



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

17225

FINAL REPORT

OF THE CONTRACT

BETWEEN

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AND

EGYPTIAN IRON, STEEL CO.

FOR THE

PROVISION OF SERVICES RELATING TO THE

INTERCOUNTRY PROGRAMME FOR MANAGED

MAINTENANCE SYSTEM

IN METALLURGICAL AND OTHER INDUSTRIES

IN AFRICA

REPORT ABOUT THE MISSION OF ENGINEER

MOSTAFA SAYED ABOUL ELA

ETHIOPIA

SYNOPSIS

A visit was made to the Ethiopian national metal works corporation steel works at Addis Ababa between 7th June to 5th August 1988 in order to assess the current operational problems experiences in the day to day operation of the rolling mill, training and consultation in rolling of rounds and profil field due to contract No. 87/118 between Egyptian Iron and Steel Co. S.A.E. (EISCO) and UNIDO (Project No. UC/UD/US/RAF/85/131).

A full appraisal of the current engineering problems was undertaken covering all aspects of design, training and expansion of the mill as a solution for the existing problems using the available area and main equipments existing.

## INTRODUCTION

According to my visit to the rolling mill in AKAKI-Addis Ababa and watching under its running condition with detailed study of its layout and specification of equipments, I reveal here under my suggestion of the existing mill summarizing its main problems with a brief description of the mill.

## DESCRIPTION OF THE ROLLING MILL

The existing mill is a small unit of 5-stands in open train of pitch diameter 25mm used for the most variety of different products, besides is incorporated with other 4-stands of the same pitch diameter 250mm used for producing the small size of product of 6 mm in semi-continuous arrangement.

The 5 stand mill is operated depending on hand looper by the Ethiopian workers and an Italian supervisor who performs most of technical work such as; adjustment of the mill, quality control of finished products, adjustment of the intermediate passes, guides and all other technical works.

- The mill has one reheating furnace of very limited effective area and narrow width without any control system or measuring devices even for the main important parameters. The furnace is positioned longitudinally in a manner that prevent any trial to use the available big area in the mill by adding some stands or equipment that can help for the mill to be more productive.

- The mill has also a platform of rails in parallel to the cooling bed dependent upon the efforts of big number of workers to transfer the products on that rails after the bar is sheared by an old type fly shear. Moreover, working around this area is very hard for the workers due to high temperature of the products.
- The mill is constrained by its three main parts; the mill, the reheating furnace and the cooling bed. However, any improvement in one part will not be a solution for the other two parts. Consequently, any trial must enclose all the three mentioned parts of the mill.

#### MAIN PROBLEMS OF THE EXISTING ROLLING MILL

There was two main urgent problems to be solved

##### the 1st: MISSING OF ROLL PASS DESIGN OF PRODUCTS

Currently, there was no definite design of passes of any product, that means, it was not able to produce any product without external help or after the Italian supervisor leave to his country which will happen in the nearest few years.

##### The 2nd LACK OF KNOWLEDGE

From the beginning of nationalization of the rolling mill, the operation and mill taking is done by one Italian expert who is by now on the age to retire. It will be a surprise to tell that no other person from the Ethiopian staff and workers is able to adjust the mill or

define the passes of any product or solve any technical or metallurgical problem, due to the fact that all the pass secrets and guides with bars arrangement is done by the Italian supervisor.

There must be three or four Ethiopian counterparts that can run the mill by at all case immediately, so that the man will be replaced in the very near future.

The other aspect of lack of knowledge on the mill operation is clearly seen on the maintenance workshop by the fact that all passes are machined without specified templates and the means of controlling produced spars and is done without written control. Such programming must be adapted and training on this aspect and general operations must be designed for short and long term duration with close attention.

#### FACING THE EXISTING MAIN PROBLEMS

I had faced these previously mentioned problems by the following steps.

1st step: For solving the 1st problem, the pass design for the all products produced by the mill is made with detail drawing (see the draft report, part No.2) with this step the Ethiopian mill/staff can have the very important part to operate the mill without external help, but without having the power to solve any technical problem or quality of products due to the lack of knowledge of rolling technology.

2nd step: The second main problem, which is the lack of knowledge by the mill staff, is faced by giving lectures of about 96 hours on rolling mill technology for producing round bars and small sections.

The lectures on rolling mill technology is prepared based on the fact that all the engineers working at the factory are mechanical engineers and have not sufficient knowledge in this specialized field. In the lectures given, the following main points of rolling mill technology are enclosed . ( see the draft report, part no.3 )

I- TECHNOLOGY OF ROLLING AND ITS THEORY:

- 1- Regimen of heating of steels in continuous reheating furnace and how to control the temperature and pressure inside the furnace.
- 2- Theory of rolling technology and its main parameters:
  - 2.1 Angle of bite and its max permissible value for different condition of rolling and roll material.
  - 2.2 Deformation zone, forward slip, pressure and neutral point.
  - 2.3 Draft, spread, coefficient of elongation, peripheral speed, effective diameter of different passes, pitch line and exit speed of metal.
3. Break down passes and how to design ( Box passes, flatoval, diamond and square passes.
4. Finishing passes and sequence of rolling passes



- 5- Rolling in continuous mill and its characteristic.
- 6- Design of inlet and outlet tackles for any pass.
- 7- Design of twisting guides in continuous and in open train mill working with repeaters between the stands.
- 8- Roller guides and their uses and advantage on rolled products.
- 9- Rolling defects with their reasons and how to treat it in the different passes and in the finished products.
- 10-Effect of different parameters on the spread of metal in the passes
- 11-How to plot the time chart for any product in different mills to calculate the productivity ( ton / hr ) and organizing the work in the production line of the mill.

## II- Lectures on Roll Pass Design

- Roll pass design of round
- " " " squares ( rounded and of sharp corners)
- " " " flats
- " " " angles

The engineers who attended these lectures from EISFA are :

- 1- Eng Wondimu Deginetu
- 2- " Getachew Gebremeskel
- 3- " Samson Tassew
- 4- " Getachew Tesfaye
- 5- " Assefa Terefe
- 6- " Tadesse Habte.

3 es step: Revamping Of the Mill.

The existing rolling mill is of old fashioned type and very low production capacity ( 4.5 tons / hr ), dependent on hand-working with hard running condition .

As the mill of the few number of stands with small roll diameter ( 250mm) relative to the initial billet square 100 mm, the finished product is not free from overlap defect as a result of using very deep roughness by welding on the roll surface of break-down passes to allow fitting in this condition of big draughting.

Really, I don't see other way far solving the existing problems rather than revamping this will to be in normal running condition with higher production capacity of good quality product without depending on hand working . This part of revamping is given in The enclosed draft report , part no 1. of new layout and full specifications of all equipments added , by using the available area exist in the mill.

---

Prepared by : Eng. Mostafa Sayed Aboul Ela

Egyptian Iron & Steel Co.

REPORT ABOUT THE MISSION OF ENGINEER

MOHAMED TAHA

TANZANIA

An official mission to TANZANIA was made with immediate objectives.

- (1) To assess the existing and specific needs of maintenance activities.
- (2) To establish / strengthen managed maintenance activities including spare parts production.

Most of the period was spent with National Engineering Co. (NECO) - One day visits were made to Aluminum AFRICA Co. (ALAF) steel casting division.

The period of 10 days was spent in Tanga steel Rolling Mills.

The last 15 days were concentrated to make an exercise to manufacture a Rolling Mill stand as a spare for a worn one for Tanga steel Rolling Mill with the cooperation of:-

- The pattern shop at NECO .
- Steel casting foundary at Tanzania-Zambia Railway association (TASARA).
- M/C shop for machining at NECO .

Work plan :

1- Studying existing situation

- Organization .
- Equipment ( designed capacity , no s , and its technical condition).
- Personel (no s , technical qualification, training , skill level).
- Maintenance activities & progress probability.
- Spare parts production & its availability.

2- Applying a simple manual preventive maintenance system

3-Implementation of the preventive maintenance system.

4-Training programmes for technicians by engineers & -  
superintendents .

5-Study general problems and bottle necks .

6-Visits to other companies to study if the chance to  
cooperate to produce spare parts using the facilit-  
ies of all partners .

National Engineering Co. ( N E C O )

-----

Cast Iron and Non ferrous foundry:

Sand preparation :

- Sand plant :

sand recirculation plant supplied by a German Co. ( Herring ) is operational on both automatic and manual modes and turns out 4.5 ton of sand/hr.

- Sand laboratory :

Supplied through URIDO .

- 1- Vibratory sieve shaker for grain distribution.
- 2- Apparatus for sand washing .
- 3- Two Laboratory dryers oven for drying sand .
- 4- " rammer for raming sand specimen
- 5- Permeability meter .
- 6- Laboratory balance .
- 7- Strength tester .
- 8- Mould hardness tester .

Pattern making :

- Band saw .
- Circular saw .
- Planing m/c .
- Ordinary lathe .
- 2 bench drilling m/c .
- Disc grinders .
- Saw blade sharpening m/C .
- Cylindrical wheel grinder .

Moulding m/cs :

- Rollover type BT 1 : no off 1 .

pattern table capacity 760 x 550 .

squeeze pressure 6 atm .

- Pin lift type no off 3.

pattern table capacity 660 x 460 .

squeeze pressure 6 atm .

pneumatic rammers .

- Melting & pouring :

- two cuplas 0-37 m<sup>2</sup> cross section area .

yield per hr 3 ton .

- crucible furnances .

two oil fired capacity 1 ton & 90 Kg for  
non-ferrous alloys .

- charging cranes .

- accessories .

Knock out equipment to knock out boxes up to

1000x200x800 % .

- Fettling equipment .

- portable angular grinders .

- table grinding wheels .

- ordinary chipping hammers .

