculturalist, drying off procedures prior to harvesting should be studied and proposals as to how the efficiency of in-field water distribution may be improved at each production unit should be made. All project components for this item should be prepared and include manpower, equipment and other needs, and detailed estimates of capital and operating costs. Appropriate schedules should be compiled.

/...

2.2.2. Cane Harvesting and Transport.

All operations concerned in the harvesting and transport of cane should be examined. They should include burning, cutting, loading, and transport. With the objective of securing the factory's daily cane supply requirements. They should also propose the most efficient methods of cutting and transporting cane.

All project components for this item should be prepared and include man-power, equipment and other needs, and detailed estimates of capital and operating costs.

2.2.3. Cultural Practices.

The management team's agronomist should examine the methods currently in operation for uprooting, land preparation, planting, fertilization, weed control and ratoon-maintenance. He should give particular attention to the need for more effective land preparation methods and for ridge and furrow formation to assist in more efficient infield water distribution.

Cane yields should be further examined together with current rotation systems. Future cane yields estimated, and future cane supply be predicted. In this way, and in the light of each factory's design capacity, the requirements for further land may be assessed.

2.2.4. Agricultural Workshops and Equipment Maintenance.

The Engineers will examine the operation of the Agricultural workshops and the facilities available both in terms of buildings and of equipment.

Accurate inventories should be taken of all agricultural machinery and equipment identifying those items in working order, those awaiting spare parts and those which should be scrapped. Inventories should also be taken of all the available workshop's equipment and tools. The engineers should determine the agricultural machinery and equipment required commensurate with their design capacities.

There should be a review of existing storage facilities and make recommendations for extension and renovation where justified.

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2.3 Infrastructure and Civil Engineering

2.3.1. Civil Engineering

The team should review or have reviewed the resources and capabilities of the civil engineering services at Jouhar and prepare proposals for the strengthening of these services as required to meet the targets of the rehabilitation programme. Existing designs and construction techniques used for estate buildings and other structures should be reviewed and alternatives proposed where these would be more cost effective.

2.3.2. Estate Infrastructure.

The team should assess the existing estate infrastructure, including office accommodation, stores, road network, electrical distribution, water supply and drainage, sanitation and communications. Recommendations should be made for maintenance, for modifications to existing infrastructure and for new infrastructure, required in view of the rehabilitation programme, production plans and proposed manning levels.

2.3.3. Social infrastructure.

The management team will review existing social facilities and services on the estate, and will determine the responsibilities of the estate, and Government agencies, for the provision of facilities. They should prepare, plans, stating priorities, for the improvement in facilities necessary for the efficient operation of the estate and required in order to attract and keep the employees needed by the estate. They should review alternative ways of providing the necessary services.

2.4 The 1985-1990 Project Economic Analysis

The team should prepare cost estimates in terms of foreign exchange and local currency, for the proposed five year rehabilitation programme to a level of detail and accuracy acceptable to international lending agencies. Estimates should also be made of future operating costs clearly indicating the incremental operating costs of the Project.

A detailed analysis will be required of the unit costs of cane

/...

and sugar production with, and without, the proposed rehabilitation Project.

The financial rate of return both incremental and absolute of the rehabilitation project should be estimated, in constant price terms, with sensitivity analysis for alternative ex-factory sugar prices and input costs. Sample accounts should be prepared, allowing for expected inflation, and taking account of the proposed capital structure of the company, and the likely terms of new investment under thepphase 2 rehabilitation programme.

The Management, team will be expected to estimate the net annual foreign exchange savings expected to result from the proposed rehabilitation project and to bring these findings together in a suitable planning document.

3.0. Not limiting the generality of the above the team will be expected to " Manage and Control " the day to day operations of SSSI Sugar estate at Jouhar. It is anticipated that the reporting responsibilities for the expatriate general manager will be as enjoyed by the incumbent general manager, namely directly and soley reporting to the Minister of Industry.

Other team members will report directly and soley to the new General Manager.

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7.2. KISMAYO MEAT FACTORY

Late in the assignment the Author was required to review the handicaps to re-opening a major meat processing facility at Kismayo Somalia.

The following section is a record of the findings.

CIVIL WORKS

All Buildings were found to be in sound overall condition.
There was no obvious signs of structural deterioration.

No obvious signs of floor movement or heave.
Some Sections of the Kill Floor, and adjacent process areas require maintenance.
All paint work has deteriorated
Drainage could not be checked as factory was not operating.
A number of gates on the 1000 head of cattle holdings pens are missing.
Grounds appear in good condition. Layout open and spacious.
The Factory buildings are about 14 years old having been built in 1969 as a USSR Bi-lateral Aid Project.

PLANT ASPECTS

Integrated meat handling facility containing Slaughtering, butchering, canning and by-products.

Kill Floor Capacity

Kill floor. 31 head / operating hour
Cooling Chambers -- fair condition and appropriately sized.

Condition

Some insulation requires replacing.
Kill floor equipment
Overhead convey system. Manual in reasonable condition.

Freezing Plant

NH3 Blast freezer. Rated operating temperature of - 30°C. Capacity 37 tons product / operating hour up to 8 hours continuous production to a maximum of 300 tons in an 8 hour period /...

Canning line

This line is obsolete has essential parts missing and cannot operate at capacity. Production management report rated capacity of 7500 x 250 g cans per running hour. Equivalent production 1.88 tons canned meat per operating hour.
Management state that because of the age and poor condition of the Cannery Canning Performance seldom exceeds 1200 cans per hour. Equivilent production 0.33 tons canned meat per operating hour. Design capacity rated approximately 15 tons of product per shift. (8 hours)

Retorts

The 8 retorts are in very poor state of repair and a great deal of insulation needs replacing. From their appearance it is unlikely that adequate retorting performance can be achieved. This was later verified in conversion with the Technical Manager who said it is usual for as much as 30 % of the finished production to be rejected because of unacceptable levels of bacteria.

Can Making

The factory is equipped with can manufacturing for the production of cans and lids from imported plate.

Body making rated at 150 / min.
Lid making rated at 300 / min.
Seam welding - electric heat.

The Can making line is obsolete. Management report spares are unavailable and the line has not operated for some time. The efficiency of the electric seam welding device is suspected.

Finished Goods Store

Capacity 2,000,000 cans.
condition - fair.

/...

Maintenance Shops

Carpenters - Acceptable.

Machine - Acceptable.

2 Lathes.

1 Grinding M.C.

1 Vertical Drill

1 Welding bay

Electric Welding Plant.

The cutting tools were ruined and need complete replacement.

Power House

3 K 65 USSR Diesel Engines.

600 BHP at the rate of 375 r.p.m.

400 KV Manufactured 1964

These engines are in very poor condition. The engineer reports that suitable spares can no longer be obtained. He has recommended their immediate replacement in a report to the Ministry of Industry.

Boiler House

3 USSR Steam boilers Oil fired installed in 1969.

Rated at 2.5 tons steam/hour each.

Engineer reports boilers are extremely inefficient. Losses are huge and spares parts are no longer available.

Cooking Water

All 3 Pumps require Spares which are unavailable.

Refrigeration Plant

Comprizing USSR Compressors :-

4 x 1 stage 2 cyl reciprocating

rated 100,000 K/cal hour

1 x 2 Stage 4 Cyl reciprocating rated 200,000 K/cal/ hour

1.2 Stage V twin reciprocating

Refrigerat. NH3

All compressors are obsolete.

All in need of maintenance, but spares are no longer available.

Excessive NH3 consumption is reported and some evidence of leaking pipework flanges and in situ. valve leak was noted and reported.

Cooking Water Large separate 4 Vent Cooking facility was reported to be in serious need of replacement.

General Conclusions

Note: <u>These conclusions concern the engineering aspects only and do not consider the economic viability of the business.</u>

The facility is a 14 year old factory designed solely for the canning of Meat. There is an integrated kill floor accepting 31 live cattle per hour for a maximum kill capacity of 300 T per shift.

The plant is no longe suitable as an operating cannery and both can manufacture and product canning are defunct.

Refrigeration plant, steam plant and electrical generation equipment requires replacing. Electrical wiring and factory services also require a careful and systematic overhaul. From an engineering view point the plant is suitable for the killing, butchering and chilling and freezing of carcass meat only. Even this will require significant expenditure on the services. However

7.3. UREA PRODUCTION FACILITY

A review of the situation facing this Project as at May 1983.

INTRODUCTION

In April 1983, the Minister of Industry His Excellency Major General Abdalla Mohammed Fadel requested that the UNIDO Project to Strengthen the Ministry of Industry (DP/SOM/81/013) review a number of important enterprises in the public sector.

The objectives of these reviews were:

- To appraise their present situation
- To identify significant problems
- To indicate initiatives that may alleviate such problems
- To present the findings in a report

This report reviews the Urea Project - Warshadda Bacrinta, a chemical fertilizer manufacturing plant presently under construction at Gezira, adjacent to the oil refinery.

This report contains two main parts namely, a review of the Technical aspects and the economic outlook. Conclusions are drawn and recommendations made.

OBJECTIVES

This review has as its main objective to describe the situation existing at the project in May, 1983. It compares the actual situation with the planned one, identifies possible variances, and highlights problems.

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4 CONCLUSIONS and RECOMMENDATION

4.1 CONCLUSIONS

1. The project is not economically feasible with present known costs
2. This process is technically unusual
3. The training programme achievement is inadequate
4. The construction phase has been fairly satisfactory
5. The mechanical completion is behind schedule, and some ommissions require rectifying (refer note).
6. The 500 Ton test run, and the 48 hour period for the guarantee run, may be inadequate for the accumulation of sound data for decision making
7. There is an immediate need to finalize and fund the technical assistance agreement
8. To guarantee adequate performance test runs be carried out on the mechanical plant, the consultant of the Somali Government should check and certify Mechanical Completion Certificates demanded by the project contractor. Performance test runs should show:
   - all columns, vessels, pumps, heat exchangers, boilers, reactors, piping and other mechanical equipment have been installed, cleaned and flushed out in conformity with flow schemes, construction drawings, project specifications and manufacturer's recommendations.
   - all instruments, control valves, differential pressure devices, interlocks, programmers and other instrumentation are correctly installed and functioning and that adjustments have been made;
   - all electrical supplies have been installed and protected as prescribed; that motors have the correct voltage supply, and speed, horse-power and direction of rotation and are free to turn without obstruction;
   - all relief devices, valves and bursting discs are correctly installed for the safe functioning of the respective plant;
   - all effluent handling facilities, flares and incinerators can accept effluent.
   - all ventilation systems and other systems for the protection of the operators and the environment are available and functioning;
   - all safety facilities, fire-fighting, first aid, etc. are adequate.

Footnote: during our survey, we noticed some confusion and disagreement on mechanical completion between TPL, Ammonia Casale, and the Somali technicians. It appears that the project contract on this point is insufficient and somewhat vague in its technical description.

4.2 RECOMMENDATION

Our analysis has revealed the fundamental problem, that for the foreseeable future the plant will be uneconomic. The preparation of Somalian technician and managers is recognized to be inadequate, and there is a pressing need for a Technical Assistance agreement. We therefore recommend that His Excellency The Minister bring these matters to the attention of the appropriate authorities.

5 TECHNICAL FACTORS

5.1 Project Description/Project Capital Budget

In July 1975, the "N REN" corporation, an American based company, presented to the Somali Development Bank (SDB) a proposal for the establishment of an ammonia - urea production plant based on naphta as feedstock. The proposal was rejected by SDB on basis of recommendations made by UNIDO project SOM/72/007, who concluded that the project was not viable. Similar advice was given to SDB by Mr. F. Sheldrick, Head of Fertilizers Department, World Bank. In December 1978, a prefeasibility study on a similar plant, using Heavy Fuel oil as feedstock, was submitted to the State Planning Commission by "Snamprogetti", an Italian based company. The study was evaluated by DTCD project SOM/78/008, and again the project was declared non-viable.

In February 1979, the "Protec" group of Italy carried out a feasibility study on the urea project for the "Ministry of Industry". Protec concluded, "The economical analysis of the project indicates that, when considering as cost factors the usual market values, the profitability is not verified, and so far the project is not feasible".

