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NATIONAL CASE STUDY

(ETHIOPIA)

ON

HUMAN RESOURCES DEVELOPMENT

FOR

INDUSTRIAL MAINTENANCE

PART - 1

Prepare by:

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Prepare for:

Regional Experts group meeting on
Human Resources Development for
Industrial Maintenance in Africa
Organized by UNIDO
Nairobi 23 - 27 June 1986

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Addis Ababa, May 1986.

C O N T E N T S

1. INTRODUCTION

a) General Background Information

Country Profile On HRD in Industrial Maintenance

Most data are 1982/83 figures.

Country	: Ethiopia
Gross Domestic Product	: 8,048 Million Birr(U.S$4000Mil)
Manufacturing GDP	: 2,631 " " " $1300Mil)
Share of Manufacturing Industry to GDP	: 32%
Main Industrial sectors	: Food, Textiles, Beverages, Leather and Leather Products, Wood, Building Materials, Chemical
Main Exports	: Coffee, Raw Hides & Skins semi-processed leather, Horticultural products, Wine, Knitwear.
Population	: 42,000,000 (1985)
Active Population	: 19,000,000
Percentage Litercy	: 47%
Population in Primary Schools	: 2,500,000
Population Secondary Grammar Schools	: 681,000
Population in Secondary Technical Schools	: 4000
Population in University & Technical Colleges	:

FIELD OF STUDY	DEGREE	DIPLOMA
AGRICULTURE	1107	1721
MEDICAL SCIENCE	1025	181
PEDAGOGICAL SCIENCE	536	1643
SOCIAL SCIENCE	4105	1156
NATURAL SCIENCE	2105	-
TECHNOLOGY	648	772
T O T A L	10526	5473

National Training Organization:

- ETHIOPIAN MANAGEMENT INSTITUTE/PRODUCTIVITY IMPROVEMENT CENTRE (EMI/PIC)

(b) Overview of Industrial maintenance problems:

Maintenance problems exist in all sectors of the economy where there are machinery, but it is exceptionally serious in State Farms, Transport and Industry. To illustrate the seriousness of the problem let's take average downtime due to breakdowns.

	Sector	Downtime %
1.	State Farms	50 - 60
2.	Transport	30 - 40
3.	Industry(manufacturing)	20 - 30

Short surveys were conducted by the"Productivity Improvement Centre" of the Ethiopian Management Institute, and the most serious maintenance problems are listed below:

P1. PRODUCTION/SERVICE LOST DUE TO DOWNTIME. Industrial output could be increased 20 - 25% by good maintenance alone.

There are also production cut-downs because of breakdowns in transporting necessary inputs to Industry. Rotting of cereals has been reported for want of transport.

P2. SHORT LIFE OF MACHINERY. In manufacturing this is not serious, but in agriculture average life of four years, and in transport only seven years.

P3. EXESSIVE SPARE PARTS CONSUMPTION ON ONE HAND AND SHORTAGE OF THE REQUIRED ONES ON THE OTHER HAND. In many case case spare parts consumption is more than 10% of the purchase value of machinery.

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This is a consequence of breakdown-maintenance policy. Sthortage of required spare parts is also a result of this policy as well as lack of knowledge of spare parts management.

P4. PAYMENT OF MAINTENANCE WORKERS NOT ADEQUATE. This is because maintenance is not recognized as a special discipline which should be treated with respect. Ten years ago the author as maintenance head of a bnewery requested offices and furnitures for his formen, and top management were surprised that such employees should have this facilities. The reply was that the formen have no business to sit in offices but to go arround machinery all day!

P5. SHORTAGE OF SKILLED MANPOWER. There is no systematic training of apprentices nor upgrading of existing workers by industry. The Productivity Improvement Centre of the Ethiopian Management Institute is the only national organization helping in upgrading skills. Fresh technical school graduates who come with general knowledge are thrown in the factory shops and it takes them years to master maintenance of specific machinery.

P6. LACK OF MANUALS NOT ONLY IN THE NATIONAL LANGUAGE BUT SOMETIMES EVEN IN ENGLISH. A certain corporation purchased several hundred machinery of the same kind to be installed in several factories and the manufacturer sent only one manual!

