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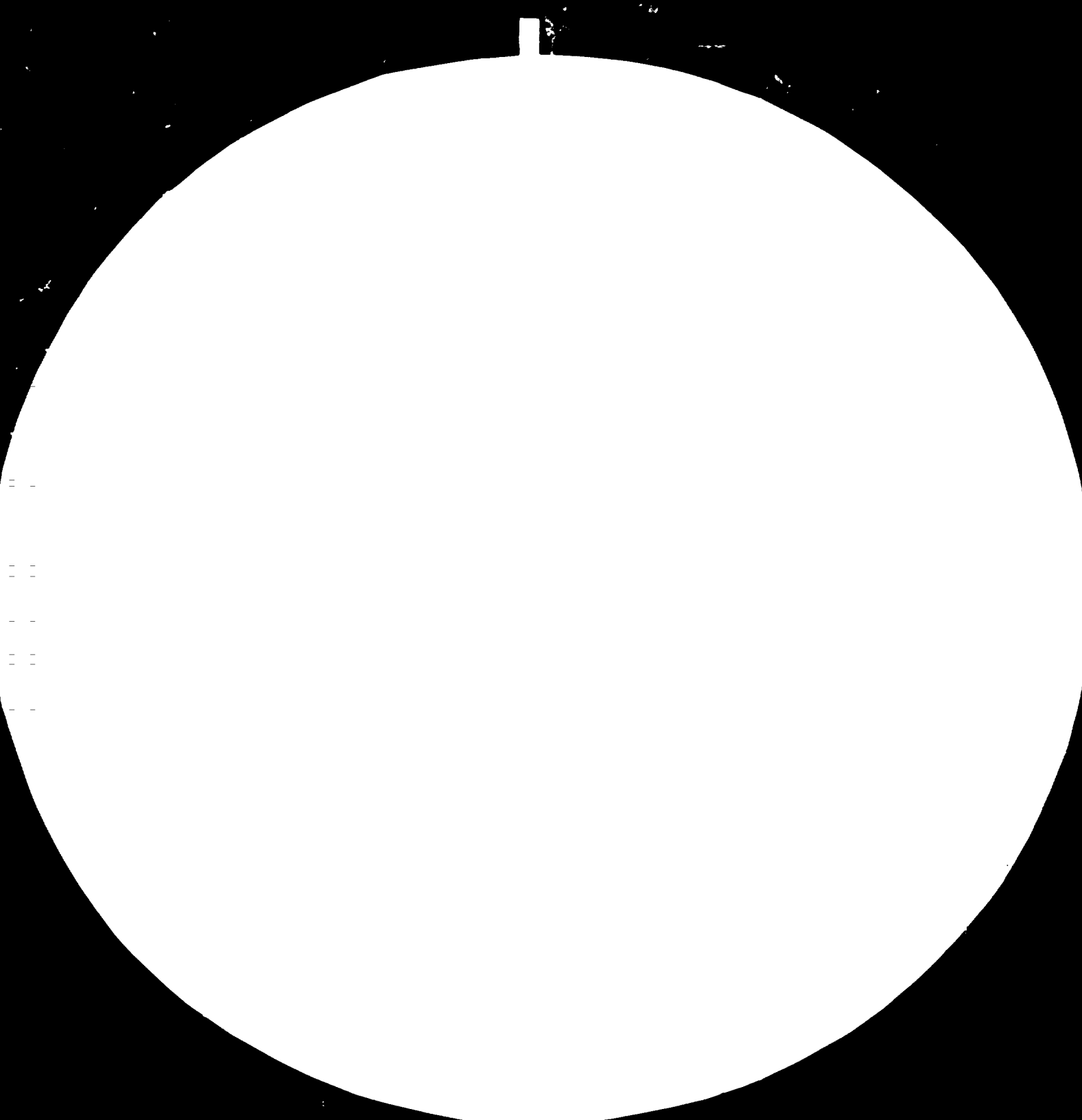

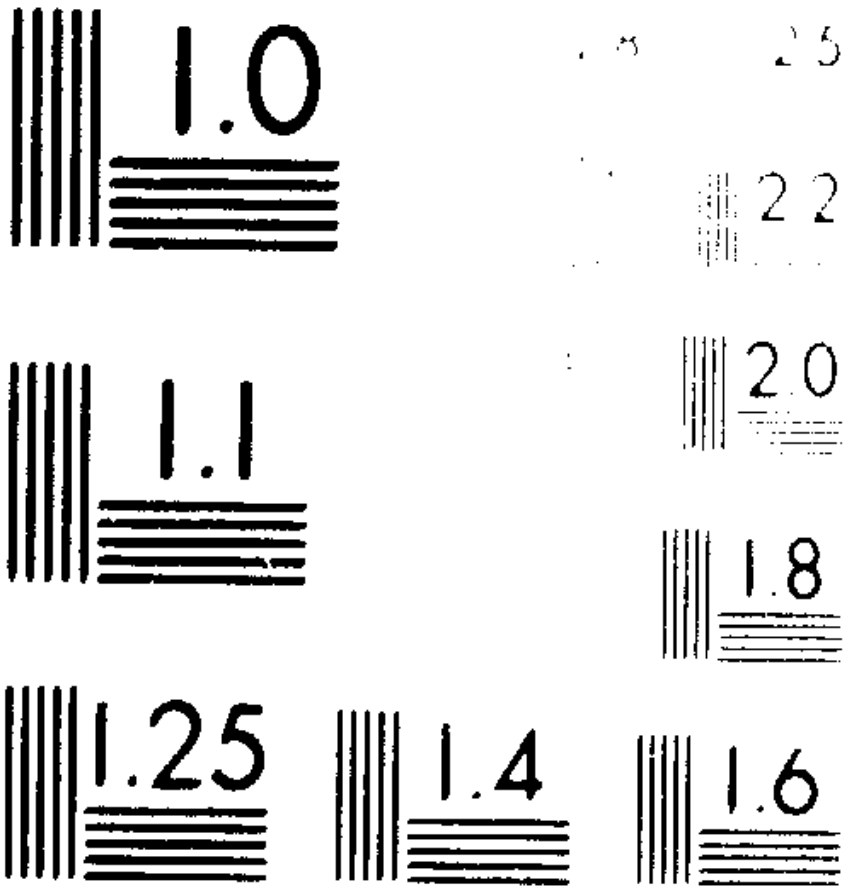
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9 September 1982
English

STRENGTHENING THE MINISTRY OF INDUSTRY

DP/SOM/72/007 and RP/SOM/82/002

SOMALI DEMOCRATIC REPUBLIC

Somalia.

Technical Report: To Improve the Operational Performance of the Integrated Textile Factory Somaltex *

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 T.M. Haworth, B.Sc.Tech A.T.I.
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INTRODUCTION

The work undertaken was a short-term consultancy assignment intended to support industrial development activities by contributing to the improvement of the operational performance of the only textile factory of importance in the country, known as "Somaltex". This required the giving of advice on the formulation of action plans and on the subsequent implementation of measures and involved the analysis of a number of areas of activity, recommending improvements and suitable systems, and introducing preventive maintenance to reduce down-time.

The duration of the author's stay in Somalia was six months from 10th December 1981 and the location was the factory at Balad, 36 kilometres North of the capital, Mogadiscio.

Good equipment is installed at the factory but, taking the norm as three-shift working for six full days per week, only half the productive capacity is currently being utilized. Maximum levels of attainable production have never been approached since the establishment of the enterprise. Large stocks of finished and unfinished fabric have been accumulating over recent years in spite of the low volume of production.

The level of output is determined by a severe and fluctuating shortage of raw material, strained foreign exchange resources, and restricted cash availabity to finance adequate stocks of spare parts, repair materials, and consumable items. The situation is compounded by erratic planning; insufficient communication; underutilization of available but limited expertise; non-conformity with basic systems, procedures, and standards for textile operations; and a lack of guidance and control for the workforce.

It is recommended that the range of expertise of the management staff is improved by obtaining the services of a qualified textile technologist with the responsibility and authority to control important areas of technological activity in production operations. Skills in mechanical and electrical maintenance need supplementing and improving especially in the finishing department. Procedures conforming to the basic requirements of production and quality control need to be instituted, established as routine, and improved and extended over time.

More training of staff and workmen is required and this should partly be accomplished by the incorporation of expatriate specialists into the management supervision for a period of at least three years. It is also extremely important that every effort should be made and no opportunity be lost to retain and fully utilize within the production organization of Somaltex the services of staff members with overseas training and several years of production experience.

Since the ratio of non-productive machine time to productive machine time is frequently unfavourable, there is a surplus of opportunity in which to carry out many forms of maintenance and to systematically examine, upgrade, and re-set many machines in the factory. Greater management efforts are needed to effectively utilize the time available and to monitor the quantity and standard of work carried out.

Furthermore, in view of the financial limitations to purchases it is preferable to obtain supplies of raw cotton rather than yarn in order to provide as much work and employment as possible in the spinning department.

Uncertainties in the attainable level of output in the short-term present difficulties in formulating plans and recommending improvements. For example, the delivery of spares to the factory in the last two to three years has been very limited. During that period deterioration in machine condition has taken place and to counteract this sizeable quantities of spares are going to become increasingly necessary with a consequent heavy financial commitment being required.

Thus, it is important to ensure that funds are available to secure supplies of raw materials and spares in preference to major rehabilitation, the purchase of new equipment, or the provision of instalments to repay creditors. The immediate aim should be to operate the full machinery complement on two shifts to have any hope of rationally organizing the work of the factory including the training of operatives. Fluctuations in supplies should be counteracted by temporarily reducing the number of working days per week and not by dispensing with the services of trained operatives or having their time and skills under-utilized during working hours by appreciably smaller workloads.

Under the circumstances each item of rehabilitation, replacement, or capital expenditure will need to be considered on its merits. If continuing limitations to production are foreseen for a few years then only the purchase of spares and a few items of basic machinery need to be considered. Thus, if fabric output is likely to remain for an extended period at the average level of the last six to twelve months then new ranges for scouring, bleaching, or mercerizing are unlikely to be necessary provided adequate rehabilitation work is carried out on existing machinery.

If better output can beforeseen, then most of the improvements referred to in the report will be essential to maintain activity. In any case, it remains a strong recommendation to obtain the services of an expatriate mechanical maintenance engineer and an expatriate electrical maintenance engineer for the finishing department.

During the first few weeks of the assignment a number of meetings took place at the factory to consider production problems and productivity. Although a few changes were made, such as a measure of improvement in the preservation of air conditions in the weaving department, the arrangement lost impetus when meetings began to be cancelled owing to a stated necessity on the part of the Somaltex staff to attend to matters put forward by the General Manager. The author's counterpart, the Head of the Maintenance Department, was frequently absent from the factory sometimes for extended periods. However, meetings arranged with the General Manager throughout the assignment usually resulted in useful discussions.

ACKNOWLEDGEMENT

The author wishes to thank Dr.A.H. Eames, the Project Manager, and the members of the U.N.I.D.O. project based at the Ministry of Industry for their assistance during the period of the assignment. He is grateful, also, to Mr.Abdulkadir Mohamed Mohamud, the Director General of Somaltex, and to Mr. Ahmed Hassan Egal, the Deputy General Manager, for their valuable assistance and kind co-operation. The members of the factory control staff were also helpful and patient in enabling the author to obtain information and he appreciates their contribution to the assignment.

I. RECOMMENDATIONS

1. Metric System

Within this report, reference will be found to yarn "count", which is the numbering system in use at the factory to indicate the thickness or fineness (size) of yarn. This is based on the metric system and is the number of units of length per unit of weight.

Thus, Nm 26 represents 26 units of length each of one thousand metres weighing a total of one kilogramme.

All spinning and yarn preparation machinery is set up to indicate production quantities in metres. Fabric constructions are referred to as having a number of threads per centimetre, i.e. in the warp and weft directions.

It would be preferable for all quantities of fabric to be designated in linear metres and square metres in order to avoid making additional calculations for conversion into yards,which simply increases the quantum of clerical and administrative work. The metric system is used in carrying out sales of fabric. For example, on the market ninety centimetres (35½ inches) is the standard unit of length, which is called one "yard".

For implementation folding machines in the finished goods sections are easily converted to measuring plaits in metres instead of yards.

2. Capacity Utilization

Basing on the first three months of 1982, the current level of output is approximately equal to 53% of capacity as measured by expected activity on the Sulzer weaving machines running for six full days per week on the three shift system. As is a typical figure in many countries, a total of 6,750 operative working hours per annum is used in computing such capacity.

When the utilization of production capacity is under consideration it is preferable to refer to square measure rather than linear measure since the use of linear measure gives an unclear indication of output in relation to true capacity on account of fabric width being ignored.

Overall capacity is limited by the availability of raw cotton, stores, and spare parts, and by the condition of the service installations, such as electricity generation, water wells, and steam supply network. Furthermore, a considerable effort in the training of new recruits would be required to enable the factory to be fully staffed for three shift working.

3. Availability of Cotton

The potential annual production from the weaving department is estimated to be twenty million square metres of fabric with an average weight of cotton of 130 gramms per square metre. These details relate to the product mix of the notional production programme. Such production is equivalent to a total of 2,600 tonnes of cotton.

With an appropriate allowance for processing waste the total requirement of raw cotton in bales would be of the order of 3,000 tonnes or 250 tonnes per month.

According to ginning production figures for Balad, total output of raw cotton originating from all sources in the country was 1,183 tonnes over fifteen months from the beginning of 1981, i.e. an average of 79 tonnes per month.

It is desirable for imports of raw cotton to be planned in such a way as to provide a consistent level of monthly cotton availability throughout the year so that wide fluctuations in the level of production operations could be avoided. Furthermore, in order to improve the level of production activity at the factory, it would be advantageous to produce lighter weight fabrics having lower weights in grams per square metre so that quantities of raw cotton provide larger quantities of fabric in terms of square metres.

4. Availability of Stores and Spares

There are shortages of stores and spares, the impact of which varies according to the item and the length of time it has been unavailable. Those that result in extremely serious production stoppages derive from spares for a sole machine in a processing sequence which cannot be temporarily by-passed; consumable stores such as chemicals for scouring and bleaching, and starch for sizing; and Diesel or boiler fuel.

It is recommended that a more systematic ordering procedure is adopted. This would be based, in the first place, on forecasts by the senior management on the utilization of factory capacity over a suitable period, say three years. If this was two thirds, for example, then it could be decided whether to operate on two shifts instead of three or to reduce the number of operating machines by one third in the event of a shortage of spares.

Then technical management, after reviewing consumption patterns over previous years and taking into account the nature of future processing technicalities, would decide total annual requirements of spares and consumable items. Cost estimates and priorities would then be

determined and budgets submitted to senior management for general approval. Subsequently, requisitions would be made out for individual or categorised items covering a suitable portion of total requirements and submitted "en bloc" for signature, forwarding, and processing.

Only one person at the factory would be authorised to sign requisitions for spares or other stores. Requisitions for capital items would be dealt with outside this procedure and should be initiated by reference to a previously agreed budget.

Since there is always a possibility of an unexpected incident or miscalculation the authorities could consider granting permission to senior management to utilize an agreed sum of money kept in reserve by the bank and authorised on an annual basis for emergency purchases without recourse to the normal processing formalities. This would then be useable if serious production stoppages were occurring or were foreseen as imminent and would apply only to imports, which could then be obtained by air freight if convenient.

Delays in the arrival of supplies at the factory tend to distort planned purchasing arrangements as well as production. Thus, quotations are obtained, which usually have a validity period and if this expires then re-negotiation has to take place or remedial arrangements have to be made. Any measures that could be adopted to speed up the granting of applications to place firm orders for supplies and to open letters of credit would help relieve the difficulties of both buyer and seller and reduce the amount of administrative work involved.

5. Factory Control Organization

It appears that administrative control at the factory is more effective than technical control. Thus, the technological and technical requirements of manufacturing are given insufficient consideration.

As a result, important aspects of production such as raw material quality and compatibility, process parameters, machine settings, process control, work methods, and air conditions receive little attention or control. It is recommended that a qualified textile technologist is taken on to the staff of the factory to co-ordinate all requirements and to generate the necessary degree of awareness in all staff.

It is also believed that an improved level of dedication and a more purposeful sense of application on the part of staff members would provide a better environment in which management would function more effectively. To promote this a first step would be the drawing up of job descriptions for all members of the control staff to ensure that responsibilities were clearly defined and to show that the accomplishment of tasks would lead to the attainment of objectives. In addition, peripheral activities for heads of departments should be kept to a minimum. Thus, frequent absences to give course instructions, to supervise examinations, or to look for stores items in short supply should be avoided and such tasks should be undertaken by those with such specific responsibilities.

6. Preventive Maintenance

This work includes the electrical equipment on machinery as well as the mechanisms on the machines themselves. It appears that there is little co-ordination between the department assigned the responsibility

of machine maintenance and the department under which the electricians work. To overcome this deficiency it is recommended that maintenance work concerned with all production machinery is assigned to one department which will then be responsible for keeping in order all mechanical and electrical equipment. This would necessitate both mechanical and electrical technicians being assigned to the department and all work being arranged under one head

To facilitate this, three working supervisors should be established in the production departments to assist the head of maintenance in keeping a good standard of machine condition and in conforming to the specified maintenance schedules.

Furthermore, the mechanical and electrical workshops should be placed under the control of a qualified engineer whose task it would be to ensure that repairs and replacements within the scope of those facilities would be attended to with the minimum of delay. Moreover, whenever possible, he would arrange to keep parts available in advance of requirements either by means of repairing or making.

7. Lubrication

It is understood that all oils and greases have to be obtained from a central state organization and that periodically an expert from one of the oil companies attends consultations to determine the country's overall industrial requirements.

Although some items stipulated by the machinery makers of the Somaltex machinery are available, there are many cases where a number of applications have to be serviced by one oil or grease. Furthermore, there appear to be serious omissions. For example, 18,576 spindle bolsters on the ring frames are provided with an oil of viscosity 10w which is normally used for a hydraulic system on the Diesel engines. If it should happen that such an application is unsuitable then much difficulty would build up over a period of time, which may lead to heavy expenditure.

It is considered that as a safety precaution all current lubrication applications should be listed and details forwarded to the main machinery suppliers i.e. Generale Impianti, Sulzer, Sucker, and Schlafhorst for their comments. These could then be taken into account to support a case for the provision of a more comprehensive list of lubricants from the central supply organization.

8. Air Conditioning

The importance of air conditioning that is operating correctly and in accordance with pre-set automatic controls cannot be overstressed. Its necessity is related to the technological requirements of processing and the creation of optimum working conditions in which operatives are able to work more effectively.

An appropriate level of relative humidity in ring spinning is approximately 50% at a temperature of 28 degrees centigrade. This creates the conditions in which processing takes place satisfactorily and quality is maintained. Furthermore, the control of loose fly and dust in the atmosphere is facilitated. In weaving, a level of 75% humidity in conjunction with good synthetic sizes will enable low levels of warp breakages to be attained in yarn of reasonable quality and consequently enhances production.

Since the cost of providing good air conditions is quite significant, it is sensible to use such a benefit with as much economy as it is possible to arrange. Thus, to allow such air to escape from open doors is wasteful and unnecessarily increases production costs.

The institution of several features of control by management is required in order to be able to attain stable conditions over long periods in work rooms. As has already been mentioned an experienced textile technologist would insist on such matters being given appropraite attention.

9. Process Control

This should be based on practical specification for machinery set-up, intermediate product parameters, and production rates. Systematic observation and testing should then be carried out to implement control procedures.

It is essential that the group of people who are assigned the task of maintaining the routine of observation, checking, and testing should have an effective base from which to carry out their duties. At present, there is a small room containing a few items of testing equipment, which is constantly overheated and filled with stale air. It is both unsuitable as an environment for carrying out material testing and as a place where people need to work conscientiously and effectively.

To bring about improved processing derived from the availability of accurate test results it is necessary to have a suitable testing laboratory. This should have enough space for strong worktops to support all testing equipment and a desk and table for people to work at. The room should be air conditioned, preferably by a free standing individual unit designed for such purpose, and be well lighted. It should then be possible to maintain reasonably stable standard testing conditions to the recommended level of RH 65% $\pm$ 2% and 20 degrees C $\pm$ 2 degrees. It is likely that this room should be alongside an outside wall to enable the air conditioning unit to operate correctly.

It is understood that the factory hopes to obtain an evenness tester to examine the regularity of slivers, rovings, and yarns on a routine basis. Such a procedure requires similar moisture content levels in all materials under test in order to ensure strict comparability both from "in-house" results and for those from other sources.

10. Finishing Department

The standard of electrical and mechanical maintenance in this department is inadequate. Machines are in poor condition, some are fitted with steam and water lines that are too small in diameter, and production costs must be heavily inflated by steam and water losses. Furthermore, cloth is frequently to be seen passing through machines in a creased or folded state partly owing to the lack of expanders and guiders. There are also many dangerous places in the department as a consequence of electrical equipment being in bad condition and holes and uncovered channels in the floor.

It is strongly recommended that the factory should employ two European maintenance engineers with good experience in finishing plants (one mechanical, one electrical) for a period of three years to upgrade installations and machinery and to institute and implement a fully detailed preventive maintenance scheme. Moreover, a training scheme for both mechanical and electrical technicians should be put into effect.

In addition, it is considered that the work of the department and the wellbeing of staff would benefit from improved conditions. These would be obtained by preventing the ingress of dust and by arranging for the extraction of hot moist air, and better ventilation.

11. Service Installations

For the generation of electrical power, five of the eight Diesel generators are in working condition. As no capacitors are available for the correction of a very low power factor, the number of units that can be supplied is extremely variable but the highest is approximately 2,250 kW per hour. The total factory load is in the region of 3,500 kW.

Arrangements should be put in hand to obtain capacitors for the

correction of the power factor when seven Diesel generators are working. This would mean a number of units that could be switched into the circuit as circumstances demanded. The three older Diesel units could be replaced over a period of time in line with the expected capacity utilization of the factory.

The supply of water is dependent on the number of wells available and the operation of submersible pumps. Even at the present level of factory output there are sometimes failures in supply. The whole installation needs upgrading and a concerted effort is needed to minimise waste.

The steam network, which mainly supplies finishing department machinery, the size cooking unit, and the sizing machine is subject to excessive loss of steam and frequent failures. The whole installation requires a very careful examination to determine where worn piping and bad joints need replacing. Furthermore, many valves and steam traps need skilled attention or replacement.

The compressed air supply is frequently inadequate to keep finishing and sizing machinery in operation. The system suffers from leaks at control valves and indiscriminate use. Unsatisfactory valves should be replaced and the use of compressed air should be restricted authorise technical application.

Furthermore, the engineering department should compute the total load in the factory and determine the adequacy of the two installed compressors. It is likely to be of benefit to disconnect the spinning department from the existing supply and install a separate system in accordance with calculated requirements. This would tend to make necessary more careful useage and promote better departmental control.

12. Factory Layout

The existing complement of machines in the spinning department can only

be supplemented to a modest extent without other major alterations being made. To obtain an increase in ring spinning capacity of 10 - 15% in the most economical way, the 1971 Trutzschler blowing scutcher line would need to be rehabilitatedand a few more SACM cards and one set of drawframes would be needed to operate alongside the existing SACM equipment. This would necessitate moving the existing assembly winder and doublers to another location.

If a greater production increase or a major change in raw materials was under consideration, it would be necessary to consider the use of the area adjacent to the existing spinning department, which would involve the removal of idle and mostly obsolete machinery, some items of which could be useful for small scale enterpreneurs with access to simple engineering facilities.

The area of the existing yarn preparation department is rather cramped. Any single item of additional machinery will necessitate major alterations being made. For example the sizing machine was installed with insufficient space for the moveable creels. The working area would need enlarging towards the North and most of the existing machinery would need re-locating to obtain the most appropriate layout for minimum cost in material handling.

It would be possible to extend the weaving department towards the North without too much difficulty but the shape of the area would then begin to assume unusual dimensions in as much as the major weaving machine dimension is usually parallel to the major room dimension.

Any extension of the finishing department would need to be in the East-West direction, i.e. in the same direction as the length of the rotary printer. Such area could then house singeing, scouring, bleaching, continuous dyeing, etc. It may also allow the newer of the two stenters to be re-located in a more suitable position.

In general, it may be taken that any extension greater than to incorporate a small increase in spinning capacity is certain to involve very high

expenditure on building alterations, additional service installations, and machinery re-location. Uner such circumstances, it is possible that additional self-contained production units separate from the existing building may be more easily justified on financial criteria.

13. Motivation of Workpeople

It is an accepted fact that wages and working conditions do much to motivate workers to consistent efforts to promote quality and quantity of production. However, the giving of guidance and the making of demands on the part of control staff also have an effect on morale.

There is little evidence that control staff endeavour to influence the attitudes and practices of the workpeople. If very little is expected or demanded then that is exactly what is given by the employees, some of whom seem to consider that conforming to factory discipline is not expected. Thus, if the correct work methods can be avoided, or something can be thrown or pushed instead of being placed, or a truck can be used for a ride no matter how risky or how close to operating machinery, then that is what frequently happens. And nobody remonstrates or tries to point out that there is a better way.

Such occurrences create the wrong atmosphere for the encouragement of serious endeavour, the implementation of systematic maintenance and quality control programmes, and the acceptance on the part of the workpeople that the factory is performing an important function, which requires conformity to certain understandings, procedures, and regulations.

14. Good Housekeeping

It is desirable to keep work areas in a factory in a clean and tidy condition for such reasons as:

- to maintain good working conditions and hygienic, disease-free air;
- to facilitate keeping machinery in a clean condition and process quality of a good standard;

- to maintain an environment in which it appears natural that quality products should be developed;
- to keep to a minimum the risk of fire;
- to preserve the good appearance of work areas;
- to promote a caring attitude amongst all workpeople

This matter is one that is strongly recommended for the urgent and constant attention of management as is also keeping all premises in a good state of repair.

15. Capital Register

TO facilitate good administrative practice and in order to benefit from the implementation of preventive maintenance schemes, it is recommended that the financial department of the factory should compile a capital register of all plant, machinery, and equipment. This would record the original cost details and the main physical details of each item and should be kept up to date by using written reports concerning re-location, changes, additions, deleted items to be written-off, and replacement parts of machines to be added to capital asset values.

16. Training

If the services of a qualified textile technologist were made available to the factory, it would enable two or three members of the higher factory management to undergo training and to broaden their experience. This would include the deputy general manager, who would benefit from courses designed to improve knowledge of planning, administrative control, and financial control; and the technical director, whose knowledge is mainly based on weaving processing.

In order to strengthen the capability of the factory organization, it is considered that the technical director, Mr.Ahmed Yusuf Suleyman,

should be re-designated as the production director, and that the previous holder of the post of technical director should be brought back in that capacity following the completion of his year's studies at SIDAM. Thus, the implementation of planning and control systems for both production and technical functions would be arranged by the co-ordination of duties of two experienced managers.

It is also of some importance for the management of the spinning department to be improved so that the technological requirements of the process would be more readily understood and stipulations regarding processing parameters would be given due consideration and then specified and implemented.

