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IMPROVEMENT OF MANAGEMENT IN THE TEXTILE INDUSTRY

XA/SUD/89/606

THE REPUBLIC OF SUDAN

Technical report: Strengthening the managerial and supervisory
functions of the General Spinning and Weaving Company Ltd.*

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

Based on the work of J. Saary, textile consultant

Backstopping officer: M. Farah
Industrial Management and Rehabilitation Branch

* This document has not been edited.

Abstract

Post Title : Consultant in Textile Management

Project Number : XA/SUD/89/606/11-01/712207

Purpose : To strengthen the managerial and supervisory function of the General Spinning and Weaving Company Ltd. in order to monitor the operations of the spinning and weaving factories and help improve their economic performance.

Duration of assignment: Scheduled for short term consultancy with a duration of 6 months.

Mills belonging to the General Spinning and

Weaving Company are :

- Hag Abdallah Spinning Mill
- Khartoum North Spinning Mill
- Port Sudan Spinning Mill
- Shandi Weaving Mill
- El Dueim Weaving Mill
- Kosti Weaving Mill
- Kadugli Weaving Mill
- Nyala Weaving Mill
- Friendship Garment Factory

Due to lack of foreign currency and consequently spare parts, the overall state of machinery and equipment in the above mentioned mills - except Friendship Gragment Factory - are deplorable.

Deplorable as the present overall state of machinery may be, the mills as a whole - more than ten years after their erection - are far from being due for scrapping or technically obsolete. It is, however, neglected and deserves to be technically reactivated and reorganised.

Enormous changes have occurred in the last 10 years in the textile industry. Major factors have been: rapid technology advances, changes in consumer tastes and vastly increased use of cotton fibres.

As Sudan is one of the most important cotton producing countries and the demand for cotton yarn and articles increases rapidly - not only locally, but also from Europe - the Government programmes, the Ministry of Industry and the Ministry of Finance should support more the General Spinning and Weaving Company and its mills.

Acknowledgement

The author wishes to thank from the General spinning and Weaving Company:

- Dr. Abdel Rahman Abdallah Ali, Managing Director
- Ibranim Mabrouk Saeed, Head of Technical Department
- Abu Baker Yahia El Fahdli, Head of Economic Research, Planning and Training Department
- Tarique Ahmed Sayed, Head of Administrative Department
- Hassan Khalaf Alla Hassan, Head of Financial Department
- Omer Mohammad Osman, Head of Commercial Department

for their assistance, support and confidence during the period of the assignment.

He is also grateful to Mr. Awad Karim Mohammed Ali, General Manager of Hag Abdallah Spinning Mill, Mr. Mohammed El Amin Agebne, General Manager of Khartoum North Spinning and their technical staff who were working closely with the expert and also helpful and patient in enabling the author to fulfill his duty and he appreciates their contribution to the assignment.

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INTRODUCTION

In the early 1970's the Ministry of Industry declared a policy of establishing manufacturing industries based on local agricultural raw materials for import substitution and the increase of foreign exchange earnings by higher added-value exports.

A 15 year tentative plan for cotton textile industrial development was prepared and approved in 1972.

In 1973 however, not long after publication of the plan, the government took the decision to accomplish part of the expansion by establishing a number of public sector mills.

In 1975 the Spinning and Weaving Corporation was established with the aim to be responsible for the textile mills in the public sector.

In the latter half of the 1970's the set of 6 identical weaving mills were established in widely separated locations, Shandi, El Jueim, Kosti, Kadugli, Nyala and Mangala.

Also 2 spinning mills were established in Port Sudan and in Hag Abdallah. The latter was planned with 2 spinning sections, fine spinning section to produce fine combed yarn for export and coarse spinning section to supply with yarn the above mentioned weaving mills.

The Port Sudan mill has not yet been brought into operation.

In 1985 the General Spinning and Weaving Company was formed to replace the Spinning and Weaving Corporation. The newly formed company had more autonomy and flexibility in the management of

textile mills belonging to the public sector.

In 1987 Khartoum North Spinning Mill was commissioned to produce combed yarn for export.

Here one has to mention Gadou Integrated Textile Mill. The contract was signed in 1975 but to date only about half of the civil construction works have been completed, although the machinery was supplied in 1980 and it has lain on site since that time. This unfinished textile mill is also belonging to the General Spinning and Weaving Company.

Since 1984 up to the present time the production of all the mills are very low and they are recording losses every year. The low production and machine efficiency caused by the poor conditions of machines due to lack of spare parts and consumables, inadequate maintenance, incorrect settings and the lack of control.

In the context of the economic recovery and structural adjustment programme undertaken by the Government, it is planned that the textile sector would be rehabilitated. This includes the re-organisation of the enterprises regarding structural set up, staffing, improvement of production systems and maintenance and ensuring effective management.

In this effort the Government has requested UNIDO to provide the assistance of a highly experienced consultant in Textile Management. UNIDO approved this request and the author started the assignment on the 13th July, 1989, under a short term consultancy with a duration of 6 months.

The purpose of the assignment was to strengthen the managerial and supervisory functions of the General Spinning and Weaving Company in order to monitor the operations of the spinning and weaving mills and help to improve their economic performances.

The General Spinning and Weaving Company applied for loan by the Arab Fund for the rehabilitation of the mills and it was approved US\$2.5 Mio. in January 1990.

I. RECOMMENDATIONS

1. Adequate and appropriate number of personnel of the General Spinning and Weaving Company Ltd. (GSWC)

a. Technical Department

The Technical Department is hopelessly understaffed and this is one of the main reasons for the low efficiency of the mills. Because of the understaffing it is impossible for the General Spinning and Weaving Company to fulfill her task, namely to monitor the operations and help improve the economic performances of the mills.

On the contrary, the mills are monitoring the Technical Department of the General Spinning and Weaving Company. There are only 2 persons, the Technical Manager and one weaving expert in the Technical Department. The Technical Manager is highly qualified, but he is fully occupied in Khartoum, he has no time and opportunity to visit and control the mills.

The weaving expert is fully occupied with the list and procedures of spare parts and consumables required for the mills.

To increase the performances of the mills it is imperative to employ adequate and appropriate number of persons in the Technical Department.

The author proposes to modify the organisation and staffing of the Technical Department as follows:

- 1 Technical Manager
- Spinning Section : 2 spinning experts
1 cotton expert
- Weaving Section : 3 weaving experts
- General Engineering Section : 2 maintenance experts
1 electrical engineer
1 civil engineer
1 statistician
1 typist clerk

The organisation chart and job descriptions are listed under paragraph III, point 1.

b. Economic Research, Planning and Training Department

This department is on one hand understaffed and on the other hand will be extended with a Time Study subsection under the leadership of the Training section.

To increase the production and machine efficiency of the mills it is necessary to increase the personnel of the Economic Research, Planning and Training Department.

Additional personnel are required:

- Research and Planning section : 1 officer
- Information section : 1 head of section
2 officers
- Training and Time study Section: 5 time study experts
2 officers

The organisation chart and job descriptions are listed under paragraph III, point 2.

2. Technical Reactivation of the mills

The lack of foreign currency and consequently lack of spare parts and consumables is one of the main reasons for the poor state of machinery and equipment.

Repairs carried out in recent years often resulted in the disconnection of numerous control devices and production units. These provisional or temporary repairs reflect desperate efforts to keep production process going, this, however, only at the price of a considerably reduced efficiency under quantitative and qualitative aspects.

To bring back the factory to a normal technical standard is one of the essential prerequisites for a successful and profitable operation in the future.

As a loan of US\$2.5 Mio approved by the Arab Fund the technical reactivation of the mills should begin as soon as possible. It would be advisable to reactivate the spinning mills and the modernisation of the weaving mills, namely changing the weaving looms to shuttleless operation, which means not only reduced process flow of material but also higher efficiency, higher production, reduced spare parts and better quality. The modernisation of a loom costs about US\$12.000.

3. Availability of consumable stores

Due to lack of foreign currency consumable stores are unavailable. Elementary items which are indispensable in a textile mill such as ring travellers, aprons, cots and lubricants are or completely missing or the quantities are not sufficient.

It is essential to secure a regular acquisition of consumable storage items immediately to avoid additional high expenses and production losses.

4. Establishing of labour formation

The mills do not have any labour formation facilities. Newly hired personnel are trying to fulfill activities they are not prepared and trained before. They are coming from the "street" directly into the mill and instead of performing duties they are damaging the machinery, causing poor quality and production. It is evident that for years a systematic labour formation and education as it is standard practice in comparable mills, is non-existent.

It is recommended to establish a labour formation and training subsection in every mill.

The task of this subsection should be:

- selection of personnel through aptitude tests and according to their particular adaptability for the respective type of operating position.
- training of the selected personnel by training instructors, who will also be responsible for the control of the progress of the trainees.
- after the termination of the training period the trainees have to sit an examination and only after good results should they be transferred to the production sections.
- follow up the trainees for a certain period.
- scheduled retraining of personnel.

The mills should hire new personnel only 4 times a year: January, April, July and October, and always in the first week of these months.

The leading of these labour formation and training subsections will be under the Training and Time Study section of the General Spinning and Weaving Company.

This section has to prepare training manuals for every type of machine based on job descriptions and also select the training instructors.

5. Establishing of mill control section

Standards and controls as to production, productivity, machine performances, machine operating conditions, wastes and quality suffer accordingly or do not exist. Production personnel are not guided by appropriate control systems and targets set by a Mill Control section. Mill Control sections do not exist at the mills and consequently there are no standards and controls at all.

It is imperative to establish Mill Control section in every mill.

6. Establishing of Time Study Subsection at the General Spinning and Weaving Company

Every spinning mill belonging to the General Spinning and Weaving Company has its own Time Study section. These Time Study sections are functioning only on paper but not at all on a practical basis. They do not have time measurement equip-

ment (Time Study board with installed stop watches) and Time Study sheets either. Workload calculations do not exist for operators and consequently considerable overstaffing in the rank-and-file of production personnel seems to be the case. Workloads are too low and at any time given many of the operators "enjoy" spare time, leave their work place and are moving around idly. Such underutilisation of the work force has a negative psychological effect. It does not lead to increased care, control and efficiency, but on the contrary to more stoppages and other problems.

It is necessary to establish a Time Study Subsection under the leadership of the Economic Research, Planning and Training Department of the General Spinning and Weaving Company.

The purpose of this centralised Time Study Subsection will be to elaborate justified workloads for the personnel at every mill through securing optimum machine operating conditions together with the Mill Control section, elaboration of job descriptions based on Work Method Analysis study, time measurements and finally, elaboration and introduction of Incentive Wage System in every mill.

Elaboration and Introduction of Incentive Wage System in every mill

At present only time-wages are being paid in the mills and inspite of serious overstaffing of labour force, the production in the mills are very low.

To increase the production and efficiency and motivate the work

force it is imperative to introduce the Incentive Wage system in every mill. The Incentive Wage System is the basis in every industry for a fair payment of the employees, because it is based on increased production and quality above a standard performance.

The standard performances will be established through sound time study.

8. Technical Assistance

The management of the company and mills are educated and motivated, but they are missing sufficient experience of efficiently operated textile manufacturing enterprises.

Appropriate experience is not available in the Sudan and it is therefore highly desirable for managerial staff to gain further experience by working with expatriate expert who possesses the necessary experience.

The expert is necessary for a long term period, not only for establishing the mill control sections, time study subsection, to train the personnel and elaborate and introduce Incentive Wage System, but also to assist the management to use these modern management tools to achieve higher production, better results and to establish sound mill management, with leadership, who can monitor progress.

9. Computerisation

The General Spinning and Weaving Company and the mills do not have any computers, and so all the financial books and records

which are sufficient to maintain basic daily accounting information are kept manually.

The consultant recommends the computerisation of the Company and the mills, which will allow not only better and faster financial reporting, but also it can be used for technical purposes such as spare parts requirements, stocks, inventory, statistical analysis, Incentive wage bonus calculation, preventive maintenance, feasibility and economic studies, etc.

The computerisation should occur in two steps.

The first step is the computerisation of the General Spinning and Weaving Company, which beside the financial accounting should monitor the preventive maintenance, spare parts and consumable requirements of the mills.

Second step is the computerisation of the mills. The computerisation will help to achieve optimum overall results of the mills.

10. Communication

The communication between the General Spinning and Weaving company and its mills takes place by radio, but this system of communication is unreliable and frequently out of order. A great deal of time and effort is spent in communication by messenger and vehicle, often very long distances because the radio was out of order.

It is necessary to improve the communication system with modern communication equipment to allow better cooperation between the General spinning and Weaving Company and its mills.

1. Job Description

copy of the UNIDO Job Description

Post title Consultant in Textile Management

Duration Six months

Date required As soon as possible

Duty station Khartoum, Sudan

Purpose of project To strengthen the managerial and supervisory functions of the Spinning and Weaving Public Co. in order to monitor the operations of the weaving and spinning factory and help improve their economic performance.

Duties

In co-operation with the personnel of the Spinning and Weaving Public Co. the consultant will carry out the following duties:

- (a) Undertake diagnostic analysis of the Company's organizational structure, staffing, procedures and operations, including analysis of the internal debit/credit status between the Company and the factories, as well as an assessment of the suitability of the existing accounting systems and procedures.
- (b) Review existing reporting procedures between the Company and the factories
- (c) Advise on and assist in the introduction of effective management information and reporting systems within the Company and as relates to the factories.
- (d) The consultant will be expected to prepare a final report setting out the findings of his mission and recommendations to the Government on further action which might be taken.

...20/...

Applications and communications regarding this Job Description should be sent to:
 Project Personnel Recruitment Branch, Department of Industrial Operations
 UNIDO, Vienna International Centre, P.O. Box 300, A-1400, Vienna, Austria

2. Extension of Activities

During the execution of the work the consultant was confronted with disorganised mill situations, where the low production was dominated by poor quality.

Due to lack of planning, control and insufficient trained personnel the efficiency of the mills were very low. This was the case especially by Hag Abdallah Spinning Mill, where the efficiency was extremely low, only 10.4% in the fiscal year 1988/89.

Hag Abdallah Spinning Mill is the most important mill of the General Spinning and Weaving Company, because of its coarse spinning section which is supposed to supply with sufficient yarn the other 5 weaving mills. But because of the extreme low production at Hag Abdallah the weaving mills were forced to reduce its capacity utilisation in order to reduce the production.

The Managing Director of the General Spinning and Weaving Company asked the consultant to visit Hag Abdallah Spinning Mill and to assist the management to improve the situation.

The author fulfilled this request and assisted the management of the above mentioned spinning mill in order to achieve higher production. The kind of assistance is described in paragraph D. Accomplished works.

3. Working Method

The consultant elaborated together with the management of the General Spinning and Weaving Company all proposed improvements.

In this way the management has the opportunity to become familiar little by little with the new procedures and at the termination of the assignment they will be able to manage and lead the mills.

So the realisation of improvements were a result of team work between the consultant and the management of the General Spinning and Weaving Company.

4. Accomplished Works

During the consultant's assignment the following works were accomplished:

- Modification of the organisation of General Spinning and Weaving Company.
 1. Technical Department
 2. Economic Research, Planning and Training Department
- Modification of the organisation of the mills.
 1. Hag Abdallah Spinning Mill
 2. Khartoum North Spinning Mill
 3. Weaving Mills
- Assistance for Hag Abdallah Spinning Mill
- Elaboration of new spinn plan
 1. Hag Abdallah Spinning Mill
 2. Khartoum North Spinning Mill
- Elaboration of optimum capacity utilisation of the weaving mills
- Elaboration of new reporting system
- Analysis of the internal debit/credit status between the company and the mills

III. MODIFICATION OF THE ORGANISATION OF GENERAL SPINNING AND WEAVING COMPANY

The organisation of the General Spinning and Weaving Company does not correspond with its responsibilities and duties laid down by the Company's policy.

The main problem is the extreme understaffing which has its bearing on the low performances of the mills.

The management is faced with almost unsurmountable problems, namely running the Company and the mills in a permanent financial crisis, and operating the mills in a deplorable technical state. Consequently, what usually is called "management" degenerated into a kind of "permanent crisis management". A small group of loyal, but hopelessly overworked men were and are fully occupied with improvising here and there. Virtually no time is left for the fulfillment of normal management tasks.

This fact characterises especially the Technical and Economic Research, Planning and Training Departments.

1. Technical Department

As stated before, the Technical Department is extremely understaffed. In this department only 2 persons are employed, namely the technical manager and one weaving expert.

To fulfill the requirements according to the responsibilities and duties, the consultant changed the organisation of this department.

The department under the leadership of the technical manager should consist of 3 sections:

- a. Spinning section: 2 spinning experts and 1 cotton expert with the following responsibilities:
- performances of the spinning mills such as production and quality.
 - technological standards such as settings, speeds, yarn and sliver breakages.
 - supervision and judgement of projects and test runs.
 - selection of best suitable raw material.
- b. Weaving section : 3 weaving experts with the following responsibilities:
- technical and technological leading of the weaving mills. As the weaving mills are relatively small units the weaving experts of the Technical Department of the General Spinning and Weaving Company will lead these units in the technical and technological field, thus centralised management of the mills.
 - performances and technological standards.
 - supervision and judgement of projects and test runs.
- c. Engineering section: 2 maintenance experts with the following responsibilities:
- state of machinery installations and equipment.
 - maintenance of them.
 - spare parts and auxiliaries requirement.
 - effectiveness of work shops.
- 1 electrical engineer with responsibilities as follows:
- state and function of electrical equipment and installations.
 - maintenance of them.
 - spare parts and auxiliaries requirement.
 - effectiveness of electrical work shops.

1 civil engineer with the following responsibilities:

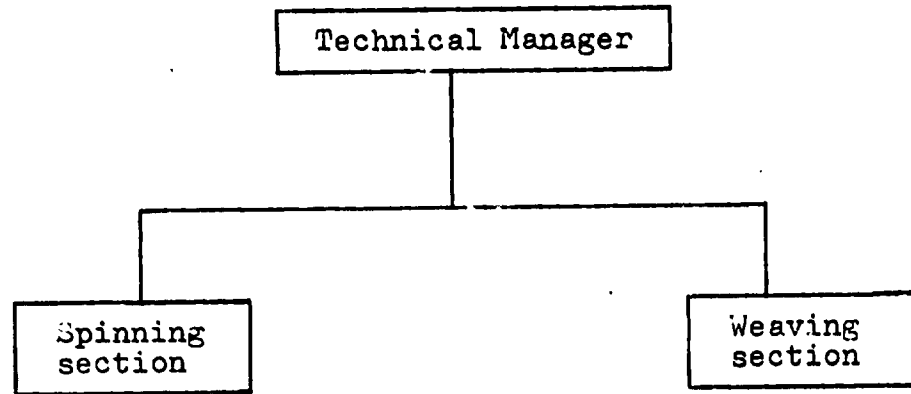
- state of buildings and houses.
- maintenance of them.
- control of plans of additional buildings and houses.
- spare parts and auxiliaries requirement.
- effectiveness of work shops.

1 statistician for internal and external reporting.

1 typist clerk for typing everything in the Technical Department.

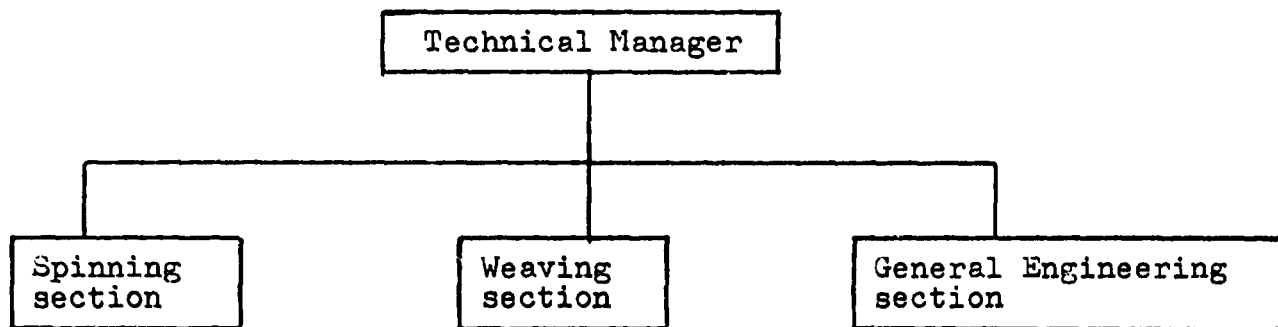
Actual and proposed organisation charts and job descriptions are as follows:

ACTUAL ORGANISATION OF THE TECHNICAL DEPARTMENT OF G.S.W.C.



- 1 Technical Manager
- 1 Weaving expert

PROPOSED ORGANISATION CHART OF THE TECHNICAL DEPARTMENT OF G.S.W.C.



1 Technical Manager

Spinning Section

2 spinning experts

1 cotton expert

Weaving Section

3 weaving experts

General Engineering Section

2 maintenance experts

1 electrical engineer

1 civil engineer

1 statistician

1 typist clerk

Technical Department - G.S.W.C

- Position : Technical Manager
- Qualification : Textile Engineer
- Responsibilities :- Annual Budget of the Mills
 - Performances of the mills
 - Spare parts, auxiliaries and accessories
 - Cooperation between GSWC and the mills
 - Modernisation and investments of the mills
 - Representation of GSWC and the mills
 - Personnel
- Duties : 1. Annual Budget of the mills.
- 1.1 Budget preparation
- a. budget meeting separately with each factory.
- b. control of accuracy of budget datas (operating capacity, efficiency, etc.).
- c. modification of datas if required.
- d. modification of the shifts per day of weaving mills by insufficient yarn supply.
- 1.2 Budget control
- a. monthly control of achieved and planned.
- b. finding the cause of unsatisfied results.
- c. modification of planned if required
- d. assistance to achieve the target.
2. Control of performances of the mills.
- a. production and efficiency.
- b. maintenance of standards.
- c. preventive maintenance of machines, secondary installations and buildings.
- d. technical leading of the weaving mills.
- e. technical assistance by technological problems.

3. Control of spare parts, auxiliaries and accessories.
 - a. utilisation
 - b. minimum stock
 - c. quotations from suppliers
 - d. establishing Letter of Credit
 - e. ordering
4. Establishing cooperation between the mills and GSWC.
 - a. transfer of staff among the mills.
 - b. delegation of trouble shooter to other mills if required.
 - c. exchanging spare parts and raw material between the mills.
 - d. 3 monthly meetings between GSWC and the mills.
5. Preparation of plans.
 - a. for modernisation of the mills.
 - b. for new investments.
 - c. for non-operating factories (Port Sudan, Gadou).
6. Representation of GSWC and the mills.
 - a. by ministries, other local official companies and international companies.
 - b. by negotiation with suppliers.
7. Control of personnel of the Technical Department.
 - a. leading, discipline and motivation.
 - b. number, absenteeism, fluctuation, annual and other leaves.
 - c. work and workload.
 - d. training.

8. General Activities.

- a. control of all reports of his department.
- b. scheduled meetings with the Managing Director and head of departments.
- c. scheduled meetings within his department.
- d. scheduled meetings with the mills.
- e. unscheduled visits to the mills.
- f. gaining further knowledge by studying foreign technical literature and magazines.
- g. advising of ministries and other official organisations such as the Bank of Sudan, IRCC, SDC, etc. in any textile problems (investments, modernisation, feasibility studies and by loan approvals, etc.).

16.12.89New Organisation Technical Department, G.S.W.C.Spinning Section: 2 spinning experts

Qualification : Textile engineer, specification: spinning

Responsibilities:- Performances of the spinning factories, such as production and quality.

- Technological standards of spinning factories, such as settings, speeds, end downs per 1000 sp. hr., sliver breakages per kg, waste percentage and yield of raw material.
- Supervision and judgement of projects and test runs in the spinning factories.

Duties

- :- 1. Establishing real planned production datas and quality standards based on actual capacity and conditions of spinning machines.

1.1 Production

- a. Production planning and control.
- b. Efficiency of machines.
- c. Percentage of idle spindles.
- d. Percentage of faulty bobbins.
- e. Elaboration and introduction of new spinnplan if required to increase production or achieve better quality.
- f. Assistance on the spot by solving technological problems of the factories, such as excess sliver and yarn breakages or poor quality and machine stops.

1.2 Quality

- a. Eveness of slivers and yarns.
- b. neps in web and slivers.
- c. Count, strength, twist and imperfection of yarn.

1.3 Machine Performances

- a. Operating speeds of machines.
- b. Settings of machines.
- c. Tension of sliver and yarn.
- d. Ring traveller changing frequencies.
- e. Top drafting rolls grinding and changing frequencies.
- f. Waste percentage.
- g. Machine stops.