P7. MAINTENANCE NOT SEPARATED FROM PRODUCTION. Usually maintenance is placed as a section in the production department in the organization chart. This leads to pressure from production to forget scheduled maintenance and continue production until machinery stop due to breakdown. It downgrades maintenance, and prevents the development of maintenance as a specialised discipline.

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(c) Methodology applied in collecting information for preparation of study.

- Own experience, eight years in industry and seven years in Ethiopian Management Institute.
- Published materials
- Interview of some officials

2. INDUSTRIAL MAINTENANCE POLICY & STRATEGY

(a) Information and assessment

- A survey was done by the Ministry of Education to see the relevance of the education system to the needs of industry. In some cases duplication of effort was discovered and there was disatisfaction from Industry's side about quality of technical school graduates. As a result of this survey the Ministry would like to revise the carriculum of technical and vocational training. Present programme is 10 + 2 years, and the Ministry has prepared a draft 10 + 3 programme which will include maintenance planning and control, production organization and material supply and utilization.

  A workshop will be held in May 1986 to discuss on the newly drafted curriculum, and to create conducive conditions for the development of technical and vocational training in the country. Representatives from 49 organizations and institutes are participating; incldуding Ethiopian Management Institute as well as Ministry of Industry.

- No mechanism for interaction exists among standard education system, specialized training institutes and industry. But in January 1986 the Ministry of Industry and Addis Ababa University signed a comprehensive co-operation programme which would make university education more practical, and would make the human resources of the university at the disposal of industry.

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- Because of the accute forign exchange situation there is a high awereness of industrial maintenance problems by Government planners and policy-makers as well as by managers of enterprises. What they lack is knowledge of what to do about the problems.

- During project design and purchase of machinery maintenance is rarely taken into consideration. In most cases initial low price is the dominant factor for selection of machinery. Standardization is completely ignored and factories end-up in owning a proliferation of various makes and models.

- Concerning co-operation on HRD in industry and in industrial maintenance at national level two corporations have done commendable tasks. One is the beverage corporation which trained maintenance worker in its other breweries first and then sent them abroad before the installation of the fourth brewery which was completed in 1985. The other is the textile corporation which trained the future maintenance workers of a new Textile Mill at the technical school in Addis Ababa first and then its biggest textile Mill in Akaki. The instructors were teachers from the technical school, foremen from the biggest Mill and instructors from the Productivity Improvement Centre (PIC).

- No means of communication for maintenance engineers exists in the country. The staff of PIC because of their close contact with Industry felt the need of publishing a quarterly bulletin which among otheps would contain cases of designed-out maintenance. The draft of the first issue was prepared 9 months ago, but so far it has not been printed because of various problems.

(b) Recommendation:-

- Holding of annual or biannual conferences of the type held in May 1986.

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- Agreement of the type signed by the Ministry of Industry and the Addis Ababa University should be signed.
- PIC should raise the awareness of all concerned for the need of planed maintenance wherever machinery exist.
- Making planned maintenance mandatory by all Ministries.
- Involvement of Maintenance engineers at project design stage.
- Emulation of the case of Beverage and Textile corporation.
- Establishment of association of maintenance engineers.
- Development of maintenance consultancy services through training of consultant engineers.
- Establishment of National Maintenance Centre within EMI or somewhere else.

3. TECHNICAL DOCUMENTATION ON MAINTENANCE

(a) Information and assessment

- The Industrial Project Services "IPS" within the Ministry of Industry established with the help of UNIDO is doing feasibility studies. Preparations of tender documents is done by foreign consultants.
- All manufacturers supply spare parts catalogues. Manuals on installation procedures and fault diagnosis also exist. But they rarely supply on maintenance procedures, and those only on lubrication, adjustment and cleaning. The outhor has seen working drawing of parts only in the petroleum refinery constructed by the Soviet Union.
- The PIC has developed manual for the design and installation of planned maintenance for the Ministry of Industry. This has been implemented by 70% of factories under the Ministry. Training programmes on maintenance management are conducted.