UNIDO Project 72/007 evaluated the feasibility study prepared by "Protec" in February 1979, again a conclusion was reached supporting the view of the non-viability of the urea project. "Technipetrol" (TPL) of Italy submitted on June 21, 1979, a commercial and financial proposal for an ammonia-urea plant with a daily production of 150MT/Day of urea, using Heavy Naphta as feedstock. The "Ministry of Industry" issued on July 3, 1979 a letter of intent to TPL, confirming its intention to assign TPL the contract on a turn-key basis, TPL however then submitted a revised proposal, dated August 10, 1979 for the construction of a urea plant.

This revised proposal was evaluated by SOM/72/007, who reiterated their evaluation, that the project was not viable. Attention was also drawn to the fact that in view of the letter of intent, TPL was entitled to charge the ministry with all costs borne by TPL in case the contract was not concluded. The "Ministry of Industry" however issued another letter of intent on September 8 1979, in which the ministry authorised TPL to start as soon as possible on the execution of the final design of the plant. This letter of intent was subject to final approval by Somali and Italian authorities.

Much could be said regarding the financial and technical background to this project but as we have to make this review on a "status quo" basis, we only look at the present situation and evaluate the plant and its economics as it stands.

The present total cost of the plant is US $70 millions. A further cost of US $6.5 millions is proposed by the TPL as being necessary to finance a "Technical Assistance Agreement" between TPL and the Somali Government. This important agreement has still not been financed. It was anticipated initially that the Italian Government would finance the agreement, but this arrangement has since been rejected. A similar approach to EEC was also recently rejected. At May 13th, 1983, TPL is continuing to press the Italian Government for financial aid to this T/A agreement. The capital asset and construction, with the total investment of US $70 millions, is financed as follows:

a) US $10.5M - Italian Govt. - 9 years - 4% interest rate
b) US $59.5M - Bank loans - 9 years - 7.75% interest rate

It is understood that the Italian Government's insurance authorities has committed to paying the interest rates of the bank loans mentioned in b) should the Somali Government not be able to fulfill this obligation. It has not been possible to get detail on this matter, nor has it been possible to verify it by reviewing official documents.

5.2 General/Process Description

The use of heavy fuel oil as feedstock dictates that a partial oxidation process be used for the preparation of syngas. For the integrated process TPL have indicated that the following Licensors have been selected for the processes involved in the subject plant.

TEXACO	- Partial oxidation and carbon removal
ALLIED CHEMICAL	- H_2S and CO_2 removal, CO_2 recovery
HALDOR TOPSOE	- Ammonia Synthesis
SNAMPROGETTI	- Urea Synthesis

Ammonia Production:

The preheated fuel is gasified at about 1400°C with an oxygen - vapour mixture. Said oxygen is obtained in an air fractionation section of traditional type. The gas produced is cooled down to 230°C and the soot is recovered in the slurry treatment section. The gas, free of soot, is sent to the CO conversion section where more hydrogen is produced. In the desulphurization section, sulphur compounds, essentially H_2S are removed from the raw gas and in the decarbonation section, bulk removal of CO_2 is taking place by means of selexol solvent. After the decarbonation section, the raw gas is mixed with nitrogen from the air seperation section, i.e. a hydrogen to nitrogen ratio suitable for ammonia synthesis. The final purification of the syngas is performed in the methanation section, where CO and CO_2 slipped respectively from conversion and decarbonation sections are converted into methane that is harmless to the synthesis catalyst.

Shift conversion, CO_2 recovery and methanation:

The raw gas leaving the partial oxydation and carbon removal section must be treated to reduce the CO content. To this purpose it is sent to the shift conversion section where CO reacts with steam producing CO_2 and hydrogen, according to the reaction

$$H_2O + CO \rightleftharpoons H_2 + CO_2$$

As the raw gas leaving the partial oxidation contains sulphurized compounds, it is necessary to use a special catalyst being sulphur resistant. The Ssk type of catalyst of H. TOPSOE Co. has been selected for this purpose. The CO_2 is sent to the urea production unit.

Urea Synthesis:

Urea is produced by synthesis from liquid ammonia and gaseous carbon dioxide.
The reactions are as follows:

$$2NH_3 + CO_2 \rightleftharpoons NH_2\ COONH_4$$

$$NH_2\ COONH_4 \rightleftharpoons NH_2\ CONH_2 + H_2O$$

As it is necessary, in order to prill urea, to concentrate the urea solution up to 99.6% wt, a vacuum concentration section in two stages is provided. The above described process is extremely simplified, and it is intended only to provide the reader with an over view of urea/ammonia production by the process intended for the Gezira facility.

other important systems employed at the plant are:

a) Fuel oil feedstock, naphta, fuel gas and diesel oil systems
b) Waste water treatment system
c) Blow down systems
d) Inert gas system
e) Instrument and service air system
f) Steam and condensate recovery system
g) Condensate system
h) Fire fighting system
i) Demineralization system
j) Raw, industrial and drinking water system
k) Cooling water system
l) Reclaiming and bagging system
m) Flushing network
n) Steam network
o) Electric power generating system/public supply system.

It must be realized, that the urea plant involves complicated mechanical/chemical engineering features, even more so than usual because of the process chosen for the ammonia production. It is therefore absolutely essential that a solution is quickly found for the financial problems facing financing of the technical assistance agreement, for the Somali Government will not, with its problems of obtaining skilled manpower of medium/high level, be able to run the plant for some years. Information from TPL and the consultants Ammonia Casale Ltd. point to the serious problem of failure to attract good personnel. They stated that it is even extremely difficult to attract good, unskilled, local persons. Further enquiring into this problem revealed a view held by both the involved expatriates and Somalian plant personnel that the lack of housing, transportation, food and recreation facilities, at the site makes it difficult to recruit the better people. Fundamental to this problem is the widespread feeling that the low levels of remuneration, especially noticeable when international comparisons are made, has led to a lack of interest by people in going to work in the chemical processing complex.

5.3 PLANNED PRODUCTION INPUTS - OUTPUTS

5.3.1 Proposals Received

Three different proposals have been submitted for the production of urea employing various feedstock. They are as follows:

1. "N REN" corporation proposal of U.S.A. with Naphta at a price of US dollars 85 per ton and total investment of US dollars 48 millions and a capacity of 90.000 tons of urea per annum.

2. Snamprogetti proposal of Italy with Heavy Fuel Naphta as feedstock at a price of US dollars 10 per ton and capital investment of US dollars 41.5 millions and capacity of 50.000 tons urea per annum, using partial oxidation process for production of Syngas for Ammonia manufacturing and Integrated Snamprogetti process for the synthesis of urea.

3. Technipetrol (TPL) proposal of Italy with Heavy Naphta at 120 US$/ton and investment of US dollars of 38.5 millions (excluding interest, financial charges and working capital) employing steam reforming of heavy naphta for syngas and traditional two plant system with one plant for ammonia and the other for urea production.

5.3.2 Proposal Seclected

TPL submitted a revised commercial and financial proposal together with a technical attachment, profitability analysis and a draft contract in response to the letter of the Ministry of National Planning which informed that heavy fuel oil is the only feedstock available.

The total price of the proposal was US $58.8 millions plus a provisional sum of US $8 millions to cover extra works, services and price escalation.
The process proposed for syngas is partial oxidation of heavy fuel oil, and for urea synthesis the "snamprogetti process". The price of heavy fuel oil assumed in the profitability analysis was US $110 per ton with the sale price of urea at US $280 per ton.

The "TPL" revised proposal, technical attachments and profitability analysis were studied and reports, comments and observations regarding viability presented to the Ministry at that time. Afterwards, a letter of intent was released to "TPL" to start, as soon as possible, the execution of the design of the plant based on TPL's revised proposal.

5.3.3 Inputs

It was assumed in the contract that at factory battery limits the following would be available:

- Fuel oil (as process feedstock and fuel)
- Fuel gas
- Heavy naphta
- Diesel oil (for electric energy)
- Raw water from local deep wells network
- Chemicals
- Bags (polythylene or polypropylene)

On the basis of the specification of raw materials and utilities available at the plant's battery limit, the plant is designed to consume the following inputs:

Expected figures

	Total consumption	Specific consumption (Unit/tons of urea)
- Fuel oil (as process)	Tons/h 2.965	Tons 0.474
- Fuel oil (as fuel)	Tons/h 2.12	Tons 0.339
- Raw water	m^3/h 70	m^3 11.2
- Electric power	Kw 2695	Kwh 431.2

Guaranteed figures (will not exceed)

- Fuel oil (as process)	Tons/h 3.146	Tons 0.503
- Fuel oil (as fuel)	Tons/h 2.378	Tons 0.380
- Raw water	m^3/h 86	m^3 13.76
- Electric power	Kw 3025	Kwh 484

Water treatment section

H_2SO_4	kg 1215
Na OH	kg 660
Chlorine	kg 105
Corrosion inhibitor	kg 150

Note: all chemicals are to be imported.
The overall consumption of chemicals per operating day will be the following:

- Process unit

Selexol	kg 135
Heavy naphta	kg 240

- Thermal power plant

Hydrozine	kg 0.9
Trisodium phosphate	kg 3

5.3.4 Output

The design of the plant is advised as being suitable to obtain the production of prilled urea not less than 150 MTPD with the following characteristics:

Expected figures (% wt)

- total nitrogen	46.3 min.
- content of water	0.3 max.
- content of biuret	0.8 max.
- granulatory	

Guaranteed figures (% wt)

- total nitrogen	46.3 min.
- content of water	0.3 max.
- content of biuret	0.9 max.
- granulatory 1-2.4mm	94% wt

5.5 PLANNED MECHANICAL COMPLETION AND CONSTRUCTION SCHEDULE

As orally reported by project coordinator on 12th May, 1983, and checked by us, nine units have been mechanically completed. However, omission of some minor items still exists, therefore, the Mechanical Completion Certificate has been issued but with the incomplete minor works noted so as to not prevent the precommissioning. This is not considered prejudical to the granting of Mechanical Completion Certificate.

Mechanical completion of the following main activities have been completed:

a) Boiler
- Completed mechanical erection of all parts including refractory
- Performed hydraulic test of Boiler Drums and Tubes
- Manufacturers hydraulic test certificates have not been produced by TPL at this date

b) Reactors, Vessels, Towers, Exchangers
- Installation of equipment, internal and structurals have been completed
- Performed hydraulic and/or water filling test.

c) Pumps

- Settled and aligned pumps and drives
- Piping connections made
- Some modifications are required and will be made by TPL during precommissioning

d) Compressors

- Installed, aligned and levelled compressors, gears and drives
- Checked alignment and leveling of the machines
- Installed all necessary auxiliary items for tube, pumps, pipes, etc.
- Cold alignment of compressors, gears and drives

e) Turbines

- Installed and cold aligned turbine and associated piping
- Installed all necessary auxiliary items for tube and sealing, pumps, pipes, etc.

f) Piping

- Completed erection of lines including all supports and removed all temporary supports required for hydraulic test
- Hydraulic test of piping as required

g) Electrical

- Installed and connected all electrical equipments (motors, switchgears, transformers, panels, etc.)

h) Instrumentation

- Hydraulic test of instrument primary hook-up's
- Erected completely field instruments with relevant secondary hook-up's, pneumatic and electrical connection
- Erected control room panel and instruments with relevant connection
- Checked cables and pneumatic tubes for correct installation and connections

This work is incomplete at this date.

i) Insulation and painting

- Insulation on equipment as required on drawings and insulation on piping as required on drawings is not yet complete.

This work is proceeding.

As seen by us, and declared by the Project Coordinator, erection has been generally out in accordance with TPL and Licensor's drawings and specifications, and does not detract from TPL's responsibilities for mechanical and performance guarantees. However some deviation from the design drawings exists. These have been noted and reported by Ammonia Casale (consultants) and by the project coordinators. These have been brought to the attention of the contractor (TPL Spa) all modification and changes are required to be made in observance of the contract by August 31st, 1983. The senior Somali Engineer on site, Eng. Dahir Warsame Elmi, has detailed knowledge of these ommissions and should be consulted for further information.