Machine shop : -

More than 60 machine tools consisting of : -

- centre lathes
- threading lathes
- vertical "
- shoper
- slotting machines
- planner
- horizontal boring m/cs
- universal milling m/cs
- vertical milling m/cs
- crank shaft grinding m/cs
- cylinder boring m/cs
- colm drill m/cs



Training programme

preventive Maintenance

No.	S u b j e c t	time (hr)	Instructor
1	General introduction	2	
2	Arranging work area	2	
3	Preventive Maintenance system	8	
4	Maintenance Instructions	8	
5	Repair Methods	8	
6	Tools ,gauges & Instruments	6	
7	Implementation of maintenance work	4	
8	Safety , safety Rolls	2	
		40	hrs

- . 4 hrs / day 10 - 12 , 13 - 15 O'clock .
- . 2 days/ week Tuesday & Thursday .
- . 10 trainees.

Selected from Maintenance & production groups.

- . Instructors , Super intendants & Engineers .

N.B. This is also an exercise for Instructors.

Tanga Steel Rolling Mills .

Bar Mill : -

Furnace capacity 8 tons / hr .

270 Ø open train 3 - high Rolling stands .

Fly shear & Cooling bed .

products Ø 10 - 25 Ks.

Wire rod Mill : - ( not commissioned built 1982).

Furnace capacity 13 ton / hr .

Rougher . 400 3 - high stands .

Intermediate 270 open train 3 high stands .

Finishing continous 250 stands .

Coilers .

Subjects discussed : -

1 - PRODUCTION

Mr. JOHN KIMBO

production super  
intendant

1.1. Production performance .

1.2. " constrains .

1.3. Mill spares fabrication.

1.3.1. rest bars.

1.3.2. safety caps.

1.3.3. guide boxes.

1.3.4. work rolls re-filling.

1.4. present pass design.

1.5. proposals for redesigning stand no. 1 passes.

2 - MAINTENANCE

Mr. KAZADHANI

Maintenance super  
intendant

2.1. Mechanical maintenance.

2.1.1. Maintenance planning.

2.1.2. Mechanical spares that can be fabricated.

locally ideas on how to fabricate.

2.1.3. Ideas to improve mechanical maintenance.

2.2. Workshop

Mr. Rophael Mndolwa  
workshop inspection

2.2.1. Introduction of a working system.

2.2.2. Work programming and training.

2.2.3. General workshop condition .

2.3. Electrical maintenance

2.3.1. present maintenance system .

2.3.2. Ideas on improving this system .

3 -GENERAL INFORMATION ON ROLLING MILLS .

Problems : -

- Low production rates .
- Long delays and stoppage time .
- The reasons from my point of view are : -
  - Not following good production practices.
  - No preventive maintenance system .
  - No available spare parts .
  - No incentive system for wages .

RECOMENDATIONS : -

- Practical training for engineers & Formen .
- Technical assistance for longer periods(1-2 years)  
in both production & maintenance to get experience  
in operational and managerial skills.

During our visit to Tanga Steel Rolling Mill from 16.8.1988 to 25.8.1988, I was informed that their was a serious problem of a worn out Rolling stand , it was worth of 45.000 US \$ to be imported from Italy, the problem was the lack of foreign currency.

I suggested to exercise manufacturing this stand locally in-coordination with several firms using all facilities.

- 1 - Pattern shop of NECO .
- 2 - Steel foundary of TAZARA or steel making facilities of ALAF with foundary personel and facilities of NECO .
- 3 - M/C shop of NECO

it saw approved by the both general managers of NECO & Tanga Steel Rolling Mill to carry on the plan .

There was no available drawings except a general assembly drawing ; So we have to make drawings from the existing stand and issue the necerray detail drawing & Work shop drawings .

The time factor was limiting , because we started 2 weeks before the end of my pressence in Tanzania .

So, we started working according to the attached - time schedule to implent as much as possible the critical parts of the project before my departure and to prepare with studies and technical assistance and using the sample stand for simulation of work in m/c shop .

Untill we recive rhe costed parts to forecast the problem and finding solution in advance to overcome any -

Difficulties they would meet after my departure .

The G.M approved special bonus , coupled with over-  
time allowance as well as provision of transportation -  
of the personnel involved at odd hours .

Preventive Maintenance System

During my presence in TANZANIA , I found most of engineers have coppies of a " preventive maintenance system".

The swedish company IDHAMMAR prepared training programes to most of Maintenance engineers in the different companies .

I prefered to complete in the same system and to apply it better than starting a different system.

Report about the Mission of Eng.

Rasrat M. Abdel salam .

"ZAMBIA "

According to the project No. UNID/Project DF/25/004, i.e Inter-country Programme for Managed Maintenance in Metallurgical and other Industries in AFRICA, the mission was held in ZAMBIA with INDICO Limited, LUSAKA.

Management of Indico limited planned my work to be with LUSAKA Engineering Co. limited "LENCO" for my staying in Lusaka. The objective of their demands to strengthen Managed Maintenance activities through training Programs, Manufacturing spare parts and producing the annual Preventive Maintenance Schedule for M/CS and Equipments of the CO. In same time to study any problems concern Production dept. and how these problems can be solved.

Meeting and discussion with the general Manager of "LENCO", he was interesting with planning preventive Maintenance as it is the only solution to maintain M/CS, Equipments in good condition to give high productivity and long life time.



Preface

LUSAKA Engineering Company limited

"LENCO"

Introduction

Lenco is jointly owned by the Zambian Government through INDECO limited and the Italian Companies, Indeco Limited is the majority shareholder .

Products

A- Light Engineering Products:

- Steel doors and window
- wire nails
- Steel conduit pipes
- Office and institutional furniture
- Medical Equipment :beds- Trolley, stretcher
- Aluminium ladders, doors and window frame partitions, Curtain Dailing.

B- HEAVY ENGINEERING PRODUCTS

- Farm Trailers
- Commercial trailers, Semitrailers and Tankers from 15 to 40 ton capacity.
- Truck bodies .
- Bus bodies

Production BLOCKS

The Company has 3 Main blocks A, B and C .

- I- BLOCK A and B : have more than 30 M/MS and equipments  
" Mech. Presses , Guillotine, Bending M/1, Drills ,  
Running , lathes, Milling, grinding . "

th. two blocks prepared for manufacturing light eng. products.

2- BLOCK (3)

Have 11 heavy duty M/CS "hydraulic press, guillotine, rolling and pressbrake M/CS ...

It is prepared to manufacture Heavy Eng. Products.

Maintenance Department

The work began with maintenance dept. And due to discussion with engineers and formen and to my observations, I submit the following Notes:-

- 1- Most of M/CS and Equipments are old manufacture.
- 2- Maintenance is done when there is sudden break down or failure .
- 3- Manual Operating and spare parts documents are not available .
- 4- Formen and workers are report for work when there is failure in M/CS: planning preventive maintenance nearly not applied.
- 5- The maintenance dept. Has more than 35 workers about 7 persons of good experience and the others of few experience.
- 6- Many of M/CS and equipments are power hydraulic operated, specially the heavy duty M/CS. Maintenance staff (Engineers and workers) have no basic information about hydraulic system.
- 7- The maintenance staff have few knowledge about kind of materials used for manufacturing spare parts.
- 8- The room may be supplied by some special M/CS and skilled workers.

Due to above notes it is decided to do (intend) two main training programmes for engineers and foremen:-

A- Planning preventive maintenance .

B- Power hydraulic system.

A- Planning preventive maintenance

I- Program For Engineers

1- Preface include the reasons of failure of M/CS and types of maintenance.

2- Concept of preventive maintenance & P.M.

3- Benefits of applying P.M. Programme

- Minimise maintenance cost
- Less downtime
- Prolong the life time of M/CS
- Ensure accuracy and productivity
- Less standby equipment
- Minimum spare parts storing
- Less downtime and increasing safety.

4- Main items needed before beginning P.M.

- Selling the program
- Initiation of P.M. program
- P.M. Inspection
- Service manuals

5- Repair cycle including the main categories and definitions : I. S , M , J

" Inspection, small, medium and capital Repair "

6- The main formula of repair cycle of (I) and (J) categories and repair cycles concern groups of M/CS and equipment "Metal cutting and metal working equipment".

- 7- The duration of repair cycle in hours, months and years and the definition of all factors used in calculation.
- 8- The repair Complexity (R.C.) of M/CS and its meaning and use for calculation the working hours and number of workers needed for the main categories of the repair cycle.
- 9- Organization of maintenance dept.

- Central Maintenance
- Area
- Combination system

10- Practical training:

With maintenance engineers, we produce the preventive maintenance schedules for M/CS and equipments of block (A), (Band (C)).

II- Program for fermen and workers

As above (I) from item 1 to 5 and some knowledge for item 6 to 9. Practical work in field about sequence operations done for categories of repair cycle, I.C.M. I.

B- Power Hydraulic system

(I)- Basic and advanced programme for engineers

1- Introduction to fluid power

- What is fluid power
- Advantages of fluid power.
- Components of fluid power.
- Types of fluid power system.

2- Properties of hydraulic fluid.

- Weight, density, specific gravity.
- Pressure head and force.
- Pascal's law and formula.
- Viscosity and Viscosity index
- Fluid contaminants.

10- Hydraulic system maintenance:

I- Excessive Noise.

- Insufficient pressure or no pressure at all.
- Abnormal pressure or fluctuation flow.
- Delivery is too small or no delivery.
- Fluid temp. is too high.
- Trouble shooting valves.

II- Basic program for foremen & workers

The same as above (I) for item 1, 2 and from item 5 to 10. Practical training on some power hydraulic M/MS in the field (Hydraulic press, press brake, guelotine).  
Proposals concern maintenance dept:

1- Annual training programmes must be held inside and outside the country to increase experience of engineers and foremen for the following items:

- Practical maintenance for M/MS and equipments concern all categories of P.M. (I, II, III, IV)
- Practical training for power hydraulic system "Hydraulic training centre in Egypt".
- Producing of spare parts (material, manufacture heat treatment) in the Big tool Room in Egyptian Iron and steel CO.