2. Establishing, introduction and control of standards in cooperation with the mill control section of the factories.

Standards for:

- a. operating speeds.
 - b. sliver breakages per kg.
 - c. yarn breakages per 1000 spindle hours.
 - d. idle spindle percentages.
 - e. weights of intermediary and finished products.
 - f. winding tension on winders.
 - g. waste standards in every production stage.
 - h. setting of machines.
3. Assistance of the spinning factories by projects and test runs.
 - a. Detailed preparation and performances of projects and test runs.
 - b. Preparation of reports with results of projects and test runs.
 4. General Activities
 - a. Scheduled and unscheduled visits of the factories with reports about the findings and proposals.
 - b. Analysis of monthly reports of the factories to secure the maintenance of standards and working out proposals by deviations.
 - c. Assisting the statistician by preparing the different reports (monthly, quarter yearly, yearly and exceptional reports and budgets).
 - d. Weekly, monthly, and yearly section meetings.
 - e. Quarter yearly meetings with the technical staff of the factories.
 - f. Assistance by new investments.

Spinning Section: 1 Cotton Expert

Qualification : Textile engineer, speciality: raw material
(cotton and synthetics)

Responsibilities: To serve the best suitable raw material for the spinning factories.

- Duties
1. Analysing of new cotton crops according to name, grade and area as follows:
 - a. staple length
 - b. micronaire
 - c. presley value
 - d. percentage of short fibers
 - e. trash content
 - f. maturity
 2. Analysis and selection of the most suitable synthetic fibers for the factories if required as follows:
 - a. cutting length
 - b. denier (fiber count)
 - c. colour (bright, semi-bright, etc.)
 - d. tenacity
 - e. elaboration of percentage of the mix by blending with cotton (65/35, 63/37, 60/40, 50/50%).
 3. General Activities
 - a. elaboration of suitable lots for the factories
 - b. working out of the number of bales per mix and the composition of mix according to the quality datas of cotton
 - c. elaboration of the maximum quantity of re-workable waste to be used in a mix
 - d. assistance of the factories by high neps value in the slivers and yarns and by all problems caused by raw material.

Weaving Section: 3 weaving experts

Qualification : Textile engineer, speciality: weaving

Responsibilities:- Performances of the weaving factories such as production and quality.

- Technological standards of weaving mills, such as settings, speeds, yarn breakages, tension.
- Supervision and judgement of projects and test runs in the weaving mills.

Duties : 1. Establishing real planned production datas and quality standards based on actual capacity and conditions of machines.

1.1 Production

- a. Production planning and control
- b. Efficiency of machines
- c. Elaboration and introduction of new weaving plan and articles if required
- d. Assistance on the spot by solving technological problems of the factories, such as sizing quality, excess yarn breakages on the different machines, excess machine stops, etc.

1.2 Quality

- a. Quality of the intermediate products, such as pirns, warper beams, and sized beams.
- b. Quality of finished product such as percentage of first grade, second grade and rags.
- c. Quality of finished product such as construction, width and selvages.

1.3 Machine Performances

- a. Operating speeds of machines
- b. Settings of machines
- c. Tension of yarn on different machines
- d. Machine stops
- e. Waste percentage

2. Establishing, introduction and control of standards in cooperation with the mill control section of the factories.

- a. Operating speeds
- b. Yarn breakages per kg or 100.000 meter yarn

- c. Loom stops per 10.000 picks
 - d. Weight or length of intermediate and finished product
 - e. Yarn tensions on machines
3. Assistance of the weaving mills by projects and test runs.
- a. Detailed preparation and performances of projects and test runs.
 - b. Preparation of reports with the results of projects and test runs.
4. General activities
- a. Scheduled and unscheduled visits of the mills with reports about the findings and proposals.
 - b. Analysis of monthly reports of the mills to secure the maintenance of standards and working out proposals by deviations.
 - c. Assisting the statistician by preparing the different reports.
 - d. Weekly, monthly and yearly section meetings.
 - e. Quarter yearly meetings with the technical staff of the mills.
 - f. Assistance by new investments.

General Engineering Section: 2 maintenance experts

Qualification : Mechanical engineer

Responsibilities :- State of the machines and secondary installations of the spinning factories and weaving mills.

- Maintenance of machinery and secondary installations.
- Spare parts and auxiliaries requirement of spinning factories and weaving mills.
- Effectiveness of work shops at the factories.

Duties :1. Control of the functions of machines and machine parts.

1.1 Spinning factories:

- a. machine stopping equipment on cards, combing sections, drawing frames, speed frames, winders, doublers, and twistors.
- b. function of air conditioning, fire fighting equipment and compressors.
- c. function of overhead cleaners.
- d. function of transport equipment.

1.2 Weaving mills:

- a. machine stopping equipment on pirn winders, warper, sizing machines and looms (fork lift and drop-wires).
- b. function of pirn bobbin building mechanism.
- c. function of size cooking equipment.
- d. function and state of drawing-in machines and knotters.
- e. function of pirn changing mechanism.
- f. function of air conditioning, fire fighting equipment and compressors.
- g. function of generators.
- h. function of transport equipment
- i. boiler and water treatment equipment.

1.3 Work shops

- a. function of work shop equipment.
- b. availability of necessary and suitable tools.

1.4 Laboratory equipment

- a. function of laboratory equipment.
- b. function of air conditioning in the laboratory.

2. Control of the maintenance of the machines, secondary installations and transport equipment.

2.1 Control of preventive maintenance.

- a. control of administrative procedures, the planning and scheduling of preventive maintenance according to the manufacturer's manuals for every machine type and the availability of the following resources:
 - diagrams with the kind of preventive maintenance (f.e. cleaning, oiling and greasing, setting general overhauling etc.) and frequencies for minimum of a 3 year period.
 - machine cards for every single machine with datas.
 - instructions for every kind of maintenance with the description of machine parts to be controlled, oiled, greased etc.
 - detailed instructions for machine settings with setting values.
 - elaboration of minimum quantity of stocks for the frequently used machine parts.
 - elaboration of the necessary personnel and the duration of machine stoppage by every kind of maintenance.
 - availability of machine reports.
- b. control of the execution of works of the preventive maintenance as follows:
 - kind and time of maintenance according to the schedule.
 - works carried out according to the instructions.

- registered works and remarks on the maintenance report.
- function of machine and parts changed.
- product quality after the preventive maintenance.
- duration of maintenance.
- registration of datas on the machine cards.

2.2 Control of break down maintenance.

- a. cause of break down.
- b. duration of break down maintenance.
- c. quality of the executed works.
- d. frequency of the type of break down.
- e. registration of datas on the machine cards.

3. Control of spare parts and auxiliaries.

- a. availability of frequently used spare parts and auxiliaries.
- b. minimum stock of frequently used spare parts and auxiliaries.
- c. consumption of spare parts and auxiliaries.
- d. ordering of justified spare parts and auxiliaries.

4. Effectiveness of work shops.

- a. machinery outfit of the work shops.
- b. qualification of staff.
- c. availability of suitable equipment and tools.
- d. quality of works carried out.
- e. efficiency of work shop and utilisation of machines and equipment.

5. Assistance of projects.

- a. detailed preparation and performance of projects.
- b. preparation of reports with the result and summary of projects.

6. General activities.

- a. scheduled and unscheduled visits to the mills with reports about the findings and recommendations.

- b. analysis of the monthly machine stops record.
- c. assisting the statistician by preparing the different reports.
- d. weekly, monthly and yearly section meetings.
- e. quarter yearly meetings with the technical staff of the mills.
- f. assistance for new investments.
- g. security of persons, machines and equipment.

General Engineering Section: 1 Electrical engineer

Qualification : Electrical engineer

Responsibilities :- State and function of electrical equipment and installations in the spinning factories and weaving mills.

- Maintenance of electrical equipment and installations.
- Spare parts and auxiliaries requirement.
- Effectiveness of electrical work shops at the factories and mills.

Duties

1. Control of the function of electrical equipment and installations.
 - a. function of motors, switches, main and auxiliary switchboard, generators, air conditioning etc.
 - b. state of electrical wiring.
 - c. lighting of production, administrative and secondary buildings.
2. Control of maintenance of electrical equipment and installations.
 - 2.1 Control of preventive maintenance of all electrical equipment and motors.
 - a. control of administrative procedures.
 - diagrams with the kind of preventive maintenance with frequencies for a minimum of 3 years.
 - cards for motors, electrical installations and wiring with datas.
 - instruction for every kind of maintenance with the descriptions of works to be executed.
 - availability of maintenance reports.
 - elaboration of minimum quality of stock for frequently used electrical parts.
 - elaboration of necessary personnel and duration of machine stoppages by every kind of maintenance.

- 2.2 Control of the execution of works of the preventive maintenance.
 - a. kind and time of maintenance according to the schedule.
 - b. works carried out according to the instructions.
 - c. registered works and remarks on the maintenance reports.
 - d. function of electrical equipment where part changed or required.
 - e. duration of maintenance.
 - f. registration of datas on the cards.
3. Control of break down maintenance.
 - a. cause of break down.
 - b. duration of repair.
 - c. quality of the executed works.
 - d. frequency of the type of break down.
 - e. registration of the cards.
4. Control of spare parts and auxiliaries.
 - a. availability of frequently used spare parts and auxiliaries.
 - b. minimum stock of them.
 - c. consumption of them.
 - d. ordering of justified spare parts and auxiliaries.
5. Effectiveness of workshop.
 - a. outfit of work shop.
 - b. qualification of staff.
 - c. quality of works carried out.
 - d. efficiency of work shop and utilisation of machines and equipment.
6. Assistance by project.
 - a. detailed preparation and performance of projects.
 - b. preparation of the reports with the results and summary of project.

7. General activities.

- a. scheduled and unscheduled visits to the mills with reports about the findings and recommendations.
- b. analysis of the monthly machine stops record.
- c. assisting the statistician by preparing the different reports.
- d. weekly, monthly and yearly section meetings.
- e. quarter yearly meetings with the technical staff of the mills.
- f. assistance by new investments.
- g. security of persons, machines and equipment.

General Engineering Section: 1 Civil engineer

- Qualification : Civil engineer
- Responsibilities :- State of buildings and houses of the factories.
- Maintenance of the buildings and houses.
 - Control of the plans of additional buildings and houses.
 - Spare parts and auxiliaries requirement.
 - Effectiveness of work shops at the factories.
- Duties : 1. Control of the state of buildings and houses and external works.
- 1.1 Control of buildings and houses.
- a. concrete works such as foundations, slabs, ducts, walls, etc.
 - b. masonry works such as walls, partions, etc.
 - c. flooring impregnation, surface hardener and ceramic tiles.
 - d. roof and ceiling.
 - e. rain water eduction system.
 - f. main water system.
 - g. drainage system.
 - h. doors and windows.
 - i. sanitary and other fittings.
- 1.2 Control of external works.
- a. internal roads and parkings.
 - b. drainage system.
 - c. fencing and gates.
 - d. swimming pool.
2. Control of maintenance of buildings, houses and external works.
- 2.1 Control of preventive maintenance.
- a. control of administrative procedures
 - diagrams with the kind of preventive maintenance with frequencies for a minimum of 3 years.
 - cards for buildings, houses and external works with datas.

- instruction for every kind of maintenance with the description of works to be executed.
- availability of maintenance reports.
- elaboration of minimum quantities of stock for frequently used parts and auxiliaries.
- elaboration of necessary personnel and duration of works by every kind of maintenance.

2.2 Control of the execution of works of the preventive maintenance.

- a. kind and time of maintenance according to the schedule.
- b. works carried out according to the instructions.
- c. registered works and remarks on the maintenance report.
- d. duration of maintenance.
- e. registration of datas on the cards.

3. Control of break down maintenance.

- a. cause of break down maintenance.
- b. duration repair.
- c. quality of the executed works.
- d. registration of the cards.

4. Control of spare parts and auxiliaries.

- a. availability of frequently used spare parts and auxiliaries.
- b. minimum stock of them.
- c. consumption of them.
- d. ordering of justified spare parts and auxiliaries.

5. Assistance by projects.

- a. detailed preparation and performance of projects.
- b. preparation of reports with the results and summary of project.

6. General activities.

- a. scheduled and unscheduled visits to the mills with reports about the findings and recommendations.
- b. weekly, monthly and yearly section meetings.
- c. quarter yearly meetings with the management of the mills.

- d. assistance by new investments.
- e. security of persons, machines,
buildings and equipment.

General Engineering Section: 1 Statistician

- Qualification** : General statistics and economics with a textile background.
- Responsibilities:**
- Timely collection of the reports prepared by the factories.
 - Accuracy of datas of factory reports.
 - Internal reporting system.
 - External reporting.
- Duties**
1. Timely collection of reports prepared by the factories.
 - a. elaboration of necessary time for report preparation at the factories.
 - b. justified time limit for report delivering to JSWC, Khartoum.
 - c. organisation of way of delivery of reports.
 2. Accuracy of datas of factory reports.
 - a. analysis, recalculation and comparison of datas.
 - b. consultation and modification by deviations.
 - c. acceptance of records only with the signature of the General Manager.
 3. Internal reporting system.
 - a. preparation of monthly, quarter yearly and yearly internal reports.
 - b. after finishing the reports, consultation with the technical sections and technical manager.
 - c. distribution of the reports.
 4. External reporting system.
 - a. Cooperation with the Economic Research Planning and Training Department to prepare the necessary external reports.
 5. General activities.
 - a. participation at all the meetings of the technical department and the sections
 - b. preparing minutes for the meeting and distributing it.

- c. assisting the technical sections by project preparations such as scheduling of activities and timely completion of the projects.
- d. assisting the technical sections by preparation of every report.
- e. control of the activities of the typist clerk.

General Engineering Section: 1 Typist clerk

- Qualification : Advanced typewriting and the knowledge of english language.
- Responsibility : All typing works within the Technical Department.
- Duties : a. typing of the internal reports.
b. typing of the reports prepared by the expert of the technical sections.
c. typing of the minutes of the meetings of the technical department and sections.
d. typing of budgets, investments, spare parts requirements, etc.
e. typing of all correspondence within the technical department.

2. Economic Research, Planning and Training Department

This department is also understaffed and the following positions are unoccupied:

- Research and Planning Section: 1 officer
- Information Section : Head of section
2 officers

- Training and Time Study Section

The training section will be named "Training and Time Study" section. This section will be responsible not only for the training of the management of the mills in Sudan and outside of Sudan, but also for the labour training in all the mills and it will be additionally extended with Time Study personnel. The Training and Time Study section will have the following functions:

- Training the management in Sudan and outside of Sudan.
Preparation of annual training plans, selection of qualified managers, approval by the Ministry of Industry, submitting the data to the National Training Department, follow up.
- Training of operators at every mill.
Preparation of aptitude tests and elaboration of training of training officers and training instructors, elaboration of the duration of the different training courses, examination of trainees at the end of the training courses.
- Time Study
As stated before every spinning mill has Time Study sections, but they are not functioning as they should and it would be unjustified to establish Time Study sections in the relatively small weaving mills.

The aim of the new organisation is the centralisation of the Time Study under the leadership of the above mentioned section of the General Spinning and Weaving Company.

The task of the Time Study is to elaborate justified work load of the personnel and introduce incentive wage system at every mill.

The principles of Time Study have not been born with the objective of obtaining the maximum efficiency of the human being, but through the realisation that its work force was used irrationally due to wrong working methods, lack of training, inadequate or improvised equipment and tools, deficient working places, physical qualifications of persons and out of standard machine performances.

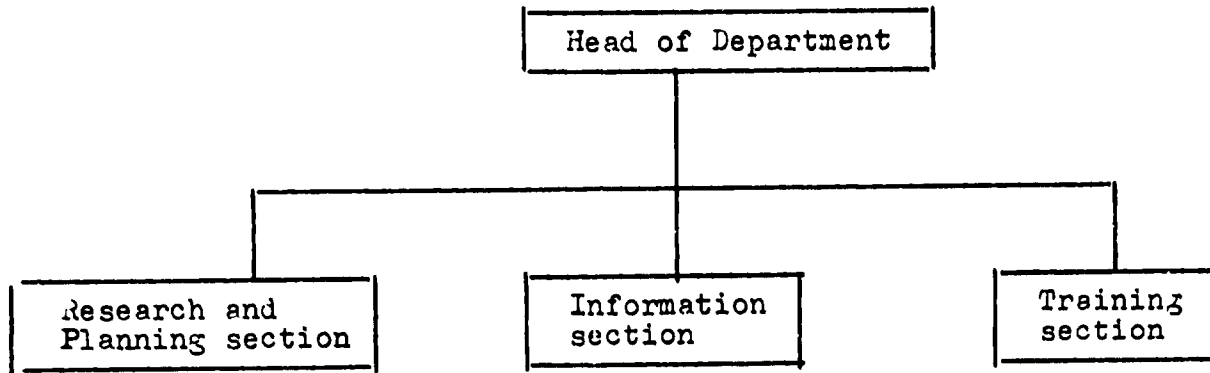
Any of these factors or a combination of them may contribute to increase the time of execution of work and the fatigue of a person without increasing the value of a product. In most cases decreased production, low quality and increased personnel and costs are the results.

Requested personnel for the Training and Time Study section are:

- 2 officers for management and operator training
- 5 time study experts

Actual and proposed organisation charts and job descriptions are as follows:

ACTUAL ORGANISATION CHART OF THE ECONOMIC RESEARCH, PLANNING
AND TRAINING DEPARTMENT OF G. S. W. C.



1 Head of Department

Research and Planning
Section

1 Head of section

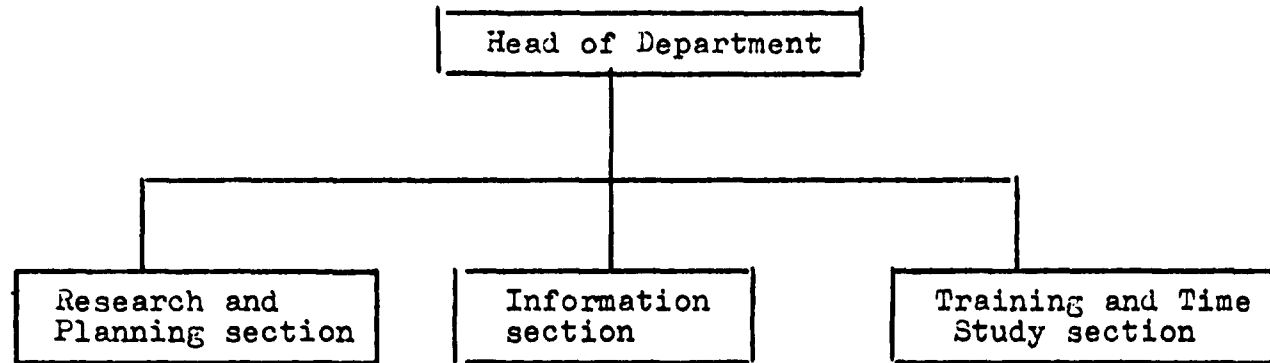
Information
Section

-

Training
Section

1 Head of section
1 clerk

PROPOSED ORGANISATION CHART OF THE ECONOMIC RESEARCH, PLANNING
TIME STUDY AND TRAINING DEPARTMENT OF G.S.W.C.



1 Head of Department

Research and Planning
section

1 Head of section

1 Officer

Information
section

1 Head of section

2 Officers

Training and Time Study
section

1 Head of section

5 Time Study experts

2 Officers

1 Clerk

Training and Time Study Section

- Position : Head of Section
- Qualification :
- Responsibilities : - Training of management of the mills
- Training of operators of the mills
- Time Study in the mills
- Incentive Wage System
- Personnel
- Duties : 1. Supervision of management training
- a. control of annual training plan and selection of managers
 - b. submitting it to the Ministry of Industry and National Training Department for approval
 - c. control of completion of necessary procedures and datas
 - d. report about the progress of each trained manager
2. Supervision of operator training
- a. control of number of personnel trained in each mill
 - b. control of fluctuation of trainees
 - c. control of progress of trainees
 - d. control of training courses
3. Supervision of Time Study
- a. progress and quality of time study
 - b. time schedule of time study at each mill
 - c. proposal of transfer of surplus of personnel
4. Supervision of Incentive Wage System
- a. correctness of the system
 - b. basis and factors of the system
 - c. correct adaptation and calculation
 - d. limits of incentive bonuses

5. Control of personnel of the section
 - a. leading, discipline and motivation
 - b. number, absenteeism, fluctuation and leaves
 - c. work and workload
 - d. training

6. General activities
 - a. control of reports of the section
 - b. scheduled meetings with the Head of the department
 - c. scheduled meetings within the section
 - d. meetings with the different ministries and other official organisations
 - e. scheduled meetings with the mills

Training and Time Study Section

- Position : Officer for management training and operator training in the weaving mills.
- Qualification :
- Responsibilities :- Training of the management of spinning and weaving mills.
- Operator training in the weaving mills.
- Duties : 1. Training of management of the spinning and weaving mills.
- a. preparation of annual training plan for management training in and outside of Sudan
 - b. submitting the annual training plan for approval to the Ministry of Industry and National Training Department
 - c. after approval, selection of the qualified managers from the mills for the different training courses
 - d. for training in Sudan direct contact with the corresponding training institutions
 - e. completion of all procedures and submitting the required personal datas to the National Training Department or to the corresponding training institution in Sudan
 - f. follow up and examination of reports after the termination of the training course
2. Control of operator training of the weaving mills.
- 2.1 New Operator training.
- a. elaboration of aptitude tests and selection of trainees
 - b. elaboration of training manuals for every type of machine based on job description

- c. elaboration of the duration of the different training courses
- d. selection of training officers and training instructors
- e. after the training courses transferring the trainees to the production sections.
- f. follow up the activities of the trainees for a certain period

2.2 Retraining of operators.

- a. selecting operators with low performances or with wrong working methods for retraining
- b. elaboration of retraining manuals
- c. elaboration of the duration of the retraining course

3. General activities

- a. scheduled and unscheduled visits to the weaving mills with reports about the findings and proposals
- b. weekly, monthly and yearly section meetings
- c. quarter yearly meetings with the operator training sections of the weaving mills

Training and Time Study Section

- Position : Officer for operator training in the spinning mills.
- Qualification :
- Responsibilities : Operator training in the spinning mills.
- Duties : 1. Control of operator training in the spinning mills.
- 1.1 New operator training
- a. elaboration of aptitude tests and selection of trainees
 - b. elaboration of training manuals for every type of machine based on job descriptions
 - c. elaboration of the duration of the different training courses
 - d. selection of training officers and training instructors
 - e. after the training courses transferring the trainees to the production sections
 - f. follow up the activities of the trainees for a certain period
- 1.2 Retraining of operators
- a. selecting operators with low performances or with wrong working methods for retraining
 - b. elaboration of retraining manuals
 - c. elaboration of the duration of the retraining course
2. General Activities
- a. scheduled and unscheduled visits to the spinning mills with reports about the findings and proposals
 - b. weekly, monthly and yearly section meetings
 - c. quarter yearly meetings with the operator training sections of the spinning mills

Time Study and Training Section

- 2 time study experts spinning
- 2 time study experts weaving
- 1 time study expert garment manufacturing

Qualification : Textile engineer with time study experience or industrial engineer with textile experience.

Responsibility :- Elaboration of workload of the personnel at each factory.
 - Introduction of incentive wage system based on individual performance.

Duties : 1. Elaboration of workload of personnel.

- 1.1 Securing optimum operating conditions of machines in cooperation with the mill control section of the factory.
 - a. control of working conditions of machines such as speeds, settings, function and cleanliness.
 - b. control of raw material, availability and quality results.
 - c. control of climatical conditions such as temperature and relative humidity.
 - d. control of cleanliness of work place, availability of transport equipment.
- 1.2 Elaboration of Work Method Analysis Study.
 - a. familiarising with the work process of the work place.
 - b. dissection of the work process into activities and the activities to elements.
 - c. developing improved worked methods and standardising it.

- observation of work methods used by different persons. An improved method can be achieved by combining the best features of the variety of work method found.
- the utilisation of Work Simplification through selection of the activities which could be carried out by other persons or small equipment (f.e. cleaning).
- the utilisation of motion Economy Study for which part of the body (fingers, hands, arms, legs and entire body) should be used to carry out the corresponding element.

1.3 Elaboration of frequencies for routine works. The frequencies for routine works have to be calculated or determined by experiments. f.e. patrol cycles, cleaning of machine parts etc.

1.4 Preparation of Job Description. After terminating the Work Method Analysis Study and elaboration of frequencies for routine works, the complete work process for the corresponding work places has to be standardised and a detailed Job Description has to be prepared.

1.5 Training of the personnel. The personnel has to be trained according to the new Job Description. This training is only a retraining and should be concentrated to a maximum of 2 hours per person.

1.6 Observation of time of the work process with stop watch and work rhythm of the person.

a. timing of the Work Method Analysis Study dissected work process.

- b. estimation of work rhythm of the person.
 - c. calculation of Normal Time based on 100% work rhythm of the person.
- 1.7 Calculation of workload of work places
- calculation of workload per machine.
 - calculation of the number of machines per work place.
 - calculation of standard personnel per production stages and per factory.
2. Elaboration, Introduction and control of incentive wage system.
- a. elaboration of incentive wage system based on individual performances.
 - b. training some personnel of the factories to calculate the incentive wages (bonuses), 3 times per month.
 - c. step-by-step introduction of the incentive wage system.
 - d. modification of incentive wage system if required.
3. General activities.
- a. organisation of material transport of the factories.
 - b. organisation of storage of intermediate products and auxiliary materials.
 - c. systematical control of the introduced incentive wage system.
 - d. modification of workload by changing data such as count, article, product weight, speeds and running conditions of machines.
 - e. scheduled visits to the factories with reports about the findings and proposals.