5.6 DESCRIPTION OF TEST-RUN ACCEPTANCE

Soon after the mechanical completion of a unit has been certified, the relevant precommissioning operations are required to be started under the supervision of the contractor's supervisory team. Feedstocks and utilities must be made available by the Factory Representatives in quantity as required to carry out the precommissioning operations.

Once the precommissioning of a unit has been satisfactorily completed, the unit will be started up and put into operation. Feedstocks and imported utilities must be made available in order to ensure an adequate and uninterrupted supply to the plant. As soon as the plant has produced 500 tons of urea, the certificate will be issued for the production commencement. Soon after the production starting date, the plant shall be brought to its full capacity and shall be runing continuously at the normal operating conditions so that the test-run can be performed. Raw materials for this first charge are to be provided by TPL Spa. When Feedstocks and imported utilities are available to ensure an adequate and uninterrupted supply to the plant and satisfactory operation at full capacity has been achieved, TPL shall give written instructions to Factory Representatives to perform the test-run in accordance with a procedure prepared by TPL and approved by Factory Representative (Somali side).
The contract calls for the duration of the guarantee test-run to be of 48 hours of on-stream operation. The measured figures that shall be taken into account for comparision with the guarantees, shall be the average values. Reproducibility and and repeatability tolerances of test methods will be issued in TPL's favour.

These gurantees are specified in the contract between TPL Spa and Ministry of National Planning of S.D.R. dated 27.9.80, Article 10.

We would however point out that in our opinion the 500 ton test run and the 48 hours guarantee run is not adequate for test purposes. A longer period in these phasis is recommended before acceptance.

5.7 TRAINING ASPECTS

The implementation of such a highly complex and technically advanced petro-chemical engineering facility requires careful preparation and intensive training of local staff to enable them to assume in due course the responsibility for its management and operation.

This was recognized and the basis of the programme to "Somalize" the operation is contained in the present contract existing between TechniPetrol Ltd. and The Somali Democratic Republic. The commitments of the contract are described in section 11.0. Attachment #1 Technical Attachment to the contract dated 27.9.80, entitled contract between Ministry of National Planning of the Somali Democratic Republic and Techni-Petrol S.p.a.

This contract obligates TPL Spa to provide the management of training and to provide technical assistance to the owner for the solution of all training aspects and problems.

Under section 11.1. TPL is required to:
- Define and agree manning levels
- Determine the qualification and experience of personnel required
- Prepare the organization of functions
- Prepare appropriate job descriptions
- Jointly with the owner define the key positions

Under section 11.1.b. The TPL Spa is obligated to:
- Establish and execute the training programmes for operating personnel
- Provide the theoretical training in each speciality
- Provide the Industrial or advanced training
- Provide the on-site practical training component - to be held during the last two months before start-up

Under section 11.1.c. The TPL Spa is obligated to:
- Coordinate the overall training provided by vendors and process lincensors

Under section 11.1.d. The Spa is obligated to:
- Indicate to the owner final utilization of trainees at the plant on completion of their training

Under section 11.2 The main objectives of the training are listed as:

- Technical and Professional training of plant personnel
- The acquaintance of trained personnel with their duties
- Make trained personnel self sufficient so as to be able to operate and maintain the plant
- Coordinate the overall training programmes provided by vendors and process licensors

Under section 11.3 The training programme is specified in 3 main phases

1. Theoretical training
2. Practical, in operating plant and vendor shops
3. Practical, on the site

Under section 11.4 The education level of each trainer and training course content shall be defined by the contractor at least 6 months before the start of the training.
The training will be provided in one single session for 45 people for 6 continuous months

The training contract places the following obligation on Somalia.

1. Provision of trainees
2. All trainees to have sufficient knowledge of the English and Italian languages and shall be competent Technical college/university graduates
3. Appoint 2 persons as Trainees Leader and Assistant. Trainees leader responsible for the behaviour of their trainees
4. The Somalian trainees will study deeply the operating manuals and mechanical catalogues of the plant
5. Lodging and administrative arrangements for the trainees
6. Bear the expenses of replacing trainees considered unsatisfactory by the contractor.

The actual situation existing with training has many omissions from the original agreed training programme described previously.

We summarize these as follows:

1. 45 trainees are required, but only 26 are receiving training
2. The Trainees Leader and Assistant have not been appointed
3. The training period of 6 continuous months has not been observed
4. The practical training aspect took place in an Italian plant of a different configuration and process from this one.

5. The on-job training aspects appear poor

6. In the opinion of the coordinator, and supported by us we believe the quality and depth of training to be inadequate. This is also the view of the Italian consultants "Ammonia Casale Spa"

The net result of the rather poor training phase will be the need for a long and expensive period of technical assistance and management.

It must be recognized that this complex technical process is unique in Somalia. Infact this particular combination of the licensors process linked in this way is rare anywhere in the world. At this design capacity it may even be unique. The effect of this pioneering of course indicates that even TPL Spa are learning. The rather weak training effort supports this view. Whatever the cause, we strongly recommend that the training and Somalization programme be thoroughly and immediately reviewed by competent specialists. It is likely that the training component will need to be greatly expanded and emphasized.

6. ECONOMIC FACTORS

6.1 Domestic Market

There exists various estimates of Domestic Demand of Urea. The most recent statistics published in "Foreign Trade Returns", Central Statistics Department are available for 1980. It indicates that imports of crude fertilizers and crude material in Somalia were 2154 tons in 1980 and 1262 tons in 1979. However, these figures appear to be rather low compared with information obtained from other sources. The urea presently used as fertilizer in Somalia is imported. Because at present it is used mainly for the following crops: Banana, sugarcane and cotton, the consumption may be estimated, taking into account the cultivated areas and the rate of fertilizer use (kg per ha). It was estimated that in 1976, 7500 tons of urea were consumed in Somalia, out of which 500 tons were for cotton, 2000 tons for sugarcane and 5000 tons for bananas. In 1980, 10,000 tons were consumed, out of which 500 tons was for cotton, 4500 tons for sugarcane and 5000 tons for bananas. The figures for 1983 are not yet available. However, the Juba Sugar Project imported 2920 tons of urea in 1983, and the annual need at full production is estimated as 1700 tons of urea for this project. It would therefore seem reasonable to expect Somalia's domestic market to consume about 10,000 metric tons per annum over the next 2 or 3 years.

The installed technical capacity of the urea plant is 45000 tons per year. This largely exceeds the present domestic market needs so the balance of urea can only be exported provided that the cost of production allows for a price competitive in the international market.

There has been some discussion concerning placing the balance on the world market, and TPL Spa have given a commitment to Somalia to undertake this sales effort guaranteeing to market it in total on the basis of prevailing world market prices. There is proposed mechanism by which Somalia and TPL Spa would meet to establish an agreed price every 4 months, this price would be the 4 monthly future's price. No mention is made of a method by which to deal with differences which may occur between the cost of production and prevailing world market prices.

6.2 International Market Trends

While Western European Urea prices in February remained at the levels of the previous month, Near East export prices declined further in February indicating the current weakness of the export market for this product. The limited trade in urea in the first half of March 1983, may have also been influenced by the decline in oil prices. However, the fall in oil prices will not necessarily result in lower fertilizer prices since the production of most of the world's ammonia, the feedstock for the production of most nitrogenous fertilizer is based on natural gas.

Japan and the Republic of Korea use naphta in the production of ammonia. However, because of the relatively high price of naphta, manufacturers have been closing ammonia and urea plants. Thus, even if the price of naphta falls as much as that of oil, ammonia producers who use naphta would still find it difficult to compete with those who produce ammonia from natural gas.

The attached table shows the f.o.b. prices of urea (bagged)[1]. The average price is US $150 - 155 for Western Europe Urea, and US $130 - 150 for Near East Urea. It demonstrated a decrease of more than 15% relatively to the price of the previous year. The trend is downward.

1. Source: Food Outlook 29 March, 1983. FAO

6.3 ECONOMIC ANALYSIS OF PRODUCTION COSTS, UREA PLANT 1984 ESTIMATE

	Quantity	Unit price US$	Production cost in US$	Production cost in So.Sh
1. Fuel oil (Feedstock)	21982 t	289 $	6 352 798	
2. Fuel oil (fuel)	16177 t	289 $	4 675 153	
3. Fuel gas L.P.G	211 t	202 $	42 622	
4. Naphta	600 t	344 $	206 400	
5. Water (cooling)				
6. Chemicals			242 400	
7. Chemicals (locally provided)				189 000
8. Catalyst			240 740	
9. Bags	900 000 p		660 000	
10. Administrative cost				
11. Electricity	25×10^6 kwh	2 So.Sh.		50 000 000
12. Technical assist. expatriate			3 250 000	
13. Wages and salaries				15 431 415
14. Maintenance			100 000	
15. Depreciation			5 000 000	
16. Interest			5 020 000	
17. Taxation			-	
18. Fees			-	
Sub total Foreign exch. cost			$ 25 790 113	
Sub total Local cost				65 620 415 So.Sh.
			$ 4 374 694	
TOTAL			$ 30 164 807	

Data Source: Fuel and Feedstock Prices - Somalia National Petroleum Agency May 1983
Other Cost - General Manager

6.4 COMPARISON OF PRODUCTION COST WITH CIF PRICE OF 1 TON OF UREA (in US $)

PRODUCTION COST (1)	670
of which COST OF FOREIGN EXCHANGE (2)	573(2)
C.I.F. IMPORT PRICE (3)	306
EXCESS COST	364
EXCESS COST (2)-(3)	267

The analysis of production cost shows that the project's foreign exchange cost alone is higher than a price of a comparable imported product. It costs 267 US $ per ton, more in foreign exchange to produce the product locally than to import it.

Because of this excess cost, it is highly improbable to export the balance between the production capacity and the domestic market needs without a substantial loss being incurred. Taking into account the international market trends this situation is not likely to change in the near future.

(2) The cost of foreign exchange should be increased by the opportunity cost of electicity which is produced in Somalia from petroleum products imported: diesel oil and heavy fuel oil.

7 METHODOLOGICAL APPENDIX

The following data were taken into consideration while calculating the production cost:

1) The annual installed technical capacity of the factory = 45000 tons, the full capacity is attainable within one year of production. Start of production: October 1983, this annual capacity is calculated from daily capacity 150 m tons per day with 300 working days in a year.

2) US $ converted to So.Sh at official exchange rate is 1US $ = 15Sh.Sh. Because the data on foreign exchange component in the cost of electricity are presently not available and the cost of other important imports: Fuel oil, Fuel gas and Naphta are given in So.Sh. it was not possible to use economic prices with a shadow exchange rate. Instead an opportunity cost was estimated in US $ for Fuel oil, Fuel gas and Heavy naphta from the figures available in So.Sh.

3) Total capital investment is 70 millions of US $ from which 59.5 millions was a commercial loan with an interest rate of 7.75% and 10.5 million a loan from the Government of Italy with an interest rate of 4%. Thus the annual interest of the first year is 5.02 millions of US $.

4) The depreciation allowance was calculated assuming that the expected plant life is 12 years, and using a uniform depreciation rate: 70:12 = 5.8 millions of US $ the first year. We have however used US $5 millions as the depreciation in 1984 year estimate.

7.4 Coca Cola Production Feasibility Review.

REVIEW

In this section comments are made on the separate sections of the feasibility study approximately in the order of their appearance in that report. Some study estimates and costs have been adjusted in what we believe is more realistic manner in the feasibility study.

Section 1. Introduction and General Summary Section

Our review indicated it lacked detail and in particular the marketing aspects received superficial treatment.

The proposed franchise agreement between Coca Cola Africa Ltd., and the proponents was not available for scrutin. It is recommended that the Ministry of Industry request perusal of this agreement before making any decision affecting approval or rejection of the venture. It is in the analysts opinion a critical document as it affects both technical and market support.

Not being in possession of plant layout, building plans, site plans or elevations no comment is made on these aspects.

The major weakness in the study relates to marketing and a lack of data. It was noted that a sales increase between year 1 and 2 of the project equalled 30 %, and 10 % is called for between years 2 and 3. Such a claim is indeed ambitious. 15 % per annum is more in keeping with sound planning for similar projects.