2- Planning preventive maintenance must be applied for the immediate future.

3- During implementation (P.M.) , complete files needed for M/MS including all data and drawing of spare parts

4- Tool Room must be supplied by some types of M/MS.

Monthly maintenance system must be done for manufacturing spare parts, dies and fixtures.

- 5- Foremen and workers according to number of blocks and volume number of M/CS must be classified into groups.
- 6- To improve the activities of workers, bonus system must be applied as production people have .

Preface:

- 1- Marketing office receives orders from customers.
- 2- Orders send to Design office (Technology office) for study and analysis.
- 3- Orders offer with all documents and drawing send to planning office.
- 4- Planning office consequently send orders to work shops and followup the production.

Passing through sequence operations of products in the 3- main blocks (A), Band (B), the following notes and proposals were raised to the G. Manager :

- 1- Quality control section is essentially for inspect products from the component parts to final products.
- 2- Many component parts manufactured by several operations, instead one or two operations can be done saving time and giving high accuracy.
- 3- Due to some old fusion M/JS, its productivity is not high (quantity and quality) as forming pipe M/C. Modern M/JS will give more productivity.
- 4- Welding in the 3 Blocks not of good quality. Welders may have more experience and also semi-automatic welding is more preferable.
- 5- Due to limited size of raw materials many joints are found in Main products " as frames, doors and windows, chassis of trailers".
- 6- Assembling of products takes more time, special fixtures can be used to save time and give more accuracy.
- 7- Sand blast is needed before painting process.
- 8- Monthly rate production can be increased by :

- r.
- Improve some operations as welding, using correct jigs and fixtures, increase experience of workers.
  - Improve the existing bonus system .



Mr. M. H. Ewinga  
General Manager  
Izumo Iusaka Co Limited

Toshiba

Dear Sir

I submit herewith some proposals concerning the  
Maintenance Department.

Notes:

- 1 - Most of the Machinery and Equipment are old types (over 100)
- 2 - Maintenance is only done when there is a sudden breakdown or failure of the Machinery and Equipment.
- 3 - It appears that the Maintenance staff (Technicians and workers) have no permanent workshop. It would appear that they report for work when there is a breakdown or failure in the machinery and equipment.  
This causes overhead costs for the company and the machinery and equipment have a short life time which causes excessive repair costs and problems with production. In short, maintenance is only carried out when breakdown of machinery and equipment.
- 4 - No operating manuals and spare parts for machinery and equipment.
- 5 - Planning of preventive maintenance (PM) should be carried out for the immediate future.
- 6 - My work began by P.M. programme with the local maintenance engineer.
  - a) - Rules, Formulas, Tables and Annual Scheduling Charts.

b)- The period of time for each Machine and equipment during to year.

c)- The time rate concerning each category of the repair-cycle ( I, S, M, C , Inspection, small medium and capital repairs).

7 - I.M. programme for foremen (small one), clearing the benefits, regular work, safety, minimum stopping hours with high productivity( quantity and quality).

8 - As some machines and equipment are power H hydraulic operated and due to the lack of experience of maintenance staff in regard to this branch, 2 training courses had been held for:

1- Mechanical maintenance Eng. - Advanced programme

2- Mechanical and Electrical maintenance foremen-Normal programme.

Positive displacement pumps, all types of directional, pressure and flow control valves, check Valve, filters and accessories. Characteristics, operation problems and maintenance of above items.

#### FLOW CHART

1- Annual I.M. Schedule for Machinery and equipment of block H and tool room and others had been done and work must begin in August.

2- Foremen and workers according to number of blocks and volume number of machines must be classified into groups one group only must be on standby for urgent work and breakdown and in the absence of workers from the main group.

- 3- Annual training programmes (theoretical and practical) must be held for unskilled workers to increase the number for qualified workers.
- 4- Electrical maintenance section is in need for an Electrical Engineers to apply the electrical P.M. also with the Mechanical section at the same time.
- 5- Following items is needed for Tool Room:
  - High precision small and big centre lathes.
  - Gear cutting machine,
  - Small forging machine of 500 lbs capacity
  - Modern and productivity cutting tools.
  - Bench loading system (spare parts, life and flames.
- 6- Due to lack operating manuals for machinery and equipment especially in regard to spare parts, draftsmen may assist during P.M. to collect and draw all data needed. A complete file must be done for all machinery.
- 7- Applied Romex system according to the monthly finished P.M. programme and also due to the percentage of man, page hours related to the actual working hours of machines (not more than 5-7 pieces).
- 8- The Mechanical Engineer may be trained outside (in Egypt) for:
  - Practical training in P.M. and hydraulic systems.
  - Knowledge of material, manufacture and heat treatment of spare parts.
  - Get training programmes for foremen and workers.

9- The Chief of Tool Room also have to be trained outside to learn :

- Knowledge of material, manufacture and heat treatment of spare parts, dies, jigs and fixtures.
- Training programme in Mechanical drawing.
- Monthly training systems for machines .

10- ensure technical cooperation between Zambia and Egypt:

Tool Egypt : 4 persons 1 Engineer , 3 Foremen

( 1. Machine and Tool - room)

Tool Zambia : 4 persons 1 Engineer, 3 Foremen.

Yours faithfully

*[Signature]*  
[Name]  
[Title]

Mr. M. M. MGA

General Manager

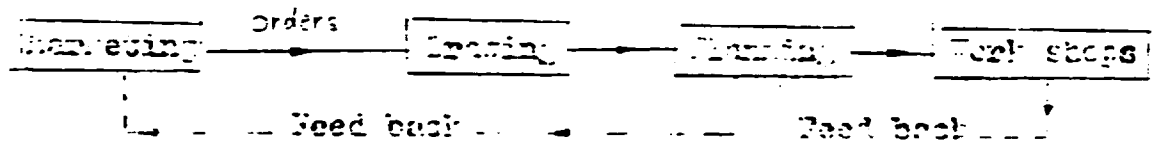
Leno Masaka Co. Limited

Lusaka

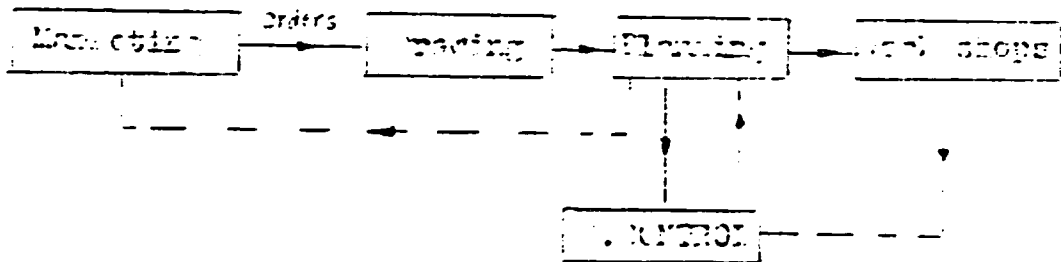
Dear Sir,

I submit herewith some notes and proposals concerning my observations of production dept, Blocks A, B and C.

- Block A : Manufacturing - chairs, office desks, file cabinet.
  - , B : , windows and doors.
  - , C : , body of trailers, buses and trucks.
- 1 - The Co. may have a quality control section for inspecting product from component parts till final products, the existing system is:



and proposed system for control products and bonus system for goods



- a- Orders from Marketing to Trading office (for new orders) or direct to planning office for repeated orders
- b- From planning office to work shops (original copy) and to quality control (2nd. copy)
- c- Feed back from work shops to Q. Control for inspection and from Q. control to planning office giving the result of inspected product.
- d- Planning office send all L.H.C. data about final products to

marketing office.

- 2- Some M/Cs are of old types not productivity in quantity and quality, as two forming pipe m/cs with gas welding. Modern M/C with Induction welding is needed.
- 3- In Block (A), some parts of Main products manufactured by using several operations, it can be done by single or double operation, that means save in time and good accuracy, like front doors of File Cabinet and office cisco. The Locking Arm of file Cabinet is manufactured manually (hard work) it can be done on mechanical press.
- 4- Material:  
In Block (B), some frames of small and medium size of windows and doors can be made from strip coils instead of sheet metal, No joints, No welding, No rejected materials.  
In Block (C), chassis is formed from several joints (limited dimension of sheet metal), weaken the chassis and take more time during assembling and welding.
- 5- Welding:  
Welding in the 3 Blocks not of high quality. In Block (A) some products can be internal welding instead of external (Loss of time for manual surface grinding) Semi automatic welding with inert gas and manual spot welding can be used. (In Block (c), all welding must be semi automatic, vertical welding must be prevented. All Tanks after welding must be rested under press. (3-5 bar), holes and fine cracks can be found during handling and transportation of tanks.
- 6- Painting:  
Some products must be sand Blast before painting to remove any rust, scaling, flux and some chips.

7- Training:

- A- Yearly welding programs for workers to improve their experience .
- B- Training programs for designers and craftsmen for manufacturing jigs and fixtures to give high productivity and quality .
- C- 4 persons ( Engineer and worker) from Zambia to have training programs (Design, assembling, welding) in Egypt, + person of the same from Egypt to Zambia.

Yours Faithfully

  
Kaatat Abdel Salam

EGYPTIAN IRON & STEEL CO.

REPORT

ON THE MISSION TO ETHIOPIAN GOVERNMENT

NATIONAL METAL WORKS CO-OPERATION

FROM 8 JUNE - 6 AUGUST 88

UNIDO PROJECT NO. UC/UD/US/RAF/181/131

CONTRACT NO. 87/118

SUBMITTED BY

ENG. ADEL HUSSEIN

EGYPTIAN IRON, STEEL CO.