IV. MODIFICATION OF THE ORGANISATION OF THE MILLS

By the analysis of the reporting system and consequently the datas in the reports, the reported low production of the mills was conspicuous. After a questionnaire - with reference to the operating capacity from the installed capacity - prepared by the author and filled out by the mills, it was obvious that the low production could not be caused only from the lack of spare parts.

Beside the honeydew problem of the cotton at Hag Abdallah Spinning Mill, the organisation of the mills was not purposely oriented to the production and quality. The organisation of every mill missed the Mill Control section which is one of the most important management tools.

Modern mill management requires sound technical and administrative methods and procedures for the effective control of the various phases of productive and administrative activities.

The purpose of the mill control is to aid in accomplishing the following important management objectives:

- establishing and maintaining of standards for machine performances, operating conditions and wastes.
- performances of tests and controls at strategic points from raw material through finished product in order to detect any faulty conditions at the source and as soon as they arise.
- maintenance of statistical control charts as an aid in detecting trends towards "out-of-standard" conditions before actual unsatisfactory product makes its appearance.
- reporting every "out-of-standard" condition and control of their elimination.

To achieve these aims it is necessary to modify the actual organisation of the mills and to establish mill control sections at

every mill.

1. Hag Abdallah Spinning Mill

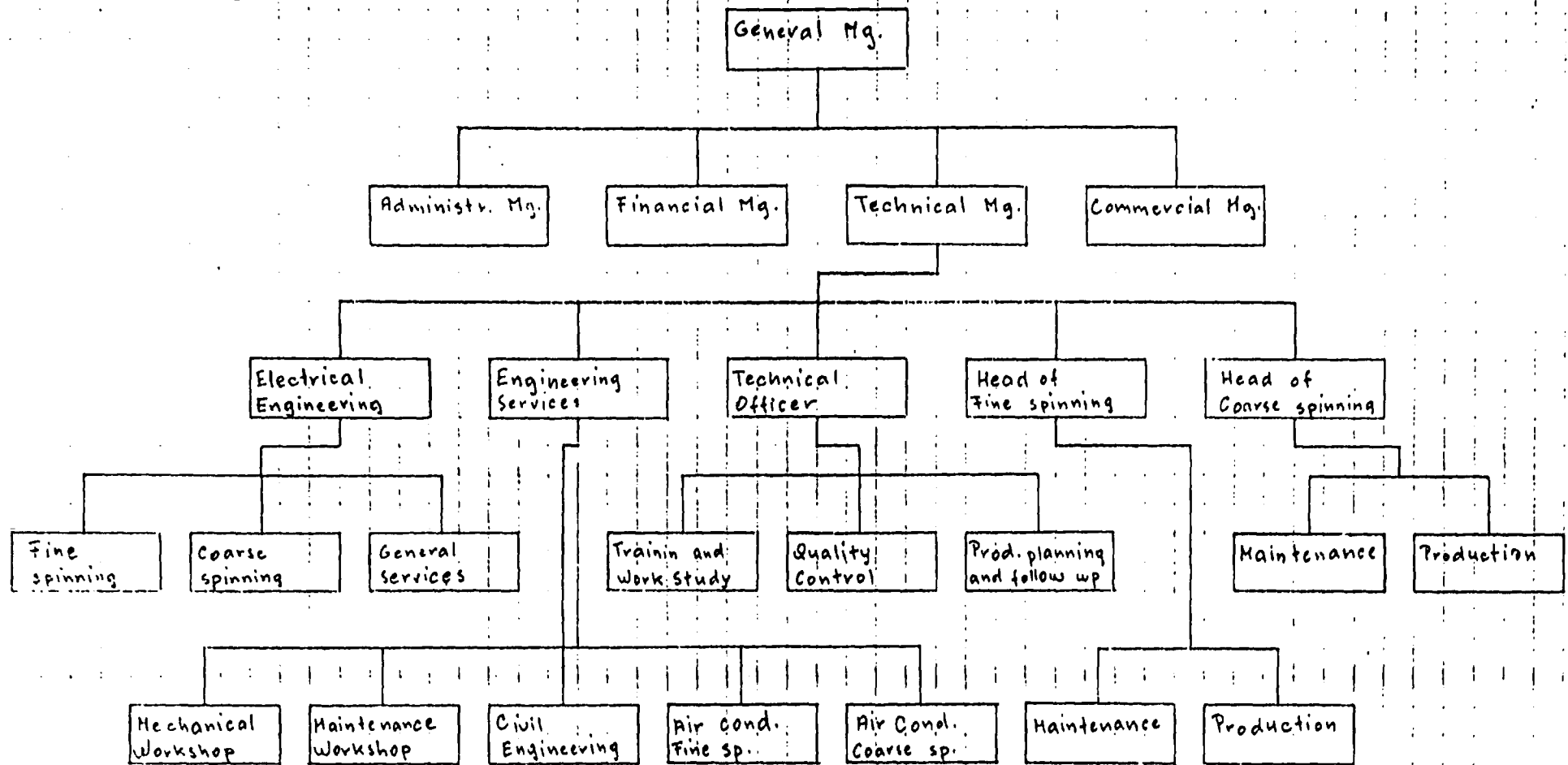
As stated before the Hag Abdallah Spinning Mill is the most important factory of the General Spinning and Weaving Company and this mill does not have neither a production section nor mill control section. The consultant modified the organisation of the Technical Department as follows:

The Technical Department under the leadership of the Technical Manager consists of 3 sections, namely:

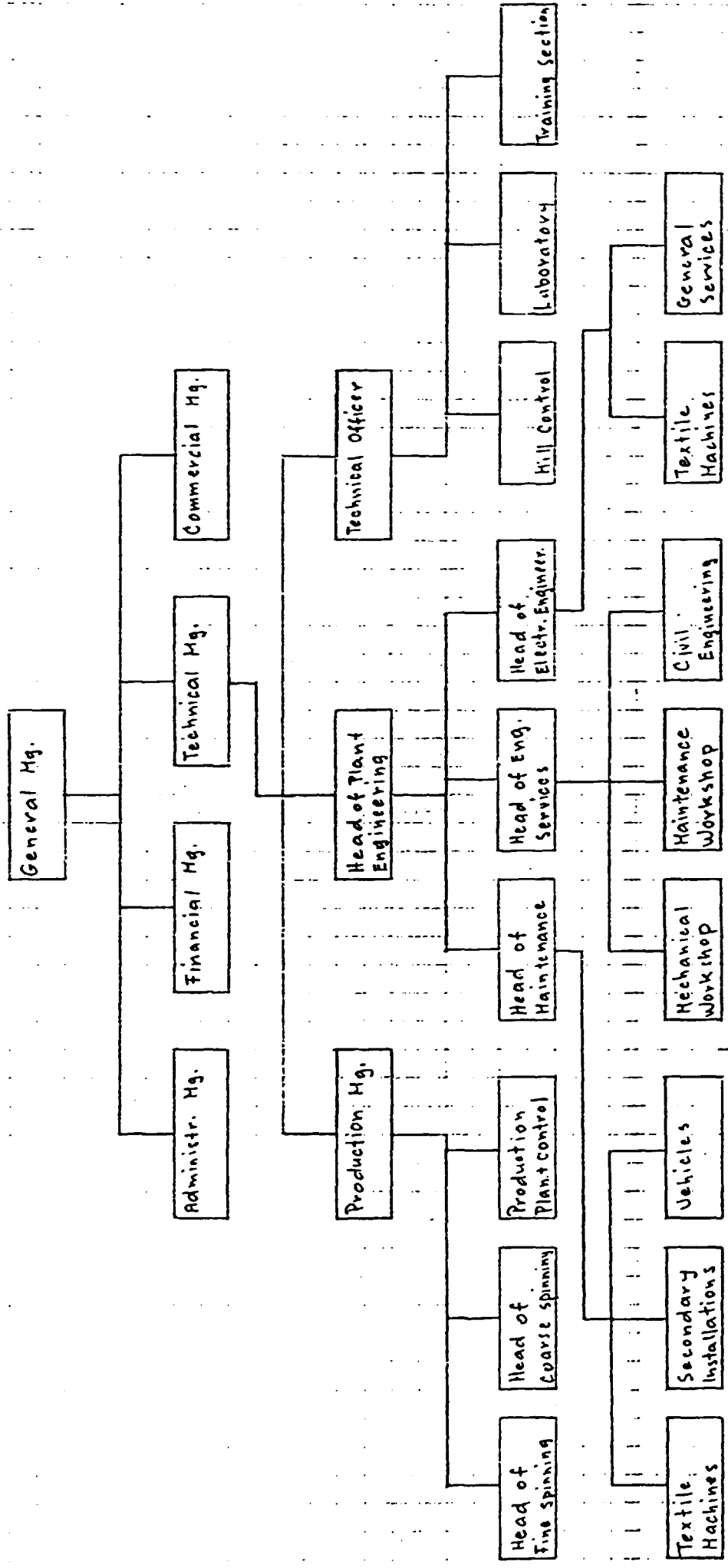
- Production section under the leadership of the production manager.
The Production section consists of 3 subsections: production planning and control, coarse spinning and fine spinning.
- Plant Engineering section under the Head of Plant Engineering. This section consists of 3 subsections: maintenance (machines, secondary installations and vehicles), engineering services mechanical workshop, maintenance workshop and civil engineering), electrical engineering (textile machines and general services).
- Technical office section under the leadership of the Technical Officer.
This section consists of 3 subsections: Mill control, Laboratory (quality control) and training subsection.

The actual and proposed organisation charts and job descriptions are as follows:

ACTUAL ORGANISATION CHART OF TECHNICAL DEPT. OF HAG ABDALLAH SPINNING MILL



PROPOSED ORGANISATION CHART OF TECHNICAL DEPT. OF HAJ ABDALLAH SPINNING MILL



Hag Abdallah - Technical Department - Production Section
 Production Manager

Qualification : Textile Engineer or Industrial Engineer

Responsibilities : - Production Planning and Control
 - Performances of fine spinning
 - Performances of coarse spinning

Duties : 1. Production Planning and Control

Planning involves the determination of the production management of what is to be achieved and how it is to be achieved, while control refers to the checking, recording and comparing of actual with planned accomplishments.

1.1 Production Planning

- a. preparation of monthly, quarter yearly and yearly production plans for fine spinning and coarse spinning with actual capacity and datas.
- b. preparation of detailed spinn plan for the fine spinning with regard to export and local sale of yarn.
- c. preparation of detailed spinn plan for the coarse spinning.

1.2 Production Control

- a. control of daily actual production of fine and coarse spinning.
- b. comparing the actual production with the planned production.
- c. finding causes of deviations and elaboration proposals for improvement.
- d. weekly production meeting with the heads of fine and coarse spinning to secure the maintenance of the planned production.

2. Control of performances of fine and coarse spinning.

- a. production of the different production stages
- b. production balance between the different production stages.
- c. production of export yarn and yarn for

local sale.

- d. quality of the intermediate and end product.
- e. maintenance of standards of machines performances.
- f. waste percentage in every production stage.
- g. yield of raw material.
- h. machine stop records.

3. General Activities

- scheduled meetings with the heads of subsections.
- scheduled meetings with the head of plant engineering and technical officer.
- production reporting.
- number of personnel.
- securing availability of raw materials.
- modification of planned production if required.
- planning of modernisations and investments.

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Hag Abdallah - Technical Department - Production Section

Head of Fine spinning

Qualification : Textile Engineer

Responsibilities : - Production of the fine spinning
 - Quality of intermediary and end product
 - Maintenance of standards
 - Percentage of waste
 - Control of personnel

Duties : 1. Production of Fine Spinning.

- a. production planning based on actual capacity.
- b. preparation of spinn plan.
- c. secure production balance between the different production stages.
- d. control of actual production.
- e. comparison of actual with planned production.
- f. finding the cause of deviations.
- g. introduction overtimes and/or additional shifts if required to overbridge temporary production bottle necks.
- h. control of machine stop records.
- i. control of doffing times of machines.

2. Control of the quality of the products.

- 2.1 Blowroom : a. component of mix
 b. number of bales per mix
 c. rework ble waste percentage per mix
- 2.2 Cards : a. count of sliver
 b. eveness of sliver
 c. neps in web
 d. short fibres in web
 e. visual control of the web
- 2.3 Combing : a. count of sliver
 b. eveness of sliver
 c. short fibres in sliver
 d. percentage of comber noils
 e. state of top drafting rolls

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- 2.4 Drawing : a. count of sliver
b. evenness of sliver
c. state of top drafting rolls
- 2.5 Speed frames: a. count of sliver
b. evenness of sliver
c. state of top drafting rolls
d. twist of sliver
e. building of bobbins
- 2.6 Ring spinning : a. count of yarn
b. evenness of yarn
c. strength of yarn
d. twist of yarn
e. imperfection of yarn
f. yarn appearances grading
g. building of cops
- 2.7 Winding : a. settings of electrical cleaners
b. density of cones
c. correct winding of cones
d. rest yarn on ring spinning bobbins
e. yarn breakages
- 2.8 Doubling : a. quality of bobbins
b. yarn tension
c. stop equipment
- 2.9 Twisting : a. quality of bobbins
b. yarn tension
c. twist
- 2.10 General : a. cleanliness of machines
b. cleanliness of work places
c. transport of material
d. availability of empty bobbins
e. utilisation of full working time

3. Control of the maintenance of standards

- a. speeds of machines
b. settings of machines
c. idle spindles
d. faulty bobbins
e. package size of intermediate and end products
f. sliver breakages per Kg from carding through speed frame
g. yarn breakages per 1000 sp. hr.
h. traveller changing frequencies

- i. quality card clothing
 - j. quality of top drafting rolls
 - k. temperature and relative humidity
4. Control of waste
- a. yield of raw material
 - b. wastes of every production stages and machines
 - c. total reworkable waste and scavenger
5. Control of personnel
- a. leading of the personnel
 - b. discipline and motivation of personnel
 - c. total number of personnel
 - d. absenteeism and fluctuation
 - e. training of personnel
 - f. work of personnel
 - g. workload of personnel
 - h. annual leave and other leaves of personnel
6. General Activities
- a. scheduled meetings with production manager and production planning and follow-up subsection
 - b. scheduled meetings with the maintenance subsection
 - c. scheduled meetings with the technical officer
 - d. securing the availability of raw material
 - e. time of delivery of export yarn
 - f. planning of modernisation and new investments.

Hag Abdallah - Technical Department - Plant Engineering Section
Head of Plant Engineering

Qualification : Mechanical Engineer

Responsibilities : - Performances of the maintenance section
- Performances of the engineering services section
- Performances of the electrical engineering section

Duties : 1. Control of performances of the maintenance section.

- 1.1 Control of preventive maintenance of textile machines, secondary installations and vehicles.
 - a. preventive maintenance planning and scheduling
 - b. maintenance of planned frequencies
 - c. quality of executed works
- 1.2 Control of break down maintenance.
 - a. quality of executed works
 - b. duration of work
 - c. used spare parts and materials
- 1.3 Availability of spare parts
 - a. minimum stock of frequently used spare parts
 - b. purchasing of spare parts

2. Control of performances of the engineering services section.

- 2.1 Control of mechanical workshop.
 - a. effectiveness of workshop
 - b. quality of works
 - c. registration of executed works

2.2 Maintenance workshop

- a. effectiveness of workshop
- b. quality of works
- c. registration of works

2.3 Control of Civil Engineering

- a. condition of buildings and civil engineering works
- b. effectiveness of civil engineering
- c. quality of works
- d. registration of works

3. Control of performances of electrical engineering section.

- a. effectiveness
- b. quality of works
- c. registration of works

4. General Activities

- a. scheduled meetings with the heads of subsections (maintenance, engineering services, electrical engineering)
- b. scheduled meetings with production manager and technical officer
- c. availability of tools and raw material
- d. planning of modernisation and new investments

Hag Abdallah - Technical Department - Plant Engineering Section
Head of maintenance

Qualification : Mechanical Engineer

Responsibilities: - Planning, execution and control of preventive maintenance of textile machines, secondary installations and vehicles.
- Control of execution of breakdown maintenance.
- Control of personnel.

Duties : 1. Preventive maintenance of textile machines, secondary installations and vehicles.

1.1 Administrative procedure

a. Planning and scheduling of preventive maintenance according to the manufacturer's manuals for every machine type.

- diagrams with the kind of preventive maintenance with frequencies for a minimum of 3 years
- machine cards for every single machine with machine datas
- instructions for every kind of maintenance with the descriptions of machine parts to be controlled, oiled, greased etc., and work to be executed
- detailed instructions for machine setting values
- availability of maintenance reports
- elaboration of minimum quantity stocks for frequently used machine parts
- elaboration of necessary personnel and duration of machine stoppages by every kind of maintenance

1.2 Control of the execution of works of the preventive maintenance.

- a. kind and time of maintenance according to the schedule
- b. works carried out according to the instructions
- c. registered works and remarks on the maintenance reports

- d. function of machine and parts changed
 - e. duration of maintenance
 - f. registration of datas on the machine cards
2. Control of breakdown maintenance.
- a. cause of breakdown
 - b. duration of breakdown maintenance
 - c. quality of the executed work
 - d. frequency of the type of breakdown
 - e. registration of datas on the machine cards
3. Control of personnel
- a. leading of the personnel
 - b. discipline and motivation of personnel
 - c. total number of personnel
 - d. absenteeism and fluctuation
 - e. training of personnel
 - f. work of personnel
 - g. annual and other leaves of personnel
4. General Activities
- a. scheduled meetings with the head of plant engineering
 - b. scheduled meeting with the production department
 - c. scheduled meetings with the fine spinning and coarse spinning maintenance groups
 - d. control of spare parts, wages and utilisation
 - e. planning of modernisation and new investment

Establishing Mill Control Section

This will be a new subsection with the aim to secure and maintain optimum machine performances based on management by exceptions, reporting only the "out of standard" conditions.

Functions and activities:

1. Establishment of standards for machine performances and wastes.
2. Performance of tests and inspections at strategic points, from blowroom through winding in order to detect any faulty conditions at the source and as soon as they arise.
3. Maintenance of statistical control charts as an aid in detecting trends towards "out of control" conditions before actual unsatisfactory product makes its appearance.
4. Reporting every "out of standard" conditions and control of their eliminations.

Monthly report of settled and unsettled "out of control" conditions.

1. Standards for machine performances

- | | | | |
|-----|----------|---|--|
| 1.1 | Blowroom | : | a. number of bales per mix
b. percentage of reworkable waste in the mix
c. speeds of machines
d. setting of screens |
| 1.2 | Carding | : | a. speeds
b. settings
c. weight of sliver in can
d. sliver breakages per Kg |
| 1.3 | Combing | : | a. speeds
b. settings
c. weights of sliver in can
d. sliver breakages per Kg |

- 1.4 Drawing : a. speeds
b. settings
c. weight of sliver in can
d. sliver breakage per Kg
- 1.5 Sped frames : a. speeds
b. settings
c. weights and sizes speed frames bobbins
d. percentage of idle spindles
e. sliver breakages per Kg
f. sliver guides and condensers
- 1.6 Ring spinning frames : a. speeds
b. settings
c. weight and sizes of bobbins
d. percentage of idle spindles
e. percentage of faulty bobbins
f. horizontal traverse motion
g. traveller changing frequencies
h. yarn breakages per 1000 sp. hr.
- 1.7 Winding : a. yarn tension
b. slab catcher setting
c. setting of electronic clearance equipment
d. speeds
e. weight and size of cones
f. yarn breakages per Kg
- 1.8 Doubling : a. speeds
b. yarn tension
c. weight and size of bobbins
d. yarn breakages per kg
- 1.9 Twisting : a. speeds
b. traveller changing frequencies
c. weight and size of bobbins
d. breakages per Kg

2. Standards for waste.

- 2.1 Blowroom : a. haggins and ties
b. screen wastes
c. sweepings
d. fly
- 2.2 Carding : a. flat strips
b. droppings under screens
c. web and sliver waste
d. sweepings
e. fly

- 2.3 Combing : a. sliver and web waste
b. combing noils
c. lap waste
d. sweepings
e. fly
 - 2.4 Drawing : a. sliver and web waste
b. suction waste
c. sweeping
d. fly
 - 2.5 Speed frame : a. drawing sliver waste
b. speed frame sliver waste
c. suction waste
d. sweepings
e. fly
 - 2.6 Ring spinning: a. speed frame sliver waste
b. suction waste
c. yarn waste
d. overhead cleaner waste
e. sweepings
f. fly
 - 2.7 Winding : a. yarn waste
b. percentage of bad ring spinning bobbins
c. percentage of bobbins with rest yarn
d. sweepings
e. fly
 - 2.8 Doubling : a. cone waste
b. yarn waste
c. sweepings
d. fly
 - 2.9 Twisting : a. single yarn waste
b. twisted yarn waste
c. sweepings
d. fly
3. Performing of controls and tests.
- 3.1 Routine controls and tests
 - a. maintenance of all machine performance standard
 - b. maintenance of all waste standards
 - c. all machine stop equipment
 - d. cleanliness of machines
 - e. cleanliness of work places
 - f. temperature and relative humidity

3.2 Special controls and tests

- a. performing a second control by every "out of standard" result before reporting
- b. recontrolling after reporting to secure standard conditions
- c. additional controls and tests if required

3.3 Elaboration of testing programs and procedures.

- a. name and purpose of test
- b. frequencies
- c. number of tests to be performed
- d. equipment required
- e. procedure
- f. evaluation

4. Maintenance of statistical control charts.

- a. sliver breakages per Kg from carding through speed frame
- b. yarn breakages per 1000 sp. hr.
- c. waste control results

5. Reporting of "out of standard" conditions.

- a. every off-standard condition has to be reported. First to the direct responsible person who is responsible for the off-standard condition and to the head of section if the responsible person is not able to eliminate the off-standard condition
- b. from the testing forms monthly report has to be prepared which indicates the "out of standard" conditions and the analysis of testing results to detect trends towards out of control conditions to secure good results and indicate the settled and unsettled "out of standard" conditions.

6. Required personnel

activity	Persons		Total
	fine sp.	coarse sp.	
supervisor	1		1
statistician	1		1
control of machine performances			
sliver breakage control	1	1	2
end down control ring spinning	1	1	2
other controls	2	2	4
waste control			
recorder	1	1	2
collector	3	3	6
Total	2	8	10

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Mill Control Section

- Position : Mill Control Supervisor
- Qualification : Textile Technician, specification spinning
- Responsibilities : - Establishing standards for machine performances and wastes.
- Maintenance of standards through performance of tests and control at strategic points from blowroom till winding in order to detect any faulty conditions at the source and as soon as it arises.
- Maintenance of statistical control charts as an aid in detecting trends toward "out of standard" conditions before actual unsatisfactory product makes its appearance.
- Reporting every "out of standard" conditions and control of their elimination.
- Reporting of settled and unsettled "out of control" conditions per month.
- Leading and control of the personnel of his section.
- Duties : 1. Elaboration of machine performance and waste standards from blowroom through winding.
2. Performing of controls and tests to maintain the standards.
- a. routine controls and tests
- b. special controls and tests
3. Reporting "out of standard" conditions and control of their elimination to allow to the top management to manage the mill by exceptions.
4. Maintenance of statistical control charts such as machine performances, sliver and yarn breakages and wastes.

5. Control of personnel

- a. leading of personnel
- b. discipline and motivation of personnel
- c. total number of personnel
- d. absenteeism and fluctuation
- e. training of personnel
- f. work and workload of personnel
- g. annual and other leaves of personnel

6. General Activities

- a. scheduled meetings with the technical officer
- b. scheduled meetings with the maintenance and production sections
- c. control of timely termination and distribution of reports
- d. monthly meetings within his subsection

Mill Control Section

- Position : Statistician
- Qualification : Textile Technician with statistical work experience
- Responsibilities : - Internal reporting of datas concerning machine performances and wastes and new products
- Preparation and distribution of "out of standard" reports
- Accuracy of the datas of reports
- Timely delivery of reports
- Duties : 1. Internal Reporting
- a. standard of machine performances and their modification
 - b. preparation of waste report
 - c. preparation of report by every new product and new controls and tests
2. "Out of standard" Report
- a. preparation of "out of standard" reports together with the control person
 - b. distribution of "out of standard" reports
 - c. control of the elimination of "out of standard" conditions
 - d. preparation of monthly report about settled and unsettled "out of standard" conditions
3. Accuracy of the datas
- a. recalculation of datas and results and consultation with the supervisor by deviations
 - b. maintenance of statistical control charts such as sliver breakages per Kg and yarn breakages per 1000 spindle hours

4. General Activities

- a. participation of all meetings of the Mill Control subsection and preparing minutes of the meetings
- b. preparation of exceptional reports if required
- c. assisting the supervisor by project preparations such as scheduling of activities and timely completion of the projects
- d. representing the supervisor in his absence

Mill Control Section

- Position : Controller of ring spinning end-downs per 1000 sp. hr.
- Qualification : Ring spinning operator with experience
- Responsibilities: Assistance to secure and maintain justified workload of operators and standard performances of machines.
- Duties : 1. Control of ring spinning machine performances per work places.
- a. control of machine performances per work places
 - b. calculation of end-downs per 1000 spindle hour
 - c. after termination of control consultation with the statistician and supervisor
 - d. presentation of "out of standard" results to the statistician

Position : Controller of sliver breakages per Kg in spinning preparation.