Even through technical and marketing support is available from Coca-Cola Africa Ltd. the planned 50 % bottling efficiency to be achieved in the first year is extremely questionable. A Profit and loss statement based on achieving 80 % in year 3 is developed herein, with only 50 % achievement of their original first year efficiency being allowed in year 1 estimates.

SUMMARY

There is no reason to doubt the technical claims of the study, however we believe the start up costs, and timing to reach planned production levels, are optimistic.

As such, costs are probably understated. A statement of more likely costs are developed herein and projected for 3 years in a Profit and Loss Statement. The increased costs affect the capitalization, and pay back period, they indicate that a longer period to reach a profitable operating factory is more likely than the promoters presently anticipate.

It is however the marketing aspects of the proposal which give most cause for concern. The claims appear optimistic, unfortunately no data is provided on the market structure, customer buying practices, the percentage of the market held by the competitor, or even the market capture that this company plans.

We are concerned that the marketing strategy as suggested built on under pricing the existing competition, will lead to severe cost competition in a fragile market. Pursuit of this proposed sales strategy could easily lead to reduced operating margins for both plants. Even to a point where the viabilities of both could disappear. We recommend that the Ministry delay approval of this proposed project pending clarification of marketing issues.

We calculate the break even point production of the proposed venture to be 1,055,255 cases, equivalent to 42,927,773 So.Sh. sales revenue at line efficiency of 80 %. We also note that the annual rate of return (net profit after allowance for taxation) on the promoters equity of 23,173,763 So.Sh. is 3.6 % in year 3. The original feasibility study anticipated a return on paid up capital in the third year of the project of 15.6 %.

Whilst we have taken a rather severe approach, based on production manufacturing experience we believe that 15.6% R.O.I. is much too optimistic. We would expect in practise the annual rate of return to fall somewhere near 3.6 % than 15. 6 % depending of course upon the skill and acumen of management.

Section II. Investment

A total investment of 59,300,000 Somali Shs is planned, see (F.4) of study. A 34 % partners equity participation is proposed, whilst

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advances from share holders of 39 % of the capital requirement is noted. Machinery and suppliers credit will make up the balance (27 %). We however calculate that 60.500.000 So.Shs. is a more likely capital requirement (Sec 8 of this report).

We noted that the bottling line and laboratory equipment is based on an exchange rate of 19 So.Shs./U.S. dollar. This we believe is prudent.

Land, buildings and equipment requires a capital budget of 10,300,000 So.Sh.

Investment estimates with the exception of pre-operating expenses, inventories and working funds are not criticized, although it should be noted that no source documentation or working papers were available, and as such discrepancies or poor estimates may be inherent. On the assumption that the time to reach production start-up is too optimistic, and the time to reach 80 % efficiency is under estimated, we believe that the pre-operating expenses, allowances and working funds may be inadequate. These have been re-calculated herein. Of considerable concern is the calculation of the costs of inventories and working funds we believe they were calculated before the July devaluation of the Somali shillings. This should be checked. A clue to this is found in the projected cost of 40 So.Sh per imported plastic crate which seems low.

The proposal that the project will become operational within 12 months from the commencement of site preparation and the letters of credit opened in favour of overseas machinery suppliers, is extremely optimistic, and should also be challenged.

The study states that " practically all raw materials will have to be imported ". The influence of the recent devaluation alone will increase raw material costs per case :-

	Estimate	After devaluation:	Increase
Coca-Cola	22.4	23.9	6.3 %
Fanta	25.4	26.6	4.4 %
Sprite	26.6	24.1	6.1 %

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This indicates for this item alone that selling prices would have to be increased between 5 % and 7 % if the increased costs are to be passed on to the consumer in order that company operating margins are protected. We note provision is being made for the treatment of Somali Sugar.

Section III

The marketing strategy proposed is based on price competition. The soundness of the strategy must be carefully questioned. It causes us concern.

In stronger markets the strategy may be sound, but in the Somali economy, with the difficulty of financing and in developing reserves of funds it could be the undoing of the project, and even of the local existing competitor. It would be ironic if the Government, in its desire to develop the industrial base encourages this project at the expense of the existing bottler, or even of the both enterprises. Caution is therefore advised.

We strongly recommend therefore that the Ministry of Industry review with the entrepreneurs the pricing question and the marketing strategy, before any decision is made regarding approval.

As noted previously the devaluation of the Somali Shillings will add to the araw material cost and a consequence of this will be a new minimum annual cost of raw material of 19,983,456 Somali Sh. in year 1, an increase of 1,121,504 So.Shillings over what was estimated in their study. This cost isit is assumed will be passed on to the consumer if margins are to be maintained. Without detailed market information we cannot estimate what effect this will have on the sales openetration.

Examination of the profitability of the existing bottler may also be revealing in this issue.

Section IV

The estimates for Raw Material costs are questionable in light of the recent currency devaluation. For example :

Raw Material per Case of product (As estimated in the feasibility study):

Raw material cost per case is estimated at :-

Coca-Cola	300 ml	=	22.40 So.Sh/case.
Fanta Orange	300 ml	=	25.46 So.Sh/case
Sprite	300 ml	=	22.66 So.Sh/case

Which is equivalent to 18,861,952 So.Sh. for 800,000 case production level the recent devaluation of the Somali currency could result however in a Raw Material cost per case :-

Raw Material

Coca Cola	300 ml	=	23.89 (+ 6.3 %)
Fanta Orange	300 ml	=	26.62 (+ 4.4 %)
Sprite	300 ml	=	24.12 (+ 6.1 %)

As a consequence the minimum annual cost of raw material in a 800,000 case rproduct year (assuming sugar and C O 2 is local) we estimate to be :-

480,000 cases	Coca Cola	X	23.89 =	11,467,200
240,000 "	Fanta	X	26.62 =	6,388,800
80,000 "	Sprite	X	24.12 =	1,929,600
Total 800,000 Cases		=	Sh.	19,785,600

Provision for internal drinkage & Sampling (1 %) = ~~Sh 197,856~~

NEW ANNUAL COST Sh 19,983,456:

Thus the recent devaluation could increase the cost of raw material by about 1,121,504 So.Sh. (5.6 %). This is if raw materials cost were calculated in the feasibility study at 12.46 So.Sh/ dollar U. . It should be noted that the feasibility study indicates the beverage base and containers will be imported into Somalia. Furthermore start up delays could magnify the influence of a weakened Somali economy. /...

Section V

Plastic Crates.

A replacement allowance of 1 % over 5 years for plastic crates seems unreasonably low. 3 % per annum would be more likely.

Therefore container expenses could be under estimated.

Section VI

Inventory and Working Funds. (Based on our changed volumes)

Year - I

1)	Concentrates / Beverage Base for 3 months inventory level :			
	450 Units of Coca Cola	x 1,446	=	650,700
	216 Units of Fanta	x 1,114	=	240,624
	57 Units of Sprite	x 1,446	=	82,422
				973,746
2)	Sugar 2 months requirements			
	110 tonnes x 21,000/=		=	2,310,000
3)	Crowns 6 months requirements			
	14,000 gross x 10.12			149,250
4)	Filter paper 6 months requirements			
	5,900 x 6.75		=	39.825
5)	Fuel and lubricants (1 month requirement)			125,000
6)	Misc (Chemicals Stationery etc)		=	250,000
7)	Spare parts		=	295,000
			Total :	5,242,821

Year - II

Add 30 % for volume increase + 10 % inflation factor	=	1,730,130
	Total	6,972,951

Year - III

Add 10 % for volume increase + 10 % inflation Factor	Total =	7,336,278

Section VI

Factory Over Heads

A 25 % contingency factor has now been added to the original estimates:

Water	...	157,000
Electricity	...	562,575
Fuel	...	1,280,000
Lube	...	75,000
Chemicals	..	109,200
Water Treatment	...	58,926
Filteraids	...	34.697
C O 2	...	37,500
Detergents	...	75,000
Filter paper	...	29.920
Lab Equip, Maintenance & Uniforms	...	286.000
	Total :	2,880,031

Section VII

A 25 % CONTINGENCY FACTOR ADDED TO COSTS

A)	Administration	678,500 So.Sh
B)	Sales and Marketing (unchanged)	190,000 So.Sh.

Section VIII

Motor Vehicle Expenses

A)	Administrative Vehicles	288,000 So.Shs.	(This was grossly under estimated and was increased by 100 %)
B)	Production Sales Vehicles	950,400 So.Shs.	(3.0550 Sh/Case) increased by 50% delivered.

Depreciation is not included in the above provisions.

Section IX

Sales and Wages.

As stated 80 % line efficiency in the first year is questioned. The following projection of costs is based on a 40 % line efficiency i.e. 200 Cases / Hour, not 400 cases per hour

300,000 Cases = 4,000 Operating hours
200 c.p. h (50 % of the estimated hourly out put)

Wage cost per operating hours = 12,832 So.Sh.
Sales and Wages estimate is :

4,000 x 12,832 So.Sh.= 5,132,800 So.Sh.

This could be an exaggeration somewhat, however it is prudent to be extremely cautious when estimating production on salaries and wages in a start-up situation.

We have estimated a production performance of 300 cases per hour for year 2, and reaching 400 cases per hou (80 % line efficiency in the third year.

Year 2/3467 x 1,423 So.Sh. = 4,937,008 So.Sh.
Year 3/3200 x 1,581 So.Sh = 5,059,200 So.Sh.

Ancillary Benefits (Unchanged)

Rental of Houses	300,000
Medical Aid Expatriate Staff	30,000
Home leave expatriate staff	80,000
Bonus Allowances	153,400
Total :	563,400

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APPENDIX A

Total Cost of Investment with Depreciation (Ref Appendix. A)

	Item	Cost So.Shs.	Rate:	Annual Charge.
1.	Land	1,200,000	-	[illegible]
2.	Buildings	9,100,000	4	364,000
3.	Machinery	33,757,593	10	3,375,759
4.	Motor Vehicles	2,650,000	20	530,000
5.	Office Furniture & Fixtures	400,000	10	40,000
6.	Coolers	100,000	20	20,000
7.	Pre Operating Expenses (18 ms)	2,250,000	20	150,000
8.	Inventory and Working Funds	5,242,831	-	-
		54,700,414	-	4,779,759

Cost of Containers

a)	Bottles	6,552,000	9,672,000	
b)	Crates	3,120,000	Total =	64,372,414
			Say:	64,400,000 So.Shs.
				3,900,000
	Less Deposit from market			60,500,000

Therefore capital requirements appear to be 60,500,000 So.Shs. which is higher than the 59,300,000 So.Sh. used in the feasibility study. The additional 1,200,000 So.Shillings will be required as new capital funds.

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APPENDIX

Calculation of Break Even Point
In terms of Case production

$$B\ E\ P = \frac{f}{p - v}$$ Where f = Fixed costs
p = Unit Sales Price.
v = Variable unit cost.

Substituting data from year 3 (80 % plant Utilization)

$$B\ E\ P = \frac{9,265,136}{40.68 - 31.9} = 1,055,255 \text{ cases}$$

In terms of sales Revenue:

$$BEP = P \frac{(f)}{p - v}$$
$$= 40.68 \quad (1,055,255)$$
$$= 42,927,773 \text{ So.Shillings.}$$

Therefore the plant would need t produce 1,055,255 cases annually to Break Even , or generate sales equivalent to 42,927,773 So.Shs. to cover its costs.