Training in all forms of control for the Diesel generating unit is urgently required as there is no monitoring of engine running performance, little control of maintenance for electrical equipment, and no concern shown for the control of costs in running the unit.

Responsibility for the correct operation of the air conditioning installation is understood to rest with the Head of the Energy Department. In view of the equipment's performance, however, it is doubtful if this person has sufficient knowledge to undertake such a task. Some training is obviously necessary but whether another person should be selected to benefit from such an arrangement is a matter to which the management should give careful consideration.

As regards the work force, a greater effort is needed to ensure that all operatives are given comprehensive instruction and adequate training in their various jobs. Observance of correct work methods will improve a person's capability and speed of working, will help to keep machinery in good condition, and will generate the conditions under which to implement schemes for incentive payments and control of quality.

In order to initiate the monitoring of process parameters in the finishing department, it is considered that the expert responsible for

bleaching, dyeing, and finishing, Mr. Otto Bergmann, should train two young graduate chemists in the range of testing that should be carried out in a departmental laboratory. This unit has been completely closed down for some time and its work needs to be resuscitated in order to carry out testing of caustic soda, hydrogen peroxide, and other liquors; process checking such as for jiggers, hot flue, soaping, and shrinkage; fluidity testing, shade matching, and wash and light fastness tests. Only by instituting such arrangements will the processing capability of the department improve and the setting of standards become possible.

17. Further Assistance

It is recommended that short-term consultancy assignments should be considered to cover the following investigations:

Two months - To assess the market requirements of knitted clothing and to determine whether a making-up unit to produce such goods would be a feasible proposition. If the findings were favourable, it could then be investigated whether there was any future for the knitting unit at Somaltex, which has now been idle for more than two years. Consideration could be given to the possibility of re-locating the eight knitting machines at another plant specialising in the production of finished goods and made-up articles.

Three months - To improve the management organization of the enterprise job description for senior officers need to be specified, co-ordination of departmental functions should be evaluated, and improved control procedures instituted.

Six months - The reasons for deficient supervisory control at the factory need investigating and the development of improved standards promoting. Clearly, supervision in a factory such as Somaltex covers a wide field and many distinct requirements. In spite of this it is

believed that an overall investigation would provide a clearer understanding of the function; identify training needs and initiate implementation; and lead to a general improvement in standards of control.

Four months - To consolidate the development of in-process quality control assistance would be valuable after a better testing laboratory has been set up and the basic testing equipment becomes available. Such work would supplement any carried out by a qualified textile technologist whose services become available to the factory since the setting up of procedures need intensive supervision to monitor results and to develop practical standards.

Three months - Taking into account the results of observations and discussions it is believed that follow-up investigations are needed to monitor the implementation of recommendations and to assess the rate of improvement in performance. This would appear to need the attention of two experts, one of whom would be a textile technologist/ engineer and the other a mechanical engineer.

II. PLANT BALANCE

A. Background

In order to make an accurate evaluation of a balanced plant situation for a factory it is necessary for market requirements to be adequately identified. Under such circumstances it is then possible to decide what product mix will take account of demand and be compatible with the production facilities and the expected profitability.

Owing to a transition period in the method of marketing and distribution uncertainty exists as to what types of fabric should be produced by the Somaltex factory. There is some evidence that a long-established type of fabric is too coarse to meet present day preferences and thus there is an endeavour to experiment with one or two lighter weight fabrics.

Unfortunately, to carry out marketing trials to assess the reaction of the public takes quite a time. Consequently, it has been necessary to make up a notional product mix after consultations in order to investigate the implications of possible parameters. Such work may seem rather academic in view of the shortages being experienced by the factory. However, the author believes that it is necessary to demonstrate what the plant is capable of producing in order to set a target standard with which to compare performance.

Furthermore, it will also help to provide a basis for any section of processing where possible future acquisitions may form the subject of an evaluation.

Meanwhile, it will have been necessary to have established and be following many of the required control procedures, in order to operate the plant effectively when materials become more readily available. Such activity would include keeping standardized machine production rates, regularly attaining satisfactory efficiency levels, maintaining conformity with optimum intermediate product specifications, and

frequent checking of yarn package shapes, weights, densities, and general condition.

The production programme thus forms an objective towards which activity may always be directed.

When considering the overall picture of plant balance at Somaltex, therefore, it should be borne in mind that, although the scale of operations may not be possible at the present time, the nature - as demonstrated by the plant balance schedules - most certainly is. Thus, yarn and cloth parameters, rates of production, and efficiencies are considered to be realistic and attainable provided the necessary degree of attention to detail and control at all stages and in all aspects is put into effect.

It is believed that sufficient allowance for difficult circumstances has been made to maximum possible efficiencies and production levels. Thus, all efficiency figures are applicable on an annual basis, i.e. they allow for normal processing stoppages and all forms of cleaning, lubrication, maintenance, and incidental breakdowns. It is expected that normal management activity would be directed towards optimum levels of operative training, overall control, and availability of stores items including consumable materials.

For the plant to be viable and to be in a position to supply goods to the population at reasonable prices, it is essential to create the conditions as soon as possible for continous three shift working in the spinning, yarn preparation, and weaving departments. This would be carried out on six days per week and twenty four hours per day (with an allowance for the taking of one meal per shift).

Thus, the total working hours per year would be derived from 300 days multiplied by 22.5 hours per day, i.e. 6,750 hours.

If, in view of market demand, a higher level of overall production became desirable then consideration could be given to operating the factory for seven days per week. This would involve employing more workers - perhaps by using a four group system with three groups of workers present on any one day to staff the three shifts while the fourth group rests.

B. Production Programme

As a starting point, the production programme for the year 1982 proposed by the management of Somaltex was used to determine the annual production of grey fabric from the Sulzer weaving machines. Details will be found in Annex 2A. The quantities of yarn required to be produced to implement this programme were then calculated and the details will be found in Annex 2B.

When compiling the spinning production programme, it was noticed that the required quantity of Nm 26s count yarn could not be attained without a certain amount of continual count changing on some roving machinery. It is the author's considered opinion that to undertake this for the sake of exactly meeting the weight requirement of 26s by a small increment of production capacity would be the cause of much work and would be uneconomic. Therefore, it was decided to assume that a slight change in the fabric production programme would be made to allow for the production of a slightly lower target for 26s. This situation is shown in the spin plan given in Annex 2C.

To counterbalance this, it would be preferable for 40s count to be allocated to the production of a somewhat larger quantity of an appropraite fabric. Furthermore, as the quantity of 50s yarn required for the completion of the weaving production programme would be very small and would not keep one ring frame operating on a continuous basis, it would be logical to drop the count altogether or to import the amount of yarn required. Of course, if a sufficiently sizeable quantity were

required, which was compatible with keeping the capacity of one roving frame in production on a continuous basis, then the situation would call for review.

However, as stated above, it became necessary to consider a notional production programme to take account of changing preferences in market demand. Details will be found in Annex 2D and in computing these, attention has been given to the maximum possible utilization of available yarn space (reed width) in the weaving machines. Although most of the fabrics have been dealt with in this way, there is still an example requiring attention on one of the towel looms where it has been usual to produce five widths occupying 312 cms of yarn space. Since one width takes up 63 cms it is still possible to add one more, thus having a total of 375 cms occupied out of 389 cms available.

The derived yarn requirements are given in Annex 2E and the arrangements to be made in the spinning department will be found in Annex 2F. Counts have been allocated to the ring frames on an annual basis so that roving bobbin production to the equivalent of a complete roving frame or a number of complete roving frames is continuously used for the feedstock. Thus, the production of yarn and roving is intended to continue without having recourse to changes of gearing and machine set-up in the ring and roving frames.

Attention to such details optimizes machinery utilization and improves the control of production costs.

The use of a notional production programme in order to provide a basis for a recommended plant balance situation is cosidered to be practical for the following reasons:

a) It is based on the Somaltex proposed production programme for 1982 except for a reduction in the quantity of Article 02 - a coarse cloth of 138 grams per square metre - grey and the introduction of a new plain cloth
- a cambric type of 122 grams per square metre - grey;

b) It results in a lower requirement of raw cotton, chemicals, diesel fuel, boiler fuel, and other consumable stores items;

c) The unmodified 1982 prooouction programme would have placed a heavy demand on the sizing section (where there is only one machine) and this situation will be eased to a significant extent.

Below will be found a comparison of the main details:

	1982 Proposal	Notional Programme
Working hours	6,750	6,750
Raw cotton required	3,640 tonnes	2,820 tonnes
Ring frames required	46	43
Average count	Nm 30.59	Nm 35.49
Imported yarn requirements	139 tonnes	91 tonnes
Looms required	154	154
Grey goods production	24.7 mill. linear m	18.3 mill. linear m
	24.6 mill. sq. metres	20.1 mill. sq. metres
Finished goods production	22.6 mill. sq. metres	18.4 mill. sq. metres
Average weight of cotton per sq. m. grey cloth	131 gm per sq. m	130 gm per sq. m

C. Sectional Capacity

The analysis given in the following paragraphs relates to the notional production programme for fabrics and the derived production requirements in the spinning, yarn preparation, and finishing departments.

Blowing

All cotton processed by the Marzoli blowing section passes successively through a twin opener, a step cleaner, and a multimixer. The stated

capacity of each machine is 480 kgs. At an efficiency of 90% this would mean an average hourly production of 432 kgs. As the production from twelve cards depends on this quantity it would mean an average hourly production of approximately 36 kgs per card, i.e. a carding rate of 40 kgs per hour.

At present, the carding rate is approximately 32.5 kgs per hour giving an average production of 29.25 kgs per hour at 90% efficiency. These are marginally higher figures than those used in the spin plan linked to the notional production programme. However, it is considered that the chosen rates allow for a variation in fibre fineness (according to the source of cotton), which, although unable to be measured, appears to have a micronaire value below rather than above 4, i.e. finer rather than coarser.

Thus, the blowing capacity is regulated to an average hourly production of approximately 350 kgs.

From the spin plan, it will be observed that this is insufficient to enable 43 ring frames to produce yearn. There is thus a choice of:

- reducing the planned overall quantity of yarn production;

- increasing the carding production rate at the expense of quality (may be tried but only in conjunction with metallic wire in good condition, accurate card setting, and a well-organized quality testing programme);

- selecting fabrics using even finer yarns, thus allowing a finer average count to be spun utilizing all or almost all the ring frames;

- making use of the idle blowing machinery from the old plant.

A brief examination of the old blowing machinery revealed that, although

the raw cotton blenders are older than the rest of the Trutzschler scutcher line (1971), rehabilitation would enable the equipment to be brought back into use. This would provide an additional average hourly production of approximately 170 kgs at an efficiency of 85%, which would be in the form of laps to feed the 1971 SACM cards.

At the selected rate of production for these cards, nine or ten could be provided with feedstock material from the Trutzschler blowing machinery. Five cards are available but some rehabilitation work is required.

During the first part of the author's assignment at the factory it was observed that the level of production was rather low. Approximately twenty ring frames were running on one shift only. Later the number of ring frames was increased to thirtyfour on two shifts and it became noticeable that the centralized electrical control panel for the blowroom and cards was responsible for many stoppages. In fact, on some occasions this resulted in all ring frame production being suspended for the whole of one or two shifts.

It was stated that replacement electrical contacts were required but were unavailable. Under such circumstances it may be concluded that an improvement in procedure is necessary to the system of ordering by the factory and/or the system of scrutinizing purchase requisitions by the authorities. The present arrangement whereby the production of a complete department can be put at risk for the sake of the purchase of electrical contact assemblies valued at a few thousand dollars will clearly benefit from review.

Furthermore, it was also apparent that the electrical maintenance staff were unable to solve quickly problems caused by photoelectric detection equipment not functioning correctly and also causing interference to productio[illegible].

Waste

With all ring frames in production, an estimate of the quantity of roving waste that would be made may be taken as 4 kgs per hour. This is equivalent to 90 kgs per day or 27 tonnes per year.

At the present time all roving waste is sent to the mattress making unit, which is unfortunate as it consists entirely of good spinnable fibre. However, it needs to be kept clean and to be prepared through a roving waste opener machine to enable it to be fed back again at the blowing section blenders.

Since the figure of 27 tonnes represents in the region of Sh. So.450,000 value of good fibre and in view of the shortage of raw cotton, the purchase of one roving waste opener machine is recommended. This should be installed as close as possible to the blowing section to enable good technical control to be maintained and to minimise material movement. Depending on the type, its capacity would be from 20 to 50 kgs per hour so it would only need to be used for one shift each day.

Carding

At present, three Marzoli cards and all five SACM cards are out of order. When the full complement is available the quantities of sliver shown in the spin plan will be available and will be sufficient to keep all 43 ring frames in production.

The twelve Marzoli cards are equipped with automatic sliver can changing mechanisms, none of which are able to work. It is understood that, in some cases, this is owing to the wearing out of a brass slide (possibly exacerbated by inadequate greasing) which is traversed by a threaded rod, and in other cases to an inability to carry out accurate adjustments. Since the mechanism were in use for two years when the cards were new a determined effort is necessary to restore them to a fully operational

standard. This will avoid the existing unsatisfactory arrangement by which workmen push out the filled can by means of using the empty one thus putting strain and rough handling on the containers and reducing the potential of their useful service lives. A full can of sliver weighs approximately 110 kgs (including can) and thus requires the use of appreciable force to move it by the present method.

Furthermore, the use of the can changing mechanism would ensure that the pre-determined sliver length measuring device had to be in use thus standardising the length of sliver for each can. This would enable workloads in carding and drawing to be properly assessed, and creelings and piecings at the drawframe to be at a minimum.

It is important to maintain the rigid metallic wire surface on the taker-in, cylinder, and doffer and semi-rigid clothing on flats on all cards in good condition by an adequate grinding and replacement programme. This will enable a reasonable level of production to be maintained without sacrificing processing quality thus avoiding a bottleneck in production.

Drawframes

The existing complement of machinery consists of four sets (two machines per set, i.e. first and second passages) of Marzoli drawframes and one set of SACM drawframes. The SACM set and one Marzoli set are unable to operate because of missing parts. The other three Marzoli sets are operating below the normally expected level of efficiency on account inadequate maintenance including roller setting adjustments in relation to fibre length, and the use of top rollers with worn covering surfaces.

Full investigation, technical assessment, rehabilitation, and maintenance work are essential to improve the performance of this section.

Roving Frames

The arrangements set out in the spin plan envisage the production of three thicknesses of roving, specifically Nm 1.1, 1.55, and 1.65. The expectation is for Nm 1.1 to be produced on package size 11 x 6.5 inches; Nm 1.55 to be produced on package sizes 11 x 6.5 and 11 x 5 inches; and Nm 1.6 to be produced on package size 11 x 5 inches.

The small SACM frame of 88 spindles would be surplus to requirements.

The two SACM frames manufactured in 1979 are no longer fitted with photcelectric broken end stop motions. It is preferable for these to be renewed to ensure that the frames are stopped quickly in the event of a broken roving occurring during running. This would reduce the possibility of the broken end being picked up and twisted into an adjacent roving, would reduce waste, and would improve efficiency.

Ring Frames

The spin plan provides for all ring frames to be fully utilized. If a coarser average count were to be needed in the future, additional frames would be required if the whole of the weaving department were to be kept operating.

It is considered that if the existing four doubling frames and one assembly winder were to be moved then four or five ring frames similar to those already installed could be added provided that balancing card, drawframe, and (perhaps) roving frame capacity could be obtained and supplied with material from the two existing blowroom production units. Space for such spinning preparatory capacity would have to be found in the building where the old spinning machinery is now housed.

(Concerning the old spinning machinery, it may be taken that the Howard and Bullough cards (year 1912), the Ingolstadt drawframes (1952), and the Howard and Bullough roving frames (1935) are obsolete and should be scrapped.)

When the ring frames were installed they were fitted with individual overhead cleaners made by Etablissements Neu. The size of the suction/blowing motor is 700 Watts and the transport motor is 60 Watts. In use, the transport motor became overheated and, therefore, the cleaners have been out of use for most of the time since 1976.

For the benefit of cleanliness, yarn quality, and operative loading they should be rehabilitated by the maker or replaced.

Assembly Winder and Doubling Frames

It is understood that these five machines have been used very infrequently in past years and there is nothing to indicate that they will be required at any time in the near future. The types of fabric needing two-fold yarns from the counts produced by Somaltex are not within the range of general market demand in Somalia. In any case, the production costs for medium quality fabrics should not be increased by the use of more expensive two-fold yarns.

However, in future years, there may be a demand for two-fold yarns to be used as warp (unsized) for weaving by small scale industrial users with a few power driven looms.

Cone Winding

As will be seen from the details given below, the existing capacity is more than adequate even allowing for the rewinding of yarn remainders. It is important, however, to ensure that all cones are produced to a minimum weight standard of approximately 1.9 kgs. This requires much firmer control than is exercised in the section at present in order to avoid the artifical inflation of the weight of total production.

A more logical approach would be to ensure that the longest length possible should be put on warping beams to enable sizing to operate with

The optimum efficiency. This would probably mean that only enough length for one warping beam of maximum length should be wound onto cones. Thus, the cone package size should be reduced and the creel changeover in warping be carried out with greater speed and efficiency.

Weight of yarn on Ring Tube:

Nm	26s	90	grams
	40s	80	grams
	50s	80	grams

Weight of yarn to be wound:

	WARP			WEFT	
Nm	kg per year	kg per hour	Nm	kg per year	kg per hour
26	687,290	101.83	26	408,049	60.46
40	600,940	89.03	40	477,620	70.76
50	202,871	30.06	50	183,960	27.26

Production per drum:

Machine	m/min	Nm	Effcy %	kg hour
Autoconer	900	26	70	1.45
Autoconer	900	40	70	0.94
B K N	700	26	65	1.05
B K N	700	40	65	0.68
B K N	700	50	70	0.58

Machine	Nm	Warp		Weft	
		kg	Drums	kg	Drums
Autoconer	26	72.50	50	-	-
B K N	26	29.33	28	60.46	58
B K N	40	89.03	131	70.76	97
B K N	50	30.06	52	27.26	47

Utilization:

Machine	Drums Available	Drums Required
Autoconer	50	50
B K N cones (warp)	408	211
B K N cheese (weft)	240	202

Warping

The two existing warping machines producing beams 2600 mm wide are more than adequate to meet the production requirements, as is shown below, provided that:

- the standard of maintenance is good;
- yarn quality is reasonable;
- the length of yarn wound on to a beam is increased above the present very low figure (length indications are given below and standardization should be insisted on by technical management);
- the time taken for creeling is reduced by the use of a properly organized system of changeover and speeder working by creeling operatives.

In making the calculations for this section the following parameters have been used:

Warper running speed:	500 metres per minute		
Yarn weight per cone:	1.9 kg	-	for both Autoconer and B K N
Yarn length per cone:	Nm 26		49,400 m
	40		76,000 m
	50		95,000 m

Yarn length per warper beam:

Nm	Suggested Length	Maximum Possible
26	24,000 m	28,000 m
40	37,000 m	40,000 m
50	46,000 m	56,000 m

Stoppages during warping:

Nm	26	5	per 100 ends per 10,000 m
	40	6	" " " " "
	50	7	" " " " "

It has been observed that some of the cones produced at present are as low as 1.5 kg in weight in order to attain the specified diameter more quickly. The average weight is probably around 1.7 kg.

The present practice is to make two warper beams from the length of yarn available on one set of cones in the creel. This obviously unnessarily limits the length of yarn per beam and consequently adversely affects sizing efficiency by compelling the sizing staff to creel more frequently than necessary.

Unless a higher standard cone weight can be continually attained consideration should be given to winding enough yarn per cone to complete one beam of maximum length in warping. Since there is excess capacity in warping this should allow the extra creeling to take place without any difficulty.

Time to produce one beam - 26s x 625 ends x 24,000 m

Running time:	48 minutes
Stoppages:	75
Creeling allowance	30
	153 minutes

Efficiency: 31.3%

Time to produce one beam - 40s x 660 ends x 37,000 m

Running time:	74 minutes
Stoppages:	147
Creeling allowance	30
	251 minutes

Efficiency 29.4%

Time to produce one beam - 50s x 660 ends x 46,000 m

Running time:	92 minutes
Stoppages:	213
Creeling allowance	30
	335 minutes

Efficiency 27.4%

Production hours required per year:

Nm	26	3,020
	40	4,057
	50	2,433
Total:		9,510 hours

Available 2 machines = 13,500 hours

Reserve 1 machine = 6,750 hours

WARPING PRODUCTION

Article	Warp Nm	Cloth Prod. metres	Crimp %	Warp Req'd '000s m	Beams	Ends	Total Ends	Total Warping Length '000s Nm 26	Nm 40	Nm 50
Grey 02	26	393,458	8	425	11	619	6,809	4,675		
New Plain	50	867,038	8	937	17	625	10,620			15,929
Grey 03	40	2,319,233	8	2,505	13	666	8,658		32,565	
Col. Check	50	220,928	8	239	17	625	10,620			4,063
New Dobby	26	70,403	6	75	12	620	7,440	900		
Grey 015/1	26	980,168	6	1,039	14	626	8,764	14,546		
Grey 015/2	26	324,068	6	344	17	618	10,520	5,848		
Grey 018/1	40	518,468	3	535	6	587	3,520		3,210	
Towel 04/1	26	33,413	400	134	8	559	4,472	1,072		
	25		5	36	8	583	4,664	288		
Towel 04/2	26	33,413	400	134	6	589	3,534	804		
	26		5	36	6	621	3,726	216		
				Total metres '000 for each count				28,349	35,775	19,992
				Effective metres '000s per hour				9.39	8.82	8.22
				Hours required per year				3,020	4,057	2,433

Sizing

The total length of warp yarn to be sized to enable the Sulzer weaving machines to operate as set out in the production programme is 6.5 million metres. This can be accomplished as is shown below provided that:

- the machine is kept in good order by a properly implemented preventive maintenance scheme;

- the quality of the beams supplied from the warping machines is standardized at a much bigher level than is at present attained;

- the sizing operators will count equal numbers of ends into each dent of the comb on the headstock to enable the loom beams to be prepared with a regular density of warp ends across the full width, thus avoiding the production of sized warp which is liable to weave unsatisfactorily and, consequently, be wasted.

- beams for the Sulzer weaving machine are made to the maximum length (i.e. yarn should be wound to a diameter which is equal to the flange diameter of the beam) to avoid the doffing of more beams than are necessary thus keeping unproductive time on the machine as low as possible;

- adequate steam is available;

- compressed air of the correct pressure is always available. (There is excessive use of compressed air at present owing to unsatisfactory methods in the spinning department and by workpeople using it to blow cotton from their clothing.)

From the warping production details given in the table it will be observed that the total length of yarn on warping beams in sets according to count is:

Nm	26	2,223,000 metres
	40	3,040,000 metres
	50	1,176,000 metres

Taking an average efficiency figure of 50% the following hourly rates of production are derived from the running speeds given:

Nm	26	750 m/hour	at	25 m/min
	40	1,050 m/hour	at	35 m/min
	50	1,200 m/hour	at	40 m/min

The required working hours are thus:

Nm	26	2,964
	40	2,896
	50	980
Total		6,840 hours

Thus demand and capacity appear to be approximately in balance, which may result in a case for occasional overtime shifts.

Knotting

At the sizing process, the length of yarn that could be wound on to a beam for the Sulzer weaving machines has been estimated in 000's metre as:

Grey 02	2.6	New Dobby	2.0	Towel 04/1	2.8
New Plain	3.2	Grey 015/1	1.7		2.8
Grey 03	3.2	Grey 015/2	1.7	Towel 04/2	3.0
Col. Check	2.5	Grey 018/1	7.0		3.0

The total number of beams requiring knotting would then be 2,384 per year or 8 for day on average. Assuming a peak requirement of 12 per day this would mean 4 beams would require attention on each of the three shifts, which constitutes a very light workload for the two knotting machine teams available.

It is understood that a third knotting machine forms part of the weaving equipment complement but is out of order. As such a machine is quite a small piece of equipment, a strong recommendation is for it to be returned to the maker by air to enable it to be overhauled and returned to be kept as a reserve unit. Production from the weaving department could be badly affected if the situation arose whereby only one knotting machine was available.

Warp Stop Motion Preparation

Owing to recruitment restrictions, it is not possible to take on new trainees for the work of placing dropwires on the warp ends by hand. Thus, people who do this work at present are not able to adapt to the normal performance rate, which should be at least 120 dropwires placed per minute. In the event of minimum downtime becoming desirable it will either be necessary to train operators with the appropriate level of ability or to obtain equipment to carry out the work. The training of women operators is the preferable choice.

Weaving

As will be seen from Annex 2D, all 154 Sulzer weaving machines are expected to operate throughout the year, i.e. for 6,750 working hours.

In order to reduce the quantity of coarse plain fabric being produced to take account of sustained low demand only eight machines have been allocated to Article Grey 02. This should enable a small supply to

be kept available to meet the requirements of a few dedicated buyers or of periodic orders.

The availability of the equally long-established Article Grey 03 will be increased by an allocation of 64 machines. This will make possible larger quantities of printed cloth and the lighter weight may help to provide a more attractive dyed fabric as compared with Article Grey 02.

It is hoped that the creation of a fabric with a slightly denser construction but finer yarns for both printed and dyed styles will prove an interesting proposition. With a determined effort to produce yarns of good quality the fabric should have a good appearance and be more serviceable for the climatic conditions.

It may, of course, be necessary to sample a range of fabric weights and appearances before the final selection is made but within the broad parameters of the specification this Article (designated as New Plain) should enable an improvement to be made in the general quality level of the factory products.

The Coloured Check Article is being produced for trial purposes from imported yarns. All eight of the 153 inches width dobby weaving machines available have been allocated to this type of production.

The New Dobby Article is intended to provide a heavier patterned fabric that may be printed or dyed. It will be 155 cms wide in the grey state and may be used as tablecloths, bed covers, or furnishings. The two 130 inches width dobby weaving machines have been allocated.

Article Grey 015 is for dyeing in khaki shades and Article Grey 018 is for bleached and dyed gauze. The two towel weaving machines are to produce the same fabric construction but in different width multiples.

Another weaving trial of a mosquio netting type fabric is being carried

out at present. The result is considered to be more suitable for a curtaining of open weave and, if dyed, may be a useful and attractive addition to the Somaltex range. It is understood that a lighter construction is to be tried to simulate mosquio netting. In general, it would seem appropriate to produce these two fabrics in two widths per 153 inches width machine instead of the three widths as for the current trial.

In order to create the conditions for the carrying out of technical improvements, the better motivation of all employees, and the future viability of the whole exterprise, it is essential to strive to the utmost extent to keep all weaving machines in good running condition, adequately supplied with yarns, attended to by well-trained and conscientious operatives, and working at high efficiency for a full six day per week throughout the year.

If the department's performance is hampered in any way then the demand for yarn will slacken and the pressure for creativity and enhancement of fabric by the finishing department will fall away. The weaving department is thus the turbine that has to drive the whole enterprise forward towards sustained improved performance.