Qualification : Spinning preparation operator with experience

Responsibility : Assistance to secure and maintain justified workload of operators and standard performances of machines from carding through speed frames.

Duties : 1. Control of spinning preparation machines performances per work place.

- a. control of machine performances per work place
- b. calculation of sliver breakages per Kg
- c. after termination of control consultation with the statistician and supervisor
- d. presentation of "out of standard" results to the statistician

- Position : Controller of machine performances
- Qualification : Operator with all round spinning experience
- Responsibility : Assistance to secure and maintain standard machine performances and production from blowroom through winding.
- Duties : 1. Control of machine performances.
- a. speeds
 - b. settings
 - c. machine stop equipment
 - d. percentage of idle spindles
 - e. percentage of faulty bobbins
 - f. sizes and functions of guides and condensers
2. Miscellaneous
- a. weight and sizes of intermediary product such as sliver in cans, weight of bobbins, cops and cones
 - b. ring traveller changing frequencies
 - c. yarn tension

Required 2 persons per spinning

Position : Waste recorder clerk

Qualification :

Responsibility : Assistance to secure and maintain the waste standards in the entire spinning mill and optimise the yield of raw material.

Duties : 1. Registration of wastes of the different production stages according to the kind of waste.

2. Calculation of total waste per month per production stage and kind of waste.

3. Calculation of percentage of different wastes.

4. Comparison of actual percentages with standards.

5. Reporting of results to the supervisor and statistician.

6. Initiation of "out of standard" reports by deviations.

7. Controlling the work of the waste collectors.

Position : Waste collector

Qualification :

Responsibility : Scheduled collection of the wastes per production stage.

Duties : 1. Scheduled collection of the different wastes per production stage.
2. To weigh the different wastes and deposit it.
3. Assisting the recorder clerk to register the wastes.

Required 1 person per shift per spinning

2. Khartoum North Spinning Mill

Khartoum North Spinning Mill is a relatively new mill and produces fine combed yarn for export.

This mill is the best operating mill with single minded and energetic management.

As the organisation missed the mill control subsection the author modified it as follows:

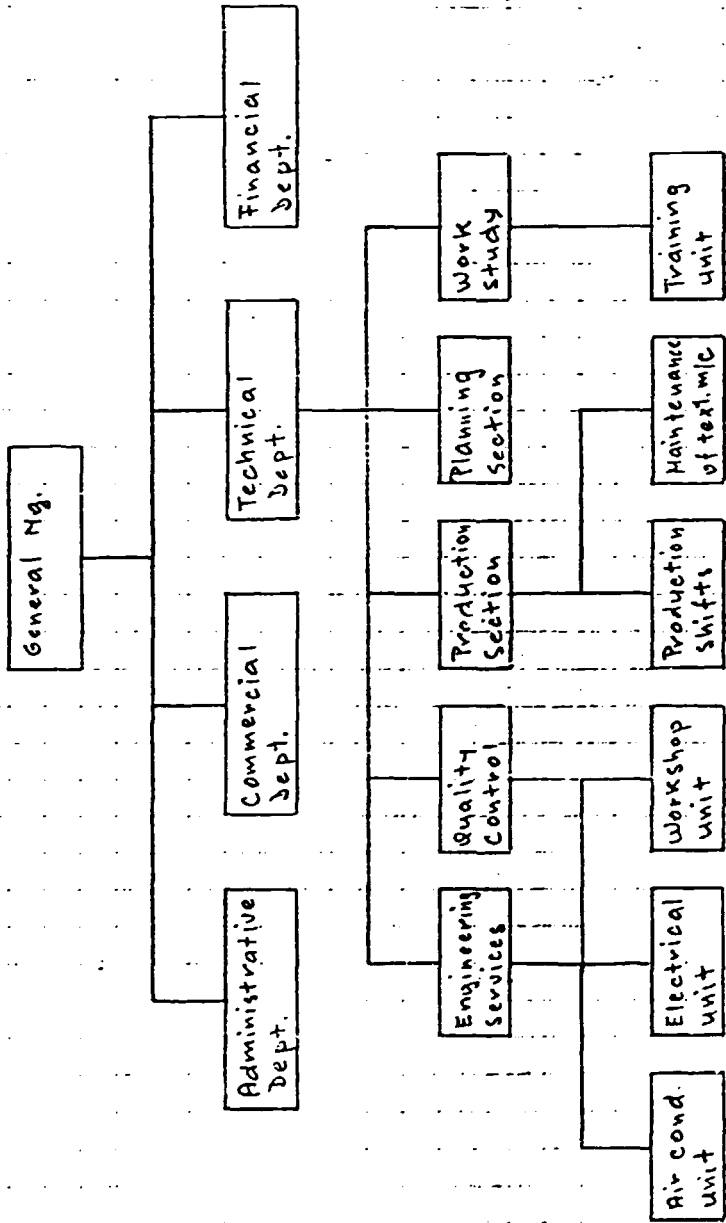
The Technical Department under the leadership of the Technical manager consists of 3 sections, namely:

- Production section under the leadership of the production manager.
This section consists of 2 subsections: production planning and control and production of the shifts.
- Technical Office section under the leadership of the technical officer.
This section consists of 3 subsections: quality control, mill control and training unit.
- Plant Engineering section under the leadership of the plant engineer.
This section consists of 3 subsections: maintenance unit, work shop and electrical unit.

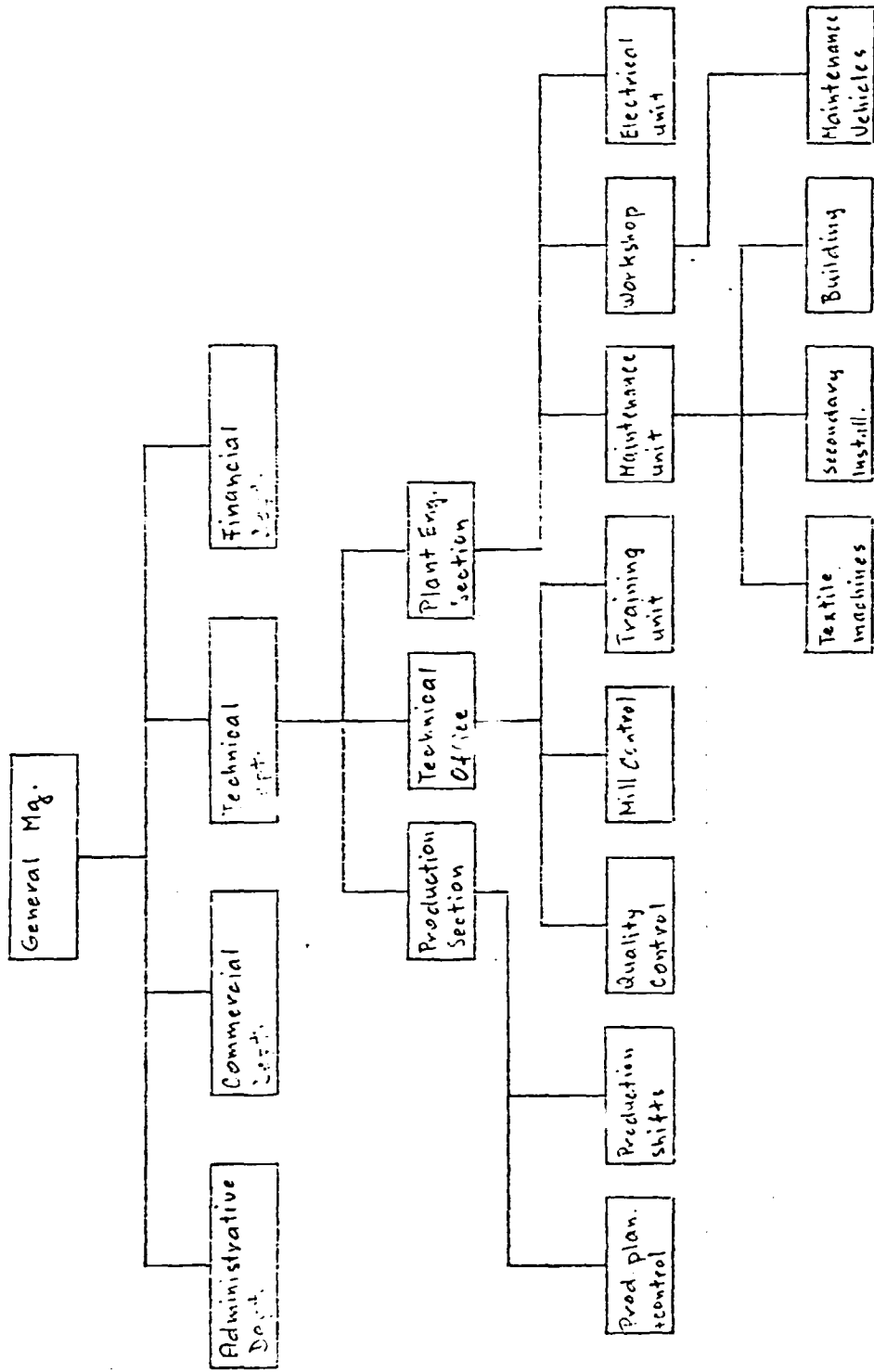
The actual and proposed organisation charts are as follows:

Note: The functions and activities of the Mill Control is exactly the same at Jag Abdallah Spinning Mill. The personnel is the same as indicated in the fine spinning section at Jag Abdallah.

ACTUAL ORGANISATION CHART OF KHARTOUM NORTH SPINNING - TECHNICAL DEPT.



PROPOSED ORGANISATION CHART OF KHARTOUM NORTH SPINNING - TECHNICAL DEPT.



3. Weaving Mills

As the weaving mills are relatively small units - each equipped with 256 weaving looms - the consultant modified the organisation as follows:

- elimination of the complete production section.

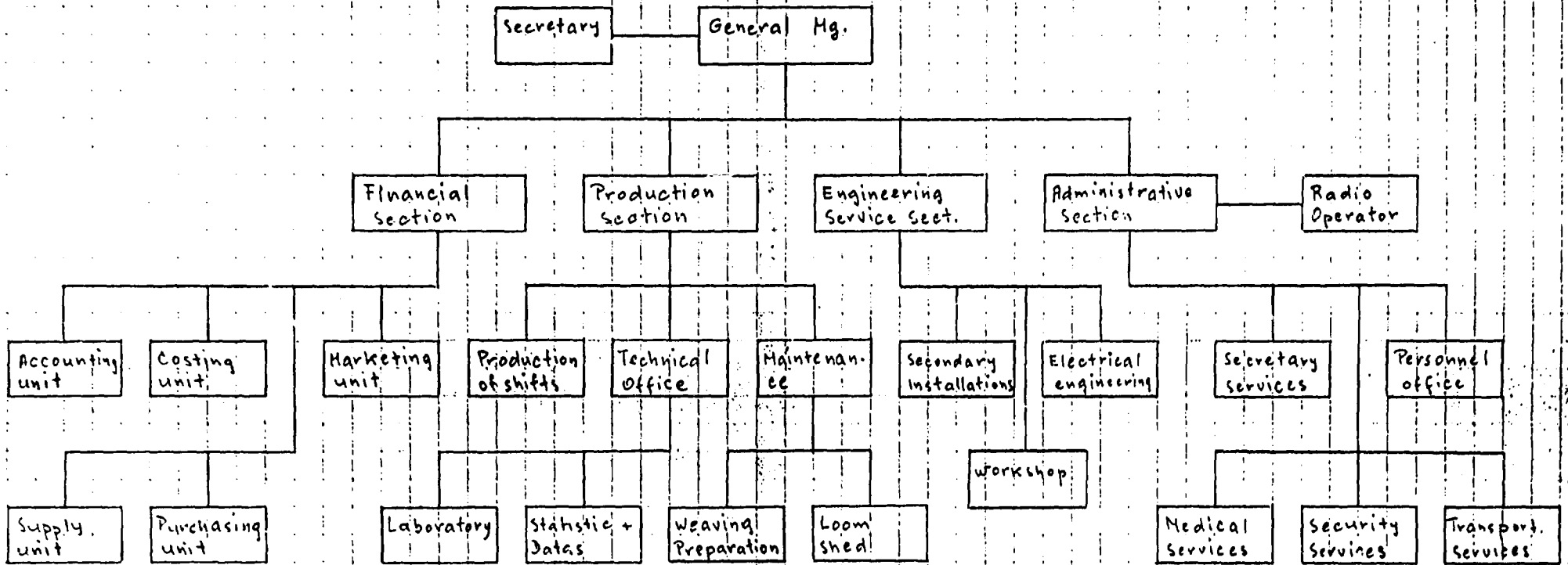
For the planning and follow-up of production the weaving experts of the Technical Department of the General Spinning and Weaving Company will be responsible and for the actual (day-by-day) production the General Manager will be responsible. The General Managers of the 5 weaving mills have technical rather than economical or marketing experience.

- establishing Mill Control section under the leadership of the Mill Control supervisor.

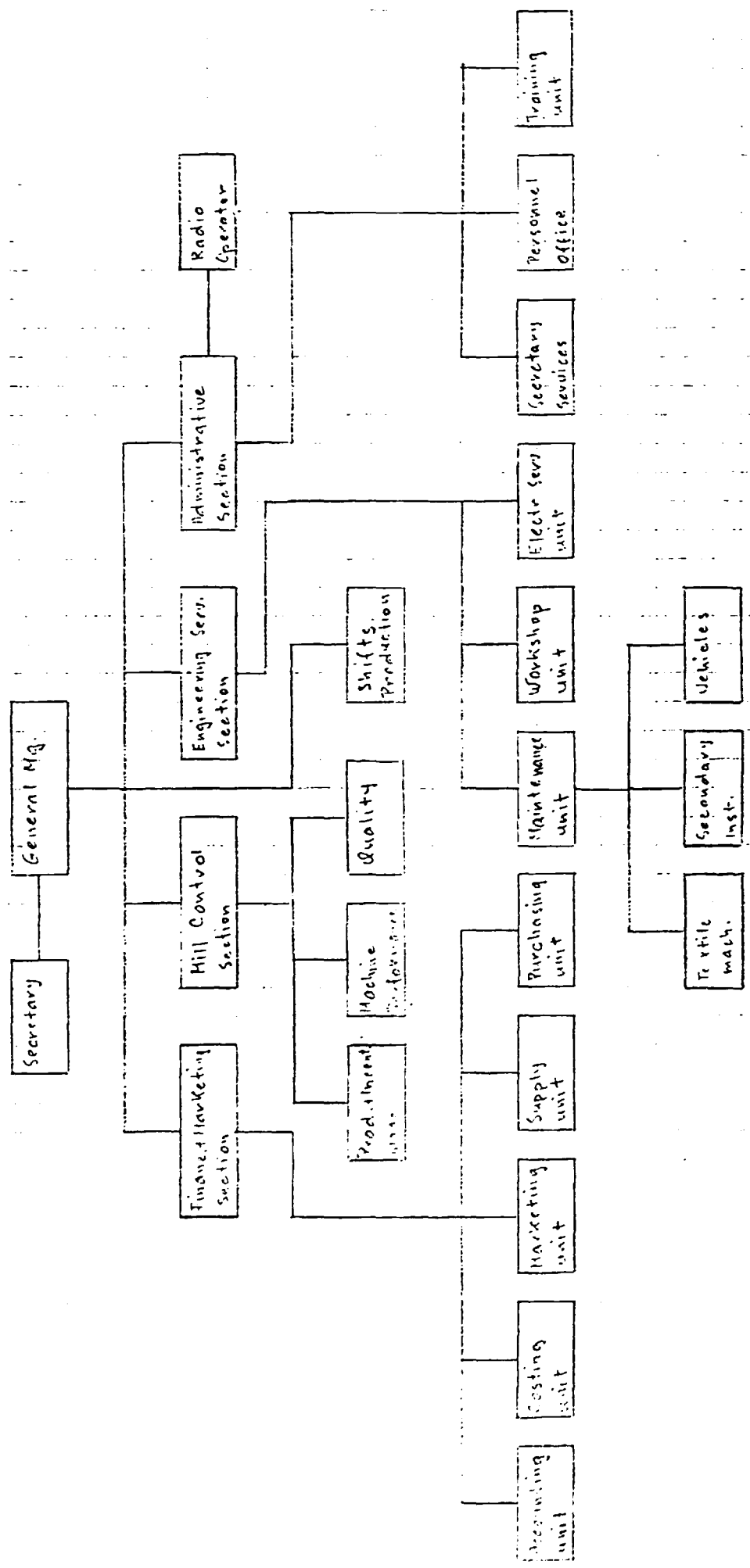
This section consists of 3 subsections, namely: quality control, machine performance control and production recording and Incentive Wage calculation.

The actual and proposed organisation charts and job descriptions are as follows:

ACTUAL ORGANISATION CHART OF WEAVING MILLS



PROPOSED ORGANISATION CHART OF WEAVING MILLS



Mill Control Subsection - Weaving Mills

This will be a new section under the leadership of the General Manager with the aim to secure and maintain optimum machine performances based on management by exceptions, reporting only the "out of standard" conditions.

Function and activities:

- Establishment of standards for production, quality machine performances and wastes.
- Maintenance of standard through performance of tests and controls at strategic points, from pirn winding to inspection in order to detect any faulty conditions at the source and as soon as it arises.
- Maintenance of statistical control charts as an aid in detecting trends toward "out of control" conditions before actual unsatisfactory product makes its appearance.
- Reporting every "out of standard" conditions and control of their elimination.
Monthly reports of settled and unsettled "out of standard" conditions, production, loom stops and quality.
- Calculation and control of incentive wage system.

1. Elaboration of standards for machine performances.

- 1.1 Pirn winder : a. speed
b. weight and size of full bobbin
c. tension of yarn
d. yarn breakages per Kg
e. counter
f. production
- 1.2 warper : a. speed
b. weight and size of beam
c. tension of yarn
d. condition of creel
e. tail of cones

- f. crossed ends
 - g. counter
 - h. yarn breakages per 10 mio meters
 - i. production
- 1.3 Sizing machine : a. speed
 b. unsized yarn tension
 c. yarn breakages per 10 mio metres
 d. size mix, cooking time
 e. crossed ends
 f. missing ends
 g. humidity measuring equipment of yarn
 h. weight and size of beam
 i. counter
 j. production
- 1.4 Looms : a. speed
 b. function of weft fork
 c. function of feeler
 d. function of pirn changing mechanism
 e. reserve yarn on weft bobbins
 f. tension of warp yarn
 g. loom stops per 10.000 picks
 h. settings
 i. pick counter
 j. production
- 1.5 Folding machine : a. laying length
 b. counter
 c. production
2. Elaboration of standards for wastes.
- 2.1 Pirn winder : a. yarn rests on cones
 b. yarn waste by knotting
- 2.2 Warper : a. yarn rests on cones
 b. yarn waste by knotting
 c. yarn on unfinished warper beam
- 2.3 Sizing machine : a. yarn on warper beam
 b. yarn on unfinished sized beam
- 2.4 Looms : a. yarn on weft bobbins
 b. bad weft bobbins
 c. tying-in waste
 d. drawing-in waste
 e. warp run out
 f. start up waste
 g. sweepings
- 2.5 Inspection : a. rags
 b. short pieces

3. Performing of controls and tests.

3.1 Routine controls and tests

- a. maintenance of production
- b. maintenance of all machine performance standards
- c. maintenance of all waste standards
- d. all machine stop equipment
- e. cleanliness of machines
- f. cleanliness of work places
- g. temperature and relative humidity
- h. maintenance of quality

3.2 Special controls and tests

- a. performing second control by every "out of standard" result before reporting
- b. recontrolling after reporting to secure standard conditions
- c. additional controls and tests if required

3.3 Elaboration of testing programs and procedures

- a. name and purpose of test
- b. frequencies
- c. number of tests to be performed
- d. equipment required
- e. procedure
- f. evaluation

4. Control of quality

4.1 Supplied yarn

- a. count, elongation and strength
- b. actual humidity and calculation of quantity with 85% humidity

4.2 Grey cloth

- a. construction
- b. selvedge
- c. width
- d. cloth quality on looms

5. Maintenance of statistical charts

- a. production
- b. yarn breakages per Kg and 10 mio yards
- c. loom stops per 10.000 picks or hour
- d. waste control results
- e. incentive wage system

6. Reporting of "out of standard" conditions

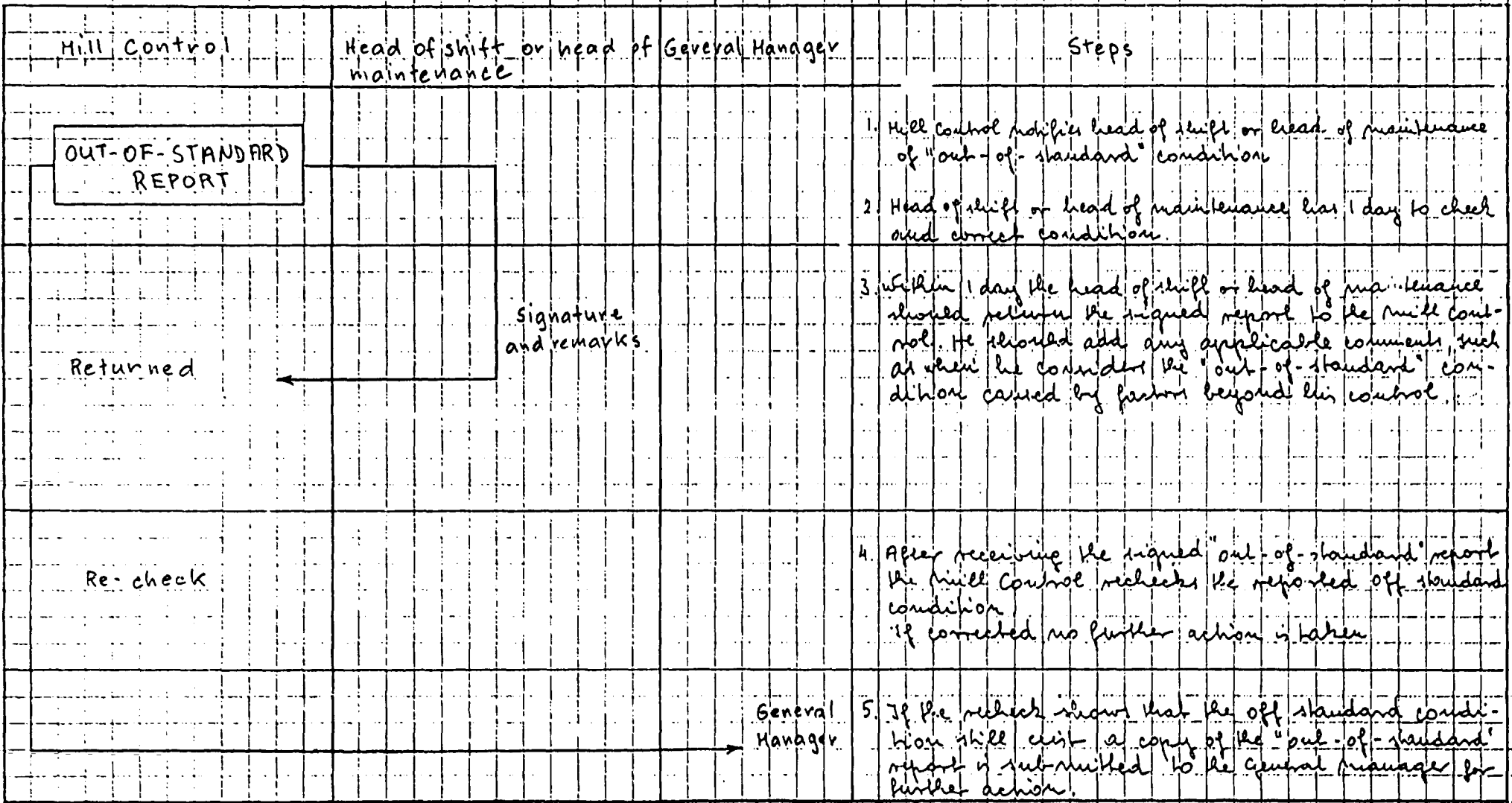
- a. Every "out of standard" condition has to be reported. First to the direct responsible person who is responsible for the off standard condition and then to the head of the section if the responsible person is not able to eliminate the "out of standard" condition.
- b. From the testing forms monthly report has to be prepared which indicate the settled and unsettled "out of standard" conditions and the analysis of testing results to detect trends toward "out of standard" conditions to secure good product.