APPENDIX

Annual rate of return on promotors equity Capital:-

	Year 1	Yr 2	Year 3
Net Profit after Tax	(6,121,379)	382,796	839,466
Equity Capital	23,173,703	23,173,703	23,173,703
Rate of Return %	(26.4)	+ 1.65	+ 3.6

***

APPENDIX

PROFIT AND LOSS PROJECTION

ITEM	Coca Cola 300 Ml	Sprite 300 Ml	Fanta 3oo ml	Total Yr 1	Total Yr 2	Total Yr 3
Case sales	300.000	50.000	150.000	500.000	650.000	800.000
Extra Territory	180.000	30.000	90.000	300.000	390.000	480.000
Basic Territory 41/81 Case	12.540,000	2.090.000	6.270.000	20.990.000	27.170.000	33.440.000
Extra Territory 38/80/Case	6.984,000	1.145.000	3.492.000	11.640.000	15.132.000	18.624.000
Total Revenue	19.524.000	3.254.000	9.972.000	32.540.000	42.302.000	52.064.000
Direct Production Expenses				19.983.456	24.779.485	30.726.561
Raw Materials				19.511.586	2.228.680	2.511.200
Container Exp.				21.495.312	27.008.165	33.237.761
Sub Total				11.044.688	15.295.835	18.826.239
Marginal contr.				[illegible]	[illegible]	[illegible]
Overhead Expenses				2.880.031	2.480.031	2.538.317
Gross Profit C/Fwd.				8.164.657	12.813.804	16.287.922
Operating Expenses						
Administration				678.500	742.500	809.325
Sales & Marketing				190.000	258.000	300.000
Motor Vehicles				1.238.400	1.310.000	1.427.900
Sales & Wages				5.132.800	4.937.008	5.059.200
Sub Total				7.239.700	7.247.508	7.586.425
Depreciation				4.779.759	4.779.759	4.779.759
Operating Profit (Loss)				(3;854.802	2.467.749	2.816.666
Interest & Bank Charges				2.266.577	1.702.157	1.137.735
Profit (Loss)before tax				(6,121,379	765,592	1.678.931
Provision for tax 50 %				Nil	382.796	839.466
Net Profit (Loss)				(6,121,379)	382.796	839,466

8.1 Preliminary report . I.E. Project DP/SOM/81.

Extracts of the Preliminary report are reproduced here in :-

This document is a tentative work plan for an Industrial Engineering assignment Project DP/SOM/81/013 whereby UNIDO acting as executing agency for UNDP is providing strength to the institutional and staff capabilities of the Ministry of Industry. Specific objectives of the work planned will be through direct assistance to improve the performance and management of priority public sector Industrial Enterprises.

The Project envisages a 5 Phase Project with about 64 % of the available time being directly involved with the factories. The Project commenced on 28th June, 1982 and is now scheduled to complete by 27th June, 1982.

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Phase	I	Analysis, evaluation, set direction, and operational Audits.
"	2	Operational audits, and project selection.
"	3	Organize and undertake training.
"	4	In plant industrial engineering.
"	5	Following-up, monitor and maintain direction.

It is predictable that the different problems, as discussed and highlighted by previous experts will require fairly intensive attention over a protracted period if lasting improvement is to result. In order to do t is it is proposed that the number of client companies donot exceed three (3) and may be limited to two (2).

The substantive planning section of this document attempts to postulate on a planning horison of one year (i.e. concluding in June 1983) for the 5 phase programme.

* The initial plan visits conducted in July by Mr. Rutter confirms these concerns, and indicates that a greater percentage of time needs to be allocated to the training component, than was originally anticipated. Furthermore assistance in matters important to the Ministry of Industry but falling outside of t is specific programme has caused effort to be deflected away from the main thrust.

An example of this is, our examination of SUAI Sugar highlighted problem areas which led to H.E. the Minister requesting further detailed review over a number of weeks.


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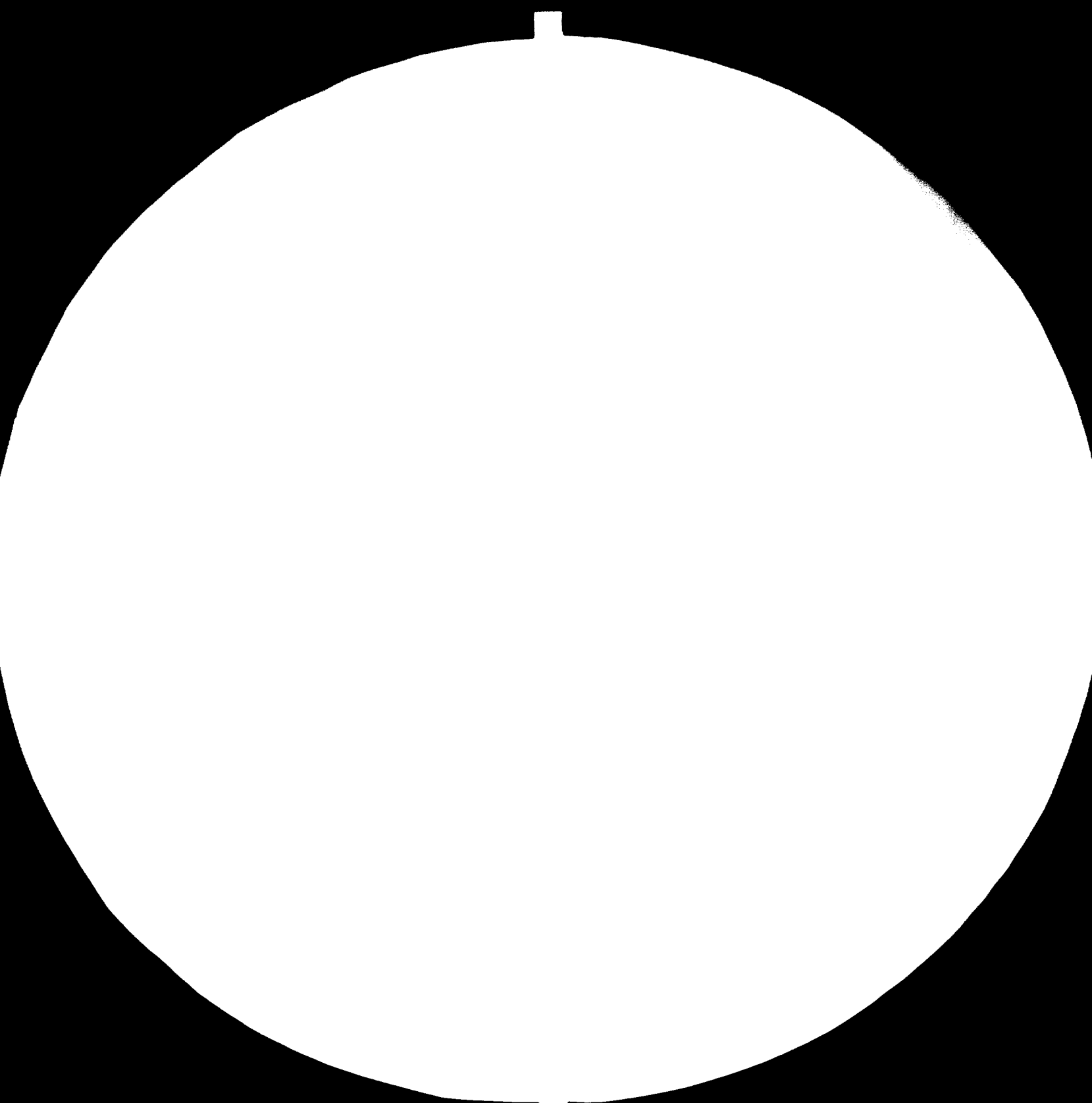

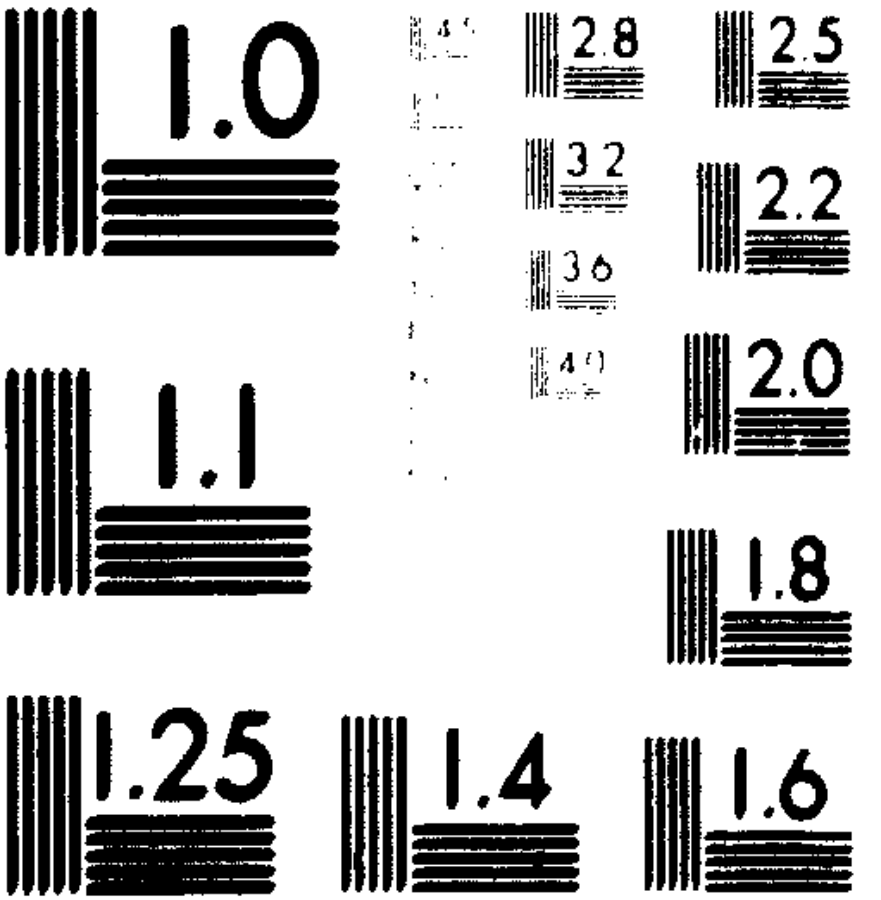

PROCEDURES.

In conducting phase 1 and 2 it is proposed that five (5) companies be subjected to an operational audit by Mr. Rutter, and his counterpart engineer. This will entail a review and appraisal of the effectiveness and efficiency of factory operations and operating procedures. The O.A. carried with it the responsibility to discover and inform top management of oper ting problems, but its chief propose is assisting management to discuss the problems that the Industrial Engineer can help resolve. As such the C.A.'s will be a fundamental input to th assigament.

This approach, which is essential to the identification of problem areas for industrial engineering remedial action has side benefits. SchSuch reports will place in the hands of the Ministry of Industry and Company management a birds eye view of the operation and the administration provesses that are specially beneficial to operating and planning personnel. It is in practice primarily a protective and constructive tool dealing with the evaluation of controls. Phase 2 will itself continue with the operational Audits and will lead to the selection of 2, or may be 3, companies for in-depth assistance. The final selection will be undertaken through a consultative process between UNIDO, the Ministry of Industry and the Companies. Phase 2 will conclude with identification of specific Industrial activities for the specified Companies and will conclude on 29 November, 1982.

Phase 3 will entail the training of selected personnel ino certain analytical tools of Industrial Engineering. In particular it is expected that training in Work Simplification and Activity Sampling will be given.

Phase 4 : will follow. In it specific systems improvements will be identified designed and installed. There will again be a practical training component to this phase. This we term the inplant engineering programme. It will conclude on 31st May, 1983.

The final, and fifth phase, is intended to place with the local management and the Department of Industry the responsibility for operating and monitoring introduced system improvements.

1. Source Project Document – Assistance to the Ministry of Industry in improving the performance of Industrial Enterprises – Number DP/SOM/81/013

The methodology which Mr. Rutter proposes to adopt has been based on the review of previous work undertaken by the Project.

The following documents have been used as key sources to this work planning proposal :-

1. Country Industrial Development profile of Somali Democratic Republic. Author International Centre for Industrial Studies UNIDO/ICIS 77 24 July, 1978.
2. Somaltex Textile Factory repair and maintenance Report. Karl H. Oberhuber UNIDO Expert Repair and Maintenance Dec. 1978.
3. Tentative Plan of Work. Maintenance Management DP/SOM/72/007 F.F. Colborne UNIDO Maintenance Expert 22 March 81.
4. Enterprise perspectives and problem areas in Mogadishu. Fraxy Fernadex Chief UN Advisor ICPE August, 1981.
5. Assistance to the Ministry of Industry in improving the performance of Industrial Enterprises, NUMBER DP/SOM/81/013. Project Document January, 1982.
6. Draft Terminal Report. Project DP/SOM/72/007 Strengthening the Ministry of Industry. Project Team of DP/SOM/81/013 June 1982.
7. Management Survey. SNAI Enterprises. Jowhar Final Report UNIDO Project S M/ 81/ 013 June 1982.