30.9.1988



REPORT  
ABOUT TECHNICAL ASSISTANCE  
PROVIDED BY ENG. ADEL HUSSEIN  
FOR ETHIOPIA GOVERNMENT  
NATIONAL METAL WORKS COOPERATIONS

THIS REPORT HAS BEEN PREPARED COVERING THE TECHNICAL ASSISTANCE PROVIDED FROM EGYPTIAN IRON, STEEL CO. HELWAN TO ETHIOPIAN GOVERNMENT UNDER PROJECT DP/EGY/85/004, RAF/85/131, FIRST OF ALL I WOULD LIKE TO RECORD MY HEARTY APPRECIATION AND THANKS FOR THE SUSTAINED SUPPORT AND GUIDANCE I HAVE RECEIVED FROM UNIDO HEAD QUARTERS IN PARTICULAR FROM DR. JURY GREBTSOV, SENIOR INDUSTRIAL DEVELOPMENT OFFICER INDUSTRIAL OPERATION DIVISION UNIDO VIENNA, MR.H.CREYDT ACTING HEAD PROJECT PERSONNEL RECRUITMENT SECTION DIVISION OF INDUSTRIAL OPERATION IN ORGANIZING THIS MISSION SUCCESSFULLY, AND ALSO DEEPLY THANKFUL FOR HIS EXTENSIVE HELP AND SUPPORT OF MR. THARWAT SABRY, SENIOR NATIONAL OFFICER UNDP/CAIRO FOR THIS SUSTAINED ADVISE AND SUPPORT.

BACK GROUND INFORMATION

THIS INTER COUNTRY PROJECT MANAGED MAINTENANCE IN METALLURGICAL. FOUNDRY INDUSTRIES RAF/85/131 HAS BEEN EVOLVED WITH THE MAIN DEVELOPMENT OBJECTIVE OF THE AFRICAN DEVELOPING COUNTRIES TO ESTABLISH AND OPERATE EFFICIENT MAINTENANCE SYSTEM IN THE METALLURGICAL INDUSTRIES, IN ORDER TO ACHEIVE THIS, THE FOLLOWING MAJOR PROJECT ACTIVITIES HAVE BEEN PLANNED UNDER THE SCOPE OF WORK OF THE PROJECT.

- CONDUCTING 3 DEMONSTRATION WORK SHOP IN EGYPTIAN IRON, STEEL CO.
- ORGANIZED A SHORT VISITS FOR AFRICAN EXPERTS TO EISCO.
- TO DEMONSTRATION THE RESULTS/ACHIEVEMENTS OF THE MANAGED MAINTENANCE SYSTEM IMPLEMENTED IN EISCO.
- TO IDENTIFY AND DISCUSS THE MAINTENANCE PROBLEM WHICH ARE EXISTING IN THE METALLURGICAL/FOUNDRY INDUSTRIES IN THE AFRICAN COUNTRIES PATHICIPACTING IN THE WORK SHOP.
- FOLLOW UP MISSION BY EGYPTIAN EXPERT TO THE COUNTRIES CONCERNED TO CARRY OUT NECESSARY STUDIES AND RENDER THE ASSISTANCE REQUIRED TO DEVELOP/IMPLEMENT IMPROVE THE EXISTING MAINTENANCE SYSTEMS AND PRACTICES.

THE ABOVE ACTIVITIES ARE CONSIDERED TO BE THE KEY FACTORS WHICH WOULD COVER ALL IMPROVEMENT OF PERFORMANCE OF IRON & STEEL AND OTHER METALLURGICAL/FOUNDRY INDUSTRIES WHICH FROM THE CORE OF THE INDUSTRIAL DEVELOPMENT FIELD OF HIGH PERIORITY WITHIN THE PROGRAMME, TARGETS OF THE AFRICAN DEVELOPMENT DECADE.

MISSION REPORT

1. NAME OF CO.: EGYPTIAN IRON, STEEL CO.
2. NAME OF MEMBER: ADEL HUSEEIN
3. COUNTRY VISITED: ETHIOPIA
4. DATES: 8 JUNE - 6 AUGUST
5. PURPOSE OF VISITS:
  - a- TO ORGANIZE PROGRAMME THROUGH LECTURES AND ON SITE DEMONSTRATIONS FOR BOTH MAINTENANCE ENGINEERS, PLANNERS AND MANAGERS IN SELECTED COMPANIES.
  - b- TO STUDY WITH LOCAL EXPERTS IN THESE COUNTRIES PROBLEMS OF SPARE PARTS PRODUCTION AND THE FIELD OF ASSISTANCE WHICH CAN BE PROVIDE BY EISCO IN THIS MATTER.
  - c- TO SPECIFY THE FUTURE TRAINING REQUIREMENTS OF THESE COUNTRIES WHICH COVERED UNDER PROJECT RAF/85/004.
  - d- EISCO ALREADY ORGANIZED 3 WORK SHOPS DURING 83,84,1985 AND TO PLAN FOR FUTURE NEEDS IT IS REQUIRED TO DISCUSS WITH THE LOCAL EXPERTS THE ACTUAL SUBJECTS NEEDED TO TAKE INTO CONSIDERATION DURING PLANNING OF FUTURE SEMINARS.
  - e- TO DISCUSS POSSIBILITIES OF SUB CONTRACT ARRANGEMENTS CONSULTANCY/EXPERT SERVICES IN THE COMPANY AND INDUSTRY LEVEL TO BE PROVIDE BY EISCO/NATIONAL CENTRE.
  - f- TO PREPARE COMPREHENSIVE REPORT HIGH LIGHTING THE EXISTING STATUS OF THE MAINTENANCE SYSTEMS IN SOME FIRMS IN THESE COUNTRIES AND SPECIFY NEEDS OF MAINTENANCE PROGRAMME IN THE FIELD OF METALLURGIUCAL AND OTHER BASIC INDUSTRIES.

MY JOB TO ETHIOPIA INCLUDES THE MAIN ACTIVITIES

- A) STUDY THE SITUATION OF THE SPARE PARTS PLANS UNDER THE METAL WORKS OPERATION FOR THE FOLLOWING POINT OF VIEW:
- 1) ORGANIZATION SUGGESTED FOR THE FACTORY
  - 2) MAINTENANCE SYSTEM
  - 3) PRODUCTION SYSTEM
- B) TO ORGANIZE PROGRAMMS THROUGH LECTURES AND ON SITE DEMONSTRATION FROM BOTH MAINTENANCE ENGINEERS PLANNERS AND MANAGERS IN SELECTED COMPANIES.
- C) STUDY THE EXISTING STATUS OF THE MAINTENANCE SYSTEM IN SOME FIRMS AND SPECIFY NEEDS OF MAINTENANCE ACTIVITIES IN ORDER TO PREPARE PROJECT FOR MANAGED MAINTENANCE SYSTEM WHICH CAN BE OPERATED UNDER NATIONAL METAL WORKS COOPERATION.

TO IMPLEMENT THE ABOVE ACTIVITIES TECHNICAL DISCUSSION ON THE LEVEL OF NATIONAL METAL WORKS CO OPERATION WITH GENERAL MANAGER DEPUTY GENERAL MANAGER FOR OPERATION AND DEPUTY GENERAL MANAGER FOR PROJECTS IN ADDITION TO DEEPLY DISCUSSION WITH THE MANAGERS ON THE LEVEL OF COOPERATION.

- PLAST VISITS WAS HELD FOR SPARE PARTS FACTORIES, FACTORY, PUMP STEEL WORK FACTORY.
- A DETAIL STUDY FOR THE SPARE PART FACTORY AND DEEPLY DISCUSSION WAS ORGANIZED ON THE LEVEL OF THE COOPERATION AND ON THE LEVEL OF THE PLANT FOR THE SYSTEMS SUGGESTED TO IMPLEMENT FOR THE SPARE PART FACTORY.

- A DETAILED DISCUSSION FOR THE ORGANIZATION WHICH CAN BE SUITABLE FOR THE PLANT (REPORT ATTACHED)
- A DETAILED DISCUSSION FOR THE MAINTENANCE SYSTEM WHICH CAN BE FIT WHICH THE SITUATION (REPORT ATTACHED).
- A DETAILED DISCUSSION FOR THE PRODUCTION SYSTEM WHICH CAN BE FIT WITH THE ABOVE CASES (REPORT ATTACHED).
- A DETAILED DISCUSSION WAS ORGANIZED FOR THE ENGINEERS AND ECONOMICS ON THE LEVEL & COOPERATION IN THE FOLLOWING ACTIVITIES.
  - INVENTORY CONTROL
  - PRODUCTION PLANNING
  - COST SYSTEM
  - BUDGET CONTROL
  - INCENTIVE SYSTEMS
  - MANAGED MAINTENANCE SYSTEM
  - ECONOMIC ENGINEERING
  - INDUSTRIAL ENGINEERING APPLICATION

CONCLUSION

DURING MY STUDY IN ETHIOPIA I FOUND THAT THERE ARE GOOD TRIALS TO IMPROVE THE SITUATION OF THE PLANTS AND TO INTRODUCE NEW TECHNIQUES FOR MANAGED MAINTENANCE, PRODUCTION PLANNING BUT THERE WAS LACK OF PLANNING AND SCHEDULING OF MAINTENANCE ACTIVITIES SO MAINLY THE MAJOR ACTIVITY OF MAINTENANCE UNDER TAKEN AFTER FAILURE. ONE OF THE MAJOR DEFFICULTIES ENCOUNTERED BY MAINTENANCE AREAS IS THE LACK OF SPARE PARTS.