7. Required personnel

Activity	shift		Total
	1st.	2nd.	
supervisor	1		1
statistician	1		1
control of machine performances			
loom stops per 10.000 picks or hr.	1		1
other controls	1		1
Production and incentive wage	3		3
waste control			
recorder	1		1
collector	1	1	2
laboratory	2		2
Total	11		12

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FLOW CHART FOR "OUT-OF-STANDARD" REPORT WEAVING



Weaving Mills - Mill Control Section

Position : Mill Control supervisor

Qualification : Textile Technician, specification weaving

Responsibilities :

- Establishing standards for production, quality, machine performances and wastes.
- Maintenance of standards through performance of tests and controls at strategic points from pirn winding through grey cloth inspection in order to detect any faulty conditions at the source and as soon as it arises.
- Maintenance of statistical control charts as an aid in detecting trends toward "out of standard" conditions before actual unsatisfactory product makes its appearance.
- Reporting of production, loom stops, quality, settled and unsettled "out of standard" conditions.
- Reporting every "out of standard condition and control of their elimination.
- calculation and control of incentive wage system.
- Leading and control of the personnel of his section.

Duties :

1. Elaboration of standards for production, machine performances, quality and wastes from pirn winding through grey cloth inspection.
2. Performing of controls and tests to maintain the standards from pirn winding through inspection. Elaborating testing programs for:
 - a. routine tests and controls
 - b. special tests and controls
3. Reporting of "out of standard" conditions and control of their elimination to allow to the top management to manage the mill by exceptions.

4. Maintenance of statistical control charts such as production, machine performances and loom stops records.
5. Control of personnel.
 - a. leading of the personnel
 - b. discipline and motivation of personnel
 - c. total number of personnel
 - d. absenteeism and fluctuation
 - e. training of personnel
 - f. work and workload of personnel
 - g. annual and other leaves of personnel
6. Control of incentive wage system and calculation of bonuses.
7. General activities
 - a. scheduled meetings with the General Manager and weaving expert of the Technical Department of GSWC, Khartoum.
 - b. scheduled meetings with the other heads of sections
 - c. timely termination of reports
 - d. monthly meetings within his section

Weaving Mills - Mill Control Section

Position : Statistician

Qualification : Textile technician with statistical work experience

Responsibilities : - Internal reporting of datas concerning production, quality, machine performances, wastes and "out of standard".

- External reporting mainly to the Technical Department of GSWC, Khartoum.
- Accuracy of datas of the reports.
- Timely delivery of reports.

Duties : 1. Internal reporting

- a. preparation of daily production report
- b. preparation of "out of standard" reports
- c. preparation of loom stops record
- d. after finishing the reports, consultation with the supervisor
- e. distribution of the reports

2. External reporting

- a. preparation of monthly reports such as Production and Productivity report (Form W-01), Weaving loom stops record (Form W-02) and Weaving Sales and Consumption report (Form W-03) and Waste report
- b. control of accuracy of datas
- c. after finishing the reports, consultation with the supervisor
- d. timely delivery of reports
- e. organisation of way of delivery of the reports

3. General activities

- a. participation of all meetings of the Mill Control section and preparing minutes of the meetings

- b. preparation of exceptional reports if required
- c. scheduled termination and delivery of reports
- d. assisting the supervisor by project preparations such as scheduling of activities and timely completion of the projects
- e. representing the supervisor in his absence

Weaving Mills - Mill Control Section - Machine performances

Position : Controller of loom stops per 10.000 picks

Qualification : Loom operator with experience

Responsibilities: - Assistance to secure and maintain justified workload of the operators and efficiency of the looms.

- Duties : 1. Control of loom performances per work place.
- a. control of loom performances and loom stops per work place
 - b. calculation of loom stops per 10.000 picks
 - c. after termination of controls, consultation with the Mill Control supervisor and statistician
 - d. presentation of "out of standard" results to the supervisor and statistician
2. Control of the function of looms
- a. speed
 - b. function of weft fork
 - c. function of feeler
 - d. reserve yarn of weft bobbins
 - e. function of pirn changing mechanism
 - f. tension of warp yarn
 - g. settings
 - h. pick counters
3. Control of folding machine
- a. laying length
 - b. counter

Weaving Mills - Mill Control Section - Machine performances

- Position : Controller of weaving preparation
- Qualification : Weaving preparation operator with experience
- Responsibilities: - Assistance to secure and maintain justified workload of operators and efficiency of the machines in the weaving preparation.
- Duties : 1. Control of performances of the machines in the weaving preparation (pirn winders, warper, sizer).
- a. control of stop equipment
 - b. machine speed
 - c. tension of yarn
 - d. yarn breakages per Kg or 10 mio. yards
 - e. weights and sizes of intermediary products
 - f. quality of intermediary products

Weaving Mills - Mill Control Section - Production registration
and Incentive Wages

Position : Clerk for production registration and calculation
of Incentive Wage Bonuses

Qualification :

Responsibilities : - Registration of production
- Calculation of incentive wage bonuses of the
personnel

Duties : 1. Registration of production

- a. daily registration of counter readings and
calculation of production at every production
stage
- b. registration of loom stops per 10 days
- c. reporting the datas to the statistician

2. Calculation of incentive wage bonuses

- a. registration of counter readings per work
place and operator
- b. calculation of bonuses 3 times per month
and monthly
- c. registration of bonuses per person
- d. presentation of bonuses to the supervisor
and financial section

Required 3 persons

Weaving Mills - Mill Control section - Machine performances

Position : Waste recorder clerk

Qualification :

Responsibilities : Assistance to secure and maintain the waste standards in the entire weaving mill and optimise the yield of raw material.

Duties : 1. Registration of wastes of the different production stages according to the kind of wastes.
2. Calculation of total wastes per month per production stage and kind of waste.
3. Calculation of the percentage of different wastes.
4. Comparison of actual waste percentages with standards.
5. Reporting of results to the supervisor and statistician.
6. Initiation of "out of standard" reports by deviations.
7. Controlling the work of the waste collectors

Position : Waste collector

Qualification :

Responsibilities : Scheduled collection of the different wastes per production stage.

Duties : 1. Scheduled collection of the wastes of the production stages according to the kind of waste.
2. To weigh the different wastes and deposit it.
3. Assisting the recorder clerk to register the wastes.

Required 1 person per shift

V. ASSISTANCE FOR HAG ABDALLAH
SPINNING MILL

As stated in paragraph II point C. because of the extreme low production of the coarse spinning section of Hag Abdallah Spinning Mill, the Managing Director of the General Spinning and Weaving Company asked the consultant to visit Hag Abdallah Spinning Mill and to assist the management to improve the situation.

The installed capacity of the coarse spinning section is 33.120 spindles and the fine spinning section is 36.000 spindles.

The operating capacity is illustrated in the next paragraph.

The coarse spinning section is utilising as raw material cotton Acala and the fine spinning section is supposed to utilise as raw material cotton Baracat.

As well known both cotton (Acala and Baracat) are contaminated with honeydew which can be processed only under 40% relative humidity. This low relative humidity cannot be achieved in the rainy season (from July until end of October) and so the entire mill stops the production process for 4 months since 1980. At the same time, Khartoum North Spinning Mill is working satisfactorily with raw material cotton Shambat, which allows a relative humidity till 52%. Hag Abdallah Spinning Mill can maintain this relative humidity in the rainy season too.

The Technical management of Hag Abdallah made test runs with cotton Shambat in 1987 and rejected to use it with the reason that it was not suited for the mill.

The consultant visited the mill together with the Technical Manager of the General Spinning and Weaving Company with the aim to perform a test run with cotton Shambat and to demonstrate that it is possible to operate the mill 12 months a year.

For the test the consultant took 20 bales of cotton Shambat from Khartoum to Hag Abdallah and with the help of the Technical Manager of GSWC, prepared the machines - which, prior to this test, were not operating for 6 months long.

The test run was successful and convinced the management of Hag Abdallah Spinning Mill that cotton Shambat is well suited for the mills.

After this test run the author worked out recommendations for Hag Abdallah Spinning Mill which are attached in ANNEX I.

VI. ELABORATION OF NEW SPINNING PLANS

1. Hag Abdallah Spinning Mill

By the visits to Hag Abdallah spinning Mill the consultant was confronted with a rather unusual method of spinning.

The fine spinning section was working with the spinning preparation subsection, but the ring spinning and winding subsections were laid down.

The coarse spinning section was working with the ring spinning and winding subsections and the spinning preparation subsection was laid down. Thus the fine spinning section processed the cotton through the speed frames, then workers transported the speed frame bobbins to the coarse spinning section (separate building) and there processed it from ring spinning through winding.

The technical management succeeded to fulfill a "miracle", namely to convert 2 separate spinning sections into one spinning section. With this unusual spinning method, the already limited capacity (due to lack of spare parts) was further reduced to less than half. The reason for this method was, according to the technical manager of Hag Abdallah spinning Mill (he is no longer employed by the company) - the uselessness of the carding machines in the coarse mill.

Of course the carding machines are not so bad as the technical manager asserted, because the consultant, some weeks before, performed the test run with cotton Shambat on these machines without major problems. The author worked out instructions under the title "Fundamentals of card maintenance" - which is attached in ANNEX II, and assured the management that after the maintenance of the cards they can get minimum 20 cards in operating conditions.

Based on these 20 cards the consultant elaborated the capacity utilisation and worked out a new spinn plan which is as follows:

Proposed Capacity Utilisation of Hag Abdallah Spinning Mill

Coarse spinning: Nm 27 = Ne 16

- carding : 3 lines with a minimum of 20 cards in 3 shift operation.
- Drawing 1st : 4 drawing frames in 3 shift operation.
- Drawing 2nd : 4 drawing frames in 3 shift operation.
- Speed frames : 6 speed frames in 2 shift operation.
- Ring Spinning : 53 ring spinning frames in 2 shift operation.
- Winding : 8 winders in 2 shift operation (22+4 persons/shift)

Fine spinning : Nm 67.8 = Ne 40

- carding : 2 lines with a minimum of 11 cards in 3 shift operation.
- combing:
- Pre-drawing : 3 drawing frames in 2 shift operation.
- Silver lap : 2 machines in 2 shift operation.
- Combers : 9 combers in 2 shift operation.
- Drawing 1st : 3 drawing frames in 2 shift operation.
- Drawing 2nd : 3 drawing frames in 2 shift operation.
- Speed frames : 5 speed frames in 2 shift operation.
- Ring spinning : 60 ring spinning frames in 2 shift operation.
- Autoconer : 6 autoconers in 2 shift operation. (6+4 persons/shift)

Production per month:

- Coarse spinning : $\frac{20.33 \times 480 \times 53 \times 15 \times 23.5}{1000}$ = 182.311Kg
- Fine spinning : $\frac{6.26 \times 480 \times 60 \times 15 \times 23.5}{1000}$ = 63.551Kg

SPINN PLAN FOR HAG ABDALLA COARSE SPINNING.

26.12.89

Machine	Nm	Doubl.	Draft	Twist / Twist/m	Spindle r.p.m.	Delivery m/min	Theo prod. per unit g/spn-Kg/h	Efficiency %	Real prod. per unit g/spn-Kg/h	waste %	Required production Kg/h	Required units	Required mach.	Required shifts and machines
Winding	17					550	1.22 2.22	70	855.56	0.2	340.09	398	5	2x8
Ring spinning	17	-	22.5	16.62 655	7400	11.30	25.1	81	20.33	3-	340.77	16.762	35	1x53
Speed frame	1.2	-	6	1.11 44	1100	23.5	1175.7	75	221.25	1.-	351.31	399	4	2x6
Drawing 2nd.	0.20	8	8	-		250	75.-	70	52.5	0.6	354.86	7	4	3x4
Drawing 1st.	0.10	8	8	-		250	75.-	70	52.5	0.6	357.-	7	4	3x4
Carding	0.20		80	-		70	21.-	85	17.25	5.-	359.15	20	20	3x20
Blowroom									600.-	5.-	378.05	1	1	3x1
Required cotton											397.95			

Production per month : $\frac{20.33 \times 480 \times 53 \times 15 \times 23.5}{1000} = 182.311 \text{ Kg}$

SPINN PLAN FOR HAG ABDALLA FINE SPINNING

27.12.89

Machine	Nm	Doubl.	Draft	Twist/" Twist/m	Spindle r.p.m.	Delivery m/min	Theo. prod. per unit g/sp.h.-kg/h	Efficiency %	Real prod. per unit g/sp.h.-kg/h	Waste %	Required prod. kg/h	Required units	Required mach.	Required shifts and machines
Winding	67.8					900	796.46	75	597.35	0.2	118.56	198.5	4	2x6
Ring spinning	67.8		28.25	^{24.11} 950	8000	242	745	84	626	3.-	118.80	12978	40	2x60
Speed frame	2.4		10.-	^{1.08} 42.5	1000	23.52	588.5	75	441.-	1.-	122.47	278	3	2x5
Drawing 2nd	0.24	2	8			250	62.50	70	43.75	0.6	123.71	3	2	2x3
Drawing 1st	0.24	2	8			250	62.50	70	43.75	0.6	124.46	3	2	2x3
Combing	0.24	2	8			210	28.23	85	24.-	16.-	125.20	6	6	2x9
Silver lap m/c	60g/m					75	266.67	75	200	1.4	149.06	1	1	2x4
Pre drawing	0.24	2	8			250	62.50	70	43.75	0.6	150.56	4	2	2x3
Carding	0.24					59.4	16.20	85	13.77	5.-	151.47	11	11	3x11
Blowroom									600.-	5.-	159.44	1	1	3x1
Required cotton :											167.83			

Production per month : $6.26 \times 480 \times 60 \times 15 \times 23.5 = 63.551 \text{ kg}$ (2% idle spindles)
 $\frac{63.551 \text{ kg}}{1000} = 52.111 \text{ kg}$ (20% idle spindles)

Khartoum North Spinning Mill

By the visits of the consultant to Khartoum North Spinning Mill, the General Manager of this mill was complaining that the mill cannot utilise the full capacity of the ring spinning section, because of the unbalance between the drawing and speed frames. The installed drawing frames cannot supply the required production. This problem was caused by the machine supplier and a result of faulty capacity calculation.

To increase the capacity utilisation in the ring spinning section the consultant worked out a new spinn plan for Khartoum North Spinning Mill, this based on coarser counts on the cards and on drawing frames which automatically gives increased production and better quality.

The new spinn plan is as follows:

SPIN PLAN - KHARTOUM NORTH SPINNING FACTORY

26.7.89.

Machine	Nm	Doubl.	Draft	Twist/" Twist/m	Spindle rpm.	Delivery m/min.	Theo. prod Per unit g/sp.h./Kg/h	Eff. %	Real prod per unit g/sp.h. Kg/h.	Waste %	Required production Kg/h.	Required units	Requ. mach.
Winding	50.85	-	-	-		520	613.57	70	429.50	0.1	245.24	571	6
Ring spinning	50.85	-	23.11	21.37 245	8700	10.33	12.19	91.6	10.31	3	245.98	238.58	57
Spinning frame	50.85	-	10	1.08 12.5	1000	23.53	611.43	75	451.30	1	253.59	527	6
Drawing 2nd p.	0.22	8	8	-	-	225	61.36	70	42.95	0.6	256.15	5.96	3
Drawing 1st p.	0.22	8	8	-	-	225	61.36	70	42.95	0.6	257.70	6	3
Combing	0.22	8				88	24.00	90	21.60	15+1	259.35	12	12
Woolen lap	65.8 g/m	6	6			60	236.88	75	177.66	1	308.63	1.44	2
Woolen lap	65.8 g/m	22	1.52			60	236.88	75	177.66	0.5	311.74	1.75	2
Card	0.22	-	100			59.4	16.20	90	14.58	5	313.31	21.5	22
Scutcher							200.00	90	180.00	5	329.80	1.83	2
Required cotton											347.16		

VII. ELABORATION OF OPTIMUM
CAPACITY UTILISATION
OF THE WEAVING MILLS

The production of the 5 weaving mills in the fiscal year 88/89 was very low - 7.159.368 yards, which correspond to an average efficiency of 31.5%.

According to the weaving mills the low production was caused by the lack of spare parts.

The author worked out a questionnaire about the actual operating capacity of the mills and distributed between the mills. The weaving mills completed it and delivered it to the consultant. According to the reported data, the consultant elaborated the possible production with a relative low machine efficiency for each factory. According to this calculation the weaving mills could produce 18.892.224 yards in 88/89 instead of 7.159.369 yards, what they produced.

The cause of the low production of the weaving mills were:

- insufficient yarn supply from Hag Abdallah spinning Mill
- ineffective organisation (missing the mill control)
- lack of spare parts
- insufficient control and aid from the General spinning and Weaving Company.

The proposed capacity utilisation and planned production of the weaving mills are as follows:

PROPOSED CAPACITY UTILISATION AND PLANNED PRODUCTION
OF THE WEAVING MILLS

Mill	Shift and looms	Planned Prod. in yd./month	Planned Prod. in yd per year	Required yarn in kg per year
Nyala	2 x 241	424.762	5.097.144	583.113
Kadugli	2 x 153	269.662	3.235.944	370.192
Shandi	1 x 186	164.353	1.972.236	225.624
Kosti	2 x 234	442.425	4.949.100	566.177
El Dueim	2 x 172	303.150	3.637.800	416.164
Total		1.574.352	18.892.224	2.161.270

Remarks:- Pirn winding in every mill has to operate in 3 shifts.

- calculations were based on the following efficiencies:
 - pirn winding : 65%
 - warping : 45%
 - sizing : 50%
 - loom shed : 70%
- The planned production (monthly and yearly) based on actual capacity of the mills reported in October 1989 and achievable if the average loom shed efficiency reaches the moderate 70%.
- The calculation of production is made with an average of 23.5 dyas per month and 7.5 hours per shift.

VIII. ELABORATION OF NEW REPORTING SYSTEM

Modern mill management requires sound reporting system for the effective control of the various phases of productive and administrative activity that leads to profitable overall results.

The multitude of management and control activities carried on in an up-to-date mill organisation may be reduced to a basic principle:

Sound mill
Management = Careful Planning + Effective Control

Planning involves the determination by management of what is to be achieved and how it is to be achieved, while control refers to the checking, recording and comparing of actual with planned accomplishments. The aim of control is to gather data helpful in improving planning, actual achievements and in the end profits.

Most of the records between the mills and the GWC are based on faulty datas and imaginations.

The weaving mills are reporting 2 production calculations: designed production and planned production and both based on installed capacity and 82% average efficiency of the looms.

The consultant calculates only the planned production but instead of 256 installed looms, he is using only the number of looms in operating conditions and utilising 70% loom efficiency instead of 82%. Due to lack of spare parts for the past several years, not only the installed capacity was reduced, but the looms in operating conditions could not operate with 82% efficiency because some important mechanisms are not functioning such as pirn changing, weft

feelers etc.

There are 2 efficiencies of mill calculations, namely the ratio between actual and designed production and between actual and planned production. The main differences between the designed, planned as calculated before and the consultant's planned calculation is shown for Kadugli Weaving Mill.

The datas of this mill were in May 89 as follows:

Installed capacity = 256 looms
 Looms in operating conditions = 153
 Actual production = 99.000 yards
 Operating shifts = 2

Items	designed	planned	consultant's planned
looms in operation	256	256	153
theoretical production yd./loom hour	7.14	7.14	7.14
looms average efficiency	82	82	70
hours per shift	8	7.5	7.5
operating shifts	3	2	2
days per month	25	23	23
production per month in yards	399.297	517.096	263.819
Ratio between actual and calculated in %	11.01	19.15	37.53

As this example shows the mills were confronted month-by-month with these extreme high calculated designed and planned production figures, which they could not reach.

Instead of motivating them, on the contrary, demoralised the management of the mills.

New in the reports are the different "Indexes" where the ratio between actual achievement and planned indicated in figures (from 0.00 to 1.00) instead of percentage. Figure 1.00 means, actual equal to planned.

The indexes are: Index Capacity Utilisation (I.C.U.), Index Production (I.P.) and Index Productivity .

The multiplication of the Indexes Production and Productivity gives the Index Mill (I.M.) which allows the classification and comparison of the mills.

The different reports are as follows:

Weaving Mills monthly reports

- | | |
|---------------------------------------|-------------------|
| 1. Production and Productivity Report | <u>terminated</u> |
| 2. Sales and consumption report | <u>terminated</u> |
| 3. Loom stops record | <u>terminated</u> |

Spinning Mills monthly reports

- | | |
|---------------------------------------|-------------------|
| 1. Production and Productivity Report | <u>terminated</u> |
| 2. Quality report | <u>terminated</u> |
| 3. Ring Spinning stops record | <u>terminated</u> |
| 4. Sales and consumption record | <u>terminated</u> |

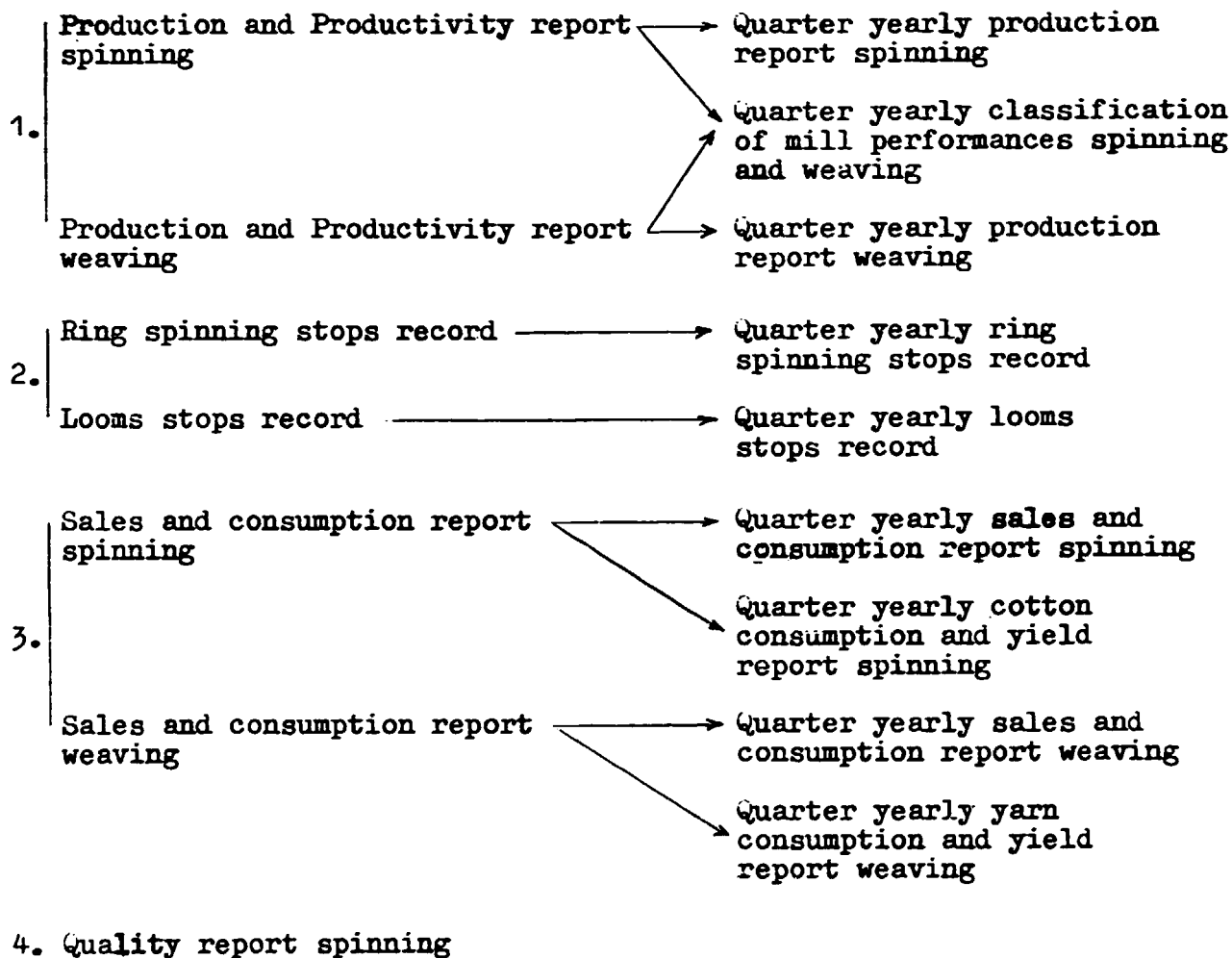
General Spinning and Weaving Corporation(GSWC) Reports

1. Monthly and quarter yearly classification and comparison of mill performances. (spinning and weaving)
2. Monthly and quarter yearly Production Report Weaving.
3. Yarn consumption and yield report weaving.
4. Monthly and quarter yearly sales and consumption report weaving.
5. Monthly and quarter yearly sales and auxiliaries consumption report spinning.
6. Monthly and quarter yearly cotton consumption and yield report spinning.
7. Monthly and quarter yearly ring spinning stops record.
8. Monthly and quarter yearly loom stops record.
9. Quarter yearly production report spinning.

Proposed Reporting System

Monthly reports from mills

Reports from GSWC
(monthly and quarter yearly)



...122/

...