(b) Recommendation:-

- Basis for IPS capability in preparation of adequate tender documents should be laid.

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- Preparation of complete maintenance procedures including inspection, minor repairs, medium repairs and overhauls for new machinery by machinery suppliers.

4. SPARE PARTS MANAGEMENT

(a) Information and assesment

- The Major problem concerning spare parts is mentioned in the introduction in page.4.
- In many cases one or two year supply of spare parts is included in purchasing contracts of plant. But the selection of these parts is left to the supplier, and many non-moving parts are dumped.
- Many factories do not have well organized spare parts store to facilitate storage and retrieval. There are incidents when parts could not be located, and they had to be ordered by air to reduce downtime. A few days later somebody discovers several of these parts in some corner.
- Ordering of very expensive parts is sometimes left to junior clerks who watch only the level in the bin card. This leads to unnecessary purchase of expensive parts which may be needed only once in the lifetime of the machine.
- Many factories manufacture same parts in theis own workshops, but still workshop utilization in low. Yet the Ministry of Industry is constructing a huge spare parts workshop to manufacture about 3600 types of parts in the initial stage. Of course the establishment of the factory has " laying the basis for engineering industries "as its other objective also.
- Reclamation of parts is also done but in acrude way. Many factories are having difficulties in purchasing reclamation equipment and supplies like special electrodes because of shortage of foreign exchange.

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- Some training on spare parts management is given by PIC as part of total maintenance management. But the portion on spare parts management is small.

(b) Recommendations:

- The four recommendations of the Paris meeting of April 1986 concerning spare parts apply to Ethiopia.
- Training in the drafting of spare part specifications for use in the equipment purchase process.
- Training in the selection of spare parts to be stocked in their designation and codification.
- Training in inventory management.
- Promotion of local manufacture of spare parts, in particular through the training of methodologists and analysts as well as machine-tool operators.

In addition:

- Collecting the existing little utilized machine-tools in various factories to form central workshops at corporation level for manufacture of spare parts
- To develop the huge spare parts factory into machine fabrication factory.
- Promotion of reclamation of spare parts including allocation of foreign exchange for this technology.

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CONTENTS

1. INTRODUCTION

Immediately after the Ethiopian Revolution of 1974, a vaccum of Managerial Cadres was created by the departure of expatriate managers. To correct the situation the government moved the previous National Productivity Centre (NPC) from the Ministry of Labour, and made it a department of the Ministry of Industry. For eight years over 90% of the activity of NPC was geared to improve management in the Ministry. To be sure, the Ministry had many problems, but the most serious was maintenance. The ILO under "project ETH/83/010 to strengthen the NPC" has rendered invaluable assistance in the form of experts, equipment and staff development to improve the managerial and technical aspects of maintenance. With the active support of ILO-Geneva, the centre has developed a result-oriented methodology, which will be described later to tackle the maintenance problem.

In 1985 the government felt there was no special need to keep NPC in the Ministry of Industry, and the Ethiopian Management Institute (EMI) was formed by amalgamating NPC and the previous Institute of Management and training. EMI gave special emphasis to maintenance by establishing The Productivity Improvement Centre (PIC). The production and maintenance management aspecs of management are the responsibility of this centre. It has also well equiped workshops for training in Automotive maintenance, reproduction of parts, maintenance welding and electrical maintenance.

The ultimate aim is to make the PIC a centre of excellence in maintenance. Since its establishment it has spread its activities to other economic sectors besides Industry. A program to improve maintenance management in the Ethiopian Electric Light and Power Authority started in June 1985 is in the evaluation stage. In December 1985 a consolidate programme to improve technical skills, maintenance and operations management in the Ministry of State Farms Development has been started.

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PIC has also started sharing its experience with other African countries. Last year we shared our experience with the National Productivity Centre of Nigeria and the Libenan Institute of Public Administration (LIPA). This year we will assist LIPA in running campaigns to improve maintenance.