THERE ARE SOME TRIALS TO PRODUCE SOME SPARE PARTS LOCALLY BUT IT IS IN THE FIRST STAGES SOMETIMES IT RETURNS TO LACK OF EXPERIENCE ORGANIZATION, MANAGEMENT PROCEDURES, THE RESULT OF ALL THESE REFLECT THE REASONS OF THE HIGH COSTS AND BAD QUALITY OF SPARE PARTS PRODUCED, NOW ETHIOPIA GOVERNMENT STARTED TO INTRODUCE THE TECHNOLOGY OF SPARE PARTS BY BUILDING A SPARE PART FACTORY WHICH WILL ASSIST IN IMPROVING THE QUALITY AND PRODUCTION OF SPARE PARTS BUT THIS NEEDS ORGANIZATION OF THE END USER WHO ARE EXPECTED TO USE THE SPARE PARTS FACTORY SO THIS MEANS A TECHNICAL ASSISTANCE ARE REQUIRED IN THE FOLLOWING

FIELDS:

- 1- SPARE PARTS PLANNING AND CONTROL
- 2- IMPROVE THE SITUATION OF ORGANIZATION OF SOME PLANTS
- 3- ALLOCATE THE PERSONNEL REQUIRED ON THE SUITABLE FIELD OF TRAINING
- 4- ENSURE THAT THE PLANT WILL OPERATE IN THE FIRST STAGE

- 5- IDENTIFY ALL SPARE PARTS REQUIRED TO CARRYING OUT A PREPARE MANAGED MAINTENANCE SYSTEM.
- 6- DEVELOP A COORDINATE AND CONTINUING PLAN FOR THE MANUFACTURE OF VITAL MAINTENANCE SPARES
- 7- INTRODUCE THE TECHNIQUES OF MANAGED MAINTENANCE SYSTEM ON THE ETHIOPIA INDUSTRY.
- 8- REORGANIZE THE INFORMATION SYSTEM ON THE LEVEL OF PLANTS AND ON THE LEVEL OF COOPERATION.
- 9- IMPROVE THE COST SYSTEM AND BUDJET CONTROL OR THE LEVEL OF PLANTS.
- 10- ENCOURAGE ABROAD TRAINING OF ETHIOPIA EXPERTS FOR TRANSFER OF EXPERIENCE AND KNOW HOW.



ብሔራዊ ብረታብረት ሥራዎች ድርጅት  
**NATIONAL METAL WORKS CORPORATION**

☎ 2447 ☎ 44 39 87, 44 72 35-38



የግብርና ሚኒስቴር ስልጠና ስራ

BIRETABIRET ADDIS ABABA, ETHIOPIA

The People's Democratic Republic of Ethiopia  
 National Metal Works Corporation

August 3, 1988

ቀን

Date

1801/88

ተማሪ

Ref.

Egyptian Iron and Steel Company  
 Hilwan  
 EGYPT

Dear Sirs:

We are writing this letter to thank you for the two engineers, Mr. Adel Hussein and Mr. Mustafa Sayed, from your reputed company who were deployed to Ethiopia from June 8, 1988 to August 3, 1988 through UNIDO to render technical assistance to our corporation. Both Engineers were working diligently during their stay here and they were of very much assistance to us.

During this time, Engineer Adel was busy reviewing the maintenance, production and other systems, prepared by the Italian Suppliers Company for Spare Parts Factory whose construction is being finalized. He also studied the existing maintenance system in the factories under our Corporation and prepared a project document that will enable us establish a managed maintenance system at the Corporation level to initially serve selected factories and which could eventually be extended to serve the other factories as well. He also had several useful discussions on various topics related to production and maintenance systems with the management of the Corporation.

Engineer Mustafa was attached to one of the factories under our Corporation, The Ethiopian Iron and Steel Foundry, which is engaged in the manufacture of re-bars and other wire products. He studied the problems pertaining to the rolling mill of the factory and gave constructive suggestions on how to improve the operational efficiency of the factory. He also gave training to the factory technical personnel on roll pass design and the various aspects of rolling mill operation and maintenance.

In general, we have benefited a lot from the two engineers and we would like to express our thanks to your Company for releasing its able engineers for such a time to share their experiences with us. We look forward for more cooperation between our two organizations in the future.

Yours sincerely,

YOHANNES ASSEFA

Deputy Manager - Development

Page ..... of .....



YA/10/88

የግብርና ሚኒስቴር ስልጠና ስራ  
 A STATE CORPORATION UNDER THE MINISTRY OF INDUSTRY



Date: 23.06.88

Report No. 1

TO: Ato Yeheyese Aseffa  
D/General Manager - Development (NMWC)

FROM: 1. Engineer Adel Hussein - Head of UNIDO Project Office in Cairo  
2. Ato Tesfaye Kidane - Head Technical Division of NMWC & Counterpa

Subject:- Some Comments & Recommendations on Organization  
Chart of the Spare Parts Factory in Ethiopia

OFFICIALS CONTACTED

1. Ato Belete Aklilu - Project Manager of S.P.P.
2. " Gebre Kiros Habtu - Plant Manager of S.P.F.
3. " W/Haweriat G/yesus - Production Manager of S.P.F.
4. " Zeki Adus - Maintenance Head of S.P.F.

After studying the existing organization chart and after making a physical observation of the plant, the following points to improve the smooth functioning of the plant are suggested as recommendations.

1. It is better and more effective if the quality control section is made an independent unit reporting to the plant manager so that it can control and ensure quality & standard of products.
2. The safety unit should also be an independent unit reporting to the plant manager because under the administration department it will not have the effectiveness and power required to influence and enforce safety regulations. Safety should be given priority by top management and should start right from the beginning.

3. It is more practical to make the technology, time study, loading (methods) under the respective production heads. Two shop managers are proposed for the factory. One production manager for semi-finished products, i.e. for the foundry and Forge shops and one production manager for the Mechanical and Heat treatment shops i.e. for finished products where most of the products that go to the heat treatment facilities come out of the mechanical workshop and return to the shop for finishing. The two shop managers will have their own maintenance and production heads. The technology studies, time studies and loading should be in the shops under the respective production heads because for one reason the methods are different for the shops and for another reason methods proposed by a separate unit away from the shops may not be accepted by the production heads and may lead to unnecessary production losses and disagreements. It is important to note here that technology can be learned better in the shop floor than from books. It is only here that engineers can get practical experience. They can discuss the problems with production personnel. They can see closely the successes and failures of their methods. The tools room should also be under the technology section where tests of new tools, jigs and fixtures can be done. Another important point is that maintenance activities can not be in a separate unit that is not related to production because under such arrangements production can not run smoothly. Conflicts and accusation will prevail in such an organization. This can easily lead to production losses where no one will be accountable. On the other hand production personnel may continue to run manufacturing machines for fear of maintenance delays. Under the existing arrangement is very difficult to co-ordinate maintenance planning because of the complexity of the plant and because of the fact that maintenance intervention can be committed only after the production head of each section has accepted.

The Technical Department may exist but its main functions should be:-

- Design (If it is absolutely needed otherwise the plant should not involve in design)

- Establishing norms for production and maintenance, modification etc.
- Introducing improvement (systems, bottleneck areas)
- Research & Development
- Training
- Data collection, technical archives and microfilms
- Computer applications
- Standardization
- Quality control (if only it is felt that it cannot be under the plant manager.

4. A central planning department reporting to the plant manager is absolutely important in order to create a strong link between the producer and the end user by developing monthly leading programs which represent the correct balance between the requirement of the end user and the facilities available. This department may consist of three divisions,

- 4.1. Region Engineer - Compares request orders with existing documents.
  - Sorts out request orders according to regions (Textiles, Sugar Etc)
  - Accepts or rejects R.O's according to established procedures.
- 4.2. Technical Head - Chooses the most economical method or the best alternative of producing the part (from rod steel, forged, cast)
- 4.3. Loading Engineer - Prepares monthly general loading for the shops and coordinates the loading of the shops.
  - Distributes information (Drawings type of material, working conditions to the production planning and methods).

(for the modified organization chart see exhibits ,I 1-5)

NOTE: 1) Drawings and other relevant information such as type of material service conditions etc. should come from the end user even though the plant can give help. If the plant starts producing parts only from its own information, it is very likely that the end user will reject the manufactured parts and as a result the relationship between the plant and the end user may deteriorate. A means should be sought to consult the end users before production starts. It should be remebered that the main objective of the spare parts factory is to serve the Ethiopian industry through the supply of the required spare parts to keep the plants running and therefore the active participation of the end users cannot be neglected. It is also important to realize here that the end user knows the parts better than the plant becuae the end user knows the working conditions of the parts.

2) Attached is a proposed organization chart of the Spare Parts Factory.

cc:- 1. General Manager (NMWC)  
2. D/ General Manager - Operations(NMWC)