Product Mix

Diversification into other types of fabric is being investigated at the present time. For example, coloured checks are being woven on the Sulzer weaving machines fitted with dobbies and four colour weft patterning.

The implication of such work is that short sets of warping beams will have to be prepared to feed a very few machines only. Such sets will need to be processed through the sizing machine where the ratio of downtime to running time will be very high, which will have a significant

effect on overall efficiency if frequently repeated.

A cautious attitude needs to be adopted in considering intentions. It should be borne in mind that the machinery set-up at the factory is for long runs and the production of large quantities of basic fabrics to satisfy high levels of demand.

Finishing

The finishing department as a whole is expected to process the full quantity of 18.3 million linear metres of grey fabric per annum produced by the weaving department. To accomplish this some machinery improvements will need to be made to certain sections within the department. Owing to shrinkage and a minimum of unavoidable wastage the quantity of grey fabric measured in square metres will be reduced by approximately 4 - 8% during processing.

It is, however, impossible to make use of precise production rates through the various machines. Although, to some extent, they are dependent on feasible machine mechanical speeds, they are influenced far more by the types, strength, and condition of the chemicals and dyestuffs available; processing techniques adopted; processing quality standards; operator skill and degree of attention; availability of water, steam, and electricity to the required specification; and overall machine condition.

Thus, in evaluating existing capacity it has been assumed that the efficiency of each machine would approximate to 67%, i.e. machines would run for a total of fifteen hours out of a nominal 22.5 hours available per day. Over one year this would amount to 4,500 machine running hours.

To arrive at the rate of production required per hour from each section comprising one machine or a number of similar machines, the total quantity to be processed has been divided by 4,500 hours. The resulting figures have been assessed by deciding whether or not each section is capable of being operated at such a rate. Details will be found in Annex 2G.

The capacity situation in the finishing department is further complicated by the relatively poor standard of machine and service installation condition as compared to what is required for a reasonable expectation of production quantity and quality. It is believed that although a shortage of parts and materials contributes to this, other significant factors such as the level of technical expertise and the lack of maintenance knowledge and skills are involved.

Recommendations for improved departmental performance will be made elsewhere in this report and in consideration of steps being taken for implementation, the breakdown of the expected quantities to be processed would be:

	Grey Fabric linear metres	Percentage of Finished Production
Bleached fabric	1.2 million	7%
Dyed fabric	7.1 million	39%
Printed fabric	9.1 million	50%
Coloured check	0.6 million	4%

Shearing

This machine is located in the area of the finishing department yet is regarded as being the responsibility of the weaving department. Since it is relatively inaccessible to weaving department staff (being on the other side of a door which is mostly kept locked in an attempt to preserve satisfactory air conditions in the weaving department), nobody controls its operations or maintenance or the staff working on the machine. There is a very strong case to transfer formally the responsibility for it to the finishing department.

Until recently, the machine was without a sewing machine to join together correctly the woven lengths of cloth by means of butt seams. Now this is available but it is unfortunate that two electric motors in separate sections of the machine are out of order. It is difficult to understand why they were not attended to during the months that the machine was only being used to remove cloth from the Sulzer weaving machine rollers.

The present method of using the cloth roller transporting truck as a stand to support each roll of multi-width fabric as they are successively unwound by the shearing machine should be discontinued. The ball bearing supports for each end of the cloth roller shaft are not substantial enough to allow this system to be used indefinitely without excessive wear and the possibility of an accident. A stronger fixed supporting stand should be constructed as soon as possible and put into use.

As was pointed out in the Preliminary Report, the shearing cylinder grinding stand, which is lying in the finished goods store should be set up in the finishing department workshop. This would enable the traverse grinding unit, which is in the general stores, to be used to maintain the cylinder cutters in sharp condition. The machine would then be in good order and could be utilized to carry out the shearing process.

For production control purposes an accurate measuring meter should be fitted to the machine to record in the metric system the total quantity of cloth passed forward into the finishing department. The existing arrangement is unsatisfactory as it simply records the surface movement of a roller on the machine.

Singeing

This process is not included in the normal sequence at the present time owing to a deficient petrol vaporizing system, which should provide fuel for the two burners of the machine. According to finishing department staff, the machine has not been in use for some years.

As a result cloth quality is inferior to the standard that could be attained. Firstly, the cloth surface is not being cleared of all the millions of short protruding fibres. This causes printed designs to be less clearly defined and affects the surface appearance of all fabrics, including the lustre expected from mercerized drills. Furthermore, any loose fibre is left to form accumulations during subsequent wet processes, which eventually form into solid matter and help to cause problems in effluent disposal.

Secondly, the facility for applying desizing liquor to all fabric is missing thus causing cloth preparation to be of an inferior standard also. It is important to remove all traces of the sizing materials that were applied to the warp yarn for the weaving process in order to ensure that subsequent chemical process of scouring can take place under the most suitable conditions. Correct desizing treatment would also allow of the possibility of increased processing speeds during scouring.

It is essential to treat the problems caused by the lack of singeing and desizing with some urgency. Taking the present machine sequence into account enquiries should be made to find out if it is possible to obtain an improved vaporizing system. It is appreciated that restrictions are placed on the use of such equipment by a number of countries but the author experienced the use of a Parex machine in India for six years without mishap.

If it is impossible to modify the exisiting machine then steps should be taken to have it replaced bearing in mind the tendency for cloth widths to be increased and the necessity for good impregnation of fabrics of varying weights and construction densities with desizing liquor at a fabric sped of 80 - 120 metres per minute. Additional space and equipment is also required to enable batches to be rotated for one to two hours while the desizing reaction is taking place.

Scouring

This machine incorporates a saturated steam reaction chamber with a fabric content of approximately 90 metres if the fabric is treaded round all the upper and lower rollers. This would allow for a reaction time of about four minutes at a speed of 22.5 metres per minute. It appears, however, that the threading is not carried out in accordance with the prescribed path and, as a consequence, possible reaction time is approximately halved.

In fact, the condition of the machine is affected by various parts being out of order along the whole length of the range. Thus, some mangle nips are not used because of the lack of adjustment in the elctrical control system for motor speed; tension compensating rollers are unable to operate the electrically controlled stop motion; and water circulation and filtering units for each washing chamber are idle.

All this adds up to a very ineffective machine and would certainly cause the factory to be at a big disadvantage if finished fabric quality was important in securing sales of cloth.

Bleaching

This machine is used to bleach the major part of fabric that has previously been scoured. It includes a reaction chamber with a capacity of 2,400 metres giving a reaction time of eighty minutes at a speed of 30 metres per hour. At a temperature of 95 - 100 degrees centigrade this is barely enough when bleaching with hydrogen peroxide.

Pretreatment Stage

As will be seen in Annex 2G, the required rate of production for the scouring and bleaching sections is approximately 60 metres per hour. This is unobtainable from the existing machinery and it will be necessary

to supplement the two sections with additional capacity.

To ensure a reasonable standard of quality this should be of the semi-continuous or continuous type. Furthermore, it should be borne in mind that fabric of wider widths tends to be produced today.

Since such machinery is expensive, it would be appropriate to ensure that reserve capacity were to be arranged to enable fabric deriving from future imports and production increases to be processed.

Mercerizing

The chainless mercerizing range made by Comerio Ercole is suitable for processing cloth approximately 1.3 metres wide over impregnating rollers which are 330 mm in diameter and 1600 mm in length. The mechanical speed range is given as 3 to 15 metres per minute and the production rate with fifty seconds of impregnation is stated to be 10 metres per minute. There are four lower and five upper rollers in the impregnating section and their circumference is approximately one metre.

Assuming a practical running speed of 8 metres per minute the hourly production capacity would be 480 metres. If one width of fabric were to be superimposed on another of similar width production capacity would be almost double but careful attention would be needed to ensure that the cloth entered the machine in the correct way, and another set of batching off equipment would be required.

Very little use was made of this equipment until last year and it appears not to have been fully commissioned by the supplier, Generale Impianti. It is now considered that the cooling equipment for the caustic soda lye is inadequate to obtain temperatures below 12 or 14 degrees centigrade whereas 8 to 10 is preferable. Furthermore, many hours are needed to effect cooling and once the reaction between the fabric and the concentrated lye begins, the temperature rises and becomes uncontrollable. In

addition, the quantity of lye able to be prepared is too small to permit anything but the smallest of batches to be processed.

To attempt to overcome this unsatisfactory silutation, it is suggested that the machinery supplier should be provided with details from a number of actual mercerizing trials to enable him to assess the situation and decide whether rectification work is feasible or to make an offer and quote for replacement equipment and a better layout.

If this proves unsuccessful then the justification for a completely new mercerizing range would need to be evaluated. If such an initial study resulted in an apparent continuing requirement for the process then the costs and benefits of new equipment would need to be considered.

Dyeing

Four main dyeing systems are in use at the present time:

- pad batch for reactive dyes
- pad dry thermofix for reactive dyes (turquoise)
- pad naphtholating developing for azoic dyes
- pad jig for Indanthren vat dyes.

The first two are simple but effective systems giving a range of bright colours. The third is to use up those dyes that have been in stock for three to five years and are still in reasonable condition but which, also, give strong bright colours. The last is the most suitable for producing khaki shades of good fastness using the available equipment.

Although it is likely that preference has already been established for colourful print cloths there is a need to improve dyeing capacity with a more productive machine, such as a pad steam process, in order to reduce reliance on the availability of jiggers (two are unusable). This will, of course, require a greater capital expenditure outlay than say four replacement jiggers to take batches but it will be necessary to evaluate such an acquisition in relation to future requirements, productivity,

processing costs, and quality of dyeing.

Assuming a total production of grey cloth of 18.2 million metres, it appears that 3.9 million metres of khaki fabric would be required. This is derived from the initial Somaltex proposal and has been included in the notional programme.

Printing

The existing machine is capable of printing approximately nine to ten million metres of fabric and this covers about half the total weaving production.

In order to turn this potential into actual production it will be necessary ot obtain adequate steam ageing capacity and adequate washing capacity. The existing Kleinewefers spiral steamer is both unsatisfactory in operation owing to staining and of too small a capacity. It is necessary to obtain a treatment time of some minutes at speeds of 20 to 30 metres per minute for effective processing.

As regards washing, one or two additional chambers would allow of a higher operating speed and it would be advantageous to add a set of drying cylinders to the range.

Stentering

The existing two stenters should be adequate for all normal production requirements.

However, the 1971 machine requires to be fitted with a weft straightening unit, a new chain rail, a new pin clip chain, and a new entry arrangement including chain drive wheels. It would be adviseable to overhaul the whole machine.

The 1977 finishing stenter has been located in a very unsatisfactory way in as much as it is at the opposite end of the process line to where it ought to be. All fabric to be finished on this machine has to pass all the way through the rather cramped L shaped department for processing.

Pressure Bleaching and Dyeing

One unit of Thies "Duobloc" equipment is available with a capacity of 250/350 kgs but it requires attention from the maker's engineering and commissioning staff. It is intended for the bleaching of medical cotton in loose stock form and the processing of yarn packages.

In order to increase the utilization of this equipment it is recommended that an approach be made to the maker to find out what additional equipment is necessary to enable the gauze fabric (Grey 018) to be scoured and bleached.

As a rough guide to capacity it may be assumed that two batches per shift could be bleached and one batch per shift could be bleached and dyed.

Knitting

This unit consists of eight interlock circular knitting machines manufactured by Mayer & Cie, Tailfingen, in 1974. Details:

Number of machines	Diameter inches	Gauge	Needles	Feeders
1	20	16	2 x 1008	40
2	18	16	2 x 900	
1	17	16	2 x 852	
2	16	16	2 x 804	32
1	15	16	2 x 756	
1	14	16	2 x 708	

All machines are Type IMG and will produce interlock fabrics, interlock pile, interlock half-cardigan, striped half-cardigan interlock, and interlock pique. However, they have been out of production for two years and there is still an appreciable quantity of all-cotton fabric in stock, from which small lots are sold from time to time. The stock position as at 17th November 1981 was:

Knitting Machine No.	Diameter inches	No. of Rolls	Yards per roll	kg per roll	Total Uards	Total kgs
33	20	1,045	100	17	104,500	17,865
32	17	956	88	11.5	84,128	10,994
44	18	1,329	75	10.5	99,675	13,955
31	15	1,244	81	11	100,764	13,684
45	14	1,216	70	6.6	85.120	8.026
47	18	1,188	103	16	122,364	19,008
40 & 46	16	1,856	91	15	168,896	27,840
Total:		8,836			765,447	111,272

Assessment is needed as to whether there is any any appreciable demand for knitted fabric. This should be linked to a careful investigation of the possibility of establishing a suitable and properly organized making-up unit.

Made-up garments are obviously f inding their way into the country but the scope for marketing a similar product on an industrial scale requires study.

Electricity Generation

The power generating installation consists of eightgenerators, three of 650 kVA and five of 690 kVA, manufactured by Reliance of Germany. They are driven by Deutz Diesel engines, three of which were manufactured in 1966 and five in 1976. At present two are damaged and unable to operate and one can only operate alone, i.e. it is not able to generate power to feed into the main supply at the same time as the other units are generating.

If the meters in the control panel are recording correctly, the power factor usually ranges from 0.65 to 0.75 although figures of 0.50 and 0.80 have been observed. Assuming that correction equipment would enable an average power factor of 0.85 to be attainable, this would ensure approximately 4,000 kW would be available per hour from seven generators with one as a standby.

The installed load is of the order of 4,200 kW and, assuming a load factor of 0.85, the power requirement would be 3,570 kW per hour. At the present time with only five generators able to operate and no power factor correction equipment, the maximum power availabily is in the region of 2,000 to 2,500 kW per hour. Any appreciable increase in cotton supplies would not necessarily result in a proportional utilization of production machinery owing to the limitation that this capacity imposes.

It is understood that management are aware of this situation and have been in touch with equipment suppliers. Early positive steps are required to remedy the deficiency and it is strongly recommended that any order for replacement or additional units should be placed with the makers whose equipment has already been installed in the Diesel Station. It is all of good quality and further additions of similar units would ensure compatibility and enable the whole generating installation particularly the main connections and the control equipment to be thoroughly overhauled at the same time by the maker's electrical engineers.

Air Conditioning

To re-iterate what has been referred to in the author's Preliminary Report dated 15th January 1982, (Appendix No.1), the control of the method of operating the units forming the air conditioning installation needs to be tightened-up and the use of the output needs to conform to strict technological requirements. Fans to remove air from the work rooms through the underfloor return air ducts need to function as designed and the practice of allowing waste to accumulate in such channels should be rectified without further delay.

In the spinning and weaving departments doors which are damaged should be replaced as a metter of urgency. Other sliding doors need to be made to operate smoothly so that they are not difficult to open and close. A small weight attached to such a door by a thin rope and suspended over a small pulley is a useful means of returning it to a closed position.

Furthermore, management supervisiors should not permit doors in these departments to remain open for long periods or on what is virtually a permanent basis. Ring spinning requires a level of relative humidity in the region of 45 - 50% and weaving 75 - 80%. Temperatures between 20 and 28 degrees centigrade are regarded as being within the comfort zone. However, the design conditions for the departments will be stipulated more specifically in the original contract descriptions.

In order to keep departmental conditions more stable it is also suggested that wherever possible a confined space should becreated at each door to make a form of "air-lock". Thus, one door used as an entry should be closed before another one to be used as an exit is opened.

The following conditions were observed mostly during random surveys in the weaving department:

Date	Department	Time	Somaltex Chart Hygrometer		Author's Psychrometer		
			°C	R.H. %	Dry °C	Wet °C	R.H. %
1981							
Dec.23	Weaving	0935	30	80			
Dec.27	Weaving	0820	27	85			
1982							
Jan.16	Weaving	1155	26	73			
Mar.17	Weaving	1145	28	70	29.0	23.0	59
Mar.17	Yarn Prep.	1345			37.0	23.0	29
Mar.20	Ring Spin.	1345			38.5	26.5	38
Mar.20	Weaving	1635			35.0	26.0	48
Mar.21	Weaving	0810			28.5	25.0	75
Mar.23	Weaving	1330	28	72	30.0	25.5	69
May 19	Weaving	1330	29	80			

Such details give an indication of the variability of conditions, their unsatisfactory nature from the technological aspect, and the failure of the equipment to curtail the amount of variability and to provide a more stable environment. The Energy Department Head should investigate the reasons for the unsatisfactory performance and take remedial action. Discussions on this matter were not possible owing to the prolonged absence of this person after being physically assulted by a workman.

Other details relating to outside conditions are given for general information:

Date	Time	Dry Bulb °C	Wet Bulb °C	R.H. %
Mar. 12	1315	35.0	23.0	34
	1515	33.5	22.0	35
	1730	29.0	22.0	52
	1830	26.5	23.0	74
Mar. 13	0700	20.5	20.0	96
	0730	22.5	21.5	92
	1000	32.0	22.5	43
	1200	35.0	24.0	49
	1300	36.5	24.5	36
Mar. 17	0630	22.0	20.5	85
	1400	37.0	23.0	29
Mar. 20	1345	34.5	25.0	45
Mar. 21	0745	28.0	24.5	74
Mar. 24	1500	35.0	26.0	48

The contribution to adverse effects made by unsatisfactory air conditions in the weaving department cannot be estimated without a very detailed survey since many other factors such as yarn quality and the quality of sizing have to be considered. However, it is an established fact that yarn strength is enhanced as a result of higher moisture regain values derived from higher levels of relative humidity.

The situation in the weaving department is illustrated by the figures given below, which indicate that production is being adversely affected by the high proportion of weaving machines subject to stoppages caused by warp breakages:

Date	Inoperative * Weaving Machines	Percentage of Operating Weaving Machines stopped on account of Warp Breakages	Running Efficiency
1981			
Dec. 23	44	44%	31%
Dec. 27	39	34%	43%
1982			
Jan. 16	34	32%	51%
Mar. 17	48	17%	65%
Mar. 23	40	25%	61%
May 19	52	34%	51%

* owing to a lack of warp beams or operatives

N.B. The figures are submitted to indicate the situation in the department and they must not be assumed to quantify running efficiency with complete accuracy. The full complement of weaving machines is 154.

Services

At the present time, a piped water system is being provided for the village of Balad. It is considered that it would be useful to obtain an extension of this system to supplement the factory's own installation.

Storage capacity for boiler and Diesel fuel is limited to a very few days. It is considered that this should be increased to at least ten days cover to provide a buffer against interruptions to supply. New straight sided tanks are recommended and these could be fitted with a

simple float-type indicator to monitor consumption rates.

Comments on the water and steam installations will be found in Appendix No. 1.

D. Machinery Improvements and Re-Conditioning

		U.S. Dollars	
Blowing	Rehabilitation of scutcher line	50,000	
	Air suction and filter	20,000	
	Roving waste opener	30,000	
Carding	Rehabilitation of 5 SACM cards	25,000	
	Restore auto-can change Marzoli	24,000	
	Replace metallic wire and flats	45,000	
Drawing	Rehabilitate 1 set SACM	10,000	
	Rehabilitate 1 set Marzoli	10,000	
Roving	Replace missing photocell stop motions on 2 SACM speedframes	5,000	
Ringframes	Protection against doffing trucks	43,000	
	Rehabilitate overhead cleaners	43,000	
	Replace overhead cleaners		172,000
Yarn Preparation	Size box framework	25,000	
	Cone carrying trucks	20,000	
	Ring tube stripping machine	30,000	
Weaving	Repair warp knotting machine	5,000	
	Purchase heald and reed cleaner	40,000	
Finishing	Shearing machine - fixed stand to support cloth rollers when unwinding	10,000	
	Measuring meter	2,000	
	Singeing machine rehabilitation	50,000	
	New singeing machine		180,000
	Batch rotation	10,000	

Finishing Cont'd.	Rehabilitate existing scouring	50,000	
	New scouring range	500,000	
	Rehabilitate existing bleaching	50,000	
	New bleaching range	500,000	
	Rehabilitate mercerizing range	100,000	
	New mercerizing range		500,000
	Liquor/Dyestuff preparation	50,000	
	Pad-steam range for dyeing	500,000	
	Steam ager for printed frabics	500,000	
	Improvements to washing range	100,000	
	Additional drying cylinders	250,000	
	Rehabilitate 1971 stentor	120,000	
	Rehabilitate 2 Omez jiggers	20,000	
	Purchase 2 plaiting machines		60,000
	Overhaul HT bleaching/dyeing	50,000	
	Additional equipment for gauze fabric	30,000	
Medical cotton	Replace missing flats on card	1,000	
Production Control	New scales	30,000	
Fuel Storage	Tanks for Boiler/Diesel fuel	300,000	
Electrical	Capacitors	40,000	
Air Conditioning	Install equipment in yarn preparation	50,000	
	Overhaul control equipment	20,000	
	Make air locks at doors	20,000	
Building	Meterial for finishing department extension (imports)	100,000	
Installations	Materials for steam network	150,000	
	Materials for water network	50,000	
	Wells	50,000	
	Total	4,153,000	4,872.000

WEAVING PRODUCTION PROGRAMME - SOMALITEX PROPOSAL

ANNEX 2A

GREY CLOTH						LOOM DETAILS							GREY CLOTH				
Article	Width cms	Ends/ cm	Picks/ cm	Yarn Counts Warp Nm	Weft Nm	Reed Dents/cm	Reed Width cms	Cloth Parts	Selvedge Space cms	Total Reed Width cms	Ends/ cm	Picks/ cm	Total ends	Warp Crimp %	Picks per metre	Sq Metres per metre	Yarn Weight per Sq Metre grams
Grey 02	89	19.2	14	26	26	9	94.6	4	9	387.4	18	13	6809	8	1400	3.56	138.1
Grey 03/1	120	24	19	40	40	11.25	120.3	3	6	390.9	22.5	18	8658	8	1900	3.60	116.6
Multi 03/2	120	24	19	40	40	11.25	120.3	3	6	390.9	22.5	18	8658	8	1900	3.60	116.6
Multi 03/3	140	29.5	22	50	50	14	151.0	2	3	305.0	28	21	8456	8	2200	2.80	113.2
Grey 015/1	100	29.5	17	26	26	7	104.4	3	6	319.2	28	16	8764	6	1700	3.00	108.7
Grey 015/2	120	29.5	17	26	26	7	125.3	3	6	381.9	28	16	10520	6	1700	3.60	108.7
Grey 018/1	88	10	7.5	40	40	9.25	94.5	4	9	387.0	9.25	7	3520	3	750	3.52	46.4
Grey 018/2	115	10	7.5	40	40	9.25	123.6	3	6	376.8	9.25	7	3430	3	750	3.45	46.4
Towel 04/1	88	28	17	26 Pile	26	2 (6.25)	95	4	9	389.0	12.5	16	4472	600	1700	3.52	426.0
				26 Grd							12.5		4664	5			
Towel 04/2	54	28	17	26 Pile	26	2 (6.25)	60	5	12	312.0	12.5	16	3534	600	1700	2.70	426.0
				26 Grd							12.5		3726	5			

GREY CLOTH	YARN PER METRE				YARN REQUIRED				LOOM DETAILS							YARN WEIGHT REQUIRED			
	Warp Nm	Grams	Weft Nm	Grams	Waste %	Warp Grams	Waste %	Weft Grams	Loom Width cms	Speed	No of Looms	Efficiency %	Metres per Loom Hour	Metres per Article Hour	Production 6750 Hours	Nm	Warp kgs	Nm	Weft kgs
Grey 02	26	282.836	26	208.600	2	288.493	2	212.772	389	200	60	85	7.2858	437.1480	2,950,749	26	851,271	26	627,857
Grey 03/1	40	233.767	40	185.678	2	238.443	2	189.392	389	200	42	85	5.3685	225.4770	1,521,970	40	362,970	40	288,269
Multi 03/2	40	233.767	40	185.678	3	240.781	2	189.392	389	200	8	80	5.0527	40.4216	272,846	40	65,697	40	51,675
Multi 03/3	50	102.650	50	134.200	3	108.130	2	136.885	330	225	2	80	4.9091	9.8182	66,273	50	12,468	50	9,072
Grey 015/1	26	357.302	26	208.700	2	364.449	2	212.883	330	225	22	85	6.7500	148.5000	1,002,375	26	365,315	26	213,509
Grey 015/2	26	428.893	26	249.704	2	437.471	2	254.699	389	200	8	85	6.0000	48.0000	324,000	26	141,741	26	82,523
Grey 018/1	40	90.640	40	72.563	2	92.453	2	74.015	389	200	5	80	12.0000	64.0000	432,000	40	39,940	40	31,975
Grey 018/2	40	88.323	40	70.650	2	90.090	2	72.064	389	200	5	80	12.0000	64.0000	432,000	40	38,919	40	31,132
Towel 04/1	26 Pile	1032.000	26	254.347	1	1042.320	2	259.434	389	200	1	70	4.9412	4.9412	33,354	26	34,766	26	8,654
	26 Grd	188.354			1	190.238										26	6,346		
Towel 04/2	26 Pile	815.539	26	204.000	1	823.695	2	208.080	389	200	1	70	4.9412	4.9412	33,354	26	27,474	26	6,941
	26 Grd	150.479			1	151.979										26	5,070		

ANNEX 21

YARN REQUIRED FROM SPINNING

Warp Nm	Kgs	Weft Nm	Kgs
26	1,431,983	26	939,344
40	507,460	40	403,031
50	12,468	50	9,072
TOTAL	1,951,911		1,351,447
GRAND TOTAL (Warp & Weft)			3,303,358 kgs

Notes: The Weaving Production Programme is based on 300 working days per year and 22.5 hours per working day.