2. IMPORTANCE OF MAINTENANCE

In recent years maintenance has been growing in importance from a mere appendage of production process to an important sub-system of the whole factory or enterprise system. And with this growing importance it has to have clearly stated objectives.

2.1 Why Importance to Maintenance ?

A few decades ago industrial machinery were simple in design, manually operated or at the most semi-automatic. They were also cheap to buy and comparatively easy to maintain. But modern machinery are partially or fully automated, and they are very expensive. They also require highly trained technicians to maintain. Older generation of machinery required more men to operate and less men for maintenance. But automated machinery are reversing the ratio in favour of maintenance personnel.

Automated machinery are also designed to give higher output per unit time. Each day's of downtime means thousands of Birr of lost production. Therefore, management are actively considering ways and means of planning and organizing their maintenance operations on scientific basis. Many factories under the Ministry of Industry have already proved the value of this by the results they achieved in the past few years.

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The other reason for the rise of importance of maintenance is the rise in the price of spare parts. In the developing countries the problem becomes even more acute in that they are forced to operate obsolete machinery because of shortage of foreign exchange to purchase the latest machinery. When they order parts for these old machinery they are charged exhorbitant prices. Because of the great distances from the origin of spare parts they are also forced to inflate their stock of parts even for new machinery. Therefore, well organized maintenance departments in the managing part as well as the processing part are becoming indispensable for proper functioning of enterprises.

2.2 Objectives

The objectives of maintenance management are to ensure machinery;

- AVAILABILITY when required for production,
- CAPABILITY as good as when new,
- RELIABILITY (especially of 1st priority machines), and to achive the above objectives
- at LEAST COST

These objectives are hammered to all participants in our training programmes. If you ask any maintenance man, who had no management training, what the objectives of his department are, the probability that he will reply "to repair" is 80%. When he thinks of his objectives this way, it is very likely he is practicing breakdown maintenance with its consequences of production loss; high spare parts consumption; low morale of maintenance workers, etc.

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There is an excellent case that illustrates this point. A few years ago a textile mill requested help from our Centre. The request was strange in that the management wanted us to help them justify their request to their corporation to reduce their annual target. A calamity had to happen for a such request to be granted.

In that year the Ministry made it mandatory for all plants to implement planned maintenance system which will involve planned stoppages of machinery. The management of the factory reasoned that if they stop machinery for planned maintenance then downtime will go up from the present 3%; and therefore, production will go down. We looked at their records and indeed the downtime was very low and most of machinery seem to be running.

We pondered over the question for some time, but further discussions and physical presence in the shop showed that most of the loomswere running without automatic devices at 60% of capacity ! Further checks as the spare parts store revealed that they had spares enough for three years ! So whenever breakdowns happened, they were immediately eliminated by replacing parts.

Later the objectives of maintenance in their totality was discussed; management agreed to buy the automatic devices to restore capacity of the looms, and the stores was organized in better way. They finally dropped their request and agreed with their corporation to have a higher annual target.

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3. RESULTS ACHIEVED IN ETHIOPIAN FACTORIES

The results shown below were achieved in a closely monitored campaign known by the name OPERATION P & M conducted in 1983. The campaign was conducted in response to the Ministry's request to help factories implement "Production and Maintenance Guidelines" which the factories found difficult to implement on their own.

3.1 Kinds of Results:

RESULT is understood to mean the diffence in performance before and after implementation of improvements. In the OPERATION P & M it was the difference between IV Q 1982 and II Q 1983. It could be understood as the translation of the objectives in physical outputs.