TK/em

# PROPOSED ORGANIZATION CHART FOR SPARE PARTS FACTORY

PLANT  
MANAGER

SAFETY  
1.1.0

SECRETARY

QUALITY  
CONTROL  
1.3.0

CENTRAL PLANNING  
DEPARTMENT  
1.2.0

FOUNDRY &  
FORGE SHOP  
1.4.0

MECHANICAL  
&  
HEAT TREATMENT  
SHOP  
1.5.0

TECHNICAL  
1.6.0

AUXILIARY  
&  
UTILITIES  
1.7.0

SALES  
&  
SUPPLY  
1.8.0

FINANCE  
1.9.0

ADMINISTRATION  
1.10.0

MAINTENANCE  
1.5.1

PRODUCTION  
1.5.2

DESIGN  
1.6.1

TRAINING  
1.6.2

Q.C.  
1.6.4

COMPUTER  
APPLICATION  
1.6.5

REFRACTORIES AND  
CIVIL WORK  
1.7.1

ELECTRICAL  
1.7.3

PROCUREMENT  
1.8.1

SALES  
1.8.2

STORE  
1.8.3

GENERAL  
ACCOUNTS  
1.9.1

COST ACC &  
BUDGET  
1.9.2

MAINTENANCE  
1.4.1

INDUSTRIAL  
ENGINEERING  
1.6.3

MECHANICAL  
1.7.2

PERSON  
1.10

GENERAL  
SERVICES  
1.10

EMPLOYEES

FOUNDRY & FORGE SHOP  
1.4.0

MAINTENANCE

PRODUCTION

PLANNING  
DOCUMENTATION

PATTERN SHOP  
TECHNOLOGY &  
TIME STUDIES

PRODUCTION  
PLANNING &  
CONTROL

MECHANICAL

ELECTRICAL

FERROUS

NON  
FERROUS

FORGING

SAND  
PREPARATION

MELTING  
&  
MOULDING

TOOL

MOULDING

FINISHING

SPAR  
PART

CORE  
SHOP

MELTING  
&  
CASTING

FINISHING

Exhibit 2

MECHANICAL & HEAT TREATMENT SHOP  
1. B. O

MAINTENANCE

PRODUCTION

PLANNING DOCUMENTATION

TECHNOLOGY AND TIME STUDIES

PRODUCTION PLANNING AND PROGRAMING

MECHANICAL

ELECTRICAL

HEAT TREATMENT

SPARE PARTS

TOOLS

MAINTENANCE SHOP

SPARE PARTS

CUTTING SHEET METAL

TOOLS FORMING AND MACHINING

TOOLS

TURNING

CLEANING AND SURFACE TREATMENT

GEAR CUTTING MILLING

DIESEL PISTON

DRILLING AND MILLING

Exhibit 3

TECHNICAL  
1.6.0

DESIGN

TRAINING

INDUSTRIAL  
ENGINEERING

QUALITY  
CONTROL

COMPUTER  
APPLICATION

DRAWING  
OFFICE

RESEARCH  
&  
DEVELOPMENT

LABORATORY

SPECIFICATION

NORMS  
STANDARDIZATION

INSPECTION

MICROFILMS  
DOCUMENTATION

SYSTEMS

Exhibit 4



AUXILIARY  
&  
UTILITIES  
1.7.0

REFRACATORIES  
&  
CIVIL WORKS

MECHANICAL

ELECTRICAL

REFRACATORIES

MATERIAL  
HANDLING

POWER  
SUPPLY

CIVIL WORKS  
MAINTENANCE

GARAGE  
(VEHICLE)

INSTRUMENTATION

UTILITIES

ELECTRICAL  
WORKSHOP

Exhibit 5

MINUTES

**Time** : 8.40 A.M. - 1 P.M.  
**Date** : June 15, 1987  
**Place** : Office of the Plant Manager of  
Ethiopian Iron & Steel Factory (EISF)  
Akaki  
**Subject** : Inter-Country Project for Managed Maintenance in Metallurgical/Foundry Industries.

**Present in the meeting were:**

1. Ato Bijuayehu Bekela - Plant Manager of EISF
2. Mr. Adel Hussien - Head of UNIDO office in Cairo
3. Dr. Adel Zaki - Commercial Counsellor, Egyptian Embassy in Addis Ababa
4. Ato Wondimu Deginetu - Technical Manager of EISF
5. " Sirage Muche - National Metal Works Corporation, Head Office representative & Secretary of the meeting.

The Plant Manager of EISF, Ato Bijuayehu Bekela opened the meeting by asking if it was possible to know as to what the purpose of the experts visit are.

Accordingly, Mr. Adel Hussien gave the following brief explanation:

He said, he is on a one month tour of five African Countries, of which Ethiopia is the second Country to be visited after Nigeria, and from here he will be going to Kenya, Tanzania and ZAMBIA.

The mission, he explained is part of a UNIDO Project intitled " Inter-Country Project for Managed Maintenance in Metallurgical and other Industries in Africa " and its main purpose is to help African Countries improve their metal and other industries by sharing the very useful experiences gained by the Egyptian Iron and Steel Co.

According to him, the EISF was facing constant and serious break-down problems, high consumption of Spare Parts and it was being runned at a total loss.

But, between 1976 - 1978, with the help of UNIDO, the Company was totally re-organized and expanded by making an extensive overhauling to all production equipments, adding new and modern Machines Instruments, Training Operators as well as by implementing well co-ordinated planning and central of " Managed Maintenance System " which includes :

- a) Preventure maintenance system .
- b) Spare Parts Planning and Central system
- c) Planned Maintenance system and
- d) Information system;

As a result of the new measures taken, the Company has become very efficient, profitable and was able to produce upto 1.2 Million tons of Steel products per year an increase of 14% of Production. This has enable Egypt not only to satisfy its local Steel need but was able to export about 30% of it. The Company was also able to Produce 80% of its Spare Parts need.

Mr. Adel further explained that, the experience gained by EISCO was shared with other Industries such as Cement, Textile, Food, Sugar and others with Egypt between 1975 - 1981 with the help of UNIDO. Since 1982, many African Countries were given the chance to share the experiences, through a UNIDO Programs by training their personnels in EISCO or by sending EISCO specialists.

Mr. Adel summarized his explanations by saying that his UNIDO office is very willing as long as it is within its financial budget, to help the EMNC in general and the EISF in particular. And the purpose of his visit is to see the factory for himself, to have discussions with its staffs, so that he could share his experiences from EISF as well as to find out possible assistance are to be given to EISF by his UNIDO Project Office in Cairo.

The Plant and Tech. Managers of the Ethiopian Iron & Steel Factory in cooperation with the representative from the EMNC had the following to say regarding their factory.

The EISF being a very old factory has many serious technical problems. The most critical one being with the rolling mill.

The rolling mill has no manuals or references, like the other machines. As a result the dimensions of passes, adjustments and alignments of rollers are made out of the experience of an experienced technicians.

Very often, incorrect pass dimensions or wrong alignments and adjustments have caused repeated failures of the driving electric motors.

The problems are further complicated by the absence of an organization in Ethiopia to re-pass the driving electric motors, and the motors have to be sent to another Country.

After lengthy and detailed presentations on the various problems facing the Ethiopian Iron and Steel Foundry (EISF), the Ethiopian side requested Mr. Adel, if it is possible to send a qualified specialist on rolling mills to EISF by his UNIDO office.

During his stay, the specialist have to be able to help in the following areas:

- a) He has to prepare drawings for all roll pass designs
- b) He has to prepare detailed guide lines on how to operate, maintain as well as on how to adjust and align the rolling mill
- c) He has to give practical training to people operating the rolling mill as well as to people in the machine shop who prepare the roll passes.

Before reaching any decision, Mr. Adel requested to have a look of the factory and the whole group of the meeting made a tour of the factory.

After the visit of the factory the meeting continued and agreed on the following points:

1. Mr. Adel agreed to send the requested specialist to EISF for three months
2. The other problems of EISF have to be handled with the problems of the other factories under the MMWC by a centrally organized "Managed Maintenance System" that will be established at the Head Office of the MMWC under a UNIDO PROJECT PROGRAMME.
3. Mr. Adel also promised to do all what he can to make the rolling mill driving motor be repaired at EISCO as soon as possible whose cost will be covered by the EISF.
4. Finally, after both sides promised to work together to improve the situation in the EISF, the meeting was ended.

DATE June 23, 1988

Report No. 2

TO : Ato Yeheyes Aseffa  
D. General Manager for Development  
N.M.W.C.

FROM : 1) Engineer Adel Hussein-Head of UNIDO Project  
Office in RISCO. *Adel Hussein*  
2) Tesfaye Kidane - Head of Technical Division of  
NMWC & Counterpart *Tesfaye Kidane*

SUBJECT : Some comments & Recommendations on Maintenance System  
of Spare Parts Factory in Ethiopia

DURATION : June 16, 1988 to June 18, 1988

Before we discuss the proposed maintenance system of the Spare Parts Factory, it will be appropriate here to briefly review what a total Managed Maintenance System should look like. A conceptual model of a comprehensive TMMS is illustrated in Exhibit 1. The following comments about this model are relevant:

- The total Managed Maintenance System is divided into four inter-related sub-systems.

- ÷ Preventive Maintenance
- + Spare Parts control
- + Planned Repair
- + Information System

- Each of these sub-system is further detailed in terms of elements in exhibit 2; Exhibit 3 depicts the the details and inter-relation of an assigned TMMS .

- Rationalization of all machinery and equipment operation involves rationalization of these subsystems. It is vital that appropriate emphasis in placed on each of them inseparately.

.../...2

As a result of Total Managed Maintenance System implementation, the improvements to be expected are:

- increased Production through increased machine availability.
- Reduced maintenance costs through
  - + reduced spare parts
  - + reduced maintenance hours

A comprehensive Total Managed Maintenance System should answer the following important questions:

1. What must be done ?
2. How must be done ?
3. When must be done ?
4. Who will be responsible ? Including why we need P.M. and where ?

Now, let us see whether or not the proposed system is comprehensive and integrated.

1) Bill of Plant Properties (B<sup>1</sup>.99.19)

The proposed coding system is not in accordance with the working item coding system of the Ministry of Industries. It is important to have a uniform coding system for all plants in case a centralized managed maintenance unit is to be established in the country in the future. It becomes very inconvenient for computer application if different coding systems are used.

2. It will not be practical to follow the procedures indicated in the system for planned repair because according to the proposed system planned maintenance is based on overall worked hours. However, in practice planned repair which may be classified as major repair, medium repair and minor repair is usually done periodically

on fixed time basis; monthly, semi-annually or annually depending on the situation. For example it will not be practical to collect the overall worked hours over a period of five years at which time a major planned repair is done without the aid of a computer. Since the quantity and frequency of planned repair differ from that of preventive maintenance, no procedure is proposed for the collecting information for planned repairs.

3. In practice, it is not easy to apply the procedures indicated in the system for maintenance of auxiliary machinery and equipment because the maintenance of such machinery & equipment can not be done on actual overall worked hours as it may be possible for direct production machines.
4. Generally, the system can be applied for preventive maintenance which mostly depend on overall worked hours usually indicated in maintenance manuals.

Overall worked hours can be obtained from two sources, either from the actual worked hours or from time study calculations which ever is more practical; This system depends on the former. Eventhough it is reasonable to take the actual worked hours, the reliability of these worked hours must be checked carefully because the accuracy of them will be dependent on the decipline of the worker reporting them. This is both important for maintenance and production and costing purposes. However, it should be realized that, in practice, these are situations where and when P.M. can be done on fixed time basis and not only on frequency based overall worked hours. It is also possible to make some sort of P.M. either to auxiliary production machinery or to direct production machinery while the machine in idling or while the machine is working without the fulfilling the maintenance procedures. For example, P.M. can be done during production windows and during holidays etc.