Weaving Production and Productivity Report, Form: W-01

The reporting of Weaving mill performances will be on the form W-01 "WEAVING PRODUCTION AND PRODUCTIVITY REPORT".

The weaving mills have to complete this form every decade (three times per month) to allow the management a full control of the mill performances and to give them possibilities for immediate corrections if required.

At the end of each month a monthly average has to be calculated and one photocopy of this form has to be sent to the Technical Department of the General Spinning and Weaving Company, Khartoum.

Explanation of the form w-01

The form is a comparison between the actual and standard situation of Capacity Utilisation, Production and Productivity. The actual situation is the real achieved mill performances during the reported period.

The standard situation is calculated as follows:

- the mill is operating with the planned machinery at 70% efficiency. Standard production/hr/10.000 picks/256 looms = $\frac{180 \times 60 \times 256 \times 0.7}{10.000} = 193.54$

- the required personnel is calculated on the above mentioned mill production and based on the world wide experience of the UNIDO Consultant is similar to mills in Arabic, African, European and South American countries. The standards are only temporary, after establishing a good trained Time Study Department, new standards has to be elaborated. The standard personnel requirement is is given on form P-04 .

The personnel includes only for the production and loom performances necessary direct and indirect employees and as listed in the form.

Pos. 1. Operating looms

As we know every mill is working with a limited capacity due to lack of spare parts.

If the bottle neck of production is in the weaving preparation (limited pirn winding spindles, etc.) the mill has to calculate the possible supplied looms with the following efficiencies in the weaving preparation:-

pirn winding:	65%
warping:	45%
sizing:	50%

f.e. if operating only 40 pirn winding spindles, the calculated operating looms would be: 137 looms

If the bottle neck of production is the loom shed, the mill has to report the real operating (ready for operation) looms.

Pos. 2. INDEX C.U. (Capacity Utilisation)

The calculation of this index given on the form is as follows:

$$\frac{\text{operating looms} \times \text{shift per day}}{256 \text{ (installed looms)} \times 3 \text{ shift}}$$

Pos. 3. Planned hours

Planned hours means the real mill operating hours.

f.e. a mill operating in 2 shifts a day, each shift 7.5 hours and 25 days in the reported month.

$$\text{Planned hours} = 7.5 \times 2 \times 25 = 375 \text{ hours}$$

From these hours can only be subtracted power cuts and lack of raw materials when the whole mill operation is stopped for certain hours or days. Not sufficient yarn supply from the weaving preparation cannot be subtracted.

f.e. if the above mentioned mill stopped for 3 days because of repairing the generators or lack of electricity from the city, the planned hours will be:

$$375 - (7.5 \times 2 \times 3) = 330 \text{ hours}$$

and if the entire mill stopped additionally 2 days because of short supply of yarn from the spinning mills, the planned hours will be:

$$330 - (7.5 \times 2 \times 2) = 300 \text{ hours.}$$

Pos. 4. Actual Production (in 10.000 picks)

On the bottom part of the form the actual production per decade and month has to be registered. The actual production in yards and the yards have to be converted to picks in 10.000. On the top of each column the technical datas of the article has to be registered.

f.e. 42/42 Ne 16/6 (16.5/16.5 Nm 27/27)

The bottom part of the form consists of 3 columns, because for each article has to be registered separate. There are 3 columns for 3 different articles. In the total column the total yards and picks in 10.000 has to be registered per decade. The total picks/10.000 per decade has to be registered in Pos. 4.

Pos. 5. Standard Production (in 10.000 picks)

The standard production will be calculated only for the operating looms as follows: $193.54 \times \text{Pos. 2} \times \text{Pos. 3}$
 $193.54 = \text{standard production/hr/256 looms in 10.000 picks}$

Pos. 6 INDEX P (Production)

The calculation of this index given on the form is as

follows:
$$\frac{\text{Actual production}}{\text{Standard production}}$$

Pos. 7. Man hours worked

Here has to be registered all the real worked hours of personnel according to the jobs laid down in the form P-04. From weaving preparation until inspection and maintenance and electrical sections.

Pos. 8. Actual man minutes (per 10.000 picks)

The actual man minutes has to be divided by the actual production:

$$\frac{\text{Pos. 7.} \times 60}{\text{Pos. 4}}$$
Pos. 9. Standard man minutes (per 10.000 picks)

Standard man minutes are calculated according to the following:

$$\frac{\text{standard personnel (form P-04)} \times \text{working hrs per shift} \times 60 \text{ mins.}}{\text{standard production} \times 225 \text{ working hours}}$$

$$= \frac{218 \times 7.5 \times 60}{193.54 \times 22.5} = 22.53 \text{ mins/10.000 picks}$$

Pos. 10. INDEX PY (Productivity)

The productivity index is calculated as follows:

$$\frac{\text{standard man mins./10.000 picks}}{\text{actual man mins. per 10.000 picks}} = \frac{\text{Pos. 9}}{\text{Pos. 8}}$$

Explanation of the different indexesINDEX C.U. (Capacity Utilisation)

This index is the ratio between the operating machines and installed machines. To achieve the standard 1.00 all the installed machines have to operate. Of course it is impossible at this date due to lack of spare parts and auxiliaries, but every factory has the possibilities through organised preventive maintenance, let manufacturing some of the spare parts locally and utilising the optimum number of machines with the existing spare parts and machine parts

as near as possible to the standard.

INDEX P (Productivity)

This index is the ratio between the actual and standard production and both are based on the operating machines. The standard is 1.00 and if the factory is performing with the operating machines according to the standard production data, the standard index - 1.00 can be achieved.

INDEX PY (Productivity)

This index is the ratio between the standard and actual man minutes per unit. Unit is kg in the spinning factories and 10.000 picks in the weaving mills. The standard is based on the standard personnel - elaborated according to the world wide experience of the UNIDO Consultant - and the standard production as explained under INDEX P.

The standard INDEX PY is 1.00. Under 1.00 means the factory is not achieving the standard production or overstaffed (too many persons) or the result of both (not enough production and overstaffing). Generally the latter mentioned is the case at all the factories.

The copy has to reach the GSWC within the first 10 days of the following month.

GSWC UNIDO	WEAVING PRODUCTION AND PRODUCTIVITY REPORT				Mill Month/Year			W-01
	Pos.	Item	Unit	Calculation	1st decade 1-10	2nd decade 11-20	3rd decade 21-31	
1.	Operating looms	looms	from mill document					
2.	INDEX C.U.	-	$\frac{\text{Pos. 1} \times \text{shift} \times \text{day}}{256 \times 3}$					
3.	Planned hours	hours	from mill document					
4.	Actual Production	in 10.000 pks	from bottom table					
5.	Standard Production	in 10.000 pks	$193.5 \times \text{Pos. 2} \times \text{Pos. 3}$					
6.	INDEX P.	-	$\text{Pos. 4} / \text{Pos. 5}$					
7.	Man hrs. worked	hours	from mill document					
8.	Actual man mins.	min. per 10.000 pks	$\frac{\text{Pos. 7} \times 60}{\text{Pos. 4}}$					
9.	Standard man mins.	min. per 10.000 pks	22.53					
10.	INDEX PY.	-	$\frac{\text{Pos. 9}}{\text{Pos. 8}}$					

DECADE	MONTHLY PRODUCTION, YARN REQUIREMENT, YARN CONSUMPTION AND YIELD REPORT							
	Production yd.	picks in 10.000	required yarn kg	purchased yarn kg	stock at last mth. kg	stock at end of mth kg	yarn cons. kg	YIELD %
1st.								
2nd.								
3rd								
month								

GSWC		STANDARD PERSONNEL					Mill		Month/Year		P-04			
UNIDO							WEAVING MILLS		January 1990					
B E C	Name of Job	Number of personnel					S E C	Name of Job	Number of personnel					
		1st	2nd	3rd	Total	sec. Total			1st.	2nd.	3rd.	Total	sec. Total	
	Head of shift	1	1	1	3	3								
WEAVING PREPARATION	Technician	1	1	1	3									
	Rewinding operator	1	1	1	3									
	Firm winding oper.	3	3	3	9									
	cleaner rewinding	-	-	-	-									
	warp operator	2	2	-	4									
	beam carrier	1	1	1	3									
	cleaner	-	-	-	-									
	sizing operator	2	2	2	6									
	drawing-in oper.	3	-	-	3									
	sweeper prep.	1	1	1	3									
	mechanic prep.	1	1	1	3									
	mechanic winding	1	1	1	3									
oiler preparation	1	1	1	3										
	Total	17	14	12	43	43								
LOOM SHED	Technician	2	2	2	6									
	Operator	13	13	13	39									
	smasher	4+1	4+1	4+1	15									
	knotting	2	2	2	6									
	Battery filler	4	4	4	12									
	beam carrier	-	-	-	-									
	doffer.	1	1	1	3									
	cloth maker	-	-	-	-									
	beam changer	2	2	2	6									
	sweeper	2	2	2	6									
	mechanic	4	4	4	12									
	cleaner	-	-	-	-									
oiler	1	-	-	1										
	Total	36	35	35	106	106								
INSPECTION	Operator	3	3	3	9									
	cutting	2	2	2	6									
	laying mc.operator	0.5	0.5	0.5	1.5									
	bale press	0.5	0.5	0.5	1.5									
	sweeper	1	1	1	3									
	supervisor	1	1	1	3									
	Total	8	8	8	24	24								
	Sub total	62	58	56	176	176								
	15% reserve	9	9	9	27	27								
	maintenance	9	-	-	9	9								
	electrician	6	-	-	6	6								
	Grand total	86	67	65	218	218								

Weaving Loom Stops Record, Form: W-02

This form serves the registration of the loom stops detailed according to the kind of stops.

The weaving factories have to complete this form every decade (3 times per month) to allow the management a full control of the mill performances and to give them possibilities for immediate corrections if required.

At the end of each month the monthly total has to be calculated and 1 copy of this form has to be sent to the Technical Department of the General Spinning and Weaving Company, Khartoum. The Technical Department has to give one copy of this form to the Managing Director. The report has to reach the Technical Department within the first 10 days of the following month.

Explanation of the form W-04

Kind of stops:

- | | |
|-----------------------|---|
| Lack of weft bobbins: | the factory has the required raw material (Yarn supply from spinning factory), but because of some reasons the pirn winding cannot supply the required quantity to the loom shed, and loom or looms have to be stopped. |
| Lack of warp beams: | the factory has the required raw material, but because of some reasons the weaving preparation (warping, sizing, drawn-in, etc.) cannot supply the required quantity to the beam shed and loom or looms have to be stopped. |
| Lack of personnel: | because of lack of personnel in the loom shed (operator, battery filler, etc.) loom or looms have to be stopped. |

- Smashing:** because of smashed ends (more than 5 ends) the loom or looms have to be stopped. Up to 5 ends the operator has to repair it.
- Typin-on:** because the new warp beam has to be tied (knotted) on and loom has to be stopped.
- Beam changing:** because of new warp beam from drawn-in section (with accessories such as reed, harness, drop-wires, etc.) has to be put on and the loom stopped.
- Maintenance:** because of scheduled preventive maintenance loom or looms have to be stopped.
- Repair Mechanical:** because of mechanical problems, which require the work of the mechanical personnel, loom or looms have to be stopped.
- Repair electrical:** because of electrical problems, which require the work of the electrical personnel, loom or looms have to be stopped.
- Lack of raw material:** because of lack of raw material (yarn supply from spinning mill) the entire factory has to be stopped. Here the factory should not continue to operate the loom shed till the last loom is empty but should stop the entire factory if due to lack of raw material (yarn from spinning factory) machines in weaving preparation (pirn winder, warper, sizing machine etc.) has to be stopped. In this case, when new supply of raw material arrives, the weaving factory is able to begin continuous operation immediately with all the machines.
- Power cut:** because of damaged generator or lack of fuel, grease, oil etc., for the generators the entire loom shed or a section of the loom shed has to be stopped. Here the factories should register also the stopped looms, because of power cut in the weaving preparation no sufficient weft bobbins and warp beams, loom or looms have to be stopped.

In the form there are three columns empty, where the factories should report other kind of loom stops, which are not mentioned above.

The loom stops have to be registered for the full time of stops and not only if the knotter, beam changing group, mechanic and electrical personnel etc., working on the looms, it means with the waiting time too.

It has to be registered per decade and month the looms per kind of stops, the hours of stops, the loom hours and the percentage. Percentage means percentage from the total stops, thus the loom hours per kind of stop and has to be divided by the total stopped loom hours and multiplied by 100.

GWC UNIDO	WEAVING LOOM STOPS RECORD								Mill	Month-Year	W-02					
	1st Decade				2nd Decade				3rd Decade				Month			
Kind of stops	looms	hours	loom hrs	%	looms	hours	loom hrs	%	looms	hours	loom hrs.	%	looms	hours	loom hrs	%
Lack of weft bobbins																
Lack of warp beam																
Lack of personnel																
Smashing																
Tying-on																
Beam changing																
Prev. maintenance																
Repair mechanical																
Repair electrical																
Lack of raw material																
Power cut																
Total																

Weaving Sales and Consumption Record, Form W-03

This form serves the registration of monthly sales revenue and consumption.

The form W-03 has to be filled out for every month and one copy has to be sent to the Technical Department of the General Spinning and Weaving Company. The copy has to reach the Technical Department of GSWC within the first 10 days of the following month.

The upper part of this form, the monthly sales revenues have to be registered. Revenue from waste should be registered only if sales actually occurred.

The lower part of this form represents the monthly consumption of the weaving mills, mainly starch, petrol and yarn. The preparation of this form is self explanatory and easy to fill out.

GSWC	WEAVING SALES AND CONSUMPTION RECORD	Mill	Month-Year	W-03
UNIDO				

Item	Production	sales quantity	unit price	Sales revenue
Cloth yd.				
Waste kg. unsized yarn	 	 	 	
Waste kg. sized yarn	 	 	 	
Rags kg. cloth	 	 	 	
Total	 	 	 	

Item	Purchased	Stock at end of last month	Stock at end of actual month	Consump- tion
Starch kg.				
Petrol gl.				
Yarn ton				

Spinning Production and Productivity Report, Form: S-01

The reporting of spinning mill performances will be in the Form S-01 "SPINNING PRODUCTION AND PRODUCTIVITY REPORT". The spinning mills have to complete this form every decade (3 times per month) to allow the management a full control of the mill performances and to give them possibilities for immediate corrections if required. At the end of the month a monthly average has to be calculated and one copy of this form has to be sent to the Technical Department of The General Spinning and Weaving Company, Khartoum.

Explanation of the Form S-01

The form is a comparison of actual situation with a standard situation of Capacity Utilisation (C.U.), Production (P) and Productivity (PY).

Pos. 1. Spindles in operation

As we know every spinning mill is working with limited capacity due to lack of spare parts.

If the bottle neck of production is in the spinning preparation (carding, drawing, etc.) the mill has to calculate the possible supplied ring spinning machines.

If the bottle neck of production is the ring spinning section, the mill has to report the spindles in operating conditions.

Pos. 2. Index C.U. (Capacity Utilisation)

This index is the ratio between the spindles in operation and installed spindles.

Index CU= spindles in operation multiplied by shift per day and divided by Installed spindles multiplied by 3 shifts per day.

If the result is 1.00 the mill is operating with the installed spindles in 3 shifts. If the result is less than 1.00 the mill is operating with reduced spindles or with less than 3 shifts or the result of both.

Pos. 3. Planned operating hours

Planned operating hours means the real mill operating hours in the decade or in the month.

f.e. a mill is operating in 2 shifts per day, each shift 7.5 hours and 23 days a month, so the planned hours per month will be: Planned hours/month = $7.5 \times 2 \times 23 = 345$ hours.

From these hours only power cut and lack of raw material can be subtracted, when the entire mill operation is stopped for certain hours or days. Not sufficient sliver supply from the spinning preparation cannot be subtracted.

f.e. if the above example mentioned mill stopped for 10 hours because of power cut and 14 hours because of lack of raw material the planned hours/month will be:
Planned hours/month = $7.5 \times 2 \times 23 - 10 - 14 = 321$ hours

Pos. 4 Count of the Produced yarn in NmPos. 5. Actual Production

The produced quantity of yarn in Kg for the reported month.

Pos. 6. Planned Production

This production is based on actual planned operating hours, spindles in operation, shift per day, real gram per spindle hour.

Real gram per spindle hour should be calculated as follows:

$$\text{Real g/spindle hour} = \frac{\text{delivery} \times 60}{Nm} \times a \times b \times c \times d$$

$$\text{delivery} = \frac{\text{spindle r.p.m.}}{\text{twist per meter}}$$

$$\text{twist per m} = \text{twist per inch} \times 39.4$$

$$\text{twist per inch} = \alpha_e \times \sqrt{Ne}$$

$$\alpha_e = \frac{\text{twist}/"}{\sqrt{Ne}}$$

$$a. = \text{factor of machine efficiency} = \frac{\text{efficiency}}{100}$$

Standard machine efficiencies:

Ne	Eff. %	Ne	Eff. %
12	87.	30	89.7
16	88.	36	90.2
20	88.5	40	90.6
24	89.	46	91.
28	89.5	50	91.3

$$b. = \text{factor of twist contraction} = \frac{100 - \text{contraction}}{100}$$

$$\text{contraction} = (\alpha_e \times 2.685) - 5$$

$$\alpha_e = \text{twist multiplier}$$

$$\text{Acala: } \alpha_e = 4.14-4.2$$

$$\text{Shambat: } \alpha_e = 3.8-4.$$

$$\text{Baracat: } \alpha_e = 3.4-3.7$$

$$c. = \text{factor of idle spindles} = \frac{100-2}{100} = 0.98$$

$$2 = \text{standard idle spindles of } 2\%$$

d. = factor of production losses due to standard end-downs
per 1000 spindle hour.

Standard end-downs/1000 sp. hr. = 40

End-downs per hour and 480 spindles = $\frac{40 \times 430}{1000} = 19.2$

Standard spinner patrol cycle per hour should be 5.

Duration of one cycle is 12 mins. By end-down a spindle is not producing in an average of 6 mins or the half of the patrol cycle.

$$\text{Factor} = \frac{100 \left(\frac{19.2 \times 6}{480 \times 60} \times 100 \right)}{100} = 0.996$$

f.e. Ne 16 = Nm 27.1 cotton Acala,

twist/m = 655, spindles r.p.m. = 7400

a. = 0.88 (see standard machine efficiencies)

$$b. = \frac{100 - \left(\frac{4.15 \times 2.685 - 5}{100} \right)}{100} = \frac{100 - (4.15 \times 2.685 - 5)}{100} = 0.9386$$

c. = 0.98

d. = 0.996

Real f/sp. hr =

$$\frac{7400 \times 60}{655 \times 27.1} \times 0.88 \times 0.9386 \times 0.98 \times 0.996 = 20.16$$

Pos. 7. Index Production (P)

The Index Production is the ratio between the actual production and the planned production.

As the planned production is based on actual datas the mills have the possibility to achieve Index P = 1.00. If the Index P is less than 1.00 it means that the mill is operating with lower efficiency or with less spindles or the result of both.

Pos. 8. Man hours worked

Here the real worked hours of all personnel have to be registered for the month for the positions laid down in the Form

P-03. Hours of personnel from blowroom through ring spinning additional maintenance personnel and electrical section.

Pos. 9. Man hours worked in combing subsection

In combed spinning the actual man hours in the combed section (pre drawing, lap forming and combers) have to be calculated.

Pos. 10. Net man hours

Here from the man hours worked (Pos. 8) the man hours worked in combing section (Pos. 9) and additional the increased personnel of blowroom and carding has to be deducted.

f.e. a mill is working 2 shifts and 24 dyas in the month

total persons = 325

persons in combing section = 16

Blowroom and carding = 18

combing noils = 16%

Net man hours = $325 - 16 - (18 \times 0.16) \times 7.5 \times 24 = 55.101.6$

Pos. 11. Factor

To compare the performances of the spinning mills with each other the basis in the Worked Man Minutes/kg (WMM/Kg) of Ne 16.

Standard Worked Man Minutes per kg yarn (WMM/Kg)

Ne	WMM/kg	Ne	WMM/kg
12	8.93	30	11.15
16	9.32	36	12.45
20	9.64	40	13.32
24	10.00	46	14.61
28	10.93	50	15.42

... 14/

f.e. If under Pos. 10 mentioned mill is producing Ne30 and 120.000kg a month, the factor will be:

$$\text{Factor} = \frac{9.32}{11.15} = 0.8359$$

If the mill is producing 80.000kg Ne30 and 40.000kg Ne40

			Basis min.	Cal.	<i>Effic.</i> Effic.	Cal.
Ne30	80.000kg	66.7%	9.32	6.22	11.15	7.437
Ne40	40.000kg	33.3%	9.32	3.10	13.32	4.436
	<u>120.000kg</u>			<u>9.32</u>		<u>11.873</u>

$$\text{Factor} = \frac{9.32}{11.873} = 0.785$$

Pos. 12. Modified Net Man hours

Modified Net Man hours equal to Net Man hours multiplied by the factor.

$$\text{Modified Net Man hours} = \text{Pos. 10} \times \text{Pos. 11}$$

Pos. 13. Worked Man Minutes (WMT)

Modified Net Man hours multiplied by 60 minutes.

$$\text{Worked Man Minutes} = \text{Pos. 12} \times 60$$

Pos. 14. Actual Man Minutes per Kg.

Actual Worked Man Minutes divided by the actual production.

$$\text{Actual WMT./Kg} = \frac{\text{Pos. 13}}{\text{Pos. 5}}$$

Pos. 15. Index Productivity (PY)

The Index Productivity is the ratio between the basis Worked Man Minutes at Ne16 and the actual man minutes per Kg.

$$\text{Index PY} = \frac{9.32}{\text{Pos. 14.}}$$

If the index is 1.00 it means that the mill is producing the planned production with the planned personnel.

If the index is lower than 1.00 it means that the mill production is lower than the planned production, or employs too much personnel (overstaffing) or the result of both.

The photocopy of the Form S-01 has to reach the Technical Department of the GSWC, Khartoum within the first 10 days of the following month.

ISWC UNIDO		SPINNING PRODUCTION AND PRODUCTIVITY REPORT				Factory	Inst. Spindles	Month/Year	S-01
Pos.	Item	Unit	calculation	1st. decade	2nd. decade	3rd decade	Month		
1.	spindles in operation	sp.							
2.	INDEX C.U.	-	$\frac{\text{Pos. 1} \times \text{shift}}{\text{inst. spindles} \times 3}$						
3.	Planned operating hrs	hrs.							
4.	count	Ne							
5.	Actual Production	Kg							
6.	Planned Production	Kg	$\frac{\text{Pos. 3} \times \text{Pos. 1} \times \text{kg/sp.hr.}}{1000}$						
7.	INDEX P. (Production)	-	$\frac{\text{Pos. 5.}}{\text{Pos. 6.}}$						
8.	Man Hrs. Worked	hrs.							
9.	Man Hrs. Worked in combing sec.	hrs.							
10.	Net Man hrs.	hrs.	Pos. 8 - Pos. 9						
11.	Factor	-							
12.	Modified Net Man Hours	hrs.	Pos. 10 x Pos. 11						
13.	Worked Man mins. (WMM)	min.	Pos. 12 x 60						
14.	Actual Man mins/Kg	$\frac{\text{min.}}{\text{kg}}$	$\frac{\text{Pos. 13.}}{\text{Pos. 5.}}$						
15.	INDEX PY	-	$\frac{9.32}{\text{Pos. 14.}}$						

/k 1/2

GSMC		STANDARD PERSONNEL				Mill		Month/Year		P-03					
UNIDO						Hag Abdallah Coarse Spinning		January 1990							
S E C	Name of Job	Number of Personnel					S E C	Name of Job	Number of Personnel						
		1st.	2nd.	3rd.	Total	sec. Total			1st.	2nd.	3rd.	Total	sec. Total		
BLOWROOM	Operator	2	2	2	6										
	cleaner	-	-	-	-										
	sweeper	-	-	-	-										
	maint. mechanic	0.5	0.5	0.5	1.5										
	supervisor	0.5	0.5	0.5	1.5										
	Total		3	3	3	9	9								
CARDING	Operator	3	3	3	9										
	cleaner	-	-	-	-										
	transport	1	1	1	3										
	sweeper	-	-	-	-										
	maint. mechanic	0.5	0.5	0.5	1.5										
	supervisor	0.5	0.5	0.5	1.5										
Total		5	5	5	15	15									
DRAWING	Operator	4	4	4	12	12									
	transport	1	1	1	3										
	sweeper	0.5	0.5	0.5	1.5										
	maint. mechanic	0.5	0.5	0.5	1.5										
	supervisor	0.5	0.5	0.5	1.5										
	Total		6.5	6.5	6.5	19.5	19.5								
ROVING	Operator	6	6	6	18										
	doffer	3	3	3	9										
	transport	1	1	1	3										
	sweeper	0.5	0.5	0.5	1.5										
	maint. mechanic	0.5	0.5	0.5	1.5										
	supervisor	0.5	0.5	0.5	1.5										
Total		11.5	11.5	11.5	34.5	34.5									
RING SPINNING	Operator	17	17	17	51										
	doffer	14	14	14	42										
	transport	2	2	2	6										
	sweeper	2	2	2	6										
	cleaner				4										
	maint. mechanic	1	1	1	3										
	supervisor	1	1	1	3										
Total		41	37	37	115	115									
	Sub Total	67	63	63	193	193									
	Reserve 15%	10	10	10	30	30									
	Head of shift	1	1	1	3	3									
	Total		78	74	74	226	226								
MAINTENANCE	engineer	2			2										
	technician	3			3										
	mechanic	21			21										
	cleaner	23			23										
	electrician	18			18										
	Grand Total	145	74	74	293	293									

Spinning Quality Report, Form: S-02

To secure a better and continuous good quality of the produced yarn a quality standard was elaborated.