FINISHED CLOTH PRODUCTION

Article	Annual Production from Looms Metres	Cloth Parts in Width	Linear Metres	Grey Width M	Grey Cloth Sq Metres	Normal in Warp %	Shrinkage Finishing Weft %	Finished Length Metres	Finished Width Metres	Total Sales Sq Metres
Grey 02	2,950,749	4	11,802,996	0.89	10,504,666	4	5	11,330,876	0.846	9,585,922
Grey 03/1	1,521,970	3	4,565,910	1.20	5,479,092	4	5	4,383,274	1.140	4,996,933
Multi 03/2	272,046	3	816,538	1.20	982,246	1	1	810,353	1.188	962,700
Multi 03/3	66,273	2	132,546	1.40	185,565	1	1	131,221	1.386	181,873
Grey 015/1	1,002,375	3	3,007,125	1.00	3,007,125	4	5	2,886,840	0.950	2,742,499
Grey 015/2	324,000	3	972,000	1.20	1,166,400	4	5	933,120	1.140	1,063,757
Grey 018/1	432,000	4	1,728,000	0.88	1,520,640	1	4	1,710,720	0.845	1,445,559
Grey 018/2	432,000	3	1,296,000	1.15	1,490,400	1	4	1,285,040	1.104	1,416,477
Towel 04/1	33,354	4	133,416	0.88	117,407	4	5.5	128,080	0.832	106,563
Towel 04/2	33,354	5	166,770	0.54	90,056	4	5.5	160,100	0.511	81,812
			24,623,301		24,543,597					22,584,095

SOMALTEX PROPOSAL - SPIN PLAN

ANNEX 2C

Section	No. of Frames	No. of Spindles Dels per fr.	Total Units	Output Count	Input Count	Ends fed	Draft	Twist Mult.	Turns per Metre	Fr. Roller or Spindle Speed	Metres del per Minute	Theor. Prod/ Unit kg/ hour	Efficiency %	Actual Prod/ Unit kg/ hour	Production required kg/hour	Waste %	Spindles Dels required	Remarks
RINGFRAMES	16	432	6912	26 wp	1.1	1	23.7	121	617	10,000	16.20	0.03738	83	0.03102				
								Trav	m/sec	26.2			"	0.02946	212.15	2	7202	6912÷203.62kg
	10	432	4320	26 wf	1.1	1	23.7	113	577	9,500	16.46	0.03798	82	0.03114				
								Trav	m/sec	24.9			"	0.02958	139.17	2	4705	4320÷127.70kg
	12	432	5184	40 wp	1.55	1	25.9	121	766	11,500	15.01	0.02251	87	0.01958				
								Trav	m/sec	30.1			"	0.01860	75.18	5	4062	5184÷96.42kg
	8	432	3456	40 wf	1.55	1	25.9	113	715	11,000	15.38	0.02307	86	0.01904				
								Trav	m/sec	28.8			"	0.01884	59.71	5	3170	3456÷65.11kg
			19872												486.21			492.93
ROVING																		
Marzoli	4	108	432	1.1	0.22	1	5.0	36	37.76	850	22.51	1.227	65	0.797	338.03	2	425	1975, 11 x 6½"
SACM	2	116	232	1.55	0.22	1	7.1	36	44.02	950	21.19	0.820	70	0.574	133.17	2	232	1979, 11 x 5 "
SACM	1	88	88	1.55	0.22	1	7.1	36	44.02	850	18.96	0.733	70	0.513	33.21	2	65	1971, 11 x 6 "
															504.41			
DRAWFRAMES																		
New	1	2	2	0.22	0.22	6	6				250	68.18	75	51.13	102.26	1	2	
Marzoli	4	2	8	0.22	0.22	6	6				220	60.00	75	45.00	360.00	1	8	
SACM	1	2	2	0.22	0.22	6	6				150	40.90	70	28.63	52.24	1	1.9	
															514.50			
CARDING																		
Marzoli	12	1	12	0.22							120	31.67	90	28.50	342.00	4	12	* Production after allowing for contraction
SACM	10	1	10	0.22							75	20.60	85	17.50	175.00	4	10	
															517.00			
BLOWING																		
Marzoli	1	Line										595.0	90	536.0	536.0	6	1	
Trutzschler	1	Line										210.0	85	180.0	180.0	6	1	
															536.0			

NOTIONAL WEAVING PRODUCTION PROGRAMME

ANNEX 20

	GREY CLOTH					LOOM DETAILS							GREY CLOTH				
Article	Width cms	Ends/cms	Picks/cm	Yarn Counts Warp	Nm Weft	Reed Dents/cm	Reed Width cms	Cloth Parts	Selvedge Space cms	Total Reed Width cms	Ends/ cm	Picks/ cm	Total Ends	Warp Crimp %	Picks per Metre	Sq Metres per Metre	Yarn Wt per Sq M grams
Grey 02	89	19.2	14	26	26	9	94.6	4	9	387.4	10	13	6809	8	1400	3.56	130.1
New Plain	120	29.5	27	50	50	14	126.4	3	6	385.2	28	26	10620	8	2700	3.60	121.1
Grey 03/1	120	24	19	40	40	11.25	128.3	2	6	390.9	22.5	10	8658	8	1900	3.60	116.6
Col Check	120	29.5	22	50	50	14	126.4	3	6	385.2	28	21	10620	8	2200	3.60	110.8
New Dobby	155	24	19	26	26	11.25	165.3	2	3	333.6	22.5	18	7440	6	1900	3.10	176.5
Grey 015/1	100	29.5	17	26	26	7	104.4	3	6	319.2	28	16	8764	6	1700	3.00	188.7
Grey 015/2	120	29.5	17	26	26	7	125.3	3	6	381.9	28	16	10520	6	1700	3.60	188.7
Grey 018/1	88	10	7.5	40	40	9.25	94.5	4	9	387.0	9.25	7	3520	3	750	3.52	46.4
Towel 04/1	88	28	17	26 pile	26	2 (6.25)	95	4	9	389.0	12.5	16	4472	400	1700	3.52	327.0
				26 grd							12.5		4664	5			
Towel 04/2	54	28	17	26 pile	26	2 (6.25)	60	5	12	312.0	12.5	16	3534	400	1700	2.70	327.0
				26 grd							12.5		3726	5			

	GREY CLOTH - YARN PER METRE				YARN REQUIRED				LOOM DETAILS							YARN WEIGHT REQUIRED			
Article	Warp Nm	Grams	Weft Nm	Grams	Waste %	Weft Grams	Waste %	Weft Grams	Loom Width cms	Speed	No. of Looms	Effic-iency %	Metres per Loom Hour	Metres per Article Hour	Production 6750 Hours	Nm	Warp kgs	Nm	Weft kgs
Grey 02	26	202.836	26	208.601	2	208.493	2	212.774	389	200	8	85	7.2858	58.29	393,458	26	113,510	26	83,710
New Plain	50	229.393	50	208.009	2	233.981	2	212.170	389	200	34	85	3.7778	128.45	867,038	50	202,071	50	183,960
Grey 03/1	40	233.767	40	185.678	2	238.443	2	189.392	389	200	64	85	5.3685	343.59	2,319,233	40	553,005	40	439,245
Col Check	50	229.393	50	169.489	3	236.275	2	172.079	389	200	8	75	4.0910	32.73	220,920	50	52,200	50	38,194
New Dobby	26	303.324	26	243.785	2	309.391	2	248.661	330	220	2	75	5.2106	10.43	70,403	26	21,703	26	17,507
Grey 015/1	26	357.302	26	208.708	2	364.449	2	212.883	330	220	22	85	6.6001	145.21	980,168	26	357,222	26	200,662
Grey 015/2	26	420.893	26	249.704	2	437.471	2	254.699	389	200	8	85	6.0001	48.01	324,068	26	141,771	26	82,540
Grey 018/1	40	90.641	40	72.563	2	92.454	2	74.015	389	200	6	80	12.8001	76.81	518,468	40	47,935	40	38,375
Towel 04/1	26 pile	680.000	26	254.347	1	694.800	2	259.434	389	200	1	70	4.9412	4.95	33,413	26	23,219	26	8,669
	26 grd	188.354			1	191.238	2									26	6,357		
Towel 04/2	26 pile	543.693	26	204.001	1	549.130	2	208.082	389	200	1	70	4.9412	4.95	33,413	26	18,949	26	6,955
	26 grd	150.474			1	151.979	2									26	5,079		

YARN REQUIRED FROM SPINNING

Warp Nm	kgs	Weft Nm	kgs
26	687,290	26	408,049
40	600,940	40	477,620
50	202,871	50	183,960
TOTAL	1,491,101		1,069,629
GRAND TOTAL (Warp & Weft)			2,560,730

Article	Annual Production From Looms Metres	Cloth Parts in Width	Linear Metres	Grey Width M
Grey 02	393,458	4	1,573,832	0.89
New Plain	867,038	3	2,601,114	1.20
Grey 03/1	2,319,233	3	6,957,698	1,20
Fol Check	220,928	3	662,784	1.20
New Dobby	70,403	2	104,806	1.55
Grey 015/1	980,168	3	2,940,504	1.00
Grey 015/2	324,068	3	972,204	1.20
Grey 018/1	518,468	4	2,073,872	0.88
Towel 04/1	33,413	4	133,652	0.88
Towel 04/2	33,413	5	167,065	0.54
			18,223,531	

ANNEX 2L

Note: The Weaving Production Programme is based on 300 working days per year and 22.5 hours per working day.

DETAILS OF CLOTH QUANTITIES

Grey Cloth Sq Metres	Nominal Shrinkage in Finishing		Finished Length Metres	Finished Width Metres	Total Sales Sq Metres
	Warp %	Weft %			
1,400,711	4	5	1,510,879	0.846	1,278,200
3,121,337	4	5	2,497,070	1.140	2,846,660
8,349,238	4	5	6,679,390	1.140	7,614,505
795,341	1	1	656,156	1.188	779,513
218,250	5	6	133,766	1.457	194,897
2,940,500	4	5	2,822,884	0.950	2,681,740
1,166,645	4	5	933,316	1.140	1,063,980
1,825,000	1	4	2,053,133	0.845	1,734,897
117,614	4	6	120,306	0.827	106,100
90,210	4	6	160,502	0.508	81,474
20,024,864			17,575,202		18,581,979

SPIN PLAN FOR NOTIONAL PROGRAMME

ANNEX 21

Section	No of Frames	No of Spindles Dels per Fr.	Total Units	Output Counts	Input Count	Ends Fed	Draft	Twist Mult.	Turns per Metre	Fr. Roller or Spindle Speed	Metres del per Minute	Theor. Prod/ Unit kg/ hour	Effic -iency %	Actual Prod Unit kg/ hour	Production Required kg/hour	Waste %	Available Production Spds/Dels	Remarks
RINGFRAMES	13	432	5616	26	1.1	1	23.7	121	617	10,000	16.20	0.03738	83	0.03102				
								Trav	m/sec	26.2			*	0.02946	162.28	2	165.45	* Production after allowing for contraction
	20	432	8640	40	1.55	1	25.9	121	766	11,500	15.01	0.02251	87	0.01958				
								Trav	m/sec	30.1			*	0.01860	159.79	3	160.71	1) Quantity req'd for Prod. Prog.
	10	432	4320	50	1.65	1	30.4	121	856	11,500	13.43	0.01611	88	0.01417				
													*	0.01346	57.31	3	59.15	2) Basis for requt in other sections
			18576												379.30		384.31	
															(1)		(2)	
ROVING																		
Marzoli	2	108	216	1.1	0.22	1	5.0	36	37.76	850	22.51	1.227	65	0.797	168.76	2	212	1975 11 x 6½ "
Marzoli	2	108	216	1.55	0.22	1	7.1	36	44.82	900	20.00	0.777	70	0.543	117.20	2	216	1975 11 x 6½ "
SACM	1	116	116	1.55	0.22	1	7.1	36	44.82	950	21.19	0.820	70	0.547	48.26	2	85	1979 11 x 5 "
SACM	1	116	116	1.65	0.22	1	7.5	36	46.24	950	20.54	0.746	70	0.522	59.90	2	115	1979 11 x 5 "
															394.20			
DRAWFRAMES																		
Marzoli	4	2	8	0.22	0.22	6	6				220	60.00	75	45.00	360.00	1	0	
SACM	1	2	2	0.22	0.22	6	6				140	38.18	70	26.72	42.09	1	1.6	Rehabilitation required
															402.09			
CARDING																		
Marzoli	12	1	12	0.22							120	31.67	90	28.50	342.00	4	12	
SACM	5	1	5	0.22							75	20.60	85	17.50	64.12	4	3.7	Rehabilitation required
															406.12			
BLOWING																		
Marzoli	1	Line										395.0	90	356.0	356.0	6	1	
Trutzschler	1	Line										200.0	85	170.0	67.0	6	0.4	Rehabilitation required
															423.0			

FINISHING DEPARTMENT

ANNEX 2G

Article	Grey Width cms	Annual Production Linear Metre	Single Desize	Scour	Bleach	Jig-gers	Inter Dry	Mer-cer-ize	Sten-ter	Winch Scour	Winch Bleach	Winch Dry	Print	Pada Color	Old Pad	Jig-gers	Batch React	Hot Flue	Wash	Dry	Lin Sten-ter	Cal-ender
02 White	65	1,574,000	350	53	53															53		53
Dye I				105	105		105							105			105		105	105		
II				158	158		158 +158							158			158 (Dry)	158	158	158		
III				35			35		35 (Pad)						35				35		35	
New Pig Pr	120	2,602,000	579	434	434				434				434					434	434		434	
Rct Pr				116	116				116				116					116	116		116	
Dye I				29	29		29							29			29		29	29		
03 Pig Pr	120	6,958,000	1,547	1,006	1,006				1,006				1,006						1,006		1,006	
Rct Pr				464	464				464				464					464	464		464	
Dye I				78	78		78							78			78		78	78		
Col Check	120	663,000	148			148	148														148	148
Dobby White	155	141,000	32	4	4															4		4
Pig Pr				8	8				8				8						8		8	
Dye I				21	21		21							21			21		21	21		
015 V Dye	100	2,941,000	654	654	654		654	654	654						654	654				654		654
V Dye	120	973,000	217	217	217		217	217	217						217	217				217		217
Gauze 010	88	2,074,000				461										230					461	
Towel 08/1	88	134,000								30	30	30									30	
Towel 08/2	54	168,000								37	37	37									37	
Metres p Hour			3,527	3,302	3,347	609	1,603	871	2,934	67	67	67	2,020	391	906	1,100	233	1,172	2,454	1,519	2,739	1,076
Metres p Min			59	57	56	11	27	15	49	2	2	2	34	7	16	19	4	20	41	22	46	18

III PREVENTIVE MAINTENANCE

A. Introduction

The System of Maintenance

Preventive maintenance is a system based on industrial experience that utilises the skills of staff to check the condition of, and to carry out restorative work on, machinery parts and assemblies at pre-arranged intervals of time. Such intervals should be set to prevent the onset of unsatisfactory running conditions and to forestall unacceptable wear, failure of accessories, or frequent breakage of parts.

However, not every machine or piece of equipment would be included automatically in such a scheme. Selection would be based on an evaluation of the consequences of failure in the light of the importance of the item and the estimated cost of breakdown and cost of repair. It is necessary to analyse the cost of maintenance work and to compare this with an assessment of the value of the resulting benefit. If the performance of a particular item would be enhanced by attention within a preventive maintenance scheme then improved reliability, higher efficiency, and a reduction in running costs would be the criteria on which this was decided.

The objectives of preventive maintenance are:

- to reduce productive time losses due to unexpected breakdowns;
- to keep machinery functioning in the way that is as close as possible to the intentions designed into the process operation;
- to minimise in the long term the costs of maintenance activity.

In effect, the work of preventive maintenance is related to preserving the production potential by means of ensuring optimum machine performance.

In the cases of parts or accessories whose useful life has become generally known with reasonable accuracy under average running conditions within the industry, it has become acceptable to use an

established time span as the basis for replacement intervals in a factory. In other cases, it is necessary to analyse the results of actual occurrences of failure in order to obtain an indication of useful life. Both these features are required to organize and implement maintenance work at Somaltex.

The effectiveness of this type of scheme depends to a large extent on the correct planning of work requirements, adherence to a stipulated timetable, the use of correct work methods, and the keeping of records which preserve details of the work carried out, the staff involved, and the incidence and pattern of occurrences.

In order to keep a balanced workload for maintenance staff it is essential for certain types of work of an extensive nature to be carried out at regular intervals of time throughout a year. This means, for example, that a service period of six months for a ring frame should not be applied to all machines at the same time. With 43 ring frames installed, one group of maintenance tasks occurring every six months will involve 86 periods of specified work to be undertaken each year. This should be arranged to be implemented on the basis of seven or eight periods per calendar month.

As well as preventing most of the instances of unexpected breakdowns, the setting-up of a preventive maintenance scheme will enable machinery performance to be improved by the elimination of faulty or broken parts and by affording the opportunity for staff to ensure consistently accurate machine settings.

Furthermore, the analysis of all recorded details will enable those responsible for maintenance control to estimate future requirements of spares and accessories with gradually improving accuracy. This is an important feature when the availability of cash and foreign exchange are limited.

Another benefit to accrue from the keeping of fully detailed records

is that the frequent repetition of a similar cause of failure is highlighted. This would enable remedial measures to be applied and would act as a warning guide if additional purchases of machinery were envisaged.

In order to set up a preventive maintenance scheme satisfactorily, it is necessary to give attention to a number of important features.

Specification of Work

The major item involved is the preparation of written specifications detailing the work to be carried out as a work tour at scheduled intervals. These should indicate as clearly as possible all items of work to be given attention.

Additional information would stipulate the frequency of the work assignment, give the selection of tools that would be required to perform all the tasks, and indicate the job category of each of the workmen required. To enable the work to be speeded up or to improve its effectiveness special tools, setting templates, and gauges could be developed or obtained and made available for use when appropriate.

Although all items of work to be carried out would be listed, it would be necessary to ensure that tasks are completed satisfactorily. For example, it is important for machine covers to be properly removed in order to carry out maintenance work on parts that are usually hidden and made inaccessible by such covers.

It is frequently advantageous to collect semi-skilled work into a group of tasks that would be carried out within a work tour by less qualified but conscientious mechanics. This would relieve skilled mechanics from simple tasks and enable them to devote their time and skills to more important work. Thus, classification of jobs by type or grade of labour would make the best use of available resources.

Programme Scheduling

In the finalised form a preventive maintenance scheme will lay down a timetable to schedule when machinery will be taken out of service and what will be carried out in accordance with the written specifications. This will take account of the necessity to preserve optimum machinery activity but under normal circumstances maintenance schedules will need to take precedence in order to adhere to the basic principles of preventive maintenance. Thus, difficulties in production should not normally be allowed to disrupt maintenance activity.

However, in the initial planning stages full consideration of the inherent requirements of both production and maintenance should be undertaken by officers from both functions to enable details to be worked out in a spirit of co-operation and of appreciation for each other's duties.

The Scheme in Operation

To initiate work within the system, a mechanic would be given a specification sheet giving the details of the work to be carried out. As he proceeded, he would record details of the tasks completed on a reporting sheet. Any extensive or unusual work, i.e. not provided for in the specification sheet, should be noted and reported so that appropriate action could be planned for the future.

In order to maintain a systematic approach and a smooth flow of work, it is necessary to make use of clear display charts to operate the timetable and to monitor the scheduling of work assignments. This will enable control staff to avoid unsuitable grouping of work tours, thus ensuring that the workload for mechanics will be spread as evenly as possible. In this way, the overall maintenance requirements (preventive plus other) will be taken care of in an adequate way.

To facilitate recognition of the situation indicated by display charts,

colour coding of frequency is adviseable. Thus work tours for different types of machinery but with similar frequencies would display the same colour indicator.

Frequent monitoring of the effectiveness of the scheme as it applies to any machine or group of machines should be undertaken. If deficiencies are found or if the interval of time between work tours appears too short then changes should be made and evaluated. If the outcome is found to be satisfactory over a period, the changes could be incorporated into a revised specification.

The skills and standards of workmanship of maintenance staff should also be checked regularly. Furthermore, overall supervisory control, including that for which the head mechanics should be responsible, should be strengthened.

To facilitate this and to enhance motivation, it is suggested that regular periodic meetings should be held by the Head of Maintenance in turn with each of the machine section groups of maintenance mechanics. The nature of the work for each tour and its problems could be considered, the use of correct work methods promoted, and interest in maintenance work in general fostered. In effect, this would be a form of on-the-job training and should lead to a definite upgrading of skills.

The keeping of records will provide confirmation of the work that has been carried out, the rates of consumption for parts and accessories, and details of further work to be planned. Such information will be retained on cards for each individual machine or piece of equipment and, in conjunction with the capital register, will provide an up to date picture of the state of plant assets. Machine downtime will be monitored and formal reports to top management will enable overall results to be assessed and programme costs to be evaluated.

The Benefits of Preventive Maintenance

1. The continuing development of machinery for textile processing has resulted in the concentration of production on reduced numbers of machines with higher rates of output. The interdependence of processing stages is an established fact but some of these are now becomming directly linked into an integrated sequence such as the blowing, carding and drawing stages in spinning.

Under these circumstances, production losses resulting from machine breakdown are more serious and have a greater effect on related processing. Preventive maintenance provides the means to alleviate such problems to a large extent.

2. The reduced incidence of breakdown following the full implmentation of a preventive maintenance schemeleads to increased machine availability thus enhancing productive machine hours. This results in greater reliability and improved production efficiency.

3. There is improved machine performance due to the elimination of bad parts and the use of consistently satisfactory settings. Improved product quality, longer machine service life, and lower losses resulting from bad quality are the benefits.

4. The number of major repairs necessary to remedy the results of gradual deterioration is reduced. This allows for a better utilization of the maintenance work force and leads to savings in labour costs.

5. Capital expenditure savings accrue from a reduction in the need for standby equipment.

6. With better control over the rates of consumption of spare parts there is a reduction in stores stock levels without sacrificing replacement cover.

7. Common causes of failure are made prominent, which leads to a reduction in breakdown frequency and provides information to aid future machine selection.

B. Preventive Maintenance at Somaltex

Organization

The responsibility for the maintenance of production machinery throughout the factory is held by an independent department in charge of a maintenance officer. This constitutes an appreciable task with around 300 individual machines ranging over 40 different types.

At present some work is carried out based on the principles of preventive maintenance in the spinning and weaving departments but it needs to be planned in a better way, supplemented into complete schemes, and monitored to improve workmanship, methods, and results.

In order to bring about the conditions under which the development of preventive maintenance could take place the following steps are suggested:

1. The maintenance officer should be made responsible for all forms of preventive maintenance on all production machinery so that control of mechanical work, electrical work, lubrication, and cleaning should rest with the maintenance department. Although frequent routine cleaning is usually carried out by unskilled or semi-skilled workmen it is necessary for this to conform to the standards required for good maintenance practice.

An outline Job Description for the maintenance officer is given below:

To plan and organize all mechanical and electrical maintenance work for all production machinery and related ancillary equipment.

To ensure that the requirements of preventive maintenance in all appropriate machine sections are specified in writing and clearly known and understood by all concerned.

To supervise the overall administration of the preventive maintenance function so that equipment and forms are available at all times and records, including charts, are kept up to date.

To determine a suitable level of activity in each machine section of processing in collaboration with the technical director and to co-ordinate all aspects of maintenance work to achieve this, if possible, during normal working hours.

Taking account of a good standard of product quality, to set an optimum standard of excellence for machine condition and to motivate all maintenance workers to achieve this.

To analyse records and to evaluate levels of consumption of parts and accessories in order to determine appropriate rates of replacement, to estimate future requirements, and to ensure that purchasing policy is consistent with supply priorities.

2. The main duties of the maintenance officer should consist of the planning of work activities and methods; the organizing and co-ordinating of all maintenance resources and equipment; the training and motivation of all departmental personnel; the controlling of the work of the department by monitoring the standard of workmanship and checking activities and achievements against plan.

For these duties to be carried out effectively, concentrated time and effort will be needed. Thus frequent absences for peripheral activities such as training students and examining unskilled workers should be avoided. It is more important to devote efforts to upgrading the skills of the existing maintenance work force.

3. To assist the maintenance officer in controlling more effectively it will be necessary to establish three working supervisors (not desk men) in the main departments as follows: 1) spinning, 2) yarn preparation and weaving, 3) finishing. Furthermore, electricins should be assigned to the maintenance department to carry out electrical work under a preventive maintenance scheme. To become familiar with the operations

of one group of machinery would be particularly advantageous for the finishing department.

4. The standard of both mechanical and electrical maintenance work in the finishing department creates a serious doubt about the level of performance in future years and the viability of the whole plant. There seems to be no alternative to obtaining the services of skilled expatriate mechanical and electrical engineers to upgrade the machinery and installations in the department and to train staff and upgrade their skills. Such engineers would need to be able to gain the co-operation of departmental staff and workmen and be in a position to stay for three to five years.

5. To keep the cost of maintenance in perspective it is a common practice to compare the size of the staff of a maintenance unit with the direct labour workmen. Figures of 5 to 15% may be applicable to factories such as Somaltex.

At present, it is understood that there are approximately 90 persons employed on mechanical maintenance work and perhaps 400 as direct labour. Summaries of numbers are given in the lists below and it will be noted that although some figures are applied to three rotating shifts normal working varies between one and two shifts.

MAINTENANCE WORK FORCE

		Shifts			
		I	II	III	D
Administration	Head of Maintenance Department				1
	Office Administration				1
	Work Planning				1
Spinning	Blowing and Carding				-
	Head Mechanic				1
	Blowing Mechanic				1
	Marzoli cards Mechanic				1

		I	II	III	D:
Spinning Cont'd.	SACM Cards Mechanic				1
	Assistant Mechanics				5
	Shifts Mechanics	1	1	1	
	Drawframes and Speedframes Head Mechanic				1
	Maintenance Mechanics				3
	Oiler				1
	Trainees				2
	Shifts Mechanics	1	1	1	
	Ring Frames Head Mechanic				1
	Maintenance Mechanics				4
	Storekeeper				1
	Shifts Mechanics	2	2	2	
Preparation	Head Mechanic				1
	Storekeeper				1
	Winding Maintenance Mechanics				3
	Shifts Mechanics	1	1	1	
	Warping/Sizing Shift Mechanics	1	1		
Weaving	Head Mechanic				1
	Preventive Maintenance Technicians				4
	Overhauling Mechanics				5
	Oilers				6
	Beam and Weft Servicing	3	3		
	Shifts Mechanics	2	2		
	Storekeeper				1
Finishing	Head Mechanic				1
	Maintenance Mechanics				4
	Shift Mechanics	3	3		
	Shearing Machine Mechanic				1
	Printing Machine Mechanic				1
Knitting	Machine Mechanic				1
	Sub-Totals	14	14	5	55
	Grand Total:				88

Somaltex Work Force

MARCH 1982

	General Manager	Deputy G.M.	Senior Managers	Dept. Managers	Section Leaders	Degree Engineers	Polytechnic Trainees	Shifts Leaders	Foremen	Grade I Technicians	Grade II	Grade III	Skilled Workers	Unskilled Workers	Accountants	Asst. Accountants	Clerks Typists	Security	Experts	Temporary	Total
Management Control	1	1				2						1	1			1	1				8
Personnel Department			1	2	6	1			10	8	15	21	33				10	98			205
Financial			1	2	6										5	7			1		22
Purchasing			1	3	5												16				25
Cotton			1														9				10
Sales & Marketing			1														26				27
Technical			1	1		1											5		1		9
Ginning Balad					1							3	7			1	1				13
Ginning Jamaame					1				1					105	1		2	7			117
Spinning				1	2			3	11	6	12	29	73	84							221
Yarn Preparation					1			3	4		6	34	54	30			4				136
Weaving				1	3			2	2		2	40	72	36			2				160
Finishing				1	4	1		2	7		40	31	34				3		2		125
Energy				1	5	1	1	5	5	10	12	27	26				3				96
Workshops				1	4		3				8	18	25								59
Maintenance				1	3		1	9	18	16	15	28	1				1				93
Others																				168	168
Total	1	1	6	14	41	6	5	24	58	40	110	232	326	255	6	9	83	105	4	168	1494

It should be borne in mind that the present situation is unrealistic in as much as the utilization of both machine capacity and available working hours is very low. Taking a superficial view temporary transfer of maintenance workmen could be made but it would be more advantageous to ensure that sufficient care and attention are given to stopped machinery as well as maintenance work being carried out on operating machines. Urgent steps are needed to get more machines in production for longer working hours and then a different interpretation of the maintenance/direct labour ratio would be created.