Review of these 7 reports alongwith several informal documents indicated that problems considerably broader than solely production related activities exist and may require resolution before industrial engineering improvement is achieved in any lasting manner.

8.2. TRAINING WORKSHOP. CIGARETTE AND MATCH FACTORY

1. Subject: Methods to up grade the skill levels of Maintenance personnel at the Cigarette and Match Factory, Mogadishu.

2. Introduction In order to combat the low level of journeyman skills present among the maintenance personnel an in-house training workshop is proposed.

This facility is intended to be a permanent/institution, operating on a daily basis at the factory.
A skilled instructor in workshop and repair practices would manage the daily training activities.

3. Background During the UNIDO Project Team's briefing on the preventive maintenance system being implemented at the factory concern was expressed over the low level of trade skills exhibited by the maintenance personnel.
The development of the preventive maintenance programme highlighted the problems, and recognized that future installation of sophisticated making and packing machinery planned for late 1983 will put increased pressure on mechanical/electrical trade skills.

Presently there are 80 mechanics and assistants at the Factory. At least 75 of hthese persons require further training.

4. Proposal A small practical training workshop facility is proposed wherein up to half a dozen persons could receive trades at any one time.
Factory management recommend that personnel attend the Workshop on a part-time, intermittent basis, arranged so as to not interfere with production activities. The Management envisages individuals attending the course for 2 hours a day twice a week. Training schedules would however be one of the initial responsibilities of the chief workshop instructor. Initially training will be in sound workshop practices in mechanical maintenance and repair. This would be broadened to include electrical trades training in due course.

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8.3 Re-equipping Proposals Paras Cigarettes Making and Packing Lines - 1983.

CIGARETTE AND MATCH FACTORY

MOGADISHU - SOMALIA

Re-equiping Faras Cigarette Making and Packing Lines - 1983

BACKGROUND

One of the most important public sector enterprises in Somalia is the Cigarette and Match Factory located in Mogadishu. In 1980 the Factory increased its annual Cigarette making capacity by 250 tons to 576 tons with the introduction of a Molins Cigarette making and Packing combination. This equipment is used for the manufacture of the Galeyr Brand of Cigarette and has proven most satisfactory.

A second Brand of Cigarette known as Faras, has been produced on Chinese Equipment some of which was manufactured in 1910. This equipment besides being slow and inefficient has in recent years become very un-reliable with 90 % of all factory down time occuring on it. Wastage through product damage is correspondingly high. A further worry is that spareparts are now no longer available from any source.

Management has recommended there placement of the 13 Chinese making and packing machines by 2 Molins Mark 8 SH Cigarette Making combinations and 2 Packing HLP combinations.

Negotiations have now been completed with the equipment manufacturers Molins Ltd of the U.K.

A quotation satisfactory to the Cigarette and Match Factory has been accepted. The cost of the equipment including all charges, such as for freight, installation and spares is U.S.$.1.990.190:= Delivery is promised for 10 months from the date of the Letter of Credit being opened and confirmed by a U.K. Bank.

The arrangement is a most satisfactory solution to the productivity problem on Faras production, and coupled with the industrial Engineering initiatives under-way at the factory it should result in greatly improved efficiency.

/...

Unfortunately there is a problem with rasing the necessary hard currency to pay for the new equipment. Although the company has adequate capital in Somali Currency, assistance is requested in finding some way to overcome the shortage of hard currency.

QUOTATION

1. **Equipment**

2. Molins MK 8 SH Cigarette Making Combinations.
2. Packing HLP combination Machine.

Including spares and installation C & F Mogadishu.

2. **Installation terms**

2	HPL 2 Hinge lid packers	
2	Link up bands	
2	MB Wrapper Boxes	
2	M.E.4 12 Overwrappers	
Total 2 Combinations FOB U.K. Port		US $ 1.121.744-00
Freight		US $ 14,998-00
Total 2 Combinations C & F Mogadishu by Sea Freight		US $ 1.136.742-00
Installation		US $ 27.664-00
Spares		US $ 44.072-00
	Total :	US $ 1.208.478-00

3. 2 MK 8 SH Cigarette Machines
2 FA 8 N Plus Assemblers
2 Hand Catcher bands

Total 2 Combinations FOB U.K. Port		US $ 674,440-00
Freight		US $ 14,038-00
Total 2 Combinations C & F Mogadishu by Sea Freight		US $ 688,478-00
Installation		US $ 30.590-00
Spares		US $ 62,644-00
	Total :-	US $ 781,712-00

4. Total Invoice Price. ... US$ 1.990.190-00

5. Delivery 10 months from date of Letter of Credit opened and confirmed by U.K. Banks.

/...

6. This offer which has been unchanged since 1980 will remain valid till December 31, 1983.

In addition to the capital equipment other engineering cost will be increased in Civil Works to be the building, in the installation of the appropriate service and the provision of essential air condition. The Factory management have at this time estimated a further US $ 250,000:- for such work.

CONCLUSION

The need for this equipment is vital. The condition of the Chinese Packing Equipment which had broken down for approximately 800 hours in 1982 (⅓ of all available factory hours) is such that replacements are essential.

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8.4 Operations Audit Questionaires:

This questionaire was developed and used by Project DP/SOM/81/013 to review the situation in the manufacturing concerns at the commencement of the Project. They are reproduced herein because they provide a sound and proven tool with which to gain an understanding of the operational strengths and weaknesses of a manufacturing organisation.

Questionnaires were completed for the following companies :

SNAI Sugar -- Jowhar.
Cigarette and Match Factory -- Mogadishu.
Somaltex Textile -- Balacad

The collected data is on file at the Ministry of Industry, Mogadishu.

PROJECT DP/SCM/81/013

QUESTIONAIRES

OPERATIONAL AUDIT QUESTIONAIRES

1. ADMINISTRATION AND MANAGEMENT

1. Is there a clear statement in writing setting out the objectives - For Company ------
   For Departments ------
2. If yes. Have objectives been made known.
   If yes . Formally ..... Informally .....
3. Are these Goals / Objectives understood and accepted by Managers ..... Supervisors ..... Staff .....
4. Are methods to meet objectives sound .....
5. Is allocation of Monetary, Physical, Staff Resources in keeping with meeting the objectives.
6. Has each Department been formally introduced to its operating objectives.
7. Are key business decisions made on basis of demonstrated needs of the business.
8. Is Management primarily market, - Customer -- Production Oriented --
9. Do Company Financial statements provide information adequate to management needs.
10. Is Financial information circulated to all Management who need it to fulfil their obligations.
11. Has activity analysed ever been performed in the Company.
12. Has a systematic study ever been carried out .
    Determine what is needed to get product out ..... What.
13. Do Executives have a strong sense of their General Responsibilities.
14. Does top management delegate.
15. Are systems / Procedures Generally Documented.
16. Does Company maintain how to documents.
17. Does company have consistent Rational Compensation Plan.

/...

GENERAL MANAGER

1. Has the role of each department been defined in writing.
2. Has the role been communicated to the other departments.
3. Is there agreement between you and department manager on this role.
4. Has the authority been delegated to carry out role.
5. Have you specified how departments performance is to be measured.
    1. Within budget.
    2. Recovery of costs.
    3. of people.
    4. Feedback from other departments.
    5. Personal judgement
    6. Cost savings
    7. Schedule Performance.
    8. Achievement of agreed standards.
    9. What happens in case of non accomplishment.
    10. How satisfied are you with individual departments and with Companies overall Performance.

18. Are Annual Performance Personal appraisals, Given_____
If yes what method employed._____

19. How is management Technical Staff appointed.

20. Does Company measure rate performance of its Managers.

21. Will the loss of any one executive severly affect the Company's Affaires.
If Yes _____ Identify position _____

22. Does Company measure and rate Managerial performance. If yes what factors are used.

I Profits.
II Expenditure – V – Budget.
III Production – V – Plan
IV Etc.

23. Is there evidence of crisis management style or it major emphasis on Problem Prevention.

24. Are problems evaluated for their profit effect and tackled in that order of priority.

25. How are Budgets constructed.

26. Are regular Budget performance meetings held . If yes who attends.
Are minutes kept of proceedings.

27. Does management (Senior) know what its investment return for Last Financial Period was (Net income ÷ Net worth = %)
If no, compute this ratio for key parts of Company.

28. Does Management (Senior) know the return on gross assets.

29. If R O I is inadequate in comparison with Prime Rate what plans have Management to improve ROI.

30. Are repetitive decisions made candidates for standard procedures.

2. PLANS AND PLANNING

1. Has Company a formal Planning Activity.
2. Is planning undertaken on a scheduled basis.
3. Where do planners fit in organisation.
4. Who instructs the planners. How ____
5. Are production and administrative supervisors consulted in Planning process.
6. Are developed plans reviewed by an impartial Authority.
7. Does Company employ outside help in aspects of Planning. If Yes -- who, when and for what purpose.
8. Have priority been attached to plans.
9. Have matching controls been established. for each plan to monitor progress.

LONG RANGE (STRATEGIC) PLANS

10. Does Company have written, defined current Goals and objectives for 3 - 5 years ahead.
11. Are the objectives and the Goals challenging and realistic.
12. Has responsibility for attainment of the Goals been clearly and individually assigned.
13. Were those to whom Goals were assigned involved in their Development.

SHORT RANGE (TACTICAL PLANS)

14. Have sub objectives been set for each Organizational Unit.
15. Are the short Range Goals compatible with the long range ones.
16. Have Goals / Objectives been communicated in writing.
17. Have detailed plans/ time schedules been set for attaining the objectives.
18. Does projections for project expenses / income fit the Tactical Plans.
19. Do cash flow projections provide proper guides to action in handling capital structure and liquid resources.
20. Are Goals and objectives consonant with Government Plans and Hopes. If yes how is this co-ordination achieved.

3. BUDGETS

1. Does the company prepare Annual Budgets.
2. Are Budgets formed after opportunities for cost improvement are Reviewed.
3. Have written Budgets for the Plans been prepared -
   Do these consider manpower needs, equipment, spare parts Operating Plant, Expenses and Income.
4. Are the Budgets formally challenged . If so How.
5. Are Budgets subject to Revision.
6. How is Realism (Leaness) of Budget assessed.
7. Are Budget variances explained by the appropriate responsibility Centre Manager.
8. Does Management rely on the Budget as opposed to making internal adjustments to compensate for inherent errors.
9. Are standards measured used as the basis for Budget Development.
10. Is there a responsible company official responsible for Budget Planning and Development.

4. CONTROLS AND CONTROLLING

1. Does a list of active controls exist if yes append to your Questionnaire.
2. If no, can controls be identified
   Who has the control responsibilities (By Sections)
3. Does formulation of plans precede formulation of relate controls. If not how are efficient controls revised.
4. Does each control have a feedback feature (Describe)
5. Have existing controls been documented in [illegible].
   Procedures
   Descriptions
   Flow Charts.
6. If no, is such documentation planned.
7. Has responsibility for formal periodic review of controls been assigned to anyone (List).
8. Are these controls over
   8.1 Cash Flows.
   8.2 Accounts Receivable collection

/...

8.3 Accounts Receivable Aging.

8.4 Bad Debt Write off.

8.5 Inventory Level.

8.6 Inventory Turn-over

8.7 Inventory Obsolescence.

8.8. Fixed Asset Acquisition

8.9 Equipment Acquisition including small Tools

8.10 Research and Development Expenditure.

8.11 Production Hours (Overtime working authorisation)

8.12 Payroll Control of new hirings.

ORGANISATION

1. Has company differentiated (By Functions) structure.
2. Does Company know its activity needs.
3. Obtain copy, or draw, organisation structure.
4. Has activity analysis ever been performed.
5. Has a system study of what is necessary to get product out of door been done.
6. Are Management positions covered by Job Descriptions. If yes obtain copies.
7. Date Job Descriptions.
8. Could any Functions be combined.
9. Could any Department / Section be eliminated.
10. Have responsibility and authority been assigned.
11. Does any Manager have more than 6 persons reporting to him.
12. Does any Manager have 2 or less reporting to him. Identify.
13. What staff positions exist.
14. Are they adequate / inadequate. Amplify.
15. Are any key staff retiring in next 2 years. Identify.
16. Has any plans for their successors been made.
17. Is the wage and salary programme tied in with the Organisation
18. How prominent is production Management positions in structure.