This quality standard based on the "USTER STATISTIC 1982" gives the upper limit of evenness (U%), thin places, thick places and neps per 1000 metres per yarn.

The upper limit values are calculated with the achieved results of 50% of the participated factories.

This form gives the standard for carded and combed yarn detailed from carding through ring spinning.

This form has to be filled out once a month and the factory has to send one copy to the Technical Department of the GSWC, Khartoum.

GSMC		SPINNING QUALITY REPORT		Mill		Month-Year		S-02		
UNIDO										
Product		Ne	Standard		Actual					
			carded	combed	carded	combed				
card sliver	U%	0.16	3.6	3.6						
comber sliver	U%	0.2		3.8						
1st Drawframe	U%	0.18	3.8	2.8						
2nd Drawframe	U%	0.24	4.0	2.5						
Speedframe sliver	U%	2	6.3	4.3						
Ring Spinning yarn	U%	16	13.0							
	thin		40							
	thick		330.0							
	neps		180.0							
	U%	30		11.5						
	thin			13						
	thick			110.0						
	neps			100.0						
	U%	40		12.0						
	thin			22.0						
	thick			130.0						
	neps			140.0						
Remarks:										

Ring Spinning Stops Record, Form: S-03

This form serves the registration of the Ring Spinning machine stops according to the kind of stops.

The spinning factories have to complete this form every decade (3 times per month) to allow the management a full control of the mill performances and to give them possibilities for immediate corrections if required.

At the end of each month the monthly total has to be calculated and one copy of the form with the calculated datas have to be sent to the Technical Department of the GSWC, Khartoum. The copy has to reach the Technical Department within the first 10 days of the following month.

Explanation of the formKind of stops:

- | | |
|------------------------------|--|
| Lack of speed frame bobbins: | the factory has the required raw material (cotton) but because of some reasons the speed hours cannot supply the required quantity of speed frame bobbins to the ring spinning and ring spinning frame (s) have to be stopped. |
| Lack of tubes: | because of lack of empty ring spinning tubes, ring spinning frame (s) have to be stopped. |
| Lack of personnel: | because of lack of personnel in the ring spinning section (operator, doffer, etc.) frame (s) have to be stopped. |
| Preventive maintenance: | because of scheduled preventive maintenance, ring spinning frame (s) have to be stopped. |

Repair mechanical: because of mechanical problems which require the work of the mechanical personnel, ring spinning frame (s) have to be stopped.

Repair electrical: because of electrical problems which require the work of the electrical personnel, ring spinning frame (s) have to be stopped.

Bad running conditions: because of bad operating conditions of the ring spinning frames caused by honeydew, relative humidity, excess end-downs, etc., ring spinning frame (s) have to be stopped.

Lack of spare parts: because of lack of spare parts (machine parts, spindle tape, cots, etc.) ring spinning frame (s) have to be stopped. Do not report single spindles.

Lack of raw material: because of lack of raw material (cotton) the entire spinning mill has to be stopped.

Power cut: because of lack of electricity supply the entire ring spinning section has to be stopped. Here the mill should register also the stopped ring spinning frames, because of power cut in the spinning preparation and no sufficient speed frame bobbins, frame (s) have to be stopped.

In this form there are 4 columns empty where the mills should register other important ring spinning frame stops which are not mentioned above.

The ring spinning frame stops have to be registered for the full time of stops.

It has to be registered per decade and month, the number of frames per kind of stops, hours of stops, spindle hours (frames x spindle of frame) and the percentage. The percentage means, the percentage of the total stops, the kind of stops in spindle hours have to be divided by the total stopped spindle hours and multiplied by 100.

GSWC		RING SPINNING STOPS RECORD								Mill		Month-Year		S-03			
UNIDO		1st. Decade				2nd. Decade				3rd. Decade				Month			
Kind of stops		mach.	hrs.	spdl. hrs.	%	mach.	hrs.	spdl. hrs.	%	mach.	hrs.	spdl. hrs.	%	mach.	hrs.	spdl. hrs.	%
Lack of speed frame bobbins																	
Lack of tubes																	
Lack of personnel																	
Preventive maintenance																	
Repair mechanical																	
Repair electrical																	
Bad running cond. (humidity etc.)																	
Lack of spare parts																	
Lack of raw material																	
Power cut																	
Total																	

Spinning Sales and Consumption Record, Form: S-04

This form serves the registration of monthly sales revenue of the spinning mills and the monthly consumption record. The form S-04 has to be filled for every month and one copy has to be sent to the Technical Department of the General Spinning and Weaving Company, Khartoum. The copy has to reach the Technical Department of GSWC within the first ten days of the following month.

The upper part of this form, the monthly sales revenues, have to be registered. Revenue from waste should be registered only if sales actually occurred.

The lower part of this form represents the monthly consumption of the spinning mills mainly cotton, petrol and other important auxiliaries if required.

The preparation of this form is self explanatory and easy to fill out.

GSWC	SPINNING SALES AND CONSUMPTION RECORD	Mill	Month-Year	S-04
UNIDO				

Item	Production	Sales quantity	Unit price SL	Sales Rev. SL
Yarn ton				
Waste 1. kg	 			
Waste 2. kg	 			
Total		 	 	

Remarks:

Item	Purchased	Stock at end of last mth.	Stock at end of actual mth.	Consumption
Cotton ton				
Petrol gl.				

Remarks:

2. Classification and Comparison of MILL Performances, Form: MI-01

1. This form is a monthly and 3 monthly classification and comparison of the factories, which are under the control of the General Spinning and Weaving Company.
2. This form (MI-01) has to be completed by the Technical Department of the GSWC and the copies have to be distributed monthly to every factory (spinning and weaving) and to GSWC (5 copies) Managing Director, Research Planning and Training Department, Administrative Department, Commercial Department and Financial Department.
3. In this form every factory has to be listed but the classification and comparison will be calculated separately for the spinning factories and for the weaving factories.

The multiplication of the 2 indexes - INDEX P and INDEX PY (Production and Productivity) will result the Index Mill.

Index Mill means the general mill or factory performances. The standard Index Mill is 1.00. It means, if the mill is delivering the planned production and employing the standard direct and indirect production personnel, the Index Mill will be 1.00. Results under 1.00 means the mill did not fulfil one or both indexes, operating with lower efficiency and too much personnel. As the mills cannot influence the capacity utilisation (I.C.U.) due to lack of spare parts the index Production (I.P.) is based on operating looms. The mills can only

influence the indexes Production and Productivity
(I.P. and I.P.Y.)

4. The monthly indexes (I.P. and I.P.Y.) have to carry over from the monthly Production and Productivity report forms S-01 and W-01.

The INDEX MILL is the multiplication of the Production and Productivity indexes.

The judgement of the classification is as follows: the highest INDEX MILL value (nearest to the standard 1.00) will receive the number 1, the second highest value will be number 2, the third highest value will be number 3, etc. It means that the mill with the classification 1 is the best spinning or weaving mill, classification 2 means the second best mill and classification 5 means the mill with the lowest.

The 3 monthly or quarter yearly indexes have to be calculated with the monthly plan hours to get exact results. The quarter yearly classification will be judged similarly to the monthly classification with numbers from 1 through 5. The quarter yearly INDEX MILL is the multiplication of the 3 monthly indexes P. and PY.

The copies should reach the addressees by the 15th of the following month.

GSWC UNIDO	CLASSIFICATION AND COMPARISON OF MILL PERFORMANCES								Months and Year				MI-01			
	Month/hrs:				Month/hrs:				Month/hrs:				Average 3 months			
MILL	I.P.	I. PY.	I. Mill 2x3	Class.	I.P.	I.PY.	I. Mill 6x7	Class.	I.P.	I.PY.	I.MILL 10x11	cla ss.	I.P.	I.PY.	I.Ml.	Class.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
H.A. Coarse sp.																
H.A. Fine sp.																
Khar- toun N. sp.																
Nyala																
Kadug- li																
Shandi																
Kosti																
El Dueim																

Calculation of the 3 months average: Pos. 14 = $\frac{\text{Pos. 2xplan hrs.} + \text{Pos. 6xplan hrs.} + \text{Pos. 10xplan hrs.}}{\text{total planned hours}}$

Pos. 15 = like Pos. 14, but instead of Pos. 2, 6, 10, it must be calculated with Pos. 3, 7, 11

Pos. 16 = Pos. 14 x Pos. 15

Quarter Yearly and Yearly Classification of Mill Performances, Form: MI-02

This form is a quarter yearly and yearly comparison of the factories, and has to be filled out by the Technical Department of the GSWC.

Also in this form every factory has to be listed but the classification and comparison will be calculated separately for the spinning factories and for the weaving factories.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within the GSWC and within the spinning and weaving companies. The copies have to reach the addressees by the 15th of the following month.

The datas for the 1st, 2nd, 3rd and 4th quarters should be transferred from the form MI-01.

The I MILL of the average 6 months, 9 months and yearly have to be calculated with the planned hours to get exact results.

The classification will be judged similarly to the monthly classification with numbers from 1-5.

GSWC UNIDO	QUARTER YEARLY AND YEARLY CLASSIFICATION OF MILL PERFORMANCES										Year		MI-02	
	1st quart.		2nd quart.		average 6 months		3rd quart.		average 9 months		4th quart.			average yr.
MILL	I.MILL	class.	I.MILL	class.	I.MILL	class.	I.MILL	class.	I.MILL	class.	I.MILL	class.	I.MILL	class.
H. A. Coarse sp.														
H. A. Fine sp.														
Khar-toum N. sp.														
Nyala														
Kadug-li														
Shandi														
Kosti														
El Dueim														

Quarter Yearly Production Report Weaving, Form: MI-03

This form serves the registration of quarter yearly production and efficiency of the weaving mills.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments of the GSWC.

As planned production is based on actual capacity and datas, the weaving mills should achieve or at least near the planned production.

The efficiency should be calculated as follows:

$$\text{Efficiency \%} = \frac{\text{actual production in 10.000 picks} \times 100}{\text{planned production in 10.000 picks}}$$

GSWC	QUARTER YEARLY PRODUCTION REPORT WEAVING				Quarter year	KI-05
UNIDO						
Mill	Months	plan prod. in yards	plan prod. in 10,000 picks	act. prod. in yards	act prod. in 10,000 picks	Effi- ciency
NYALA						
		Total 3 months				
	Remarks:					
KADUGLI						
		Total 3 months				
	Remarks:					
SHANDI						
		Total 3 months				
	Remarks:					
KOSTI						
		Total 3 months				
	Remarks:					
EL DUEIM						
		Total 3 months				
	Remarks:					

Yarn Consumption and Yield Report Weaving, Form: M1-04

This form serves the registration of monthly and quarter yearly registration of yarn consumption and yield of raw material (consumed yarn).

The form has to be filled out by the Technical Department of GSWC and every month has to be submitted to the Managing Director of GSWC.

The purpose of this form is to give an exact picture about the utilisation of raw material (yarn).

Explanation of the form

The upper part of the form is the yield % of raw material of the weaving mills and has to calculate as follows:

- required yarn: the required yarn is calculated from the monthly production in yards and multiplied by the required weight of yarn with 5% contraction and 5% waste per yard of cloth. Required yarn with 5% contraction and 5% waste for one yard of cloth is equal to:

weight of one yard of cloth=

$$\frac{1540 + 1512 \times 0.914}{27 \times 1000 \times 0.95 \times 0.95} = 0.1144\text{kg}$$

- consumed yarn: the consumed yarn is carried over from the form W-01 or W-03.
- Yield %: the yield % of yarn is calculated as follows:

$$\text{Yield \%} = \frac{\text{required yarn}}{\text{consumed yarn}} \times 100$$

If the yield % is between 95.5-100 percent it means that the weaving mill is working with 5-10 percentage of waste.

If the yield % is lower than 95.4% it means that the weaving mill is producing too much waste.

GSWC UNIDO		YARN CONSUMPTION AND YIELD REPORT WEAVING			Quarter year	MI-04
Mill	Items	Month:	Month:	Month:	quarter year	
NYALA	required yarn kg.					
	consumed yarn kg.					
	YIELD %					
KADUGLI	required yarn kg.					
	consumed yarn kg.					
	YIELD %					
SHANDI	required yarn kg.					
	consumed yarn kg.					
	YIELD %					
KOSTI	required yarn kg.					
	consumed yarn kg.					
	YIELD %					
EL DUEIM	required yarn kg.					
	consumed yarn kg.					
	YIELD %					
TOTAL	required yarn kg.					
	consumed yarn kg.					
	YIELD %					

Yarn production and purchase	Month:	Month:	Month:	Quarter year
Hag Abdallah kg.				
Other spinning mill kg.				

Weaving Quarter Yearly Sales and Auxiliaries
Consumption Report, Form: M1-05

This form serves the quarter yearly registration of sales revenue per yard and auxiliaries consumption per yard.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within the GSWC.

The purpose of this report is to control the sales revenue and auxiliaries consumption per produced yarn.

Explanation of the form

The upper part is the monthly registration of production in yards and total sales revenue in local currency (SL) and the sales revenue per produced yard of each weaving factory per quarter year. The lower part of the form is the monthly registration of auxiliaries consumption (starch and petrol) and the average quarter yearly consumption per produced yard. The datas per month have to carry over from the form W-03.

GSWC UNIDO	WEAVING QUARTER YEARLY SALES AND AUXILIARIES CONSUMPTION RECORD	Quarter year	MI-05

Mill	Month:		Month:		Month:		Quarter year:		
	Production yd.	Sales revenue SL.	Production yd.	Sales revenue SL.	Production yd.	Sales revenue SL.	Total pro. yd.	Total sl. revenue SL.	Rev. per yd.
NYALA									
KADUGLI									
SHANDI									
KOSTI									
EL DUEIM									
TOTAL									

Mill	Month:		Month:		Month:		Quarter year:			
	starch kg.	Petrol gl.	Starch kg.	Petrol gl.	Starch kg.	Petrol gl.	starch kg.		Petrol gl.	
							total conspt.	kg/yd	Total conspt.	gl/yd
NYALA										
KADUGLI										
SHANDI										
KOSTI										
EL DUEIM										
TOTAL										

Spinning Quarter Yearly Sales and Auxiliaries
Consumption Record, Form M1-06

This form serves the quarter yearly registration of sales revenue per ton and auxiliaries consumption per ton.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within the GSWC.

The purpose of this report is to control the sales revenue and auxiliaries consumption per produced ton of yarn.

Explanation of the form

The upper part of the form is the monthly registration of production in tons and total sales revenue in local currency (SL), and the quarter yearly average sales revenue of each spinning mill. The lower part of the form is the monthly registration of auxiliaries consumption and the average quarter yearly consumption per produced ton of yarn.

The datas per month have to carry over from the form S-04.

GSWC	SPINNING QUARTER YEARLY SALES AND AUXILIARIES CONSUMPTION RECORD	Quarter year	MI-06
UNIDO			

Mill	Month:		Month:		Month:		Quarter year:		
	Produc- tion ton	Sales revenue SL	Produc- tion ton	Sales revenue SL	Produc- tion ton	Sales revenue SL	Total Pro- duction ton	Total sales revenue SL	Revenue per ton
H.A.Coarse spinning									
H.A.Fine spinning									
Khartoum N. spinn- ing									
Total									

Mill	Month:		Month:		Month:		Quarter year:		
H.A.Coarse spinning									
H.A.Fine spinning									
Khartoum N. spinn- ing									
Total									

Cotton Consumption and Yield Report Spinning, Form M1-07

This form serves the quarter yearly registration of cotton consumption and yield percentage.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within the GSWC.

The purpose of this report is to serve the optimum utilization of raw material.

Explanation of the form

The monthly and quarter yearly registration of datas per spinning mills.

Yarn production:	in the month produced yarn in tcns
Required cotton:	the produced yarn multiplied by 100 and divided by the yield percentage required
Consumed cotton:	cotton consumption for the month from form S-04
Yield percentage required:	100 minus the total standard wastes according to spin plan
Yield percentage consumed:	actual yarn production multiplied by 100 and divided by the consumed cotton

If the yield percentage differs slightly from the yield percentage required, the mill is working economically with standard or nearly standard wastes.

If the difference is bigger between the two yield percentages, the mill performance is bad, caused by "but-of-standard" conditions.

GSWC		COTTON CONSUMPTION AND YIELD			Quarter year	M1-07
UNIDO		REPORT SPINNING				
Mill	Items	Month	Month	Month	Quarter year	
HAG ABDALLAH COARSE SPINNING	Yarn Pro- duction ton					
	Required cotton ton					
	Consumed cotton ton					
	YIELD re- quired %					
	YIELD con- sumed %					
HAG ABDALLAH FINE SPINNING	Yarn Pro- duction ton					
	Required cotton ton					
	Consumed cotton ton					
	YIELD re- quired %					
	YIELD con- sumed %					
KHARTOUM NORTH SPINNING	Yarn Pro- duction ton					
	Required cotton ton					
	Consumed cotton ton					
	YIELD re- quired %					
	YIELD con- sumed %					

Quarter yearly Ring Spinning Stops Record, Form: M1-08

This form serves the quarter yearly registration of lost spindle hours per spinning mill.

The Technical Department of GSWC has to fillout this form and has to distribute it between the different departments within the GSWC.

The purpose of this report is to reduce the percentage of lost spindlehours and consequently increase the production.

Explanation of the form

The form is the monthly and quarter yearly registration of lost spindle hours in percentage per spinning mill.

Lost spindle hours:	the total spindle hours lost in the month from form S-03
Total spindle hours:	from form S-01 spindles in operation (Pos. 1) multiplied by Planned operating hours (Pos. 3) equal to total spindle hours.
Percentage:	lost spindle hours multiplied by 100 and divided by the total spindle hours.

Quarter yearly Loom Stops Record, Form M1-09

This form serves the quarter yearly registration of lost loom hours per weaving mill. The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within GSWC.

Explanation of the form

Lost loom hours: the total loom hours lost in the month from form W-02.

Total loom hours: from form W-01 operating looms (Pos. 1) multiplied by planned hours (Pos. 3).

Percentage: lost loom hours multiplied by 100 and divided by the total loom hours.

GSWC	QUARTER YEARLY RING SPINNING STOPS RECORD											Quarter year	M1-08
UNIDC													
Mill	Month:			Month:			Month:			Quarter Year:			
	lost sp.hr.	total sp.hr.	%	lost sp.hr.	total sp.hr.	%	lost sp.hr.	total sp.hr.	%	lost sp.hr.	total sp.hr.	%	
Hag Abdal- lah coarse spinning													
Hag Abdal- lah fine spinning													
Khartoum North spinning													

GSWC	QUARTER YEARLY LOOM STOPS RECORD											Quarter year	M1-08
UNIDO													
Mill	Month:			Month:			Month:			Quarter Year:			
	lost loom hrs.	total loom hrs.	%	lost loom hrs.	total loom hrs.	%	lost loom hrs.	total loom hrs.	%	lost loom hrs.	total loom hrs.	%	
Nyala													
Kadugli													
Shendi													
Kosti													
El Sueim													

Quarter Yearly Production Report Spinning, Form M1-10

This form serves the registration of quarter yearly production and efficiency of spinning mills.

The Technical Department of GSWC has to fill out this form and has to distribute it between the different departments within the GSWC.

As planned production is based on actual capacity and datas, the spinning mills should achieve or at least near the planned production.

The efficiency percentage should be calculated as follows:

Actual production multiplied by 100 and divided by the planned production.

GSWC	QUARTER YEARLY PRODUCTION REPORT SPINNING			Quarter year	M1-10
UNIDO					
Mill	Months	Actual Production kg.	Planned Pro- duction kg.	Efficiency %	
Hag Abdallah coarse sp.					
	Total 3 months				
	Remarks:				
Hag Abdallah fine sp.					
	Total 3 months				
	Remarks:				
Khartoum North Spinning					
	Total 3 months				
	Remarks:				

IX. ANALYSIS OF THE INTERNAL DEBIT/CREDIT STATUS
BETWEEN THE COMPANY AND THE MILLS

The financial accounting of the General Spinning and Weaving Company is characterised by substantial deficiencies. The past and present overall situation of the company and its mills with regard to management and administration is to be considered partly the consequence and partly the reason for a situation characterised

by:

- the non existence over years properly and timely kept financial records and controls of any kind of useful cost accounting, both essential instruments of management.
- the absence of any kind of corporate planning, be it short, medium or long term.
- the poor technical state of the mills and the low efficiency of production with resulting financial losses.

Monthly and quartely financial management reports are rare and when they are produced they tend to suffer from the same failings as annual reports, for example late preparation by several months. Timely preparation of financial management reports is extremely important and it may be that if this cannot be achieved then it is better that they are not producing at all.

The only source of revenue of the GSWC is the contribution of the mills. The quantity of the contribution is set arbitrary by the General Spinning and Weaving Company and it is based on volume of yearly revenue rather than the financial situation of the mills. At the beginning of the financial year the GSWC is preparing a budget where calculated expenditures set against contributions of the mills. The mills are supposed to pay the contributions quarter yearly, but this does not happen.

The financial review of the financial year 1988/89 is as follows:

- total expenditure	= SL 17.23 mio
- contributions paid	= SL 9.74 mio
- contribution payable	= SL 7.49 mio

The contributions were set as follows:

- Hag Abdallah Spinning Mill	: 40% = SL 6.89 mio
- Kostli Weaving Mill	: 15% = SL 2.59 mio
- El Dueim Weaving Mill	: 15% = SL 2.58 mio
- Kadugli Weaving Mill	: 15% = SL 2.58 mio
- Friendship Garment Factory	: <u>15%</u> = <u>SL 2.59 mio</u>
Total contributions	<u>100%</u> <u>SL17.23 mio</u>

The other mills do not pay contributions.

The amount of contribution payable is covered by suppliers credits and bank loans.

The contributions are set as debit to the corresponding mill and carried forward till the mill is able to pay it.

The financial review of the GSWC does not correspond exactly with the financial review of the mills because of wrong entries and incorrect deferrals between financial years.

Certainly ~~no~~ general conclusion on the future financial state of the GSWC can be drawn from past records.

The classification of all doubts and a reconciliation of all outstanding discrepancies could only be the result of a detailed investigation of the past years.

To settle the financial situation and introduce modern cost accounting UNIDO delegated a financial expert to the General Spinning and Weaving Company for 6 months who will handle the matter in detail.

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X. ACHIEVED RESULTS AND THEIR
UTILISATION

Besides the duties laid down in the UNIDO Job Description the consultant offered his assistance directly to the mills. This was necessary, not only because of the low production of the mills, but also because the management of GSWC asked him to assist. Several visits by the consultant resulted in positive test runs.

The results of the consultant's work at the General Spinning and Weaving Company constitutes 2 categories:

- Results already have been utilised
- Results which will be utilised in the future

Results which already have been utilised

a. Hag Abdallah Spinning Mill

As Hag Abdallah Spinning Mill is the most important mill of the GSWC not only that its coarse spinning section is supposed to supply with yarn the 5 weaving mills, but additionally, the fine spinning section should produce fine combed yarn for export, therefore it was obvious that the consultant showed more interest in this mill.

As stated before the two separate spinning sections were operating as one spinning section, namely the fine spinning section with the spinning preparation and the coarse spinning section with ring spinning and winding. With this unusual method the already limited capacity - due to lack of spare parts - was further reduced to less than half. Thus the mill produced only coarse yarn but only 30% of the requirement of the weaving mills and did not produce fine yarn since 1936.

1. Coarse Spinning Section

As a result of the consultant's assistance the coarse spinning section operates again as an independent unit. At this time with 17 cards and produces 4000 Kg yarn a day, which is already twice the sum which was produced last year.

2. Fine Spinning Section

The fine spinning section is also working again as an independent unit and produces Ne40 combed yarn for export. This section was acting before as the pre-spinning subsection of the coarse spinning section, thus produced only intermediate products for the coarse mill. It is interesting to know that this spinning section exported yarn at the last time in 1986.

The General Spinning and Weaving Company already received some demands for export yarn from Europe.

b. Khartoum North Spinning Mill

As it was mentioned before this mill could not utilise the full ring spinning capacity because of the low production of the drawing frames. This bottle neck of production caused by the incorrect production calculation in the planning phase of this mill.

The consultant elaborated and introduced a new spinn plan, based on coarse counts in the pre-spinning and so an effective increase of production on the drawing frames was achieved.