When preventive maintenance has been fully implemented it will then be possible to calculate the total number of man hours required to properly service the scheme. Until that time it is more important to ensure that all maintenance work is properly planned and carried out and the level of available skills of the maintenance staff carefully assessed.

There is, of course, an opportunity to transfer any maintenance workman who does not conform to the minimum standard of skill and dedication. Furthermore, it appears to be necessary to assess the aims of the training school in the light of the apparently generous staffing of the maintenance unit.

Preventive Maintenance Specifications

During the course of the author's assignment many specifications were compiled, which set out the items of work to be carried out under a preventive maintenance scheme and indicated frequencies for such groups of tasks. These were handed over to the General Manager and required translating, typing, and duplicating.

Further work is also required to supplement these and to continue the preparation of additional specifications and this will involve attention from the Head of Maintenance, Mr. Hassan Olad Adan, the Textile Engineer, Mr. Abbas Ahmed Mohamed, and the Maintenance Supervisor

for the department of the concerned machines. It is suggested that a target of one type of machine every six weeks would result in many machines being covered by preventive maintenance methods after another year has elapsed. Such preparatory work would need to be monitored by top management both to give the necessary drive and to promote motivation and interest.

At the request of the Head of Maintenance the specifications were prepared combined with a reporting section. After duplication of some of these difficulty was encountered in arranging for further typing work to be carried out. It is believed that if this remains a problem it may be possible to arrange for the work to be done on a private basis and Mr. A. Eames, the U.N.I.D.O. Project Manager, or Mr. R. Rush, of SIDAM, may be consulted.

During the course of one or two years it is expected that some work specifications may be slightly modified and some frequencies extended in the light of experience in operating the system. This may result from technical considerations or the desirability of making suitable arrangements to even out the work load of maintenance staff. During this period work specifications would continue to be duplicated but at some stage thereafter it would be desirable to prepare the specifications separately from a reporting section to avoid the frequent repetition of the wording of a firm specification. If such a record were printed on to a stiff card and put in a plastic folder the expenditure on documentation for the system could be reduced.

It has been stated that the situation at the factory characterized by fluctuating production volume and lack of spares and repair materials made it difficult to begin the implementation of prventive maintenance as promoted by the previous report on the subject prepared by the U.N.I.D.O. consultant, Mr. P. Colborne, dated May 1981. While the author appreciates that such factors do contribute difficulties which hinder full implementation in the most effective way it is not considered

to preclude the setting up of a preventive maintenance system and developing many aspects.

If some machines are out of production it is clear that the quantum of work carried out to overcome wear and tear and to re-adjust settings will be lighter. Under such circumstances, maintenance staff must have an easier work load and spare time. It is not difficult to intersperse the modified set of tasks into a normal routine to care for machinery that is (temporarily) out of production. Moreover, it is feasible and desirable to transfer production to frames that have been out of production for lengthy periods in order to keep them in reasonable condition.

One of the responsibilities of management is to overcome problems relating to changing methods and requirements. Thus, although there may be limitations to the full implementation of preventive maintenance, with basic planning and organization much good could be accomplished given the determination to put into practice a system, which has become widely acknowledged as being necessary for the effective management of textile machinery maintenance.

The following preventive maintenance specifications have been made available:

Section	Machine	Type	Reference	Frequency
Blowing	Blenders and Conveyors	Mechanical	PMMC - S.01 - 01	Shift
		Mechanical	- 04	Week
		Mechanical	- 07	Month
		Electrical	PMEL - S.01 - 07	Month
		Inspection	SIT - S.01 - 10	3 Months
Blowing	Two-Beater Opener	Mechanical	PMMC - S.02 - 01	Shift
		Mechanical	- 04	Week
		Mechanical	- 07	Month
Blowing	Step Cleaner	Mechanical	PMMC - S.03 - 01	Shift
		Mechanical	- 04	Week

Blowing	Automixer	Mechanical	PMMC - S.04 - 01	Shift
		Mechanical	- 09	2 Months
Blowing	Hopper Feeder	Mechanical	PMMC - S.05 - 01	Shift
		Mechanical	- 04	Week
		Mechanical	- 09	2 Months
Blowing	Conveying Lattices	Mechanical	PMMC - S.06 - 01	Shift
		Mechanical	- 04	Week
Blowing	Waste Collector	Mechanical	PMMC - S.07 - 01	Shift
		Mechanical	- 04	Week
Blowing		Lubrication		Day
		Lubrication		Week
	Reduction Gears	Oil Change		6 Months
	Reduction Gears	Oil Change		1 Year
Blow and Card	Photocells Check	Electrical		Week
Carding	Marzoli Cards & Chutes	Mechanical	PMMC - S.08 - 01	Shift
		Mechanical	- 04	Week
		Mechanical	- 10	3 Months
		Mechanical	- 13	6 Months
	Safety Devices	Mechanical		
		Electrical	PMEL - S.08 - 04	Week
		Electrical	- 07	Month
		Inspection	SIT - S.08 - 10	3 Months
		Inspection	- 15	1 Year
	Reduction Gears	Oil Change		6 Months
Drawing	Marzoli Drawframes	Mechanical	PMMC - S.09 - 04	Week
		Mechanical	- 07	Month
		Mechanical	- 13	6 Months
Roving	Marzoli Speedframes	Mechanical	PMMC - S.10 - 02	Day
		Mechanical	- 04	Week
		Mechanical	- 05	2 Weeks
Spinning	Marzoli Ringframes	Mechanical	PMMC - S.11 - 04	Week
		Mechanical	- 05	2 Weeks

Spinning	Marzoli Ringframes	Mechanical		- 07	1 Month
		Mechanical		- 10	3 Months
		Mechanical		- 13	6 Months
		Mechanical		- 15	1 Year
		Mechanical		- 16	2 Years
		Inspection	SIT - S.11	- 15	1 Year
Sizing	Sucker	General Specification			
		Care and Maintenance			
		Mechanical	PMMC - P.05	- 04	Week
		Mechanical		- 05	250 hours
		Mechanical		- 07	500 hours
		Mechanical		- 09	1,000 hours
		Mechanical		- 11	2,000 hours
		Mechanical		- 13	4,000 hours
		Mechanical		- 14	5,000 hours
		Mechanical		- 16	10,000 hours
		Electrical	PMEL - P.05	- 07	500 hours
		Electrical		- 09	1,000 hours
		Electrical		- 13	4,000 hours
		Inspection	SIT - P.05	- 10	3 Months
	Size Box Section	Inspection		- 13	6 Months
	Drying Section	Inspection		- 13	6 Months
	Headstock Section	Inspection		- 13	6 Months

Procurement of Stores

The necessity to order spare parts and consumable stores depends on the existing availability and the rates of consumption of individual items. Large orders will be needed to obtain replacments for "fast moving" items (high rates of consumption) but they will have to be fixed in relation to the variability of demand, the variability of lead time (the period between a requisition being written out at the factory and the required item being replenished), and the acceptable degree of risk of being out of stock.

Care in ordering will also be necessary to avoid situations where cash has been utilised to give unnecessary or extended cover for some items whilst others are completely out of stock and cash unavailable.

Although this could be described as an extreme example, it may be taken to illustrate the importance of exercising care on a continuous basis. It is essential for senior management to keep the technical officers at the factory aware of the situation in relation to the availability of finance and raw material since this will determine the number of shifts per day planned for operations and the level of activity within such capacity.

The keeping of a systematic procedure for the obtaining of stores is inhibited by delay as was exemplified by the case of corn starch for the sizing process. Investigation showed that the period of time involved between making out a requisition for replacement supplies and a quantity becoming available at the factory was just over two years. In the meantime, supplies had to be gleaned from whatever source was available with unavoidable consequences on the quality of sizing and the level of end breakages in weaving. Furthermore, the supplier's quoted selling price was no longer applicable owing to increases in line with the passing of time.

The maintaining of production and the control of inventory and costs are made extremely difficult under such circumstances.

It would seem to be appropriate at the present stage of development to endeavour to work with an ordering procedure that is as simple as possible. This could be advanced into a more sophisticated system when facilities were such that the computation of economic order quantities would result in inventory cost savings.

A suitable procedure to meet present day requirements is outlined below.

1) Senior management should make an estimate of the expected level of

production over a period of three years and inform the factory management of the findings. A review of the current year could be made after six months in order to determine if any re-assessment of related factors was called for.

2) Under the direction of the Technical Director, the expected requirements of replacements for each Factory Department should be considered in rotation by the Head of Maintenance, the Departmental Manager, the Electrical Supervisor, and the Departmental Supervisor responsible for maintenance. Requirements should be categorised into spares, accessories, and consumable items. On the basis of the potential loss in production from an "out of stock" situation, items should be allocated priority in three levels:

First Priority:
- consumable stores in constant daily or weekly use
- spares for important machines such as where there is only one in the processing sequence
- spares to avoid a complete bottleneck by maintaining activity in part of a machine group, such as one half of the carding section or one third of the ring frames
- any item that completely controls one section of processing and where non-availability would be critical.

Second Priority:
- consumable stores in frequent but periodical use making sure that where two or three items have to be used in conjunction with each other that this fact is clearly indicated
- spares of lesser but still significant importance.

Third Priority:
- all other items.

It may be fairly pointed out that any replacement item for which an order is placed is necessary for the maintaining of production. However,

it is believed that after due consideration it will be concluded that there is an advantage under current circumstances in assigning priority. However, it will be necessary to be objective by not making everything into first priority and to be careful that not all third priority orders are rejected by the authorities without proper consideration.

3) After investigating the availability of spares to meet expected replacement rates for critical machines in the first place and then for other machines, it will be necessary to establish what stock level will be used for each item to determine when re-ordering has to take place. This should take account of:

a) the supplier's delivery period
b) the period of time required for official formalities
c) the length of time for transport between countries
d) the length of time for transfer between the arrival point and the factory.

The lead time derived from these factors will govern the calculation of re-ordering levels. The longer this lead time is, the greater will be the stock levels, the storage space requirements, the risk of deterioration, and the costs of financing the inventory.

To allow for the inevitable variability of b,c, and d it will be necessary to assume maximum values for lead time in the case of critical items and average values in other cases. If maximum values were used in all cases it would eventually result in excessive stock levels.

The situation is represented by the following:

Re-order level = $L\bar{q} + m$

where $L\bar{q}$ is the average demand over the lead time and m is some additional safety stock

$= L\bar{q} + K.SD$

where SD is the standard deviation for demand consumption with a normal distribution

if K = 1, the re-order level will exceed demand 83% of the time
if K = 2, the re-order level will exceed demand 97.5% of the time
if K = 3, the re-order level will exceed demand 99.5% of the time

Consumption

At the present time it is impossible to determine average rates of consumption with any accuracy as the recording system in the stores has almost been neglected since 1979/1980. Since there are three or four people working in the stores including the storekeeper the reason for this situation is difficult to understand. In any event it is clear that a basic requirement of sound storekeeping is being ignored. Urgent remedial steps are necessary in order to conform to good management practice and to safeguard items.

Correct stores procedures and adequate records would also preclude the necessity for the Head of Maintenance having to spend time on keeping his own notes and lists in order to have some idea of stock levels and re-ordering requirements. Such a method is too haphazard and obviously contributes to the unsatisfactory situation regarding spares availability.

Storage Facilities

The existing areas used for the storage of spare parts and consumable items are, in general, soundly constructed and in reasonable condition and are considered to be adequate.

There is a large central store equipped with open shelves for spares and accessories. Adjacent to this is another store with sizeable areas of floor space for the storage of materials in sacks, bales, or boxes and a series of shelves in an ascending step formation for the storage of drums and other containers. Additional floor space is also available beneath these shelves. Subsidiary stores for parts of small size are

also available in the spinning, yarn preparation, and weaving departments.

Apart from the necessity to restore the available stock card and Kalamazoo record system, the two main requirements in the stores section are to allocate groups of parts to shelf units and to preserve good condition by periodic examination, cleaning, and protecting all the items that form the stores inventory. Thus, groupirg needs to be organized and parts need to be maintained in a neat and tidy manner.

This would mean for example, that one set of shelves may be allocated to the storage of ring frame spare parts and accessories, and another set of shelves may be allocated to ball and roller bearings for all factory machines. Shafting, piping, and bars may be stored in open type racks and such items as Vee belts may be suspended on long pegs attached to a suitable framework,

In view of the necessity to improve the organization of storage arrangements and the safe custody of items, it is suggested that Mr. Abbas Ahmed Mohamed should be given control of such work. This would enable him to utilize his knowledge and training received overseas and during one year's studies at SIDAM. Although the stores are formally under the control of the Finance Department, the present administration arrangements are unsatisfactory.

Items such as stationery, literature, medicines, and any used parts or equipment should not be included in the stores kept for production purposes.

DETAILS OF PRODUCTION, CONSUMPTION, AND EXPENDITURE

(Figures provided by Somaltex)

		1977	1978	1979	1980	1981
Weaving Production	Yards	10,146,100	12,652,100	9,546,200	13,128,800	10,127,200
Consumption of:						
Raw Cotton	Sh. So.	13,633,548	19,831,958	16,597,713	22,415,649	14,623,204
Imported Yarn	Sh. So.	-	413,191	597,533	4,727,574	15,818,758
Dyes and Chemicals	Sh. So.	2,488,264	1,657,887	1,448,248	1,993,980	2,998,738
Diesel and Boiler Fuel	Sh. So.	3,189,140	3,693,278	4,220,267	11,249,482	10,153,242
Spare Parts	Sh. So.	901,623	1,022,593	401,581	969,656	1,608,026
Expenditure on Spares and Accessories:						
Imported	Sh. So.	4,446,614	984,673	2,411,983	2,046,957	458.236
Local	Sh. So.	883,225	40,749	1,126,158	-	589,561

Exchange Rates up to 30 - 6 - 1981				
1 U.S. Dollar	Sh. So. 6.2327	May 1982	12.4654
1 £ Sterling	13.1475		22.4738
1 D.M.	2.7402		5.3951
180 Lira	1.0000	104 Lira	1.0000

Sucker Sizing Machine

Machines requiring re-conditioning work to be carried out have been included in the list at the end of the Section on Plant Balance. However, it is considered that the present state of the size box on the only sizing machine in the factory is so bad that it requires urgent attention.

Bad corrosion has taken place within the control box housing owing to the prolonged leakage of steam from a faulty pipe. This has been exacerbated by moisture and heat rising from poorly covered drainage channel alongside.

Panels containing control buttons and electrical contacts are no longer firmly fixed and it is possible that there could be a number of controls functioning incorrectly leading to unsatisfactory processing.

It is considered that the whole of the size box framework and housing will need to be replaced to enable the numerous controls and functional parts to be firmly and accurately fixed. The machine maker will need to be appraised of the situation and a final decision taken on the required remedial action.

Furthermore a number of other electronic controls and indicators situated on a supporting pedestal alongside the machine headstock are also in an unsatisfactory condition resulting from the prolonged effects of steam. The supporting arrangement appears to need re-designing and putting on a firm foundation, which will prevent steam being conducted into the meter housing.

It was noted that a table of processing tensions to be utilized on the sizing machine was old and, in some cases, out of date. Basing on current details of counts and the number of ends in sets for the various Fabric Articles a new table was prepared and handed over. A copy is shown below.

"SUCKER SIZING MACHINE"

Article	Count NM	Total Ends	Creel Tension	Inlet Tension	Normal Sq. Zing Press	Crawl Sq. Zing Press	Wet Tension	Dry Tension	Winding Tension	Pressing Pressure Meter	Pressing Pressure Total
02	20	6809	110	55	520	350	90	300	375	200	400
02	26	6809	95	50	500	350	80	250	315	190	380
03	40	8658	75	40	480	350	60	180	230	130	260
015	26	8764	120	60	480	350	100	320	400	200	400
018	40	2620	25	10	500	350	20	75	95	70	140
018	40	3520	30	15	520	350	25	105	140	90	180
04	26	pile 4472	60	30	520	350	50	125	165	100	200
		Ground 4664	65	35	520	350	55	130	170	120	240
04	26	pile 3534	45	25	520	350	40	130	180	120	240
		Ground 3726	50	30	520	350	45	140	190	120	240

Down-time

In order to evaluate the effectiveness of the preventive maintenance system, it will be necessary to keep accurate records of occurrences of down-time for each section of machinery throughout the factory.

At present, a form is used to record the number of machines stopped on any day although it is designed to be used for each shift. In general, the information recorded is vague and seems not to represent an actual situation. For example, no details are provideo for the finishing department.

It will be necessary for clerical staff in each production department to record which machines are stopped and for what reason. They will have to distinguish between the following states:

- operating and in production
- not operating; undergoing planned maintenance
- not operating; undergoing repair following breakdown
- not operating; but available to operate when required.

Precise times when a machine is stopped and re-started should be recorded to obtain the length of unproductive periods, if necessary in hours and minutes. Summaries should then be made in the production control office.

As exmaple of a suitable form for such a summary will be found below.

MACHINE LOST TIME ANALYSIS

For (date)

Shift	Machine Types	No of Machines Installed	No of Machines Allocated	Shift Working Hours	Total Allocated Hours	Hours Lost according to Machine Stoppage: Administration: No material	No labour	No electricity	No water	No steam	No spares	Maintenance: Planned: Overhaul	Lubrication	Cleaning	Unplanned: Mechanical	Electrical	Inc. Inst.		Total Machine Hours Lost	Percent of Total Allocated Hours
I	Cotton Blenders	3																		
	Waste Blender	1																		
	Cards Marzoli	12																		
	Cards SACM	5																		
	Ring F. Marzoli	36																		
	Ring F. SACM	7																		
II	Cotton Blenders	3																		
	Waste Blender	1																		
	Cards Marzoli	12																		
	Cards SACM	5																		
	Ring F. Marzoli	36																		
	Ring F. SACM	7																		
III	Cotton Blenders	3																		
	Waste Blender	1																		
	Cards Marzoli	12																		
	Cards SACM	5																		
	Ring F. Marzoli	36																		
	Ring F. SACM	7																		

IV. IN-PROCESS QUALITY CONTROL

A. Important Features

There are two aspects of control, to which the management of Somalex need to give attention. The first relates to an adequate specification of product parameters, including the material outputs of the intermediate processing stages; and the second relates to the use of correct methods, systems and procedures in order to ensure satisfactory processing and satisfactory end-products.

In the spinning department there are large variations in the count of yarn spun by one frame. In the weaving department it has become acceptable to use different numbers of threads per centimetre and different counts of yarn to produce varying types of fabric and yet these are all designated by one identifying reference, i.e. Article 02. Such situations lead to processing difficulties and make it impossible to trace what took place in the event of subsequent investigations.

The basis for the adequate specification of products will include parameters used in the drawing-up of the production programmes as detailed in the annexes to the chapter on Plant Balance.

The matter of cost is not considered at this stage except to stress that, as is the case with all production costs, there needs to be a balance between what is achieved and what such achievement requires in the way of expenditure. The necessity to control costs is always present and as a consequence management should consider, at least, the implications of plans and arrangements.

However, the requirements of control at the factory are so basic that there is no question but that the cost of such activity will have to be incurred if rational and correct production methods are going

to be put into effect. This does not necessarily mean that the cost of production will increase since the concept to be followed is more likely to be "better value" in the way of quality control at the present level of expenditure.

To amplify this, it is understood that staffing consists of a supervisor of the testing laboratory, one or two technicians who work there, and eighteen quality controllers who work in various sections and on various shifts. Having experience of the factory arrangements indicates that the work of several quality controllers must be completely ineffective. Furthermore, some of their duties must be a duplication of what constitutes the work of supervisors. Thus, re-deployment will reduce staffing costs and enable expenditure to be incurred by other forms of more effective control.

There are four main requirements to be met before effective activity in quality control can be instituted:

1. The purchase of basic testing equipment including accurate balances and sets of weights for the weighing of material samples

2. The setting-up of a testing laboratory with controlled air conditions

3. The services of an experienced textile technologist to plan and implement all the requirements of production processing and control

4. The effective use of air conditioning equipment in the spinning and weaving departments and the maintaining of the correct rate of air changes and stable conditions of relative humidity and temperature.

B. Control in the Spinning Department

The prerequisite for the establishment of a system of control in the spinning department is to organize a proper method of blending cotton in the blowing section and to ensure that it is always followed.

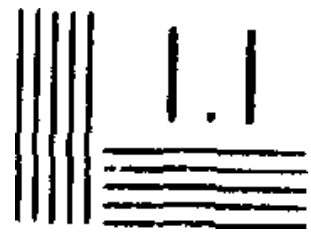
This should be based on an assessment of the quality of the cotton in bales. A proportion of the stock of bales should be tested to ascertain staple length, uniformity, fibre strength, fibre fineness, and grade. Consideration of the results of such testing should then determine what proportion of bales of each type need to be incorporated into a mixing in order to balance various characteristics and obtain a blend that can be repeated in subsequent batches over as long a period as possible.

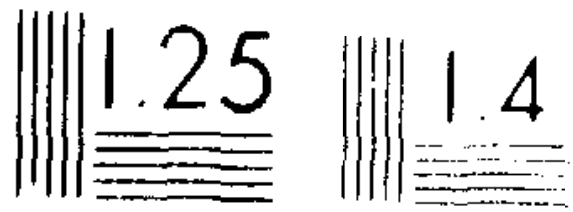
This will assist in maintaining even-running during processing, which should enable the weight/length relationship in each section of processing to be more stable and reduce the number of attempted corrections by pinion changing based on spurious factors.

In the blowing section the three raw cotton blenders should be set up so that all are operating in a similar way. Thus, the same speeds and settings should be arranged for the feed lattices, the upright spiked lattices, and the evener lattices and the distances between the spiked lattice and evener lattice. Trials of cotton delivery rates from each should be made so that one third of the cotton processed will be deposited by each on to the conveyor belt that feeds the twin opener.

Under no circumstances should one blender be allowed to remain out of operation while the other two are used to maintain the feeding of cotton. All three should operate at all times and if there is a fault on one then feeding should be stopped until the required remedial


1.0


1.1


1.25
1.4
1.6

action is completed. These machines are so simple and easily maintained that there is no reason for any prolonged breakdown to occur.

Another feature which should never be allowed to take place is the feeding of cotton from one or two bales only. This is against all the principles of good spinning practice and can only render futile any attempts to keep stable weight/length relationship over the whole extent of the processing.

The waste cotton blender should be adjusted in such a way as to regulate the feeding of waste over the whole period of time when the three raw cotton blenders are operating. In this way a controlled and constant percentage of waste will be added to the mixture of cotton throughout the whole of the running period in the blowing section. The speeds of the various machine components and the settings should be arranged to accommodate this essential feature.

It is recommended that twentyfour bales should be selected to form the batches making up the constituents of the mixing. Eight should then be placed in a line behind each blender and equal quantities of cotton from each of the eight bales should then be placed on the related feed lattice after pulling the mass of cotton apart by hand into pieces of 2 to 3 kgs weight.

A somewhat more complex (but advantageous) arrangement would be to have various stages of bale useage within the total of twentyfour. Thus, in each line of eight, two bales could have one quarter remaining, two could be at the halfway stage, two could have three-quarters remaining, and two could be full bales newly placed in position. This would result in the feeding of cotton from groups of bales at different stages at all times and would enhance the constant attempt to overcome uncontrolled variability. It would also ensure a more even-running blend by avoiding non-standard rates of feeding caused by the less-dense outer portions of bales all being fed at the same time. The

workload of preparing and laying down bales would also be spread more evenly.

Another essential feature to be attended to is the repair of one of the air extraction filters for the blowing section. This has been out of action for far too long and it is unfortunate that the UNIDO project office was prevented from finalising arrangements to have the required brass gearwheel made in Mogadiscio when the Somaltex maintenance section stated that the wheel would soon be made ready using their own facilities.

When the air extraction filter has been repaired it will be possible to keep closed the large doors into the blowing section thus enabling a more controlled air conditioned atmosphere to be maintained. This will assist in avoiding variations in weight/length relationships by keeping a more stable level of humidity.

In order to have a practical arrangement for the feeding of cotton on to the feed lattices of the blenders, it is necessary to bear in mind that one objective is to have some cotton from all eight bales in the hopper at the same time. Thus, the capacity of each hopper will be utulised by a suitable quantity of cotton from each bale mutiplied eight times. It cannot be overstressed, however, that whatever quantity is taken from each bale it should be pulled apart into small pieces to enable an adequate opening and mixing action to take place in the blenders.

Another feature that would enhance en even-running process would be to maintain a buffer stock of card sliver cans between the carding and drawing sections. This could be created by having coloured bands painted on the cans for identifcation purposes. Thus, batches of twelve cans (from the Marzoli cards) would be distinguishable by different colours. Then the first group of cans to be produced on one day would all have the same solour code and the next group would have another colour and so on.

When taking cans for the drawframe creel, it would be possible to have one can of each colour code thus ensuring that the slivers passing through the drawing process were a mixture of cotton from different times of the shift or day.

An extension of this procedure would be to ensure that the cans of sliver that were creeled at the finisher drawframe consisted of three cans from each of the breaker drawframe deliveries in the set. Thus, if the breaker deliveries were indentified as 'A' and 'B' then three 'A' cans and three 'B' cans would be creeled behind one finisher delivery.

Testing Programme

The extent of any testing programme will depend on the facilities available;the quality standard considered to be appropriate to meet processing criteria and a demand by the public to be able to purchase a satisfactory piece of fabric when a selection is available; and on the costs involved. Cost is related to the expenditure required to provide a room where tests can be made in an environment that will give accurate and useable data; the costs of testing equipment; the number of staff involved; and the costs involved in the nature and extent of sampling and testing.

Testing facilities to give accurate and meaningful results are not available at Somaltex. The conditions under which any testing has to take place are quite in appropriate. Some items of testing equipment have parts missing, e.g. balances with only one or two weights, while the use of other items is ineffective or of doubtful accuracy.

However, in order to envisage what needs to be accomplished, an outline testing programme is described and it is essential for the basic needs to be satisfied at an early stage if quality consciousness is to be promoted. To carry out a systematic routine testing operation in the best possible way it is desirable to have a controlled atmosphere in the testing laboratory.

The atmosphere for testing is specified as one with a relative humidity of 65%±2% and a temperature of 20 degrees C ± 2 degrees.C. In tropical and sub-tropical regions a higher standard temperature of 27 degrees C may be used when difficulties are encountered in obtaining 20 degrees C.

Fibre Tests

Staple length by hand pulling	1 bale in 20
Comb sorter for fibre array and effective length	2 bales per week
Digial fibrograph for length distribution, 2.5% span length, and uniformity	1 bale in 10
Moisture content	Ginning process
Moisture content raw cotton	1 bale in 20
Micronaire Fineness/Maturity	1 bale in 20
Fibre strength Pressley/Stelometer	1 bale in 20
Trash content Shirley Analyser	1 bale in 20

Count Control

The care required to be exercised in the blowing section has been outlined above.