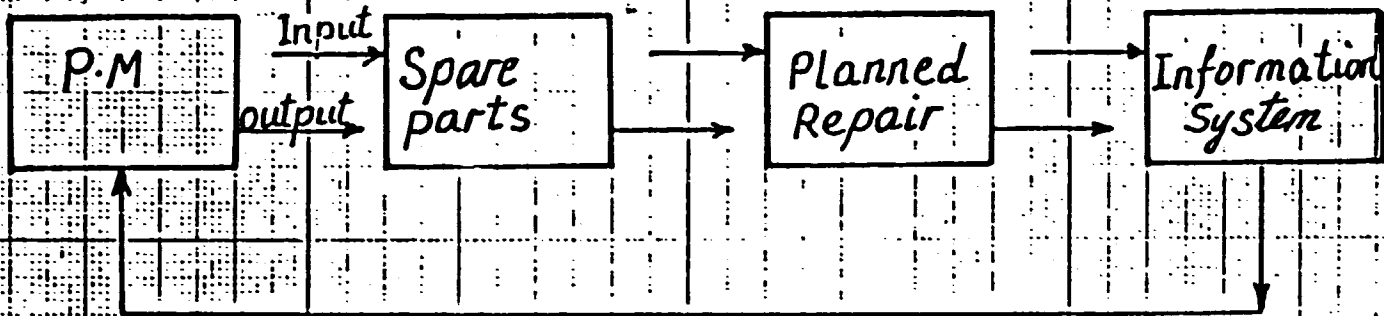
5. In the proposed system, it is not at all clear how the sub-systems are inter-related, ie, how the output of one sub system is to be an input to another. How do we use the information from the P.M. for spare parts control? And how do we use the spare parts control for planned repair? In the same manner how do we use the planned repair to build an information system? How do we use the information system we have built to strengthen our P. maintenance system?
  
6. The short-coming of the system becomes more obvious when one tries to fit it to the existing organization chart. For example, if the maintenance division is under the technical department and not under the same production manager who should equally pay attention to the well being of his machines and production targets, it will be very difficult to apply the system. This will finally lead to unnecessary disagreements and accusations resulting in production losses for which no one will be accountable. Here, we are not suggesting that the inherent differences between maintenance and production will completely disappear, we are rather recommending a means of reducing it to a minimum.

CC.

General Manager NNWC.  
D/General Manager NNWC  
Operation



## Exhibit 1



## Exhibit 2

### PREVENTIVE MAINTENANCE

#### Quantity

#### Frequency

F	Feeling
I	Inspection
T	Tightening
C	Cleaning
A	Adjustment
	Lubrication

1	Daily
2	Weekly
3	Biweekly
4	Monthly
	etc.

#### Spare parts

#### Planned repair

#### Information system

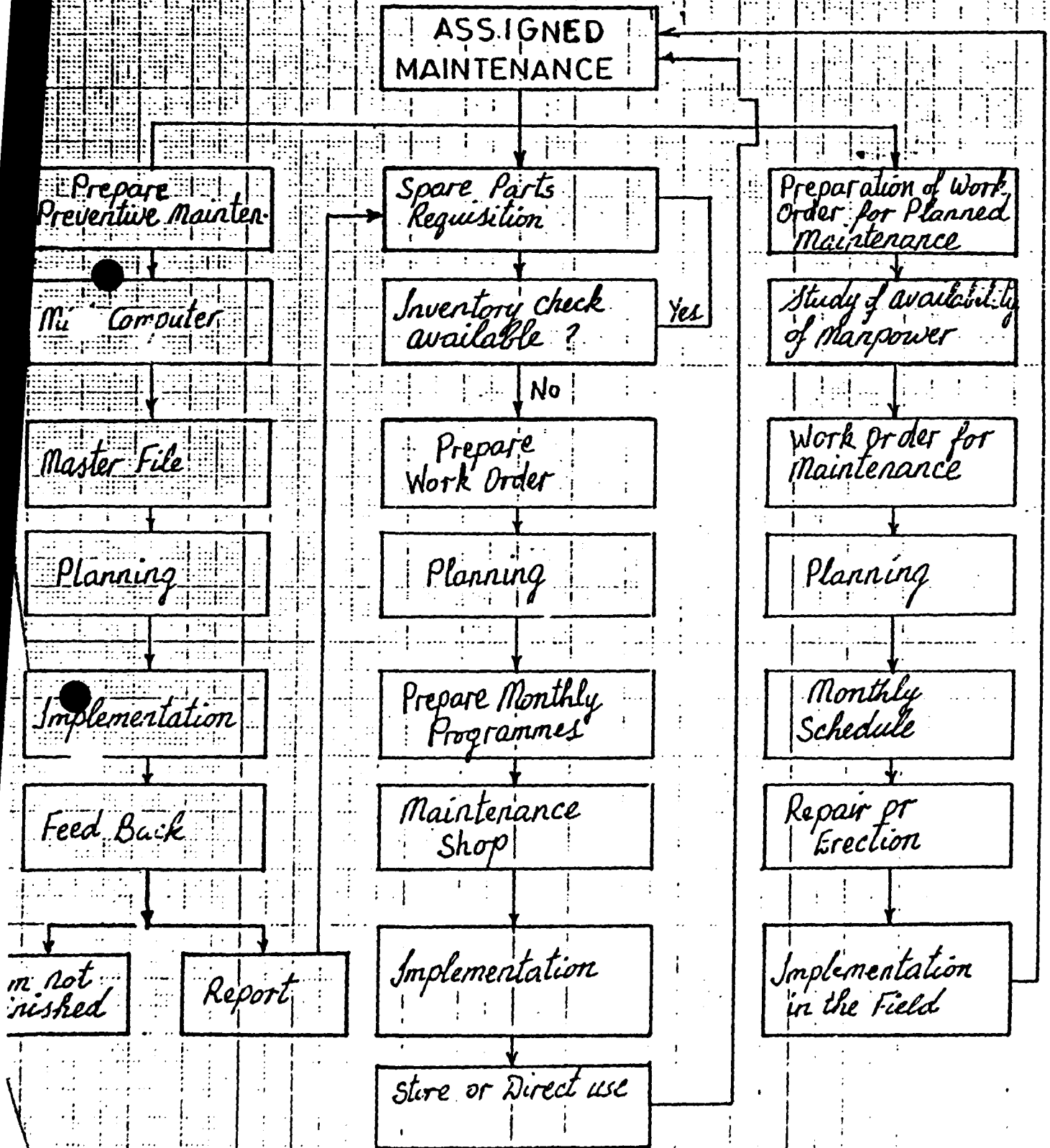
1	Inventory
2	Scheduling
3	Planning
4	Loading
5	Procurement

1	Major Repair
2	Medium Repair
3	Minor

1	Coding
2	History data
3	Service Record
4	Plant Record
5	Plant Inventory

### EXHIBIT 3

## Total Managed Maintenance System (General)



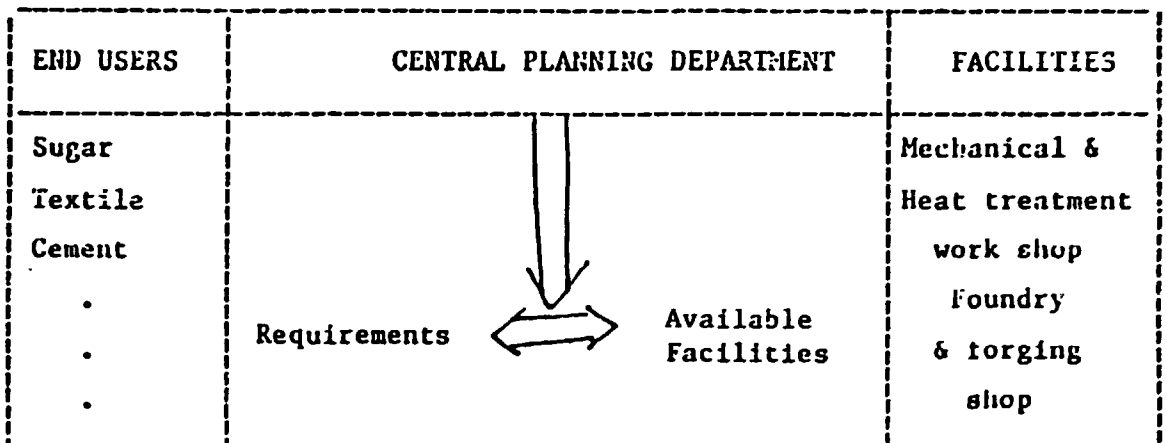
TO : Ato Yeheyesh Aseffa  
D/General Manager for Development  
N.M.W.C.

FROM : 1) Eng. Adel Hussien, *Adel Hussien*  
Head of UNIDO Project Office in EISCO  
2) Tesfaye Kidāne, *Tesfaye Kidāne*  
Head, Technical Division  
NMWC & Counterpart

SUBJECT : Some comments and recommendations on Production  
System of Spare Parts Factory

DURATION : June 20, 1988 to June 24, 1988

We start this report with a simple chart but a very important one:



### 1. End users

Since the objective of establishing the spare parts factory is to serve the Ethiopian industry through the supply of spare parts to keep them run smoothly, it is impossible to undermine the active participation of the other plants. It is vital that the end users should be part of the spare parts production system. It is through this way that the spare parts factory can fulfill its main task. The spare parts plant can't undermine and ignore the end-users and simply try to produce spare parts like automotive spare parts producers that manufacture standard parts for well forecast markets.

It is not at all enough to collect information from the end-users and start production. A means should be created how to *initiate* the end-users to make them active participant of the spare parts production system. A system should be developed to create a strong link between the plant and the end-users. The chart in page 1 shows this relation-ship.