This production increase resulted in 12% increases of ring spinning capacity utilisation which equals to 12% more output of the mill.

2. Results which will be utilised
in the future

a. Hag Abdallah Spinning Mill

1. New raw material

With the author's successful test run with cotton Shaabat at Hag Abdallah Spinning Mill, it will be allowed to process this cotton during the rainy season which will allow the mill to operate 12 months per year instead of 8 months per year as was the case in the last 10 years. It means not only higher production, but also reduced cost because some of the main costs (wages and salaries and every fixed cost) were paid also for the 4 months shut down period.

2. Introduction of modified organisation

With the introduction of modified organisation, selection of capable persons for the new positions and detailed job description, the spinning sections are already operating as independent units.

The target is for the coarse spinning, with the combination of the card maintenance program, the management intends to operate 35 cards and produce 7500 Kg yarn per day. The target for the fine spinning is to achieve a monthly production of 56.000 Kg, Ne 40 combed yarn for export. This means an additional export revenue of about US\$225.000 per month.

b. New organisation of the mills

The consultant elaborated new organisation also for Khartoum North Spinning Mill and for the 5 weaving mills. He finished also detailed job descriptions for the new positions, but he

could not introduce it due to lack of time (short time consultancy).

With the introduction of these new organisations the production of the mills will increase in the future.

c. Modification of the organisation of the General Spinning and Weaving Company

The consultant modified the organisation of the Technical Department and the Economic Research, Planning and Training Department, but the General Spinning and Weaving Company could not fill till now the vacant positions.

With the adequate and appropriate staff for the above mentioned departments the General Spinning and Weaving Company will be able to assist and monitor the mills and achieve better production, better quality and better overall results.

d. Capacity utilisation of the weaving mills

The consultant elaborated the planned production based on actual capacity utilisation of the weaving mills. These production figures were considered by the elaboration of budget of the mills.

To achieve the planned production the weaving mills have to increase the efficiencies of the mills from an average of 38.34% to 70%. As the mills are aware that this efficiency is achievable, it will definitely result in production increases in the future.

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XI. SUMMARY

The management and administration of the General Spinning and Weaving Company have been a major problem area. Due to extreme understaffing it could not fulfill its task.

The main reasons are as follows:

- Capable managers have been forced by circumstances into "fire fighting" roles and no time is left for the fulfillment of their normal management tasks, namely lead, monitor and assist the mills.
- Management was not supported by adequate and appropriate information and reporting system.
- The failure of the financial department either to provide reliable report or safe guard the company's assets.
- The insufficient support of the Government, Ministry of Industry and Ministry of Finance not only financial, but also other related fields.

These above mentioned reasons have led to low morale amongst the management of the mills, the history of disorganised management and overstaffing of labour force has led to low performances, with decreases rather than increases in efficiency.

Demand trends show if the mills were to achieve the planned production the GSWC would be able to market successfully the extra output either locally or outside of Sudan.

The existing management of the GSWC and generally of the mills are capable, able and willing to fulfill the aim set by the Government, namely to turn profitable the mills in the public sector, if they have the sufficient support from the Government.

ANNEXES

ANNEX IRecommendations for Hag Abdallah Spinning MillA. Cotton to be used

1. Try to purchase new crop of Shambat and sell Acala or try to change Acala for new crop Shambat.
2. Working with Shambat allows the factory to run 12 months per year instead of 8 months, because Shambat is not contaminated with honeydew and can process above 40% R.H.
3. The price of Shambat is exactly the same as the price of Acala - SL4.437 per lb.
4. The Fine Spinning should work with the new crop Shambat Ne 30 and Ne 40 counts.
5. The Coarse Spinning should work with the new crop Shambat mixed with the old crop Shambat Ne16 count. The mix should begin with 30 bales new crop Shambat and 2 bales old crop Shambat.

Systematically increasing the bales of old crop Shambat in the mix till the running conditions are remaining reasonable and yarn strength and U% still satisfactory for the weaving mills.

With this method not only the price of the mix and consequently the production cost will be reduced (price of old Shambat SL2.30 per lb) but also the stock of old crop Shambat will be converted to money to L.

B. Machinesa. coarse spinning

1. clean, adjust and reset the machines in the coarse spinning from opening to speed frames and stop to latent about the bad conditions of the machines. The conditions of the machines are not so bad as the management asserts.

1.1 slowroom: - repair dust collection system (condensers and fans) ...2/

- 1.2 Carding : - try to arrange minimum 20-23 cards for operation from the installed 52 cards
- clean the clothings of cyclinders and doffers
 - rectify and grind the clothings of cyclinders and doffers
 - make complete new settings of the cards
 - it would be necessary to increase the frequency of cleaning and stripping of the clothings
 - operators have to clean the cards and take out the wastes more frequently
- 1.3 Drawing : - try to get in operation 4 first and 4 second passages drawing frames from the installed 10+10
- select for the drawing frames top drafting rolls with maximum diameters
 - grind slightly these selected top drafting rolls to avoid slubby sliver
 - adjust settings of drafting rolls according to requirement
 - use 8 cans and 8 draft per drawing head
 - change trumpet if required
- 1.4 Speed frame:- try to get in production 5 speed frames from the installed 11 speed frames
- clean completely the speed frames, especially the drafting system and flyers. The flyers have to polish inside to avoid accumulation of fibers and so sliver breakages
 - increase break draft from 1.04 to 1.10-1.12
 - increase setting in the rear zone from 63mm to 75mm

- adjust setting in front zone according to requirement
- select top drafting rolls with the maximum diameters
- grind slightly these selected top drafting rolls
- increase slightly the twist of the sliver to prevent sliver lappings
- arrange tension according to new diameter of sliver and bobbin caused by higher twist (tension gear, layers per inch)
- arrange the speed frames with wooden blocks to secure a constant beginning tension
- equip the flyers with rubber heads to secure the right twist between the top of the flyers and delivery rolls
- modify the delivery speed between 22-25 m/min.
- select the plastic clips according to requirement (front zone condenser)

1.5 Ring

- Spinning :
- If the increased twist of speed frame sliver causes problems (undrafted sliver) on the ring spinning frames, so the rear zone setting of the ring spinning frame has to be increased. If this gives unsatisfactory results, additionally the break draft has to be increased
 - adjust the settings according to the fiber length

b. Fine spinning

If the coarse spinning is prepared and the speed frames are producing bobbins, the fine spinning has to terminate the material for Ne16 and has to produce material for Ne30 or Ne40.

The machines have to be set as described under Coarse spinning.

ANNEX IIFUNDAMENTALS OF CARD MAINTENANCE

Purpose: To achieve a higher evenness of the card sliver and secure optimum running conditions from carding through ring spinning, it is necessary to carry out scheduled card maintenance.

A. GENERAL MAINTENANCE1. Cleaning of cards

Mills maintaining positive and definite cleaning cycles on their cards realize benefits in improved quality as well as increased efficiency in yarn production.

- Eight times per shift it should be hooked out between ends of doffers, stripping roll, transfer roll and under the doffer. This prevents accumulation of chokes in these areas. Chokes in these areas are very detrimental to the proper operation of the card as it does cause excessive heating, loss of speed and uneven web.
- Each time a card is stopped off for grinding or resetting, it should be hooked out between ends of cylinders, arches, screens and frames to avoid the accumulation of chokes. Many cards are now equipped with automatic suction cleaning which removes excessive fly from the card, however this suction cleaning system does not prevent the accumulation of chokes mentioned above.
- Cylinder, Doffer and Flat clothing should be brushed or stripped periodically to remove trash, hulls and other foreign matter which may become embedded in the clothings. The frequency should be based on experience.

2. Lickerin, lickerin screen, mote knives and feed plate

The clothing of the lickerin has to be sharp and free of damage, otherwise you cannot expect to obtain quality carding.

With the advent of high speed carding, lickerin clothing should be checked twice a year and replaced if dull.

As a guide we indicate that the lickerin clothing should be replaced after processing of 120.000 Kgs of cotton.

Never grind the clothing of the lickerin

The proper setting of the lickerin, lickerin screen, mote knives, feed rolls and feed plate cannot be overemphasised. This is a very important area of the card and requires precision setting and maintenance.

The lickerin screen should be set with a quadrant guage which is specially designed for this purpose. The quadrant guage do allow precision setting and takes the guesswork out of the lickerin screen setting.

When setting the mote knife, a mote knife angle guage should be used. It is very important that the mote knives be set at a proper angle in order to remove impurities from the fibers. Most knives should be checked periodically for sharpness and resharpened if dull. It should be checked twice a year.

The nose of the feed plate should be as exact as possible and should be free of any nicks or burrs which would cause fibres to hang.

As a general rule the nose of the feed plate is set to the lickerin at 0.001 inch of every ounce of lap feed. For example: the feed plate would be set on 0.014 inches for a 14 ounces lap.

3. Feed roll

The proper maintenance and setting of the feed roll does have a direct relation to card damage. Jerk-ins at the feed roll are one of the major causes of damage to metallic clothing. These Jerk-ins can be prevented if close attention is given to the setting and maintenance of the feed roll.

When new feed rolls are installed, the head roll bearings should be carefully inspected to make sure they are not worn. Worn bearings will allow the feed roll to raise up when lump passes between the feed roll and feed plate. This lump is then jerked in by the lickerin and forced into the cyclinder, causing damage.

The feed roll should be set close enough to the feed plate and then locked in that position so that these lumps will be held by the feed roll until they are slowly carded into small bunches by the lickerin.

On a 14 ounce lap, the setting of the feed roll to the feed plate should be 0.003-0.005 inches. On new feed roll bearings it is sometimes necessary to file the bottom part of the bearings in order to attain this close setting.

Fluted feed rolls should be checked periodically to make sure the flutes are sharp and have not been rounded off. If the flutes are rounded off, the feed roll will not have holding power which it should.

4. Cycliner screen

Good, accurate cyclinder screens are an absolute necessity on metallic clothed cards in order to prevent excessive air currents and blow out.

The following maintenance points on cyclinder screens should be followed:

- When installing new cyclinder screens, the nose of the screen should be taped with spinning tape or similar tape in order to prevent scuffing and burring of the nose.
- Cyclinder screens should be pulled and cleaned at least every six months.
- The nose of the cyclinder screen is very important. It should be checked periodically to make sure there are no nicks and burrs which would cause fibres to hang. If the nose of the screen has a tendency to accumulate lumps or chokes, it is sometimes necessary to move the nose

- of the screen closer to the cyclinder so that the cyclinder will keep the nose free of fibers.
- On long staple fibers it is sometimes necessary to shorten the nose of the cyclinder screen from 1-3 inches shorter than standard. This prevents the nose of the screen from interfering with the transfer of long staple fibers from the cyclinder to the doffer, which creates a problem commonly known as "disappearing web".
 - When setting cyclinder screens, the centre adjusting point at the bottom of the card should be carefully checked. The front section and the back section of the screen joins at this point. The two sections of the screen should either be perfectly level with each other or the front section of the screen should be slightly higher than the back section where they join together. If the back section is higher than the front section, this will act as a disturbing factor on the air current which follows the direction of the cyclinder.

5. Card plates

It is very important that the card plates be set as accurately as possible.

Card plates should be pulled and checked at least every six months. Any plates which have been burred or nicked should be filed and polished until they are perfectly smooth. Nicks and burrs would fibres to hang in these areas, creating poor quality web.

When setting card plates it is always a good idea to sline each plate so that it will set to the cyclinder with a 0.005 inch bow in the centre. This helps to direct the air currents toward the centre part of the cyclinder, thereby preventing a certain amount of blow-out toward the side of the card. New plates should conform to the radius of the cyclinder as closely as possible.

Particular attention should be given to the setting of the top front plate.

The upper position of the top front plate has a direct relation to the amount of flat strips removed from the card. It is sometimes necessary to relocate the eccentric studs in the flexible bends in order to obtain the correct distance between the flats and the top front plate.

Careful attention should be given to the setting of the bottom front plate in relation to the cylinder and doffer. If the bottom front plate is set too high from the tangency point of the cylinder and doffer, snowballing will occur. This plate should be set straight across and should not be bowed. In cases where fibre is allowed to warp around the doffer, this causes damage to the cylinder because these fibres force the bottom front plate into the cylinder clothing.

Extreme care should be taken to prevent these fibres from wrapping on the doffer. Where this cannot be prevented, some mills have cut off one inch on this bottom front plate in order to prevent it from being pushed into the cylinder. In this case the mill is more concerned about the damage which occur than the snowballing on the doffer.

6. Lubrication of card

Improper lubrication of the card creates excessive wear and results in increased replacement costs.

It is recommended that each mill design their own lubrication charts based on the type of equipment in production.

Precaution should be taken against over-lubrication as well as under-lubrication. Excessive oil from bearings and other parts of the card does have a tendency to saturate the metallic clothing. As fibres come in contact with these oily spots, they tend to load on the metallic wire. This is a very undesirable situation and should be prevented.

7. Loading of cylinder and doffer

When newly metallic clothed cylinders and doffers are first put into production, some loading will be noticed. This is due to the rust preventive on the clothing. A little spanish whiting or starch can be sprinkled on the stripping roll while stripping and this will absorb the rust preventive and eliminate loading at start-up.

On occasions, some loading will be noticed on cards which have been in production for some time. Streak-loading or spot loading normally indicates light heavy places in the lap. Generally, there are no adjustments that can be made at the card to prevent this type of loading.

There are certain card faults which cause loading across the entire surface of the cylinder. This should be prevented whenever possible as this does cause a very neppy web.

When these conditions occur, the following steps should be taken:

- check settings of doffer to cylinder. If doffer is too far from cylinder, loading will occur on cylinder.
- check flat settings. If flats are set too close, loading will occur on cylinder.
- check settings of plates. If plates are set too close, loading will occur on cylinder.
- check flats for sharpness.
- check metallic clothing on cylinder for sharpness. If it is dull, loading will occur.

B. MAINTENANCE OF CARD CLOTHING

1. Flat clothing

Basically there are two major types of flat clothing. One major type is commonly referred to as Conventional Non-hardener Point Wire. This is generally a flexible wire with knee. The most widely used counts are 100's, 110's and 120's. This type of flat clothing should definitely be ground on a cycle based on every 6.000Kg of material carded. When re-grinding this type of flat clothing an "emery" type grinding

fillet should be used.

The other major type of flat clothing is commonly referred to as Hard Point or Metallic clothing. This type of flat clothing is available in a variety of designs. One advantage of Hard Point type flat clothing is that it does not require frequent grinding. This type of flat clothing can be regrounded on a "when needed" basis. In order to achieve the best possible results from this type flat clothing, it should be checked once every six months and regrounded if dull. As a guide, we can say that hard point type flat clothing should be regrounded after processing 120,000 Kg of cotton and replaced after processing of 480,000 Kg cotton.

Flats should definitely be re-set after each grinding. All parts of the flat motion drive mechanism should be properly lubricated and checked periodically for wear. Every precaution should be taken to prevent "facing" of the flat clothing the cylinder clothing. However, when "facing" does occur, the flat clothing should be regrounded or replaced, depending upon the severity of the "facing".

Particular attention should be given to the setting of the back flat adjusting stands (next to lickerin). If these flat stands are not properly set, the flat irons will reach the flexible blends in a "cocked" position or at a 45 degree angle. This increases the possibility of facing on the flat clothing. These flat stands should be set so that the flats are pressed on the flexible bends in a flat position.

2. Stripping of metallic clothing on cylinders and doffers

Stripping of the metallic card clothing on cylinders and doffers should be performed on an "if needed" basis only. Normally frequent stripping will not be necessary unless the stock being handled includes a great deal of trash and foreign matter.

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When stripping, the stripping roller has to be set slightly deeper than the bottom of the teeth in the metallic clothing. Excessive depths of setting will not afford a better stripping and will cause undue damage to the metallic clothing. It is recommended that No 35 stripper fillet be used whenever possible.

During stripping, strip only long enough to remove most of the foreign matter and trash which have accumulated on the cylinder and doffer. Generally, only a few revolutions of the cylinder and doffer - about 3-5 - are sufficient to remove all the foreign matter, which can be removed with a stripping roller. Prolonged running of the stripping roller will be of no benefit and may indeed cause excessive damage to the metallic clothing. The stripping roller should not be set in its brackets on the card until the cylinder and doffer have come to a complete stop. The cylinder and doffer should be started slowly, slightly before or at the same time the stripping roller is started. After stripping, the stripping roller should be removed from the card before the cylinder or doffer comes to a complete stop. If the stripping roller continues to revolve while the cylinder or doffer is stopped, the metallic clothing will be excessively stripped in one area.

3. Grinding of metallic clothings

Grinding of the metallic clothing is one of the most important phases of the maintenance program. The personnel assigned to this job should be thoroughly trained in the use of the solid rock traversing grinder.

As a guide, we can indicate that the frequencies for regrinding and/or replacing the card clothing should be after processing the following amount of cotton:

	<u>Regrind</u>	<u>Replace</u>
cylinder	120.000 Kg	430.000 Kg
doffer	120.000 Kg	480.000 Kg
flats	120.000 Kg	480.000 Kg

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	<u>Regrind</u>	<u>Replace</u>
transfer roll	-	480.000 Kg
stripping roll	-	480.000 Kg
lickerin	-	120.000 Kg

After grinding or new clothings, always new settings have to be made.

In grinding a metallic clothed card, the grinder is set according to the spark and sound. The grinding time should average approximately one hour per card.

The steps to follow in preparing a mettalic clothed card for grinding are as follows:

- place traverse grinder in card stands.
- remove traverse mechanism.
- rotate traverse screw by hand until grinding drum (rock) is near end of roll (cyclinder or doffer). Be sure and keep a long leaf guage between the rock and the metallic clothing during this procedure.
- adjust clearance between rock and metallic clothing at 0.010 inches.
- rotate traverse screw until rock is near opposite end of roll (cyclinder or doffer) keeping long leaf guage between rock and metallic clothing.
- repeat step 4 above.
- return traverse rock to original end and double check clearance between rock and metallic clothing.
- install grinder drive bell.
- rotate cyclinder or doffer in reverse direction.
- adjust traverse rock to metallic clothing until light spark occurs.

Caution: Do not make adjustments of the traverse rock until the rock is near the end of the cyclinder or doffer.

Once the grinding rock is properly adjusted to the metallic clothing so that a light spark occurs, allow the rock to grind for approximately 30 minutes before making any further adjustments.

The amount of grinding will vary according to the condition of of the clothing, therefore, the grinding time can only be judged by the person doing the grinding.

If the purpose of grinding is merely to sharpen the wire, a light "touching up" will be sufficient.

If the clothing is damaged heavier grinding will be necessary.

4. Resetting the card

The modern card is a precision machine which requires periodic adjustment in order to obtain quality production.

There are many variables that do affect the proper operation of the card. Each card room should be evaluated in the light of the prevailing variables and individual setting schedules outlined and maintained.

Some of the variables to be considered are:

- condition of card room floor. The card will operate more efficiently for longer periods of time when it is placed on a sturdy floor. Mills which are faced with shaky floors should recognize this fact and plan their resetting schedules accordingly.
- no one at this point has prepared a definite list of reasons why card setting change from time to time. However it should be recognized that card settings do change during periods of normal operation, therefore it is necessary that card settings be checked on a periodic basis.

Many mills combine the cleaning and grinding schedules with their resetting schedules.

Resetting should be done every 3 months.

At the present time all resetting of the card is based on the "feel of the guage". This "feel of the guage" varies from individual to individual. Therefore, slight variations in settings do occur from card to card. However, there are certain techniques which do help to accomplish the close, accurate settings required by metallic clothing.

These are:

- Always double check all settings points after all nuts and bolts have been tightened. Settings can change by the tightening of a bolt.
- Rotating surfaces (cylinder, doffer, lickerin etc.) should be checked around the entire circumference to ensure that a good setting is obtained completely around the working surface.

- Setting points should be checked after all belts have been installed. Tight belts can change some settings.
- Setting by guage is best determinated by the process of elimination. For example: if a part is to be set on 0.006 inches, then you should not be able to "feel" a 0.005, but a 0.007 inches guage should not go.

5. Facings on cards

Facing probably accounts for more damage to all types of cards clothing than any other single factor. Facing of the cyclinder with the plates, doffer, lickerin and screens may occur at times.

The most frequent facings are encountered between the lower edge of the bottom front plate and the cyclinder. This is caused generally by the web "climbing the doffer" and pressing the bottom edge of the front plate into the cyclinder. This is very undesirable as it injures the cyclinder clothings as well as the front plate.

The second most common facings are between the cyclinder and flats. Probably the best way to detect this is by observing the flats for the shiny teeth that are caused by facing. It is a very good habit to always look at the flats for shiny faced clothing whenever looking at the cards. Unless this facing is detected by eye, it will probably continue. When newly clothed flats are installed before they are ground on the card, they are very susceptible to facing because of the variation in height of the wire on the flats.

During the very deplorable condition of facing the sharp carding teeth of the flats are pounded millions of times by the sharp teeth of the cyclinder at a speed of about 25 miles per hour. A terrific and very detrimental abrasive action results, which injures both the flats and cyclinder clothings. Depending upon the severity of the facing, it is sometimes necessary to regrind more than once to remove the faced surface from the flats and cyclinder clothings.

If facing has occurred only on a portion of the cyclinder to an extent that it would depreciate the balance of the metallic clothing to grind the entire cyclinder clothing, we can then remove and replace this faced section of metallic clothing.

6. Blowout and chokes

Blowout and chokes on metallic clothed cards will be more noticeable because metallic clothing is self cleaning.

However blowout and chokes can be controlled with proper settings and maintenance. If blowout and chokes are excessive, the following areas of the card should be checked:

- Setting of arches to cyclinder. Normal clearance is 0.022 inches. However, arches must be perfectly square to the cyclinder from front to back.
- Plate settings should be rechecked. Many mills use shims to bow all plates 0.005 inches in centre, giving a wider setting in the centre than on each end. Air currents are then directed towards centre of card.
- screen settings should be rechecked, particularly in areas where screen sections join together.

Chokes on the front nose of the cycliner screen are a source of trouble as they cause a ragged selvage in the web. Most cards have a make-up piece between the doffer shroud and arch. This leaves a gap where fibres can build up and form chokes. Particular attention should be given to this area to make sure that all surfaces of card and screen are smooth and free of burrs. Setting points in this area should be checked if chokes are noticed.

7. Neps

Experience has proven that metallic clothings will provide a much lower nep count on any fiber carded. In order to maintain a consistent, low nep count, rigid maintenance and re-setting schedules must be followed. Some mills have found that grinding the metallic clothed cyclinder immediately improves the nep count. However, experience has proven that this is only a temporary measure and the nep count will rise again over a period of two weeks. It is good card room practice to make periodic nep counts on all cards and record these.

Card grinders should be asked to check thoroughly every card which shows a high nep count. Various parts of the card should be checked in the order listed below:

- check all setting points. Reset any setting point that may be off.
- check flats for dullness. Regrind if dull.
- check lickerin for dullness or damage. Replace if not in good conditions.
- check setting and sharpness of mote knives. Reset or re-sharpen as needed.
- check the clothing of cylinder and doffer for dullness or damage. Regrinding of the clothing of cylinder and doffer should not be attended until all other parts of the card are thoroughly checked.

8. Cloudy Web

Cloudy webs are an indication that the card is not performing properly.

A cloudy web would indicate the following defects:

- Lickerin screen is too far from lickerin.
- Feed plate is too far from lickerin.
- Lickerin clothing is dull.
- Flat strips uneven. Too much space between flats and top front plate.

9. Ragged selvage

Ragged selvages at the web are generally caused by chokes on the front nose of the cylinder screen. However, ragged selvages can also be caused by lap shifting at the back of the card. Lap guides should be set so that the lap does not shift as it is fed into the card. Oil on the selvages of the metallic clothing can also cause loading which in turn creates a ragged selvage.

C. Card Settings

For information we enclose recommended card settings for metallic clothing based on cotton fibres being carded. These are recommended settings only and should be used as a guide in establishing the best settings which produce the best results and quality.

<u>Card parts</u>	<u>setting in inches</u>
Feed plate to lickerin	0.010
Lickerin to cyclinder	0.007
Cyclinder to doffer	0.006
Doffer to stripping roll	0.007
Stripping roll to transfer roll	0.007
Flats to cyclinder (0.012 is side of lickerin)	0.007-0.010-0.012
Back plate to cyclinder (top edge)	0.022
Back plate to cyclinder (bottom edge)	0.022
Top front plate to cyclinder (top edge)	according to waste
Top front plate to cyclinder (bottom edge)	0.032
Bottom front plate to cyclinder (top edge)	0.032
Bottom front plate to cyclinder (bottom edge)	0.015
Lickerin screen to lickerin	0.022
Cyclinder screen to cyclinder (back)	0.022
(bottom)	0.034
(front)	3/16 (0.187)
Mote knife (upper)	0.012
Mote knife (lower)	0.010
	} 22 degree angle
Cyclinder Rpm	300
Lickerin Rpm	800
Flats	3 1/2 inches/min.