Carding

Test the cards fed by each feeder in two groups each week, i.e. when twelve cards are in production there would be two testing periods each week and each period would involve six cards. Take four samples of sliver 50 metres long from each card at intervals of half an hour and obtain the weight of each length. Thus, there will be four weighings from each card and the mean weight of the four results should be calculated. Any major difference between the mean values and the specified norminal weight should be investigated.

It is to be understood that if all cards are expected to produce the same nominal weight per unit length then the gearing on each card should be the same and the settings should be standardised.

As the cards are chute fed it is necessary to ensure that the weight of the layer of cotton between the lower conveying rollers in the lower silo and the card feed roller is the same in each case as determined by an accurate weighing balance. The length of the layer is 0.406 metre and the metric count would be determined by dividing by the weight of the layer in grams. To increase the weight, increase the capacity of the lower silo collecting box and/or increase the number of nips of the vibrating screen. To decrease the weight, decrease the capacity of the lower silo collecting box and/or decrease the number of nips of the vibrating screen. The capacity of the lower collecting box can be varied between 200 and 400 grams.

Drawframes

The initial period of activity will involve trying to standardise all breaker drawframes and all finisher drawframes with the same gearing set up for each group, assuming each set of drawframes (one breaker and finisher) is allocated to the production of the same size (weight per unit length) of sliver. An intensive period of investigation will be necessary to determine the sampling variation and what drafts and pinions will result in a suitable weight per unit length of sliver that will fit into the planned processing draft distribution, i.e. the spinning production programme or spin plan.

Examination and adjustment should continue until all first passage drawframes can produce similar sliver weights with the same gearing on each machine. All second passage drawframes should also be fitted with the same gearing on each machine to produce similar sliver weights. All machines in each passage should be able to produce sliver equivalent to the mean sliver weight.

One hundred measurements will be required for each finisher drawframe which will involve quite a considerable period of testing as it is necessary to limit one test to each set of creel cans. Not until the next batch of creel cans has been placed behind the drawframe can a subsequent test be made. A series of five metre lengths from each delivery should be tested and the data recorded and analysed.

Delivery	Delivery	Range
No. 1 (grams)	No. 2 (grams)	
x'	x"	w
x'	x"	w
x' etc.	x" etc.	w etc.
Overall mean weight		Mean range

The control chart would then be set up to record the subsequent results from one second passage (finisher) drawframe. The distance of the limits from the mean sliver weight would be determined by first obtaining the standard deviation of the mean range of the two sliver weighings, i.e. 0.887 x mean range, and then multiplying this by 2.58 for the 1% limits and dividing by the square root of 2 (tests) or 1.414.

For control purposes half the deliveries of the first passage should be tested once per day, i.e. day 1 - deliveries 1, 3, 5, and 7; day 2 - deliveries 2, 4, 6 and 8. All deliveries of the second passage should be tested once every shift. The test length to be weighed on each occasion is five metres, and the mean of each pair of results (representing one machine) would be obtained. The horizontal axis of the chart would represent the shifts and a point showing the mean for one machine would be recorded using the vertical axis to determine whether it should be below or above the horizontal line depending on whether it was lighter or heavier than the mean sliver weight already established and represented by the horizontal axis.

Speedframes

The roving size (weight per unit length) should be tested once per week on each frame. The purpose of this would be to detect any machine faults. No attempt should be made to adjust pinions in relation to the results obtained. Any useful corrective action should already have been carried out at the finisher drawframe as determined by the control chart.

As with the other machine sections, the speedframes should be operated with standard pinions in relation to the roving size and preparatory work to establish this situation may be necessary.

In carrying out the testing routine three bobbins should be taken from the front row of spindles and three from the back. Different spindles should be used each week. Indentification marks should be put on the bobbins and 25 metres measured off from each and the weights of each length obtained.

It is important to investigate whether there is any differential stretching of the roving, which causes the roving size to vary with the stage of the bobbin build. After testing the six bobbins for mean weight per unit length the quantity of roving on each bobbin should be successively reduced and a twentyfive metre length measured and weighed when threequarters full, half full, a quarter full, and just before the bare bobbin is reached.

The weight figures so obtained should be listed thus giving five results per bobbin. Examination of the data would then indicate if there was any serious difference in size (ratching) such as may be caused by incorrect winding wheels, ratchet wheels, cone drums, or cone drum belts.

Ring Frames

According to present practice, attempts to control long term variation in count at the ring frame depend on the chnaging of pinions in relation to periodically observed count values. Frequently, such changes are not only unhelpful but they actually amplify the variation. The infrequency of any practicable testing scheme in relation to the large quantities of yarn produced precludes the system as a means of count control.

Almost all the work of controlling the count of yarn spun on the ring frames has to be accomplished by following correct working practices in the blowing section; by obtaining similar average values of weight per unit length of sliver at each card; and by adjusting sliver size at the drawframes in accordance with procedures based on the use of control charts.

Adjustment of the lower feed silos on the cards should enable a reasonable level of similarity to be obtained over all the cards. Short term variations would be more easily controlled by autolevellers but as these are not fitted the consequences arising from the use of chute feeding will have to be accepted.

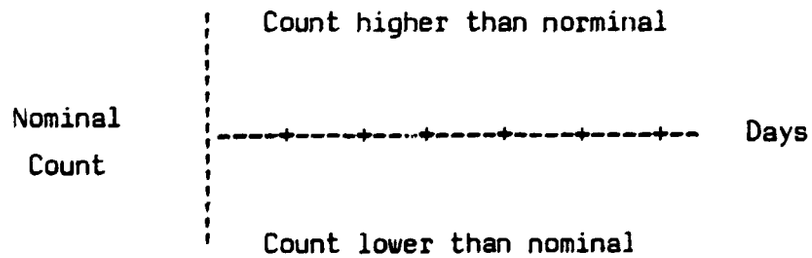
To control the variations in yarn count from the ring frame refers to very long variations, which cause the average count of a frame or even of the whole department to change from day to day. While the work of standardising processing up to the drawframes is proceeding, it is useful to set up temporary control charts for the ring frames. When control at the earlier sections of processing is established in a better way, fresh measurements of yarn count should be made and control chart parameters should be re-calculated.

As a temporary measure testing could proceed on the basis of checking every third ring frame each day. Thus, on day 1 from numbers 1, 4, 7, 10 etc. would be checked; day 2 numbers 2, 5, 8, 11, etc; day 3 numbers 3, 6, 9, 12, etc. and so on. From each frame, take six ring tubes from each side at full doff.

Day 1	Side A	Spindle Nos.	1	31	61	91	121	151
	Side B	Spindle Nos.	217	247	277	307	337	367
Day 4	Side A	Spindle Nos.	3	33	63	93	123	153
	Side B	Spindle Nos.	219	249	279	309	339	389
Day 7	Side A	Spindle Nos.	5	35	65	95	125	155
	Side B	Spindle Nos.	221	251	281	311	341	391

In order to carry out this procedure it will be necessary to take the sample of ring tubes just as the full doff is ready. Thus, the testing will proceed over a period of a few hours taking one frame at a time. After obtaining the mean count values if the figures are outside the range Nm 25s to 27s for Nm 26s or Nm 38s to 42s for Nm 40s then a form of correction by changing pinions will have to be carried out.

Select several ring frames, e.g. numbers 3, 8, and 17 if twenty ring frames are in production and make a chart for each one to record what count values are obtained and what action is taken on each testing day. Plot the results in relation to the horizontal axis representing days in order to assess the effectiveness of the temporary procedure. The nominal count (Nm 26s or Nm 40s) should coincide with the horizontal axis.



The setting up of control charts for the monitoring of count at the ring frame is to distinguish between variations resulting from sampling and significant variations resulting from a serious change which affects the mean.

In the initial stages, intensive testing is needed on each frame to establish standard draft pinion for each count. If it is found that certain frames do not give correct results, it is necessary to find and remove causes of this. Frame to frame differences can arise from the development of badly running gear trains, and numerous variations of roller settings, roller loadings, and conditions of cots, aprons, and spacers. It is unlikely that precise nominal count values will be obtained over the whole series of ring frames but this is unavoidable and results from the relationship between the number of teeth on draft pinions and the difference in count each tooth makes.

To make an assessment of the mean count of yarn from a ring frame take ring tubes from each side of the frame and do not sample yarn from a spindle more than once in any round of testing. Take three sets of four tubes from each side and obtain the count for each tube and the range for each set of four. Repeat at intervals of half an hour until 120 tubes have been sampled. The means of the count and range can then be calculated. Limits for the control chart so that only 1% of themeasurement will fall outside can be derived from the formula:

$$\text{Standard Deviation of the Range} = \text{SDR} + 0.486 \times \text{mean range}$$

$$\text{Distance of the limits from the mean} = \pm \left(\text{SDR} \times 2.58 \right) + \sqrt{4}$$

C. Control in the Yarn Preparation Department

The processing of yarn through the yarn preparation department should be facilitated by an adequate testing programme through the various stages of spinning. This will provide details which will enable deficiencies to be diagnosed and remedial measures to be instituted.

Winding machinery that has been correctly set-up and properly cleaned and maintained will then create the basis on which the control of quality is established. Attention to the position and alignment of the yarn supply package will minimise snagging and excessive variations in tension and ensure that the yarn passes satisfactorily to the tensioning and clearing unit.

Adequate tensioning will ensure the removal of weak places and contribute to the production of a well formed and firm yarn package. The correct setting of clearers will control the size and number of thick places to an acceptable standard.

Good supervision is necessary to monitor conformity with work practices developed during training and to ensure that packages are produced, which are free from entanglements, poor knots, and extraneous matter adhering to the yarn. Furthermore, once made, packages should be handled carefully and not subjected to throwing, dumping, or abrasion.

In warping, it is necessary to produce beams containing the maximum length of yarn, of the correct density, and formed in such a way as to ensure satisfactory unwinding in sizing with the minimum of crossed ends and incidence of yarn breakage. This requires the correct aligning of yarn supply packages with the creel tensioning units, the proper functioning of the broken end stop motion, and the conscientious attention of properly trained operators and maintenance staff. Control should also be exercised in relation to the obtaining of similar thread tensions across the full width of the yarn sheet and the condition of the beam flanges.

The control of quality in the sizing process is of the utmost importance since its function is to impart weavability to the warp wound on to the weaving beam. Performance in weaving largely reflects the quality of workmanship in the sizing section. It is thus necessary to control the work practices of the operators, the mechanical condition of the sizing machine, correct size preparation and storage, and the sized yarn properties.

When the warping beams are placed in the creel of the sizing machine it is important to ensure that they are all properly aligned with the size box. Also the individual beam braking units should be working correctly so that the tension in the yarn is similar for each beam. Furthermore, the yarn tension between the creel and size box should be in accordance with the processing specification stipulated by the technical section of the management.

For the size box it is necessary to ensure good cleanliness of all parts so that any accumulations of fibre, yarn, or hard size are removed. Squeeze roll surfaces should be free from damage and immersion rolls should be operating at the depth specified by the factory. Yarn tensions and size temperature should also be in accordance with specified values.

In the drying section, all cylinder surfaces should be absolutely clean and free from damage. No leaks should be permitted, steam pressures should be correct and all cylinders should be free from accumulations of internal condensate. All steam traps and the vapour exhaust hood should operate correctly.

At the headstock yarn tensions should be in accordance with specified values. Each end should pass forward quite separate from those on each side. Residual moisture and normal running speed should be within the specified tolerances.

The basis for satisfactory size preparation is the selection of suitable ingredients for a mixing and the specification of correct quantities. Then the operator needs to adhere to clear instructions at all times. Thus quantities, cooking temperature, and length of cooking time should all be controlled.

Frequent laboratory analysis is necessary to collect data on per cent size pick-up, per cent moisture regain, single end elongation of sized and unsized yarn, and single ends breaking strength of sized and unsized yarn. Results may indicate such possibilities as low per cent

solids, improper temperatures, improper immersion deptn or level of size. A low moisture regain may indicate that running speed is too low.

During periods of observation of sizing machine operations it was noted that the frequency of stoppages or slow-running was far too high. This usually resulted from the improper preparation of the warping beams and is a matter that requres a lot of attention from the management if the Sulzer weaving machines are to operate at reasonable levels of performance.

D. Control in the Weaving Department.

As has been indicated, the basis for correctly woven fabrics is started in the yarn preparation department. This assumes that yarn for both warp and weft is of a satisfactory standard.

However it is necessary for operatives, maintenance technicians, and control staff to remain alert at all times to the possibility of the development of faults arising from failures in previous processing stages, malfunctioning of weaving machine mechanisms, or disturbance to settings. The type and incidence of defects need to be reported on systematically so that details can be analysed and the causes of deficiencies investigated.

To meet specifications, yarn counts, fabric weave, threads per centimetre, cloth width, and length of piece in relation to the marked length of warp should all be checked. Supervisors should be trained to recognize all fabric defects and should inspect the fabric on each weaving machine at least once every shift in order to satisfy themslves that systems instituted for the control of quality are working satisfactorily or to point out any defects.

E. Control in the Finishing Department.

To facilitate process control it is necessary to set up standards for loomstate width and for the length of piece for each sort. It is useful, also, to weigh each piece. After the calculation of suitable plus and minus tolerances routine records of these simple checks will enable the establishment of a suitable form of monitoring and control.

This would then be enhanced by chemical testing carried out by the finishing department laboratory; the use of machine controls, such as liquors at the correct temperatures; and operators conforming to processing instructions.

Such work would be supported by continual careful checking of machine operations by control staff including the departmental manager, supervisors and foremen.

The main features of a control programme would be:

- avoidance of indelible staining and other forms of contamination
- use of correct methods for the joining of piece ends
- specification of chemical and dyestuff recipes
- specification of processing instructions
- periodic determination of residual size after sizing and desizing
- absorbency after scouring
- monitoring of bleaching process for pH, hydrogen peroxide concentration, and temperatures
- fluidity testing to monitor the degree of cellulose degradation

- effectiveness of bleaching by comparison with standard white
- levelness of dyeing and shade matching
- resistance of dye or print to light, washing, and in some cases to rubbing.

In order to quantify the results obtained by quality control it is necessary to determine the ratio of standard fabric to seconds and fents as cut in the finished goods section. All cutting summary sheets should be analysed on a weekly basis and the results calculated as the percentage of standard grade, seconds, and fents for each sort e.g. for Article 02, Article 03, etc.

Faults should be categorised according to the origin i.e. spinning, weaving or finishing and further broken down into types to facilitate remedial action. Limits for the percentage of seconds should be set and made effective.

F. Existing Laboratory Equipment

	Condition
1. Comb Sorter - Zweigle	
- for fibre length distribution	Moderate
2. Pressley Tester - J.M. Doebrich, Tuscon	
- No rolling beam weight or fibre clamps	Unusable
3. Torsion Balance - Zweigle	
- Scale 0 to 200 milligrams	Accuracy unknown
4. Wrap reel - Zweigle	
Electrically driven. Metric System	Satisfactory
5. Wrap Reel - Calderera Bossi	
- Measures in yards for English counts	Unsable
6. Wrap Reel - Calderera Bossi	
- Measures in yards for English counts	Unusable

7.	Quadrant Balance - for English counts	Inaccurate
8.	Quadrant Balance - Louis Schopper - for Metric counts	Good
9.	Quadrant Balance - Zweigle - for Metric counts	Inaccurate
10.	Dynamoter - Calderera Bossi - yarn strength ranges 0 to 25, 50, and 100 kgs	Good
11.	Twist Tester - Calderera Bossi - Electrically driven. 2 counters	Good
12.	Yarn Inspection - Calderera Bossi - Electrically driven. Taper Boards	Good
13.	Moisture Testing Oven - Calderera Bossi - Electrically heated. Not used	Unknown
14.	Moisture Meter - Aqua Boy - To test cotton samples. Not used	Unknown
15.	Microscope - Pzo Poland - for fibre examination	Satisfactory
16.	Two tachometers - Jacquet	Satisfactory
17.	Stroboscope - Lael Milan - Neon - inferior type - Sockets not available in Spinning Department	Accuracy unkno

G. Additional Basic Equipment Requirements

		U.S. Dollars
1.	Air conditioning equipment for controlled conditions	40,000
2.	Analyser to determine amount of trash in raw cotton or sliver	30,000
3.	Baer comb sorter to examine fibre length distribution	2,500

	U.S. Dollars
4. Micronaire to determine fibre fineness and maturity	5,000
5. Special balance to weigh 5 grams. Accuracy ± 5 milligrams	2,000
6. Rolling beam weight an two sets of fibre clamps for existing Pressley fibre strength tester	2.000
7. Nep counting templates to monitor card web quality	1,000
8. Metric wrapping block for sliver and roving	1,000
9. Evenness testing installation for sliver, roving and yarn	
- measuring unit	
- integrator for CV% and recorder	
- spectrograph for analysis of variations	
- imperfection indicator for counting thick and thin places and neps	50,000
10. Single thread yarn strength tester in ranges 0 - 2000 grams	4,000
11. Top roller eccentricity tester for drawframe, speedframe, and ringframe top rollers	4,000
12. Botton roller eccentricity tester for use at a frame	2,000
13. Two psycrometers (sling hygrometers)	200
14. Moisture meter	2,000
15. Gratings for the testing of:	
- reed dent spacing	
- threads per cm in plain cloth	
- pick spacing irregularities	300

	U.S. Dollars
16. Three weighing balances:	
a) with digital read-out up to 1,000 grams and large pan for card feed	
b) ordinary laboratory balance with weights	
c) with digital direct read-out up to 100 grams for size determination of sliver, roving, and yarn	3,000
17. Stroboscope to determine speeds of revolution	
- Xenon type	3,000
18. pH meter to test acidity and alkalinity	500
19. Size refractometer to indicate concentration	500

V. PRODUCTION PLANNING AND CONTROL

A. Co-ordination of Activities

Production planning needs to begin with an analysis of various forecasts such as:

- what sectors of market demand can best be satisfied by the available production facilities;
- trends in consumer preferences, such as fabric types, fabric weights, fibre constituents, finished styles;
- level of technology and capability available in production facilities and likely cost of operations;
- availability of finance, raw materials, and all other supplies;
- management manpower resources;
- availability of labour and related skill levels;
- forms of required training.

Other factors have then to be considered. For example, although many Somali women show a marked preference for cotton voile made from two-fold yarn or a similar product made from synthetic fibre, it is not possible to contemplate the production of such fabrics with the existing factory facilities and raw material supplies.

Furthermore, popular shirting fabrics in many countries are made from blended yarns containing 66% polyester fibre and 34% cotton. Other blends may be under consideration but such matters as expected yarn

strengths and fabric performance have to be analysed carefully to avoid results which are inferior to those from the use of 100% cotton. Thus, machine suitability and finishing techniques need to be studied. An assessment of future raw material cost trends should also be attempted.

In order to provide accurate information with which to link production programme estimates it is necessary also to prepare outline budgets for the financial year:

- Sales Budget
  giving expected quantities of sales for each type of fabric and the selling prices;

- Purchases Budget
  giving all requirements of raw materials and consumable stores required to meet the Sales Budget;

- Capital Expenditure Budget
  showing what funds have to be made available to maintain the expected level of machin ery performance;

- Cash Flow Statement
  showing how revenue and expenditure arise month by month and lead to the resultant availability or lack of cash funds.

Thus, it is important for the management of Somaltex to take account of many factors before deciding on a production programme for any year. Although the level of operations at the factory depends on some factors which appear to be outside the control of the management, it is strongly recommended that the best possible assessment of these is made periodically so that the level of production may be stabilized for as long a period as possible. This would enable related matters, such as working hours, steam and

electricity generation, numbers of operatives, consumption of dyestuffs and chemicals, and maintenance schedules to be kept as steady as possible over a period of time, which is practical in terms of the circumstances.

After all the main policy decisions have been taken, it is then possible to convert the details into a production programme covering the spinning, yarn preparation, weaving, and finishing departments. The technical supervising management will then determine sectional capacities and individual machine production rates in order to form the basis for a production control programme.

The implementation of effective control will then depend on:

- the accurate specification of pratical in-process and product parameters;
- conforming to standards for settings and speeds;
- carrying out the testing programme to monitor raw material quality and in-process parameters;
- good supervision and effective maintenance;
- the use of correct work practices and the control of waste and seconds;
- accurate production records.

B. Production Control.

Prerequisites

Correct information is essential in order to be able to monitor

production volume and to make meaningful comparisons with standard expectations. This would be based on reliable records of weighed or measured quantities. Wherever possible such details would be the results of actually weighing or measuring material and not be estimates, such as an assumed standard weight or length multiplied by a number derived from counted units.

There is little equipment at the factory to carry out accurate weighing and measuring and this situation should be rectified if better control arrangements are to be instituted. Ideal requirements are:

1. Scales of 250 kgs to weigh raw cotton bales.

2. Scale of 25 or 50 kgs to weigh spinning waste.

3. Scale of 50 kgs to weigh yarn doffs from a ring frame. or wound cones and cheeses.

4. Scale of 1,000 kgs to weigh yarn on warping beams.

5. Scale of 50 kgs to weigh fabric pieces.

6. Scale of 25 kgs to weigh yarn waste.

7. Scale of 25 kgs to weigh fabric fents.

To facilitate accuracy and to prevent mixing of intermediate products, the use is recommended of colour identification to distinguish between different roving sizes, and yarn counts at the ring and winding frames. This would also reduce the possibility of producing non-standard fabrics.

As far as can be ascertained, there is no checking of yarn input and cloth output for the weaving department. At the present time this

could be instituted in a simple form by comparing actual lengths of sized warp and weights of weft cheeses with fabric quantities derived from pick counter readings. Clearly, all such details would need to be recorded on every shift and summarized monthly and annually.

To carry out a more careful check it would be necessary to change the present arrangement, which consists of unrolling fabric from the Sulzer weaving machine rolls and through the shearing machine, re-winding the fabric on to large batches of about six thousand metres.

To improve on this it would be beneficial to determine suitable standard piece lengths according to the sorts of fabrics produced. This would necessitate the use on the sizing machine of the piece marking mechanisim, which marks the sized warp to indicate pre-set and measured lengths. Such marks would show where fabric should be cut out at the weaving machine in order to standardize normal piece lengths wihtin a small range.

Unrolling of pieces would then have to take place as a separate operation allowing measuring to take place before fabric was joined together, sheared, and batched. Measuring could be carried out either by a meter with a revolving disc wheel or by using plaiting machines to fold cloth into consistent one metre lengths, which are tightly folded, and can then be counted manually.

Such a system would also allow grey fabric inspection to take place and thus improve quality control. Furthermore, the input/output check becomes more accurate.

Production Records

In order to monitor production performance it is necessary to compare output with the capacity of key sections of machinery. Thus, given the expected standard production rates it is possible to calculate what should be produced in relation to shift working hours and machine activity.

Activity is a figure derived from the hours that a machine is in operation (including stoppages inherent in the process) expressed as a percentage of the shift working hours. For example, if a machine was stopped for two hours for a breakdown to be repaired or for planned maintenance to take place and if the shift working hours were eight then activity would be 75%.

It is important to obtain indications of activity in order to be able to evaluate the attained level of production. For any machine or group of similar machines making the same product details would be recorded as follows:

- Number of machines
- Shift working hours
- Possible working hours
- Actual working hours
- Activity
- Standard production per machine hour
- Standard production quantity in possible working hours
- Standard production quantity in actual working hours
- Actual production quantity
- Performance ratio.

Machines where such monitoring should be carried out are:

<u>Spinning</u>:

Cards	weigh each can produced and record number of cans
Drawframes	record details from production meter
Speedframes	record details from production meter
Ringframes	record details from production meter and weigh each doff of yarn - summarize for each count

Yarn Preparation:

Winding	weigh cones and cheeses produced and record numbers of packages - summarize for each operator, frame, and count.
Warping	weigh each beam produced and record details of length and number of ends - also useful as a check on yarn count.
Sizing	record details of length and number of ends.

Weaving:

Weaving	record details from pick counters and summarize according to fabric sort.

Finishing:

Shearing	record length of fabric passing through machine.
Singeing	record length of fabric passing through machine.
Scouring	record length of fabric passing through machine
Bleaching	record length of fabric passing through machine.
Finished Goods	record length of fabric made-up and packed ready for dispatch or transfer to another storage area.

It should be noted that activity will help to indicate what proportion of capacity is being utilized on each shift. Thus if ten weaving machines are stopped for a lack of orders, or a lack of operatives the working hours lost would be reflected in a lower figure of actual working hours. However, periodic failures in control resulting in

non-availability of material would be reflected in a lower figure of performance ratio.

It will be noted that it has been preposed to weigh product packages from certain sections of machinery e.g. cards. Under present circumstances, this would be impossible as no weighing scales are available. Thus the degree of control to be effected will be determined by decisions in relation to the purchase of new weighing scales.

Operator Workloads

When attempts are being made to optimize production levels by exercising control over various features it is important not to overlook situations which curtail machine running hours. One example has been referred to elsewhere in relation to stopping machinery unnecessarily at the time of shift changeover.

Another example noticed by the author concerns the doffing of ring frames. When this occurs a frame is sometimes stopped for 30 minutes or more owing to poor planning and organization. Since stopped time is the main factor affecting ring frame efficiency it is necessary to keep to a minimum by ensuring that a frame is only out of production for two or three minutes, which is an acceptable standard. This necessitates having several doffers attending to a frame at one time and having a supervisor or head doffer to ensure that the frame is re-started without delay. Doffers should be trained to remove full ring tubes and to piece up any ends that break when the frame is re-started.

A simple calculation will indicate the workload for a doffer:

From the notional production programme:

Ringframe production per hour		Yarn on Ring Tube	Ring Tubes per hour
Nm 26s	165.45 kgs	90 grams	1,839
40s	160.71 kgs	80 grams	2,009
50s	58.15 kgs	80 grams	727
		Total ring tubes	4,575

Thus each of 10 doffers per shift would have a workload in the region of 460 ring tubes doffed per hour. This would allow adequate time for all preparations and for the re-starting of a frame after doffing, including piecing up any broken ends.

C. Control of Material

Material Usage

Another feature of production control concerns the care which is exercised in producing as much saleable material as possible in relation to the input of raw material. It is assumed that once raw cotton has been purchased it is almost certain that it must be processed and, therefore, it is essential to make a careful selection from samples in order to obtain the most suitable for satisfactory and economical processing.

Subsequently, it is necessary to distinguish between waste that is unavoidable and waste that is dependent on machine settings and work practices. For example it is clearly necessary to remove sand, trash from the cotton plant, and motes (part or whole cotton seeds with attached fibres) from raw cotton in order to prepare fibre for spinning into yarn. However, the quantity of good fibre which is also removed

along with such impurities depends on the use of technical knowledge and the accuracy of machine settings. Furthermore, the accumulation of waste at other processes such as ring spinning needs to be minimised for, although it is largely suitable for re-use, re-processing results in deterioration in the quality of fibre.

Cotton Bales.

The individual weight of every bale of raw cotton put into storage should be obtained and recorded. At the time of weighing each bale should be given a number and the weight recorded against this.

When bales are sent into the blowing room for processing the weight of each should be taken again and a comparison made with the previous weighing to detect any loss e.g. due to the evaporation of excessive moisture.