Firstly, the end-users should be enabled to identify their requirements correctly by way of introducing "Total Managed Maintenance Systems". After the end-users know their correct requirements, they should be made to know how to request them. It is very essential that the plant should properly introduce itself means of advertisements and publications that may include but not limited to the following information:

- a) Maximum weight and length of parts that can be produced by the available facilities,
- b) Available facilities, materials, skill levels etc;
- c) Approximate time required to process a part;
- d) Priority setting-it is important that emergency should not exceed more than 10% of plant output otherwise scheduling of the shops will be disturbed and productivity of the whole plant will decrease;
- e) Standard request orders (uniform for all plants), which include:
  - complete and standard drawings with uniform coding provided by the plant,
  - Type of material, kind of heattreatment, working conditions etc;
  - Correct quantity; *etc.* all of them should be signed and handed over to the plant by appropriate personnel.

## 2. Central Planning Department

After identifying their requirements, after knowing how to present their requests and after meeting payment terms, delivery terms & transport conditions etc, request orders of end users should come to the Central Planning Department. This is the important department

in the spare parts factory that creates a strong link between the end-users and the plant itself by developing monthly programs representing the correct balance of the requirements of the end-user and the available facilities. The department should consist of three divisions, the activities of which are listed below:

- a) Region Engineer - Receives requests,
  - Sorts out requests according to regions (Sugar, Textile, Cement etc...) ,
  - Accepts or rejects requests according to established procedures ,
  - Sets priorities etc...
  
- b) Technical Engineer - Chooses the most economical way and best alternative to produce the part (ex. rod steel, cast, forge).
  
- c) Loading Engineer - Distributes information to production planning and control.
  - prepares monthly loading program for the shops.
  - Takes care of the semi-finished product store etc...,

### 3. SHOP

The loading engineer from central planning department spreads information and monthly loading programs to respective shops. The production planning and control unit in each shop receives this information and distributes the information to technology studies and time studies units, in the shops and provides feedback information to central planning and relevant departments as necessary. It is very important to note the difference between central planning and shop level planning.

In the Central planning department global loading of the shops in the plant is co-ordinated whereas the production planning and control plans and co-ordinates its own shop and knows little about the activities of the other shops. In the proposed production system, shop level planning is stressed but due emphasis is not given to the central planning department. This kind of approach to production can appropriately fit to standard spare parts producers like automotive spare parts producers. The proposed system doesn't clearly indicate the inventory control systems.

It is not at all wise to store non-standard spare parts except standard ones such as tools and piston rings any longer time than necessary. The end-users should be forced to take them immediately other wise a big problem in the store will arise.

Generally, the proposed production system is a quite complicated system partly due to the fact that duties and responsibilities are not separated in the organization system. However, the forms and procedures in the proposed system can be modified to fit to a more simplified and practical model. A simplified model is attached with this report. The details of the model are not worked out because it was found out that more time was required.

cc:- General Manager of NNWC  
D/General Manager of NNWC  
(Operation)

TK/ml

Technical Service

ACCOUNTS & SALES DEPARTMENTS

CENTRAL PLANNING DEPARTMENT

Maintenance Information

Maintenance Information

LOADING ENG.

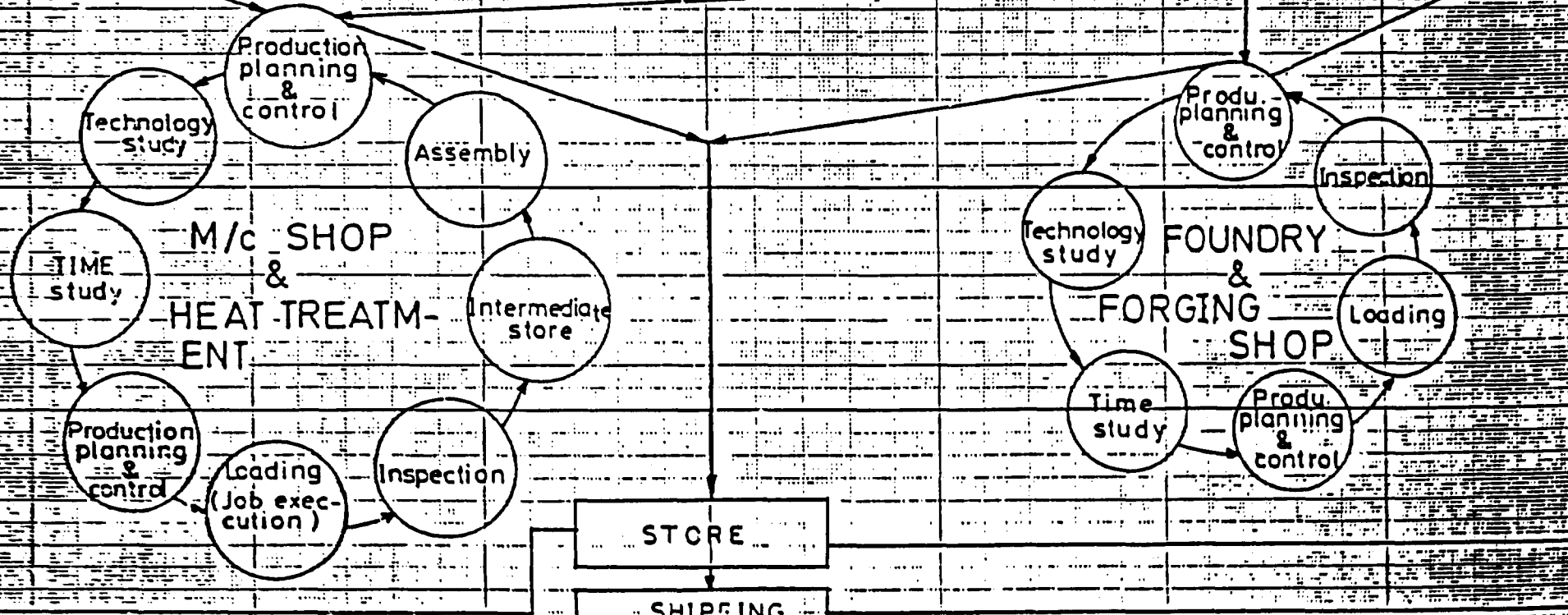
TECHNICAL ENG.

REGION ENG.

TECHNICAL ENG.

LOADING ENG.

SEMI-FINI STORE



MINUTES

وڪرل

TIME : 10.00 a.m - 11.00 a.m

DATE : June 18, 1987

PLACE : Office of G.M. of The National Metal Works Corporation

SUBJECT : UNIDO's Technical Assistance to The National Metal Works Corporation.

Present in the meeting

1. Col. Alula Berhane - G.M. of National Metal Works Corp
2. Mr. Adel Hussien - Head of UNIDO Project Office in C <sup>Ad</sup>
3. Dr. Adel Zaki - Commercial Counsellor of Egyptian Embassy - Addis Ababa <sup>D. Adel Zu</sup>
- 4! Ato Shimelis Yirgu - Head of Operation's Dept. <sup>fl-</sup>
5. Ato Sirage Muche - Head of Quality Control Division Secretary of the meeting <sup>f</sup>

Col. Alula Birhane opened the meeting by asking how Mr. find the situation of the factories he visited.

Accordingly, Mr. Adel had the following to say.

In regard to his visit of the Ethiopian Iron and Steel F (EISF), he has found the factory to operate with no proper wo systems including the absence preventive mentenance and Spare planning and contralling systems. On the top of this, he has learnt that the factory has serious technical problems with i rolling mill.



In regard to his visit of the Spare Parts Project Factory, he is of the opinion that centrally organized and controlled strong working systems including;

- a) Spare Parts planning and controlling
- b) Preventive maintenance
- c) Work order system
- d) Cost Analysis
- e) Quality controlling
- f) Information system
- h) Planned maintenance and others

have to be introduced from the start of the factory's operation.

In addition, Mr. Adel expressed his feelings that, the other factories under the National Metal Works Corporation might be running like the EISF with no proper working systems, and he assured that he will have UNIDOS budget to assist in such problem areas.

Col. Alula on his part expressed his feelings that the problems if possible be handled on priority basis. That is to say first, the new factories like the Spare Part and Water Pump factories could be helped from the beginning

- a) By counter checking the systems being introduced by the suppliers and to make those factories have strong systems including;
  - 1) Preventive maintenance
  - 2) Spare Parts Planning & Control
  - 3) Planned maintenance and others

before they face similar problems like the ones the old factories are experiencing now. Secondly, the problems of the other factor

A-11

...13

Dir. Adel Za

could be handled by a well organized and centrally controlled "Managed Maintenance System". The General Manger, further pointed that his Corporation expects UNIDO's practical assistance in all problem areas.

After examining the problems from all corners, the meeting has agreed on the following assistance to be given to the NMWC from UNIDO Project Office.

- I. A specialist be sent to the Ethiopian Iron and Steel Foundry for three months to help the factory in the following areas.
  - a) To prepare detail drawings for all roll passe designs.
  - b) To prepare detailed manuals and guide lines on how to maintain, adjust/align and operate the rolling mill.
  - c) To give practical trainings to rolling mill operators and to workshop technicians who prepares the roll passes and others.
  
- II. One senior experienced expert to be sent to the N.M.W.C. for four months
  - a) to check all systems being introduced by the supplier as well as establishing a strong "managed maintenance system" including preventive maintenance, Spare Parts Planning and Contralling, Planned maintenance and Information Systems for Spare Part Project Factory.
  - b) To prepare a project document to establish a centrally organaized & strong "Managed Maintenance System" at the head office of the N.M.W.C. to deal with the other factories. The project document will be presented to the UNIDO Office in Addis Ababa by the Ethiopian side.

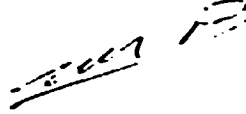
A-U

1/14

Dr Adulza

Finally, the meeting was ended at 11 a.m after the General Manager presented his sincer thanks and appreciations to Mr. Adel for his effort made to understand and to solve our problems.

A-11



Dr. Adel Zaki