/...

10. Is there a formal Training Policy and Programme.
If yes aimed at what group/s and with what objective.

PERSONNEL - MANPOWER SURVEY

11. What Training Techniques are in use.
12. How are production personnel trained.
13. Are operations people involved in determination of training needs.
14. Is Government involved with
Selection
Training
If so in what way
15. Do supervisors give on-the-job-Training
16. Is there an apprentice or Technician Development Programme
17. Outline hiring & determination practices

MANPOWER USE

18. Do employees participate in induction Training.
19. What are Disciplinary Procedures.
20. Is there Trades Union.
21. What is grievance procedures.
22. What is incidence of grievance & work stoppages.
23. Who is responsible for observance & maintenance of adequate and legal working conditions.
24. Are new employees on probation . Describe.
25. Are reference checks made on Key new employees.
26. Are health checks made on new employees.

PERSONNEL ADMINISTRATION.

27. Does Company maintain adequate personnel files.
28. How does Company control establishment levels.
29. Are Job Descriptions employed.
For what jobs.
Do Job Descriptions follow standard format.
30. Are there established personnel policies.
31. Are supervisors informed of personnel policy changes before they become public.

/...

RESEARCH AND DEVELOPMENT

1. Is there a formal / informal approach to R & D.
2. Can all managers intput to R & D.
3. Does company receive research based economic, industry and Engineering reports From Industry / Professional Sources.
4. Does company have ongoing contract arrangements with licensing opportunities. Product opportunities, Joint Ventures, Technology sharing etc.
5. Does company sponsor skill improvement.
   If yes Amplify _____
6. Has R & D effort produced anything of value.
7. Is R & D related to Market Research.
8. Are Projects Budget controlled.
9. Obtain Resumes of R & D Staff.
10. Has Company added new Products in Last 3 years. Provide information.

PERSONNEL

General

1. Are human relations considered important.
2. Detail the organisation of personnel function as P and as Actual.
3. Is responsibility for the basic formulation of the personnel programme a corporate. Management Function.
4. Do other Departments understand Role and Relationship of the Personnel Department.

MANPOWER SUPPLY

5. Is there a Manpower Planning Document . Does it identify specific skills.
6. Is there adequate skills at hand. If not, what is being done to rectify problems.
7. Is Performance measured against known standards.
8. Is performance appraisal of existing and supervision conducted.
9. Is there a formal promotion policy.

/...

10. Is there a formal Training Policy and Programme.
If yes aimed at what group/s and with what objective.

PERSONNEL - MANPOWER SURVEY

11. What Training Techniques are in use.
12. How are production personnel trained.
13. Are operations people involved in determination of training needs.
14. Is Government involved with
Selection
Training
If so in what way
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17. Outline hiring / termination practices

MANPOWER USE

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26. Are health checks made on new employees.

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29. Are Job Descriptions employed.
For what jobs.
Do Job Descriptions follow standard format.
30. Are there established personnel policies.
31. Are supervisors informed of personnel policy changes before they become public.

/...

32. Are Company Goals and Objectives simply explained to Employees.
33. Is there a company publication, info sheet or similar publication.
34. Does the Company have an Employee Benefit Programme.
35. Are wages Reviewed for Equity.
36. Are wage incentives employed.
37. If yes do they serve as an incentive to greater productivity.
38. What are overtime practices.
39. Detail overtime costs, ratio and trends.
40. Is there a pay scale for Grades of work.
41. Are mangement salaries reviewed and periodically adjusted.
42. Are outstanding service / performance personnel honoured.

CLERICAL OPERATIONS

1. Is staffing tailored to work load.
2. How was staffing level determined and when.
3. Is recruitment under one persons control
4. Turnover incidence.
5. Have flow charts been made of clerical operations.
6. Is there a formal organisation chart. If Yes obtain copy.
7. What training takes place.
8. Are one write systems employed.
9. Are records protected from Fire/ Theft.
10. Do clericals operations appear free of Duplication.
11. Has Layout of office / work stations been efficiency planned.
12. Is there Conference facilities.
13. Are Filing / Storage facilities adequate.
14. List office equipment work saving devices copiers / word processors (Communication systems)

MANUFACTURING

GENERAL

1. What does Factory manufacture.
2. How many employees. How many under your control

/...

2. What is Plant production Per Employee
Per Unit or wage.
Describe your problem areas. Per Unit of Investment.

3. What on going activities exist to improve efficiency of production.

4. Does production complain of inadequate or complex product specification.

5. Are there long standing High Cost Production situations.

6. List outstanding unresolved Engineering problems.

7. Does Accounting give Manufacturing product costs on a frequent, systematic reporting basis.

8. Is reporting adequate, accurate, useful.

9. Are such reports analysed and used by Production Management.

10. Is material cost (percent of production cost) known.

MANUFACTURING:

PRODUCTION CONTROL

11. Are Sales forecast communicated to production.

12. Are related schedules Developed.

13. Are schedules related to inventory situations. If Yes. Explain the method.

14. Obtain copy of Production Plan. Append to Questionnaire.

15. How accurately does production correaltes to the production plan. Are variances known, highlighted and analysed.

16. Is up todate / accurate vendor or procurement lead times Related to production schedules so that need materials / parts are readily available to production. If this is un-satisfactory amplify and explain herein.

17. Is delivery given appropriate importance in vendor selection.

18. Does Planning Product work load for each machine in sufficient detail to allow forecasting of Manpower Machine priorities,

19. Have production standards been established to facilitate correct machine loading and minimize bottlenecks.

/...

20. Are machine speeds calculated nd prescribed b Management
Can operators alter. Machine speeds / volumes.

21. Does production control check accuracy of the records.

22. If component parts and sub-asemblies are produced. Their schedules tie - in with end product schedules.

23. Is there a work order system.

24. Are shop ##'s used are written work order used.
Obtain copy 1 Chart Routing.

25. Are work orders ever started with materials and com onents unavailable.

26. What is quality control management like.
Rate its importance.

27. Are schedules checked for materials availability before release to production.

28. Are materials listed on work orders.

29. Do work orders indicate standard times for processing or Assembly.

30. If yes, How are standards developed.

31. Is there a continuous programme to standardize, Review and Amend such standards.

32. Does work order system provide documents for cost control of Job Pro ress.
Machine Re air Records and Close-out control upon completion of job.

33. Is actual production com ared it planned production.

34. Are make or buy decisions formalized.
Is Production / Engineering involved.

35. Are Sup lies of commodity used. Parts Consolidated.

36. Is a record of scrap, wastage and rejects maintained.

37. Is their a value analysis programme.

38. Are Idle time re orts prepared for machines and men.
Is idle time cause identified.

/...

39. Have make or buy decisions been reviewed in the past year.

40. Is there a method of following a product through the Factory.
If yes What is it. Obtain copies of Documentation

OPERATIONS

1. Does each production step or manufacturing operations appear essential.
2. Can any be eliminated or combined.
3. Are there delays or idle time that can be reduced.
4. When materials are checked for Accuracy and completeness and quality can sampling procedures be used.
5. Are economic lots sizes known.
6. If Yes, are Fixed Costs (Set-up time etc.) reduced to efficient levels.
7. Are Stock-outs a Factor.
8. Are slow moving inventory items known.
9. Are those responsible for plant capacity scheduling are of capacities for each product/ part capacity.
10. What is level of product returned. Is the cause investigated.
11. Is excess labour recorded.
12. Is materials handling costs examined and improvements considered.

FACILITIES AND EQUIPMENT

13. Is manufacturing area needed as laid out.
14. Is it orderly clean and pleasant
15. Are outside areas orderly.
16. Are aislet, storage areas orderly
17. Are safety precautions in evidence.
18. Are efficiency tests on machines comparing designed output to actual carried out.
19. Are scales checked.
20. Is Building height efficiently used.

/...

21.a Is warehouse well laid out / organised / neat

22.a Is lighting level appropriate to activity.

21.b Are repetitive actions reviewed from stand point of Automation / Mechanization.

22.b Washroom Lavatories - Condition.

PRODUCTION PERSONNEL ORGANIZATION.

1. Is production manager included in the planning group.

2. Does Production Manager plan/ liase with sales.

3. Must Foreman have authority of production Manager to authorise overtime working.

4. What is ratio of supervisors to Hourly Workers by individual section in production and ancillary areas.

5. Do machine operators or key machines have a Back up Operator.

6. Are hourly production workers Adequately supervised on unusual working shifts.

7. How are Supervisors selected.
   Trained
   Promoted
   Disciplined

8. Indicate Turn Over level of hourly paid workers.

9. How are production employes Trained
   Re-Trained.

10. Is there a set procedure for obtaining Tools/ Materials

11. Is Garage / Waste / Rejected materials checked / and Disposal authorised.

12. Are production records checked against issued materials to ascertain disposal of material.

13. Is shipping / receiving under constant surveillance

14. How effective is plant security.

15. Are employee searches ever carried out.
    If Yes - How Frequently . Randomly ?

16. Is there an I.E. on Staff.

17. If no, are Management interested in / or Planning [illegible] such an appointment.

/...

9. Is there a Standards Group.

10. Are Engineering projects priorized.
    If so. By whom On What Basis.

11. Is CPM/PERT used as a Control.

12. What is Ratio of Engineering Overtime to Regular Hours on projects / Service work.

13. How are Engineering Cost records maintained.

14. Does Engineering participate in preparation of Plant Capital Expenditure requirements.

15. Are Engineering costs charged back to user.

16. How does Accounting allocate Engineering costs.

17. How flexible can Engineers be in accepting random assignment
    How is this controlled.

18. Does Engineering produced a monthly Project Status Summary / Any Periodic Summary.
    - Obtain samples.

19. Are closed out Project cost reports analysed.
    - By whom.

20. Is there Review of proposed Projects prior to authorization by a qualified group. Do they determine Cash needs.
    Profitability
    Product Life.
    Value to Company.

PRODUCT ENGINEERING

1. How does marketing liase with product Engineering.

2. Is there a review procedure for determining manufacturing parts obsolescence.

3. Is Engineering officially represented at product planning meetings.

PLANT ENGINEERING

1. Does Engineering department serve Plant Engineering needs.

2. Are equipment purchases, material selection, project design influenced by first cost decision (Capital Exp).

/...

ENGINEERING

GENERAL

1. Are Engineering Plans Developed.
   By whom.
   For what purpose.
2. Are such Plans integrated with Corporate Plans
3. Is there a Budget for Engineering
   Is it formally Reviewed. By whom.
4. Is Engineering Budgets Costs Compared with Production costs.
   If yes. What is Trend.
5. Does Engineering Service have cost centres allocated, Reported, and Monitored.
6. What Financial / Cost accounts info does Engineering receive.
   [illegible] expensed [illegible].
7. Are Engineering Charges expenses or capitalised.
8. Is Engineering permitted to specify manufacturers vendors.
9. Is there a clear policy statement for Engineering.
10. Does Engineering and Its clients understand the Engineering Objectives Are they reasonable.

ENGINEERING CONTROLS

1. Are Project Estimates : Developed
   Cost
   Time
   Start / Finish
   Materials.
2. Who is responsible for such estimates
3. Does Estimator / Supervising Engineering utilise std. costs
4. Are Standard / Actual Costs compiled and scrutized.
5. Have recent estimates been considered satisfactory.
6. Do maser Plans have controls devised for them.
7. Is non Project work covered by Open Work Order ## s.
8. Are Project status reports prepared.

/...