	Due to
RESULT I PRODUCTION INCREASE	a) Downtime reduction b) Capacity restoration
RESULT II WASTE REDUCTION	a) Better adjustment of machinery
RESULT III FOREIGN EXCHANGE SPENT ON SPARE PARTS	a) Reproduction parts locally (own & other W/shop) b) Reclamation of parts locally (") c) Good spare parts management d) Better supervision when replacing parts
RESULT IV FOREIGN EXCHANGE SAVING ON INVESTMENT	a) Extension of life of machinery b) Putting idle machines back into operation
RESULT V INCREASE OF RELIABILITY	a) Reduction of Frequency of Breakdowns

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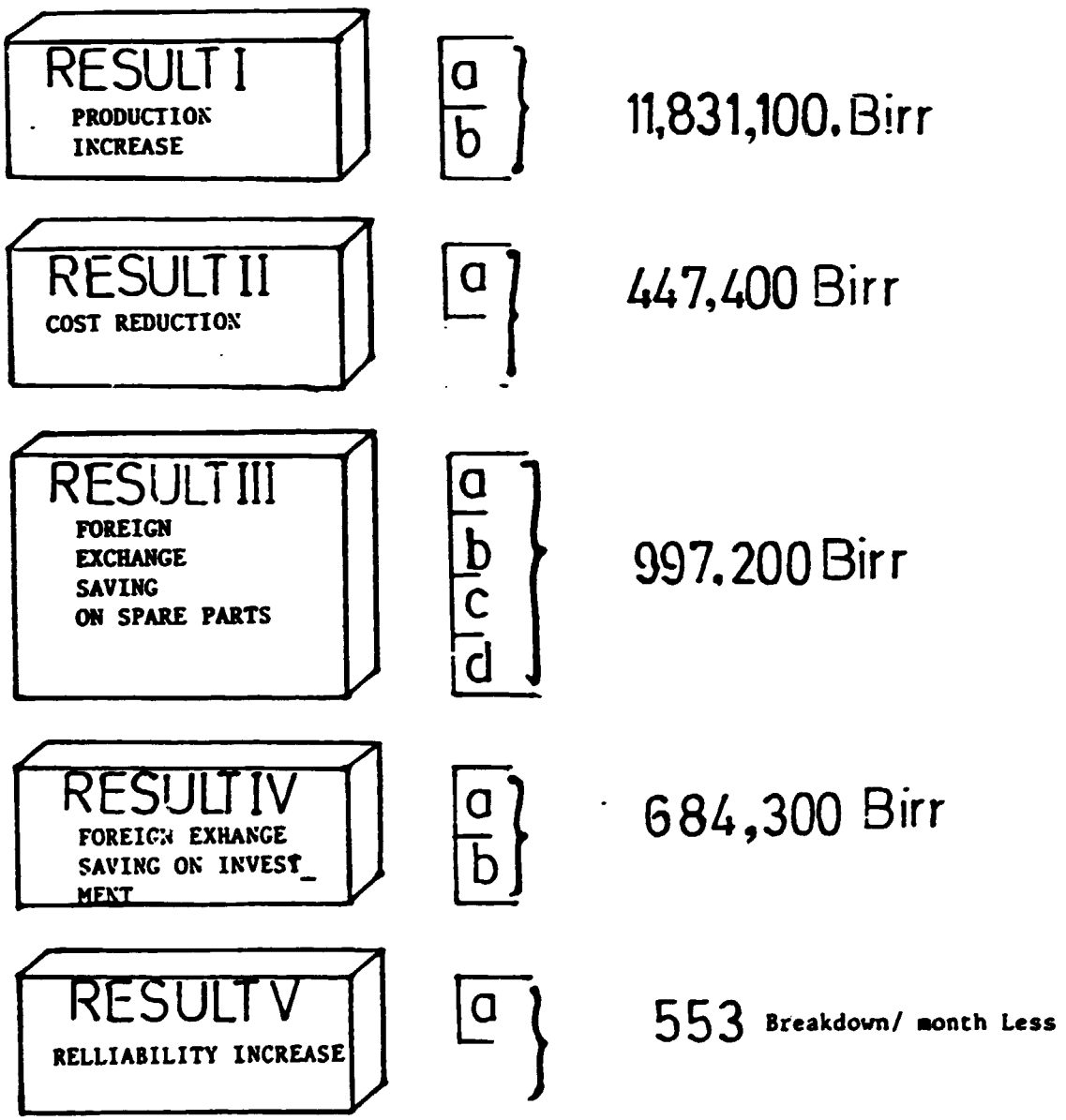
3.2 Summary of the RESULT

In the OPERATION P & M over 100 factories participated, but only twenty seven have quantifies their RESULTS. Below is the summary of the quantification.