By individually weighing and recording the covering and banding from each of 100 bales taken at random a standard tare weight (covering and banding) should be established and checked every three months (or more frequently according to the number of different sources of cotton).

This should be used to obtain the total tare weight to be deducted from the gross weight of cotton bales put into process so that an accurate figure for the weight of raw cotton forming the input can be obtained.

Cotton Mixing - Waste Percentage.

For the production of carded yarns it is universal practice to re-use some of the cotton, which is collected as the waste from the different sections of the spinning process, e.g. card sliver, drawframe sliver, roving which has already been prepared by passing it through a roving waste opener, and waste collected as a mass of fibre from the suction systems of drawframes, roving frames, and ring frames.

In order to maintain a reasonable standard of yarn quality it is essential that this procedure does not result in excessive quantities of waste being put back into the mixing. For example, a minimum of 96 kg of raw cotton and a maximum of 4 kg of re-useable waste should be used together and this would be a reasonable initial target, which should be improved upon as more control of the spinning process develops.

To ensure that the situation is under constant control, it is necessary to have conscientious attention and for all waste to be weighed before being put on to the lattice of the waste blender. A scale with a range of 0 to 25 or 50 kg should be installed in the blowing section.

Thus the quantity of waste fed per hour can be compared with the rate of useage of weighed raw cotton bales.

The operation of the waste blender should be regulated to deliver re-processed cotton constantly while the other raw cotton blenders are operating i.e. all four should deliver cotton. Furthermore, there should be no large accumulation of collected waste over a period of time.

Waste Analysis.

The waste removed from the beater and opener units and other collection points in the blowing section and from each of the cards should be examined by a person fron technical supervision at frequent periods. This would enable an assessment to be made of the effectiveness of processing and to arrange for remedial action if, for example, an excessive proporation of good fibre was being removed.

A more accurate analysis could be carried out by using equipment such as the Shirley Analyser, which will enable figures representing the proportions of the various constituents to be compared over a long period of time. This piece of equipment is also extremely valuable in the assessment of cotton samples representing offers for sale and cotton bales at the factory to be used for yarn production.

Waste Test.

To obtain a standard for the permissable amount of waste throughout the spinning process it is necessary to carry out a periodic waste test, say once every three months. This would need to be carefully supervised throughout its duration and accurate recording of tare weights and material quantities is essential.

The basis for the test would be a quantity of raw cotton, say 1,000 kgs, made up from the constituents of a mixing that could be maintained for at least a few weeks. This would then be processed through the blowing section and half the carding section taking care to ensure that all machines were properly set-up, clean, and free from any waste and fibre accumulations.

Conscientious operatives and clerks should be present and the weights of good material produced and all quantities of waste accumulated should be recorded.

A representative quantity would then be processed through drawframes, speedframes, and ringframes and weights of good material and waste again recorded.

Using the principle that ten percent waste is represented by the situation of 110 kgs of raw cotton being needed to produce 100 kgs of good yarn on ring tubes, the quantities of waste produced at each process can be set against the outputs and percentage waste figures calculated. The final quantity of good yarn able to be produced from the original quantity of raw cotton should include an allowance based on the sectional waste percentages and the quantities of waste accumulated.

Care should be taken to ensure correct air conditions throughout the spinning department at the time of each test.

Waste Reports

At the present time there are quite large quantities of yarn waste to be found in the factory and it is considered that uses other than the making of rope need to be investigated. If sales to market traders or handicraft units could be made at reasonable prices, this may provide a regular offtake. Other uses such as for thin tubular banding or string could help to create a small scale industry. However, it is necessary for management to keep in mind the objective of minimising all waste arising from processing.

Shift reports enable the situation to be monitored and these consist of details showing what quantities of waste arise at each process. Such quantities should be weighed and delt with either by transfer away from factory operations to a separate store, or to a collecting point for re-use. Monthly summaries showing the accumulated weights of waste compared to throughput would indicate the effectiveness of waste control arrangements and figures could be compared with the standards indicated in the spin plan as well as waste test averages.

Monthly Reconciliation

In order to monitor production, material usage,and work in progress it is necessary to make a reliable estimate of the situation at the end of each month. This would involve the checking of raw material stocks, quantities of material throughout the process, and stocks of finished and unfinished fabric. Such information would also form the basis for the calculation of monthly financial results.

For each processing section it would then be possible to relate commencing and finishing stocks to production and waste quantities using summaries obtained from shift records. Discrepancies could then be investigated within a short time of recording the situation of material stocks.

SPINNING PRODUCTION AND EFFICIENCY REPORT FOR Monday DATE 15 March 1982

Shift	Counts Nm	Frames Allocated	Hours per Shift	Total Frame Hours	Standard Metres per Frame per Hour	Standard Total Metres	Recorded Total Metres	Efficiency %	Standard kilos per Frame per Hour	Standard Total Kilos	Recorded Total Kilos	Efficiency %	Weight of Each Count 26s	40s	50s	
A	26s 40s 50s												x	x	x	x
Shift Total																
B	26s 40s 50s												x	x	x	x
Shift Total																
C	26s 40s 50s												x	x	x	x
Shift Total																
												Each Count Sub-total	x	x	x	x x x x kgs
												Grand Total				x kgs

WEAVING PRODUCTION AND EFFICIENCY REPORT FOR Monday DATE 15 March 1982

ARTICLE	LOOMS ALLOCATED		SPEED	PER SHIFT		SHIFT A		SHIFT B		SHIFT C		TOTAL	
	Type	No.	Standard Picks per Minute	Loom Hours	Standard Picks (Mill)	Actual Picks (Mill)	Effic iency %	Actual Picks (Mill)	Effic iency %	Actual Picks (Mill)	Effic iency %	Actual Picks (Mill)	Effic iency %
Grey 02	153 ES	20	200	160	1·920	1·440	75·0	1·344	70·0			2·784	72·5
Towel 04	153 VSD	1	200	8	0·096	0·058	60·4	0·061	63·5			0·119	62·0
Looms idle	153 ES	12											
Looms idle	130 ES	4											
TOTAL		154		168	2·016	1·498	74·3	1·405	69·7			2·903	72·0

Form Ref N.

FABRIC PROCESS STOCK LAST WEEKDAY/ DATE .....

SECTION / ARTICLE	1		2		3		4		5		6		7		8		9		10		11		TOTAL	
Weaving Sulzer Rolls																								
Shearing Sulzer Rolls																								
Total Sulzer Rolls																								
	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S
Singeing																								
Scouring																								
Bleaching																								
Mercerizing																								
Jiggers / Winch																								
Dyeing																								
Printing																								
Washing																								
Cylinder Drying																								
Hot Flue																								
Stentering																								
Calendering																								
Miscellaneous																								
Total																								

FINISHED GOODS STOCK (METRES) LAST WEEKDAY DATE _____

SECTION / ARTICLE	1	2	3	4	5	6	7	8	9	10	11	TOTAL
Finished width cms												
Incoming From Process												
Inspection												
Making Up												
Baling												
Finished Stock												
Total												

APPENDIX 1

PRELIMINARY REPORT 15th January 1982

PROJECT DP/SOM/81/013 (DP/SOM/72/007)

PROJECT IN THE SOMALI DEMOCRATIC REPUBLIC TO IMPROVE THE OPERATIONAL PERFORMANCE OF THE VERTICALLY INTEGRATED COTTON TEXTILE FACTORY - SOMALTEX.

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BACKGROUND

1. Somaltex, a public sector enterprise, is an integrated cotton textile production plant manufacturing woven fabrics, which are sold in loomstate, bleached, dyed and printed styles. Equipment for various lines of subsidiary products is also installed, some of which does not operate.

2. The company was established in 1966 a joint-venture basis with 51% of the capital owned by Somalis and 49% by Germans. In 1973 it was nationalised and Sh.So. 140 million was spent on modernisation. (1) Thus, much of the machinery and equipment dates from 1975.

3. With the objective of improving the performance of industrial enterprises, the U N D P Project specifies a number of short-term consultancies, of which the author's is one. The purpose is to improve productivity and overall performance by the formulation of action plans and the implementation of fundamental requirements, such as a comprehensive preventive maintenance scheme. The Job Description for the assignment will be found in Annex A.

4. The author arrived in Somalia on 10th December 1981, and, after completing administrative formalities and a familiarisation visit on the 14th, commenced his stay at the factory on the 16th.

Note (1) Case Study No.2 prepared for the National Workshop of Public Enterprises August 9-13 1981 - Management Perspectives and Problem Areas in Somaltex by Praxy Fernandes - page 2.

INTRODUCTION

1. The Somali Democratic Republic has a population of about four million people. Assuming a per capita consumption of six square metres, market demand in the country amounts to 24 million square metres.

2. It is estimated that approximately 16 million square metres of this demand could be met by Somaltex weaving department, assuming the factory operated with the existing product mix for two shifts per day as at present and on six days per week.

3. The Somaltex factory is situated just outside the isolated village of Balad, 36kms northwest of the capital, Mogadiscio. The electricity supply is generated on site by Diesel power and the water supply is drawn from wells.

4. The factory buildings are of sound construction with hollow block (at first one part cement one part stone chippings, later one part cement one part grit one part sand) walls and corrugated asbestos sheeting for the roof. Insulation immediately below the roof in the spinning and weaving department is still in reasonable condition but elsewhere it is subject to deterioration - sometimes severe.

5. Air conditioning equipment by Luwa is installed in the spinning department and by Sulzer in the weaving department. The effectiveness in both departments requires evaluation in relation to the design specifications but conditioned air is allowed to pass out of the workrooms by doors, which are either left open or are in damaged condition. The air conditioning equipment in the yarn preparation department does not operate as a result of deterioration.

6. Although the factory is an integrated production unit, the balance between each department requires evaluation in the light of future requirements. A preliminary indication by senior management of the types of cloth likely to be in demand over the next few years would be valuable in the near future.

7. An estimate of spinning capacity reveals that, subject to certain parameters, enough yarn could be provided to keep the weaving department running on two shifts per day, which has been the normal operating system for the last six years.

8. The machine complement is made up of pre- and post-1975 equipment and the list showing most of the individual items will be found in Annex B.

9. The main factory work areas occupy approximately 25,725 square metres. In addition, there are other separate buildings for oil-fired boilers, diesel generators, mechanical and electrical workshops, and stores for raw materials, spares and consumable items. An approximation to the layout will be found in Annex C.

10. There are eight circular knitting machines on the factory premises which have not produced fabric for almost two years. Quantities of the product are still in stock and there is no programme for operating the equipment during 1982. It is understood that there is no outlets in the country for the type of fabric that was produced. A careful investigation is needed in an endeavour to make use of this asset if this seems feasible under present circumstances. In the meantime, a programme of care and maintenance needs to be put into effect.

11. Within the factory compound is a training centre, which gives instruction and an opportunity for practical work in the areas of mechanical and electrical maintenance. This is an extremely important field of endeavour, which needs careful planning and judicious evaluation of performance. The appropriate balance between training in school and experience on-the-job is a feature that requires careful analysis.

12. Many comments in this preliminary report are based on observation and information received in response to enquiry. The author has attempted to be factual and objective but if some details are partly or entirely incorrect he would be grateful if the information needed to remedy such deficiencies were to be made available subsequently.

PROBLEM AREAS

1. Availability of supplies

1.1 The most serious feature of the present situation is the shortage of raw material (raw cotton and yarn) and consumable stores items, such as ring spinning travellers, ingredients for the size mixing, chemicals, dyestuffs and materials to make replacement components and to carry out repairs. It has been stated that most of these deficiencies have resulted from the lack of foreign exchange or the delay in opening letters of credit.

1.2 One example, the implications of which were discussed at a meeting in Balad on 3rd January 1982, showed how 22½ months elapsed between the factory filling out a requisition form for 50 tonnes of maize flour for sizing (an essential process to enable weaving to take place) and the material (31 tonnes) arriving at Mogadiscio Port (January 1982).

1.3 Raw cotton availability depends on local sources as well as imports. It is expected that 15,000 quintals (1,500,000kgs) of seed cotton will be harvested during 1982, which should provide approximately 500 tonnes of raw cotton. It is difficult, unfortunately, for the factory to spread the use of this over a prolonged period of time by confining it as the basic component of a mixing to a narrow range of yarn counts. This is a consequence of the integrated blowing and carding process, which pre-determines that only one mixing may be put through the full complement of twelve cards for maximum production volume. If two different mixings are alternated, this creates difficulties in arranging in-process material storage and production continuity.

1.4 The alternative of using a proportion of imported and local cotton at the same time to preserve an even-running mixing over as long a period as possible also becomes irrelevant owing to the timing of the arrival of such supplies. This situation can only be remedied by building up a suitable stock position at the factory and this is a prerequisite for planning the most effective processing and production techniques in order to optimize the use of resources.

1.5 To enable the weaving department to operate at a level approaching its capacity for two shifts on six days per week requires 2,600 tonnes of raw cotton. It is understood that 250 tonnes of imported cotton are now in Mogadiscio Port but that no further supplies have been arranged. Yarn production from the spinning department for the year 1981 was 945 tonnes, which is less than half the capacity. Fuller details of production for 1981 covering all departments will be found in Annex D.

1.6 At the present time, yarn imported from Pakistan is in use as raw material for the yarn preparation and weaving departments. When funds available for purchases are limited it would be advantageous to plan for supplies of cotton in preference to yarn in order to maintain as much activity as possible in the spinning department. In the event of further supplies of yarn, however, it will be necessary to regularly monitor quality to ensure conformity with the original offer samples and the contract specifications of yarn quality parameters.

1.7 As regards spares and consumable stores it would facilitate planning of maintenance and production if more information were available to production personnel concerning the stage reached in the ordering and supply process for all important items. It is recommended that a system should be set up to eanble up-to-date information to be posted on a report, which would be circulated at suitable intervals of time to all senior managers.

2. Water Supply

2.1 The supply of water is drawn from five wells situated within the factory compound. Four use submersible pumps (no spare available) from a depth of about 100 metres and one uses a scroll lift from a depth of about 120 metres. The water is hard and untreated and only that for the boiler is filtered. Previously, there were about ten wells but a number collapsed and were not repaired.

2.2 The department responsible for the water supply is very concerned about the precarious balance between availability and demand. Especially during the months of January, February and March the volume of water passing to the wells is significantly reduced and it is likely that the only reason for the absence of difficulty at the present time is the level of cloth throughout.

2.3 It would seem to be essential, therefore, to carry out a thorough investigation of the situation as soon as possible in order to decide what plans for rehabilitation need to be made. Concurrently, all steps should be taken to avoid the excessive and wasteful use of water.

3. Marketing

3.1. Following fairly recent changes in distribution arrangements, the creation of a marketing department and the development of marketing skills constitute a major new challenge to the enterprise. (2).

Note (2) Management Perspectives and Problem Areas in Somaltex by Praxy Fernandes - pages 11 and 3.

3.2 One of the features of this oevelopment should be for the production and marketing activities to be planned together. It should be borne in mind that there is a limit to what one factory can produce economically in the way of woven cloth variety. The main aim should be to have two or three basic articles produced on the majority of the weaving machines and for variety to be introduced in the finishing department by use of design, colour, and style. The yarn preparation department is not equipped to cope with coloured woven styles of cloth. Furthermore, the higher the number of articles in production the higher is the cost of production and the lower is the overall volume of production.

3.3 If the nature of the factory machinery is taken into consideration it is clear that it was set up to process long runs of basic cloth types. Thus, economical production would enable a sizeable proportion of the population to be supplied at reasonable cost with its basic needs. To provide the range of variety that would satisfy other areas of market demand imports of special cloths in modest quantities would need to be arranged. In this connection, it is understood that print cloths are a permitted item of import (2) and care should be exercised tc avoid depriving the factory of the opportunity of producing a suitable and lucrative style of cloth.

4. Production Programme

4.1 The Machinery complement consist of pre- and post-1975 equipment.

4.2 Most of the pre-1975 equipment has not operated for some time and is in a separate (but adjacent) part of the factory premises. Capacity would be limited to 8 Ingolstadt ring frames manufactured in 1950/52 (3,456 spindles) and 140 SACM looms of 110 cms reed space, which appear to be quite old and require shuttles to be able to operate.

4.3 The operational ring frames are all of 51mm ring diameter with a lift of 230mm. Ring tube outer diameter is 27 to 29mm giving a favourable winding-on angle. It is considered that the optimum range of counts for which these frames were intended is Nm 30s to 50s, ie. Ne 18s to 30s. Although this does not preclude the spinning of counts somewhat below and above the range, it should be appreciated that a fairly comprehensive selection of fabrics is possible within the inner limits. For example:

Drill	Warp 30s Nm		Weft 20s Nm		Sheeting	48s	40s
Cambric	50s		50s		Poplinette	54s	50s.

4.4 The evaluation of a suitable plant balance should take this into account as well as the selection of fabrics to meet appropriate areas of market demand; the most likely types of cotton to be available in the future; the development of the workforce; the optimum usage of equipment; and a suitable return on resources.

4.5 Furthermore, taking into consideration the apparently severely restricted availability of cotton, the production of fabrics of lighter weight per square metre will increase the output in terms of square and linear metres.

4.6 For example, two types of plain weave fabric have been produced by the factory for a number of years. Article 02 has a cotton content of approximately 162gm per sq. m. whilst article 03 has 115gm per sq. m. If the 250 tonnes of raw cotton due soon at the factory were used to produce article 03 it would enable 1.93 mill. square metres to be produced as compared with 1.27 mill. square metres of art. 02. There are other features of such a calculation to be taken into account but attention to the principle seems to be needed under the circumstances.

5. Preventive Maintenance

5.1 Mr P Colborne, a UNIDO consultant who spent some time at the factory during the second quarter of 1981, left some useful material in the way of a report, some notes, examples of checklists, and a number of charts giving an indication of what was required to set up a comprehensive preventive maintenance scheme. Unfortunately, the impetus to develop and implement this seems to have been lacking subsequently. This may be partly as a result of production curtailment leading to disruption in normal operating arrangements and reduced working hours. However, the required degree of attention to bring a suitable scheme into existence will form one of the important features of work for the current assignment.

5.2 As was previously noted in a meeting held at the factory on 3rd January 1982 it would be beneficial if a control centre could be provided where all the charts and programming boards could be set up in an effectively organized way.

6. Departmental Organization

6.1 It is understood that the existing arrangement of departmental organization is as shown in Annex E. In order to improve its effectiveness it will be necessary to draw up job descriptions for each departmental and sectional head and to make out comprehensive specifications covering standards for material in process, product quality, and target productions. Any variations from agreed norms would be the subject of investigations by senior management.

6.2 According to observation, control of work practices needs tightening up. This would develop from a clearer definition of responsibilities, procedures, and methods. The practice of a departmental head writing a memo to another head and assuming that he has then fulfilled his responsibility concerning a matter in his department is to be deprecated.

7. Shift Changeover

7.1 One of the advantages of three shift working is the improved opportunity to keep machinery running and preserve continuity of production throughout the working day. Thus, at the time of shift changeover, ie. morning shift - outgoing and afternoon shift - incoming, it is normal practice to ensure that machinery is kept operating, particularly in such sections as sizing and finishing where stoppages become prolonged and wasteful owing to the nature of the process.

7.2 It is considered that the factory would gain a significant and cost-saving benefit if it reviews the present system and arranges for the incoming shift workers to be present at their workplaces for a few minutes before the outgoing shift workers leave. At the same time all machinery should be kept operating in the normal way.

7.3 Advantages to accrue would be that workmen would conform to better work practices, waste in such processes as sizing and printing would be avoided at that time, and wide fluctuations in consumption demands for electrical and steam power would be reduced. Furthermore, overall production would improve in terms of quantity and quality.

8. Spinning Department

8.1 It has been noted that only a few bales of local cotton are laid down in one mixing in the blowing room. This may or may not be the standard practice during normal production periods but it should be borne in mind that it is better to use cotton from 18 to 24 bales at once in order to improve the possibility of a well-blended and even-running mixture of cotton.

8.2 The total complement of ring frames is 43, of which about half are in use at present. It would be advantageous to stop one of those in production each week and allocate another in its place thus keeping all in better running condition and enabling maintenance schedules to be preserved.

8.3 On each of the running frames many spindles are found to be non-productive. This practice should be avoided as it necessitates running more frames than are required for that level of production thus wasting electricity and increasing production costs.

8.4 As another factor in the saving of energy, the practice of running fan motors of the broken end suction units on ring frames that are not in production should be discontinued.

8.5 An examination of empty ring tubes shows many cut places where yarn remains have been removed by cutting. Other methods are available to replace this bad practice and they should be investigated to find the most suitable. Damage of the kind referred to considerably shortens the life of the tubes and may also cause snagging during unwinding. It is also recommended to arrange for the ring tube supplier to print the date of an order on the tubes instead of repeating 1974 along with Somaltex on every tube. This would enable the department to keep account of tube life by an annual count of all tubes.

9. Yarn Preparation

9.1 In order to improve the processing standard and the productivity of the sizing and weaving machines it is essential for better formed warpers beams to be prepared. The making of one or more complete revolutions of a warpers beam after an end has broken during warping and the beam has braked to a stop should be avoided. Furthermore, the operator should find the broken end in its precise place in the yarn sheet and re-join by knotting without any possibility of causing a crossed end.

9.2 The alloy beams for both warping and weaving machines are large and heavy. They are sometimes dragged on the floor for considerable distances. This can cause rough places on the flanges and a loosening of bolts with a consequential disturbance to the setting of width between flanges. It is clearly a practice to be avoided.

9.3 Furthermore, someone on each shift should be made responsible for ensuring that a standard distance between flanges is used for all beams in accordance with the correct measurement for each warping and weaving machine size. Barrels should also be checked for eccentricity. These measures will facilitate use in the sizing machine and ensure standardized positioning in the weaving machines.

9.4 In sizing, the present recipe makes use of maize flour and camel fat only. This will not give the best result in weaving on such complex and demanding equipment as Sulzer machines and should be regarded as an expedient only. An endeavour should be made to obtain improved ingredients if necessary by retaining consultants to carry out trials in order to specify a standard sizing recipe and obtain optimum weaving performance.

9.5 In order to obtain the more regular spacing of ends in the sheet of yarn at the sizing machine when winding onto the weaving beam it is preferable to count equal numbers of ends into each dent in the expanding comb at the front of the headstock. As explained, beams produced on the sizing machine at Somaltex are large in both diameter and distance between flanges and thus any imperfections during formation of the yarn package are very much accentuated. Although this is a time-consuming procedure it can be accomplished by two men starting in the middle of the sheet and working outwards. In any event, there is very little attempt at present to carry out work associated with the sizing machine at anything but a leisurely pace.

9.6 Yarn packages in the form of cones or cheeses should be handled carefully by placing them on individual pegs or holders instead of throwing or dropping them into containers. Such a practice is liable to damage both yarn and package former.

10. Weaving Department

10.1 Having regard to the level of production of the whole factory, the weaving department determines throughput and therefore has a big influence on the profitability and viability of the whole enterprise.

10.2 It is therefore a matter for concern that, although the department has been able to keep most of the Sulzer weaving machines in operation up to the present time, there is in the near future likely to be a noticeable deterioration in the situation owing to the running down of the stock of replacement spares and accessories.

10.3 Although there is a possibility of machines stopping for lack of yarn during the early part of this year, it is important to maintain stocks of spares and accessories at an optimum level to enable the department to take quick and full advantage of yarn supplies when they become available. It is much more difficult to arrange supplies of spares than supplies of cotton owing to the wide variety of parts involved.

10.4 At the present time, a number of 153 inch looms are weaving with the reed space underutilized, ie. producing two parts of cloth instead of three. This is an uneconomical practice which seems to have arisen as a result of a lack of beams of the correct width. A walk round the department reveals that there are at least sixty beams containing varying quantities of yarn that have been abandoned in the last few months because they are unweavable and there has been no decision as to the salvage procedure to follow. This matter has been discussed and positive steps are required to resolve the situation.

10.5 For the maintenance of optimum processing standards and machine condition steady air conditioning are required within the department. This is particularly the case for such complex and finely set equipment as Sulzer weaving machines. It is believed that the air conditioning equipment will be fitted with automatic controls to keep the temperature and the relative humidity steady. At present they fluctuate widely to the detriment of production and machine condition. An investigation into the causes of this situation is necessary but a prerequisite is to determine what system is required to control the opening and closing of access doors to the department.

10.6 It has been noticed that the two Terry towelling looms are somewhat neglected and are frequently stopped and without attention.

10.7 Furthermore, the weaving storeroom situated on the outside wall near to the weaving manager's office is in a neglected state and valuable accessories are likely to be damaged in the rainy season owing to the bad state of the corrugated metal roof.

10.8 The layout of weaving machines in the department showing widths and types will be found in Annex F.

11. Finishing Department

11.1 As the name implies, the last stages of processing take place within this department and, to a large extent, they determine how the public receives the products and evaluates the standard of quality and workmanship that have gone into their production. It is important, therefore, to devise the best possible conditions in terms of machine availability, standard of machine maintenance, careful workmanship, and adequate cleanliness.

11.2 "Good Housekeeping" does much to set the tone and atmosphere of this department but at Somaltex it seems to be rated with rather a low priority. Unless corrective action is taken the situation will become progressively more serious but less obviously noticed because of lowering standards. It is admitted that a finishing department is somewhat at a disadvantage in as much as it makes widespread use of steam, water, and a wide range of chemicals and dyestuffs. However, it should not be made an excuse for the acceptance of unfavourable conditions. A continual effort is needed to remove congealed deposits of dirt, miscellaneous rubbish, grit and dust on the machines and floor, and accumulation of fluff.

11.3 As is surely known, tanks, chambers, and rollers need cleaning down between processing in order to preserve the condition of equipment and prevent contamination of subsequent cloth runs. If machinery is likely to be stopped for unusually long periods owing to a major breakdown or lack of spares, full advantage of the situation should be taken by carrying out thorough inspections of all machine functions and parts, and necessary repairs, and scheduled maintenance procedures. Periodical cleaning and lubrication should also be attended to.

11.4 Furthermore. electrical control boxes and cabinets in areas where damaging fumes are present should be supplied with forced air to form an overpressure which will prevent the ingress of such fumes.

11.5 The shearing machine is only being used to unroll cloth from the weaving machine rollers at the present time. As well as using excessive electrical energy for a simple process the opportunity is being lost to upgrade fabric, particularly drills and print cloths, by removing lumps and other imperfections that affect the surface of such cloths. It is not entirely clear why the machine is being used in this way but the shearing cylinder grinding machine, which is to be found within the department and in the stores, should be set up in the mechanical workshop and used to sharpen the shearing cylinder cutters. Blades also require attention as described in the machine manual.

11.6 It is understood that the singeing machine has not been used for some years owing to the unsatisfactory performance of the petrol vaporizing system. The machine supplier should be held responsible for putting everything in order. If the position is still unsatisfactory, enquiries should be started to find a replacement machine, which should have a sufficiently large liquor tank to enable desizing liquor to be adequetely absorbed at high cloth speeds. Machines which may conform to the factory's requirements are Parex from India or Kyoto from Japan. The collaborating company of Parex - Ernest Turner Ltd, Clifton, Manchester - may also be able to offer a suitable machine using vaporised petrol.