3. What is relationship of Plant Engineering to company Engineering Management.
4. Are Machine and process modifications subject to Review prior to modification - If so. By whom.
5. Is a machine and equipment standardization programme in effect or contemplated.
6. Do plant Layout Plans exist.
   Where are they.
7. Is there a Technical Library including catalogue Tech. Specs etc.
8. Is there an Engineering Filing System.
9. Is there reproduction Equipment for Engineering

Inventory Control

1. Obtain value of inventory by general category
   i.e. R.M.
   Work in Progress.
   Finished goods.
2. Are all material purchases delivered to control stores as opposed to directly to production/ engineering service units.
3. Is one person responsible for inventory management.
4. Are inventory turnover ratio calculated. If Yes What are they ?
5. Are perpetual inventory records maintained.
   for RM
   Work in Progress.
   Finished stock.
6. Are inventory records maintained in bins or stock areas.
7. Outline Security Measures.
8. Are vendor counts doubled checked by receiver.
9. Can any stock items be : Standardized.
   Reduced.
   Eliminated.

/...

10. Are perpetual inventory records checked by periodic physical stock checks - If Yes. What was data and counts of previous 2 checks. Ask for evidence.

11. Are following classes of inventory under accounts control.

    a) Consignments out
    b) Materials owned by Company but in hands of suppliers, other processors etc.
    c) Consignment.

12. Storage facilities and equipment. Does it appear adequate What does production management think of its adequacy.
13. How is storage capacity known, calculated and utilised.
14. Are storage area aisles clear, smoothly paved and well lighted.
15. Are storage areas clear and well lit.
16. Are key storage areas adjacent to majority user. Is it capable of change.
17. Are shipments ready for truckers when they arrive.
18. Is there a schedule for regular stock taking.
19. Are stores cleaned out regularly.
20. Is there an adequate sup ly of fire extinguishers.
21. What mechanical handling aids exist in the stores. Are they adequate, safe, in good working order.
22. Outline stores control system.

Materials Handling and Storage.

1. Is MH a major activity - If no go to next section.
2. Is MH a specialized section.
3. Is MH a activity of production interest.
4. Has a MH study ever been carried out.
5. Is there any indication of haphazard and/or excessive accumulation of stored material.
6. List Mobile MH equipment by type and task it performs.
7. Are materials consumed excessively, If yes, What evidence is there.
8. Are identical items stored in one location in order to

aid location time.

9. Are fast moving items located near user.

10. What scope is there for palletizing
conveyor handling
gravity feeding.

11. Is incoming material documented
checked
Routed
Recorded.

Engineering Department -- ORGANIZATION.

1. Is department formally structured.
Get copy of Organization chart.

2. Is it a functionally distributed, or a departmentally distributed organization.

3. Is division, between engineering, production, and quality control clear.

4. What is utilization of engineers and related technical staff.
Is there staff turnover - Details.

5. Are positions covered by job descriptions.
If yes. Obtain Copies.

6. What is ratio of engineers (qualified) to engineering staff.

7. Are there specialized engineering groups.
If yes list them.

8. Do engineers ever serve as project managers within the Company.

9. What provision is made for technical training including exposure to production, quality control marketing and accounting problems.

10. What provision is made for recruitment of engineering skills for future needs.

/...

MAINTENANCE

1. Does Company have enough facilities and equipment to warrant a formal maintenance programme.
2. Is there a formalized maintenance programme.
3. Who controls the maintenance programme.
4. Does M.P. provide servicing on a planned basis i.e. Does maintenance performed in a timely manner prevent breakdowns.
5. Are maintenance, labour and material expenses charged directly to the departments in which the work is performed.
6. Is production department encouraged to report impending problems. Are they followed up. If yes - then how ?
7. Is there a schedule for routine maintenance.
8. Has maintenance been studied to highlight priorities and avoid over maintenance
9. Are histories kept for big equipment.
10. Is plant lubrication properly controlled and regularly scheduled.
11. Are breakdown reports prepared. Who are they circulated to and how froquent.
12. Is there a daily maintenance work force report indicating the disposition of the maintenance men.
13. What is a % of overtime for maintenance workers.
14. Is an up to date equipment record file kept in the maintenance department.
15. Does maintenance have its own budget.
16. Is % of actual hours worked periodically compared with planned.
17. What is % of plant down time for maintenance reasons (Is it under 10 %)
18. What is stores withdrawal procedure for maintenance Personnel.
19. Does production department have to control the amount of maintenance carried out on overtime.

/...

20. Are any other departments (than maintenance) charged with inspection responsibility.

21. Who has final say on policies on hiring, firing, promotion, and demotions within the maintenance department.

22. What training has maintenance personnel received.

23. Can ratio of emergency to planned maintenance be determined.

24. Are maintenance studies for production equipment agreed in advance between maintenance and production departments.

25. Are maintenance check lists used.

26. Is performance of preventative maintenance jobs inspected on a random sample basis by maintenance Supervisor.

27. Do foremen inspect each job as it is completed.

28. Has a maintenance productivity study ever been made.

29. Has maintenance ever been subjected to I.E.

30. What is procedure for maintenance order spare parts, supplies etc.

31. Can maintenance make local purchases. To what value.

32. Is maintenance consulted in the setting of inventory of spare parts levels.

33. Are tool and similar items adequate. Readily at hand, in good condition.

34. Who carries responsibility for hand tools.
Are they periodically checked.

35. Is there a standardization programme for spares, supplies and tools.

36. Do maintenance supervisor ever meet together to discuss performance. Do they meet from time to time with other management ?

37. What are the high cost, long standing maintenance situations. Does this indicate unsolved engineering problems.

PROPERTY PLANT EQUIPMENT

1. Are plant ledgers maintained.

2. If Yes are they balanced annually with general ledger controls ?

/...

3. Is a periodic inventory of plant items undertaken (By whom)

4. What insurance cover ? Are periodic appraisals carried out for insurance purposes.

5. Has Company experienced advisability of Sale and leaseback of property, plant and equipment to obtain cash. Is this possible in a public company.

6. Are depreciation policies reviewed annually.

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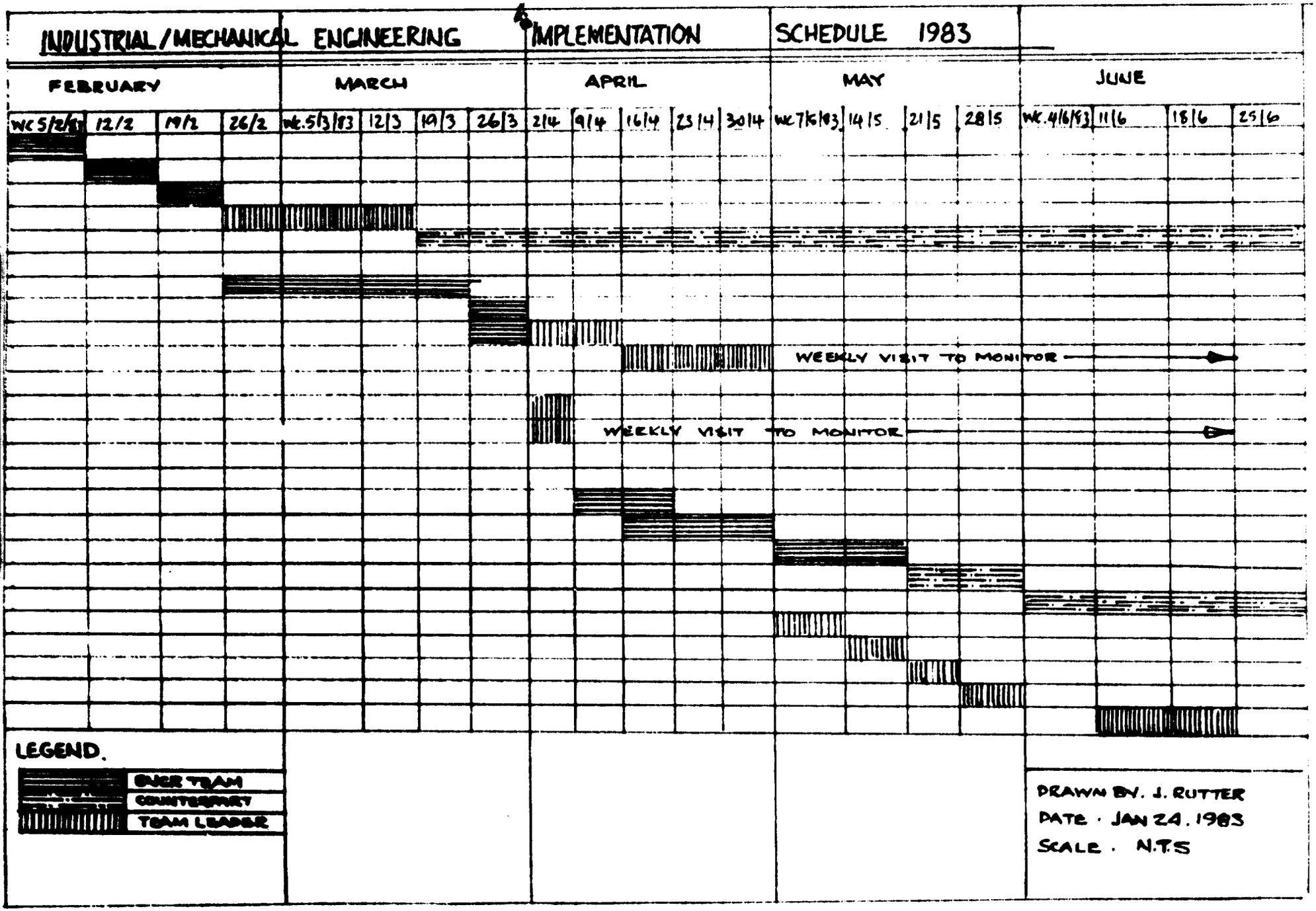
FACTORY		MAJOR OUTPUTS	SUB OBJECTIVES
A CIGARETTE AND MATCH FACTORY	1	PLANNED MAINTENANCE PROGRAMME	• Reduce down time.
		• DESIGN	• Demonstrate Cost benefit.
		• TEST (With the mechanics)	• Train Somalis in system and Maintenance Practices.
		• TRAIN	
		• INSTALL	• Have them operate system
		• EXPAND	
	2.	PRODUCTION ENGINEERING	• Demonstrate potential
		STUDY METHODS	• Train Manager in assessing productivity.
		DEVELOP IMPROVEMENTS	
		ASSIST WITH IMPLEMENTATION	• Have Manager apply knowledge
		ASSIST WITH MAKING/ PACKING STUDY.	• Select best equipment for Factory
	3.	PLAN I&E. FUNCTION AT FACTORY	• Gain G.M.'s support.
B: SOMALTEX FACTORY	1	PLANNED MAINTENANCE PROGRAM	• Reduce down time
		• Organisation Plan	• Demonstrate cost benefit.
		• DESIGN SYSTEM	• Improve organisation
		• TEST	• Train Somalis in system and in Maintenances Practices.
		• TRAIN	
		• INSTALL	
		• EXPAND	• Have them operate system.
	2	FACTORY SERVICES ENGINEERING	
			• Improve reliability of
		DEVELOP REHABILITATION PLANS	• present plant.
		FOR ELECTRICITY	• Design for new improved.
		WATER	Plant.
		STEAM	
		AIR SUPPLY	
	3	PLAN I&E. FUNCTION AT FACTORY	• Gain G.M's support.

MILESTONES	SUPPORT ACTIVITIES	RESOURCE NEEDS
• Programme approval by G.M./ Director Public Enterprizes • System approved by Tech.Mgt. • Trainees graduate • System Start up • System hand over	– – Provision of Trained counterpart	• Transportation • Counterpart at Factory until April, 1984. • Translation. • Training workshop • Tools Typing copying
• Programme approval by GM/Director Public Enterprizes. • Manager completes training • Manager completes production study		• As above.
• Recommendations approved	–	–
Structure / Job description approved by G.M.	– –	–
• Programe approved by G.M./Director of F.E. • Items as for Cigarette and Match Factory TO MAY , 1984	Provision of trained Counterpart.	• Transportation • Counterpart at Factory until May, 1984 • Translation. • Training Workshop • Tools Typing Copying
• Findings agreed by Technical Management • Proposals agreed by General Manager.		• Measuring and Testing equipment and devices. • Small tools • Transportation.
Structure / Job description approved by G.M.	–	–



INDUSTRIAL ENGINEERING IMPLEMENTATION CHART