11.7 The absence of a singeing process again detracts from correct processing procedures and affects the appearance of the finished cloth surface. In addition, the absense of a desizing process results in cloth which is inadequetely prepared for scouring and causes processing to proceed at speeds which are below the optimum thus limiting production.

11.8 As regards storage of chemicals, it is noticeable that a number of places in various parts of the department are used to keep full and part bags over prolonged periods. Owing to infrequent use there is no control over consumption and the stocks are not protected against spoilage. It is considered that such items should be kept in the usual storage areas and issued under supervision.

12. Cloth Stock

12.1 At the present time, there is a high stock level of cloth in the warehouse and in other areas, which is reputed to be approximately four million yards. This is equivalent to five or six months production at the present rate. Part of the quantity is knitted fabric and if, as has been stated, there are no requirements within Somalia for this product, it would seem to be worthwhile to explore the possibility of finding an export outlet in order to release quickly the money tied up. The fabric has been lying without movement for at least two years and may suffer deterioration and loss in value.

12.2 As well as affecting turnover, this slowly moving stock creates a high risk area for fire. The practice of people smoking within the area is extremely dangerous and ought to be prohibited. The existing ban on smoking in other high risk areas should also be rigourously enforced.

12.3 It is probable that some of the accumulation of cloth has resulted from a slowing down of throughput in the finishing department. An investigation may help to highlight the difficulties and prepare the way for concerted action on the part of advisers and management staff to bring machinery into full production and speed up process flow to the extent that significant quantities of stock can be moved. A period of three-shift working may be considered.

13. In-process Control

13.1 Although a full investigation has not yet been possible, it appears that little control is exerted over processing parameters. This is probably owing to organizational deficiencies as well as the lack of a basic testing programme.

13.2 The atmosphere in the testing laboratories is not air conditioned and thus test results will be subject to wide variation and misinterpretation. Furthermore, technicians cannot work effectively with the required degree of conscientious attention in such conditions as are to be found at present.

14. Stores Control

14.1 Only a brief inspection of the stores has been made. However, it was apparent that one or two stock items had deteriorated to the point of being useless and required throwing away and writing off. Additionally, a number of second-hand items and others for which no useful life remained were to be seen. These required, respectively, keeping elsewhere and removing.

15. Steam Network

15.1 An occasion was noted when vast quantities of steam escaped from a fractured packing in a steam line to the spinning department air conditioning installation. Since there is no need for any steam to be used for such a purpose at the present time of year, an enquiry revealed that more than one valve in the steam line was rusted-up and unable to function. It is understood that this is typical of the steam network as a whole.

15.2 Urgent work needs to be started to remedy the situation, which could be dangerous under certain circumstances. In any case it can cause waste and loss. If two or three valves were taken out of service every week then over a year the installation could be brought back to a reasonable and safe condition.

16. Safety

16.1 Many places are to be found in the factory where holes in the floor are either inadequately covered by weak or unsuitable materials or are not covered at all. This constitutes a serious safety hazard and interferes with the passage of personnel and the movement of containers and other equipment.

16.2 In addition, many cable channels and electrical control boxes are uncovered and harbour large amounts of rubbish and accumulated fluff. Thus, this is also a fire hazard. The energy department should set up a schedule for giving continual attention to all such places by monitoring the situation and arranging for regular cleaning to be carried out by competent and careful energy department staff where control boxes and cable runways are to be found. It is clear that all uncovered places should be given immediate attention with a view to arranging urgent remedial action.

PLANNED ASSIGNMENT ACTIVITIES

1. Introduction of Preventive Maintenance

a) The counterpart expert, Mr Hassan Olad Adan, will be closely involved in this work and it is considered that he will need to be relieved of some of his more time-consuming normal duties.

b) Organization of a suitable scheme will be directed towards the most important operational machine sections such as those where only one machine is installed and where a number of similar machines require periodical attention as, for example, ringframes and weaving department. This work will commence with an analysis of present practices and an evaluation of existing maintenance staff deployment and maintenance facilities.

c) The scheme will include the frequency of cleaning, lubrication and attention to machinery parts and assemblies. The availability of spares will be investigated. An outline of work required for control equipment will also be given.

d) Implementation will be started wherever possible.

e) In addition, there will be a general evaluation of requirements to upgrade the condition of machinery and equipment where appropriate.

f) The development of systems for the storage and procurement of spare parts will be based on an analysis of the existing storage arrangements and procedures used for recording, requisitioning, and issueing. Recommendations for any improvements will be given, including a suitable system of reporting to keep concerned staff informed of the stage reached in the procurement of spares and of the estimated times of arrival at the factory.

2. Plant Balancing Proposals

a) These will be based on any available projections of market demand according to types of fabric, the rehabilitation of existing machinery where appropriate, and the acquisition of additional machinery where this is indicated by reference to production technology or volume requirements.

b) The proposals will be drawn up by describing the types and numbers of machines involved and by indicating suitable production rates and target quantities.

c) To assist in the making of short-term arrangements, suggestions will be put forward on an informal basis to make the most economical use of available raw materials showing the longest possible period of activity that is compatible with an appropriate number of machines.

3. Production Planning and Control

a) A scheme will be introduced in relation to an appropriate plant balance and production programme. Attention will be given to the avoidance of factors that may affect production continuity, particularly in relation to the availability of spares and stores.

b) Specifications will be set out giving standard machine production rates and sectional production targets to maintain an even flow of production. These will take account of the satisfactory utilization of labour and machinery. The main features of processing and product specifications will be given.

c) After the evaluation of current practices, monitoring and display methods will be evaluated and the factors involved in the reconciliation of material inputs and outputs will be outlined.

d) Forms for the recording of material stocks and movements between processes will be introduced.

4. In-process Quality Control

a) The existing situation in relation to the appropriate quality features needed to satisfy market requirements and to the applied quality standards at various stages of processing will be investigated. Recommendations of appropriate targets as management objectives will be made.

b) A testing programme to enable management to work towards the desired objectives will be devised including the nature and frequency of testing.

c) Existing facilities and staffing arrangements will be reviewed and recommendations for improvements will be made.

d) Methods of evaluating the state of machinery and the work practices used by the operatives will be introduced. The use of control charts will be outlined and preliminary work for their development will be started.

5. Training

a) It is considered that the identification of training needs relates mainly to staff exercising a controlling function within the factory production organization.

b) This will involve discussions to determine the background and experience of individuals, the evaluation of departmental performances, and an assessment of future needs. It is likely that a picture of the situation will be put together over a period of time and recommendations made in the light of findings.

WORK PROGRAMME

Week Commencing	Week Number	Preventive Maintenance	Other Work
January 23	1	planning discussions	short term production planning
30	2	sizing machine	preliminary plant balance
February 6	3	scouring and bleaching	long term production planning
13	4	shearing and singeing	production control
20	5	blowing	production control
27	6	carding	process stocks and movement
March 6	7	contingency period	training
13	8	drawframes	plant balancing
20	9	speedframes	machinery reconditioning
27	10	ringframes	sectional improvements
April 3	11	ringframes	stores - storage
10	12	winding and warping	stores - procurement
17	13	contingency period	training
24	14	weaving	quality control
May 1	15	weaving	quality control
8	16	drying and stenters	quality control
15	17	jiggers and wash range	control charts
22	18	printing	training
28	19	mercerizing	report preparation
June 5	20	steamer, calendar	report preparation
12	21	evaluation	finalising report
19	22	winding up	report discussions

ANNEX A DP/SOM/81/013
Preliminary Report - Somaltex
T M Haworth

PROJECT IN THE SOMALI DEMOCRATIC REPUBLIC
U N I D O JOB DESCRIPTION

Post Title: Consultant in Cotton Textile Engineering

Purpose of Project:
To advise the Government on measures to improve the operational performance of the vertically integrated cotton textile mill "SOMALTEX".

Duties:
Under the supervision of the team leader and in co-operation with the international experts and the national personnel, the expert will primarily collaborate with the Somaltex management at all levels and is specifically expected to:

1. Give advice on the formalities of action plans and on subsequent implementation of measures;

2. Give special attention to the following main individual problems:

a) plant balancing by proposing improvements to all the processing stages such as spinning preparation, weaving, finishing including dyeing and rotary printing;

b) reduction of down-time through the introduction of preventive maintenance and reconditioning of production equipment; suitable systems should be developed for the most suitable storage and procurement of spare parts;

c) in-process quality control should be oriented towards production quantity and quality;

d) production organization will be strengthened by the above measures and by introducing suitable systems for production planning and control including a system for recording material stocks and flow within the plant;

e) identification of required training for personnel at Somaltex, particularly at production level and the design of the incentive scheme for the production personnel.

The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken.

ANNEX B DP/SOM/81/013

Preliminary Report - Somaltex

T M Haworth

FACTORY EQUIPMENT

SPINNING DEPARTMENT MACHINERY

SECTION 1 Very Old

		Year
1	Blowroom line producing laps	
9	Howard and Bullough cards	1912
	Ingolstadt drawframes (each 6 deliveries)	1952
	Howard and Bullough flyer frames	1935
8	Ingolstadt ringframes Model RB 70a (432 spindles lift 200mm ring dia. 48mm)	1950/52

SECTION 2 Reconditioning may be considered

4	Blenders	Trutzschler		1950
1	Scutcher line 965mm wide producing laps (beater/step cleaner/beater)	Trutzschler		1972
5	Cards 960mm wide lap feed can dia. 610mm	SACM HPM3		1971
1	Drawframe 1st passage 2 dels can dia. 460mm	SACM		1971
1	Drawframe 2nd passage 2 dels can dia. 460mm	SACM		1971

SECTION 3

3	Raw cotton blenders 1000mm wide lattice 4m	Marzoli	B10/1	1975
1	Waste blender		B11/1	
1	Conveyor and set of permanent magnets		B20	
2	Dust extractor/filter		B91/1	
1	Twin beater opener		B31/1	
1	Horizontal condenser		B40	
1	Step cleaner with porcupine beater		B51/1	
1	Horizontal cage condenser		B40/2	
1	Automixer (10 compartments)		B140/3	
1	Two way distributor		B60	
2	Condensers		B40/1	
2	Hopper feeders with Kirschner beater		B75/2	
2	sets conveying lattices		B121/1	
2	filters		B90	

12	Cards with chute feed 1016mm wide can dia. 1000mm	C40	1975
4	Drawframes 1st passage 2 dels can dia. 520mm	Marzoli	1975
4	Drawframes 2nd passage 2 dels can dia. 520mm	Marzoli	1975
4	Speedframes 108 spindles package 11 x 6½"	Marzoli BC3	1975
2	Speedframes 116 spindles package 11 x 5"	SACM BB6 MC3	1979
1	Speedframe 88 spindles package 11 x 6"	SACM BB	1971
36	Ringrames 432 spindles ring dia. 51mm lift 245mm	Marzoli RC1	1975
7	Ringframes 432 spindles ring dia. 51mm lift 245mm	SACM	1971
1	Assembly winder (2 ends) 72 drums model USA	Savio	
4	Ring doubling frames 360 spindles ring dia. 51mm lift 245mm	Marzoli TRC	1975

YARN PREPARATION DEPARTMENT MACHINERY

3	Cone winders 120 drums Type BKN rotary drum traverse 125mm speed 700m/min	Schlafhorst	1975
2	Cheese winders 120 drums Type BKN rotary drum traverse 125mm speed 700m/min	Schlafhorst	1975
1	Cheese winder 48 drums Type BKN rotary drum traverse 125mm speed 600m/min	Schlafhorst	1975
1	Cone winder 50 drums 4d 20' Type Autoconer GKNXP50 rotary drum traverse 125mm speed 900m/min	Schlafhorst	1980
1	Direct warper creel 588 ends Type MZD beam flange dia. 760mm width between flangos 1800mm	Schlafhorst	1975
1	Direct warper creel 768 ends Type MZD beam flange dia. 1000mm width between flanges 2600mm	Schlafhorst	1975
1	Direct warper creel 672 ends Type MZD beam flange dia. 1000mm width between flanges 2600mm	Schlafhorst	1980
1	Sizing machine size box and cylinders 2700mm wide cylinder dia. 800mm moveable creels for 18 beams	Sucker	1975

weavers beam flanges dia. 800mm
width between flanges 2900 and 3200mm

APPENDIX 1 (cont'd)

ANNEX B

WEAVING DEPARTMENT MACHINERY

22	Weaving machines 130 inches wide	Type 130ES 105E10 225ppm	Sulzer	1975
2	Weaving machines 130 inches wide	Type 130VSD 105KT 225ppm with dobby	Sulzer	1975
120	Weaving machines 153 inches wide	Type 153ES 105E10 200ppm	Sulzer	1975
8	Weaving machines 153 inches wide	Type 153VSD 105KT 200ppm with dobby	Sulzer	1975
2	Weaving machines 153 inches wide	Type 153VSD 105KTG 200ppm with dobby for towelling	Sulzer	1975
3	Knotting machines for use in the weaveroom		Knotex	1975

FINISHING DEPARTMENT MACHINERY		Width	Year
1	MONFORTS shearing machine with batch delivery and filter unit with 4 deposits	1.8m	1970
1	COMERIO ERCOLE singeing machine Type Bp2 quench/liquor tank with 4 lower guide rolls	1.8m	1975
1	OMEZ scouring machine with batch/plait delivery impregnator reaction chamber 3 washing chamber	1.6m	1974
1	OMEZ bleaching machine with batch/plait delivery impregnator reaction chamber 3 washing chambers	1.6m	1974
1	COMERIO ERCOLE CHAINLESS MERCERISER Type IMS-10	1.6m	1975
2	COMERIO ERCOLE 12 cylinder dryer Type ACV-12/1 cylinder dia. 570mm pressure 3.5kg/sq cm	1.8m	1975
1	COMERIO ERCOLE Pad Mangle 3 bowls Type Padcolour	1.8m	1975
4	GERBER jiggers (only 2 able to operate)	1.2m	1960
2	OMEZ jiggers (both waiting for spares)	1.6m	1975
1	UNIONMATEX winch bleaching machine (knitted goods)	2.7m	
1	ALEA loop dryer (knitted goods)		
1	ARBACH rolling machine (knitted goods)		1975
1	COMERIO ERCOLE Hot flue dryer Type HFP	1.8m	1975
1	ARTOS clip stenter 8 sections 18m long 3 bowl and 2 bowl mangles steam heated batch/plait	1.7m	1972
1	REGGIANI rotary screen printing machine 8/12 colours drying chamber with 6 sections	1.7/8m	1975

APPENDIX 1 (cont'd)

ANNEX B

		Width	Year
1	KLEINEWEFERS spiral steamer	1.8m	1975
1	OMEZ washing range 5 chambers 6 mangles	1.6m	1975
1	COMERIO ERCOLE 4 bowl pneumatic calendar Type C4p-30	1.8m	1975
1	(NO NAME) 2 bowl pad mangle	1.4m	1955
1	ARTOS finishing clip stenter 6 sections 15m long 2 bowl pad mangle batch delivery oil heated	1.6m	1977
1	HARLACHER complete installation for making rotary screens		1975
2	SYSTEM SCHULTHEIS inspected machines from batch	1.6m	
2	plaiting (folding) machines (Monforts -1) No Name -1)	1.4m	
2	MONFORTS folding and lapping machines Type MWE/2D	0.8m	1975
1	THIES pressure dyeing installation for yarn Type Duobloc M with auxiliary tanks		1975
1	THIES hydroextractor		1975
2	ATLAS COPCO air compressors to supply the finishing and yarn preparation departments		1975

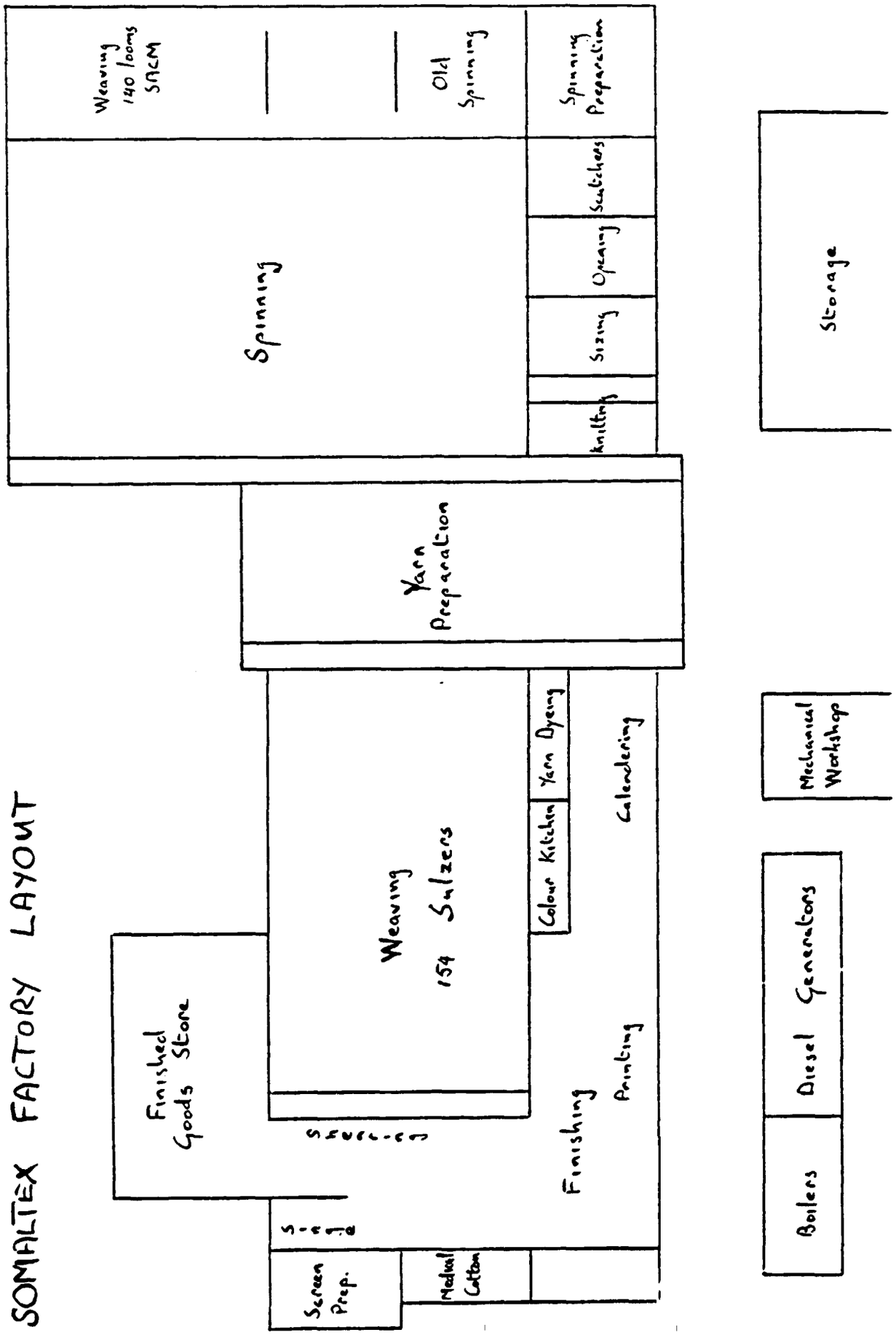
MEDICAL COTTON UNIT

Cotton in loose stock form is first bleached in the THIES pressure installation

1	FLEISSNER hot air dryer	1975
1	INGOLSTADT hopper opener	1975
1	INGOLSTADT card delivering rolled cotton laps	1975
1	gauze rolling machine producing rolls 80cms wide	
1	cutting machine	
1	GERHARD STENMANS BORHEIM machine for sanitary towels	
1	M M sterilizer	
1	A B K bandage cutting machine	
1	GERHARD STENMANS BORHEIM bandage cutting machine	

KNITTING MACHINERY

8	MAYER & CIE (TAILFINGEN) interlock circular knitting machines producing a fabric 14" to 20" diametre Machine Type IMG	1974


SOMALTEX FACTORY LAYOUT
Weaving 140 looms SACM
Old Spinning
Spinning Preparation
Spinning
Switches
Opening
Sizing
Knitting
Storage
Yarn Preparation
Weaving 154 Sulzers
Colour Kitchen
Yarn Dyeing
Calendering
Finished Goods Store
Finishing
Printing
Screen Prep.
Medical Cotton
Boilers
Diesel Generators
Mechanical Workshop

PRODUCTION DETAILS 1981

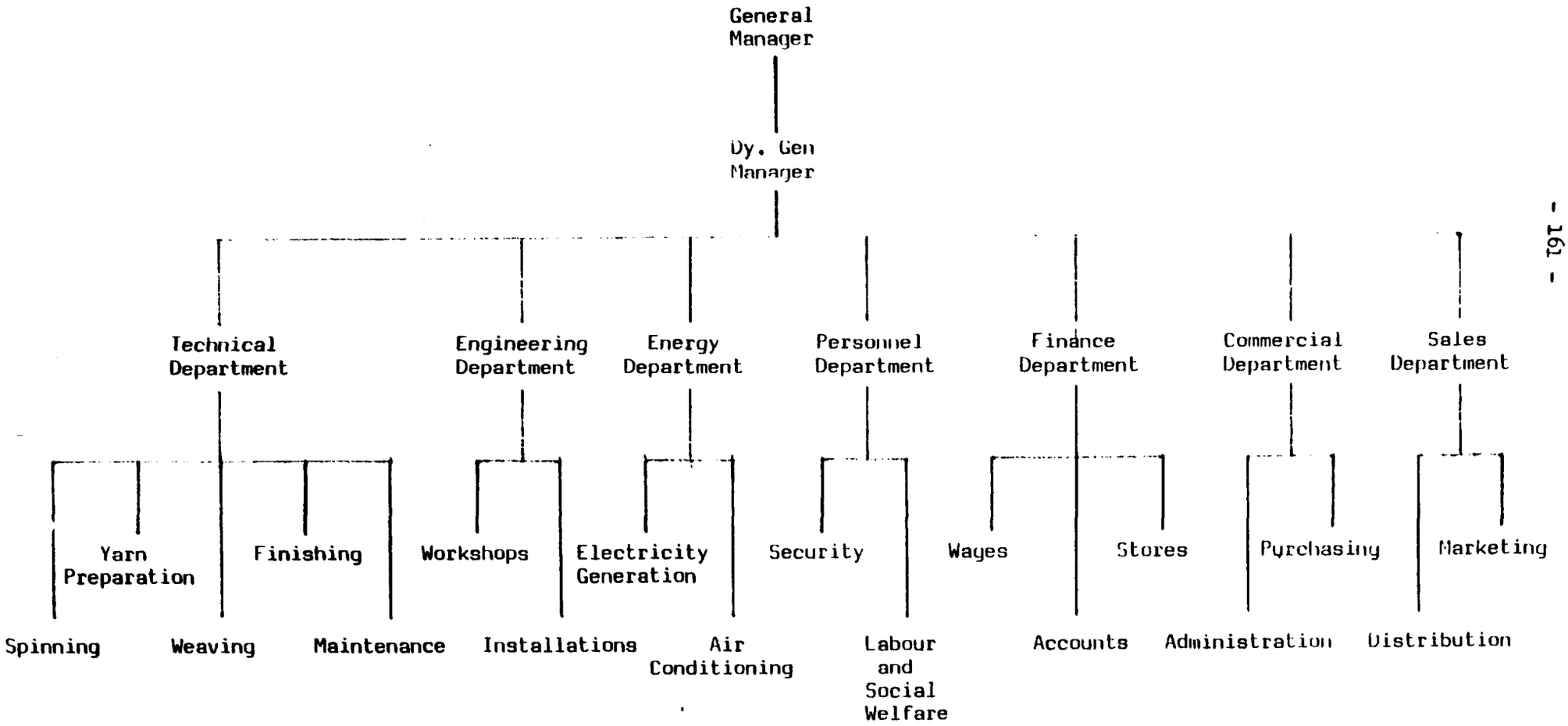
ANNEX D

MONTH	SPINNING Kg	YARN PREPARATION Kg	WEAVING YARDS	FINISHING YARDS	FINISHING BUNDLES	GINNING Kg	MEDICAL COTTON Kg	MATTRESS	PILLOW
JANUARY	118,740	236,375.0	1,206,910	801,092	2,062	-	3,400	1,702	507
FEBRUARY	38,759	65,285.2	346,784	180,937	566	-	1,076	430	1,032
MARCH	59,731	83,260.7	456,549	357,233	523	53,844	959	1,695	106
APRIL	109,210	201,028.1	1,075,849	647,660	1,880	50,690	-	1,118	397
MAY	100,610	178,494.3	922,799	584,133	1,562	60,740	-	1,069	77
JUNE	122,289	203,330.2	1,034,816	664,799	1,648	-	-	1,222	186
JULY	114,552	218,259.1	947,957	444,087	1,643	-	-	1,320	148
AUGUST	86,375	211,836.3	892,229	598,584	1,282	-	-	879	89
SEPTEMBER	69,168	225,189.7	882,767	603,978	1,607	9,121	-	587	90
OCTOBER	51,165	187,653.3	789,068	459,303	1,591	11,465	-	438	157
NOVEMBER	50,338	234,733.3	813,630	448,400	1,363	55,291	-	662	177
DECEMBER	24,640	207,121.2	760,300	492,154	1,044	145,386	-	534	85
TOTAL	945,577	2,242,566.4	10,129,658	6,282,360	16,771	386,531	5,396	11,656	2,851

Note: This table includes some minor discrepencies which cannot be corrected at the time of typing.

SOMALTEX ORGANIZATION CHART

ANNEX E
Preliminary Report



ANNEX F

APPENDIX 2

PEOPLE CONSULTED

U N I D O	
Project Manager	Dr. A. H. Eames
Co-Manager	Mr. Abdulkadir Hassan Hussein
Financial Management Expert	Mr. S. Noorani
SOMALTEX	
Director General	Mr. Abdulkadir Mohamed Mohamud
Deputy General Manager	Mr. Ahmed Hassan Egal
Personnel Director	Mr. Abdishakur Mohamed Adan
Technical Director	Mr. Ahmed Yusuf Suleyman
Head of Maintenance	Mr. Hassan Olad Adan
Spinning Manager	Mr. Mahamoud Mohamed Qalib
Weaving Manager	Mr. Mahamoud Sheik Nuur
Finishing Manager	Mr. Hussen Osman Ahmed
Energy Department Manager	Mr. Mohamed Mussa
Textile Engineer	Mr. Abbas Ahmed Mahamed
Preparation Supervisor	Mr. Abdullahi Kalaf Adan
Electrical Supervisor	Mr. Ibrahim Omar Digale
Workshop Supervisor	Mr. Mohamed Addow Arwah
SIDAM student	Mr. Suleyman ex technical director
Financial Adviser	Mr. Mirza Afsar
Weaving Adviser	Mr. Ghulam Sabir
Finishing Adviser	Mr. Otto Bergmann
Print Screen Making Adviser	Mr. Gerd Ximdal