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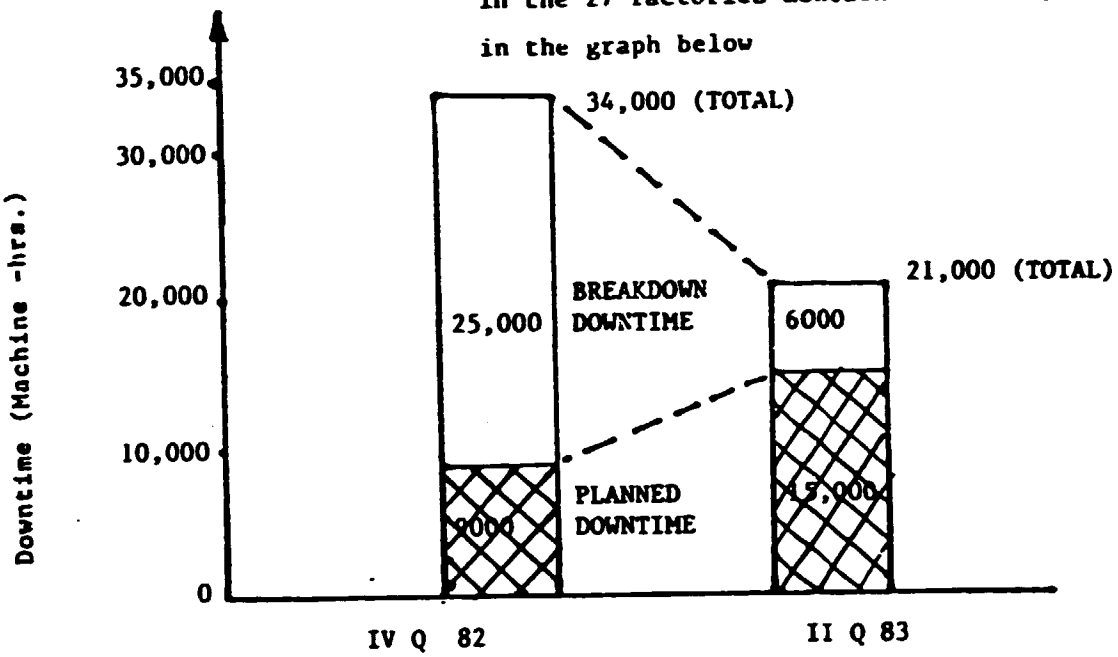
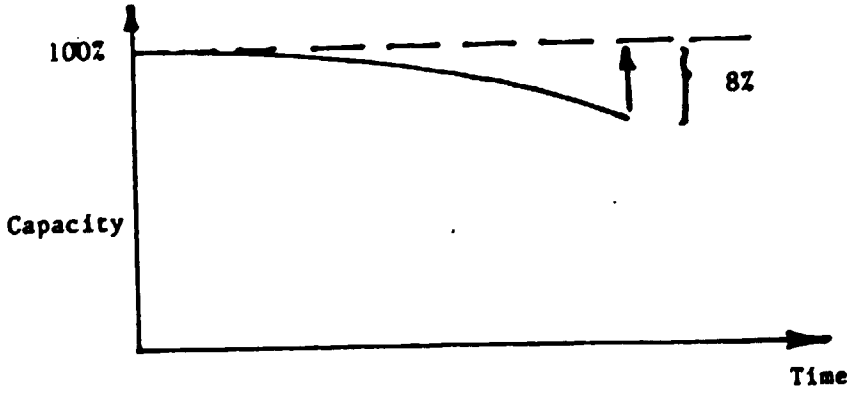
3.2.1 Downtime Reduction:

Planned stoppages for routine maintenance decrease the total downtime. This was clearly demonstrated in the 27 factories mentioned earlier, and is presented in the graph below



3.2.2 Capacity Restoration

Machinery capacity is restored after a well executed medium or major repair. After implementation of planned maintenance capacity of machinery was increased by 8%.



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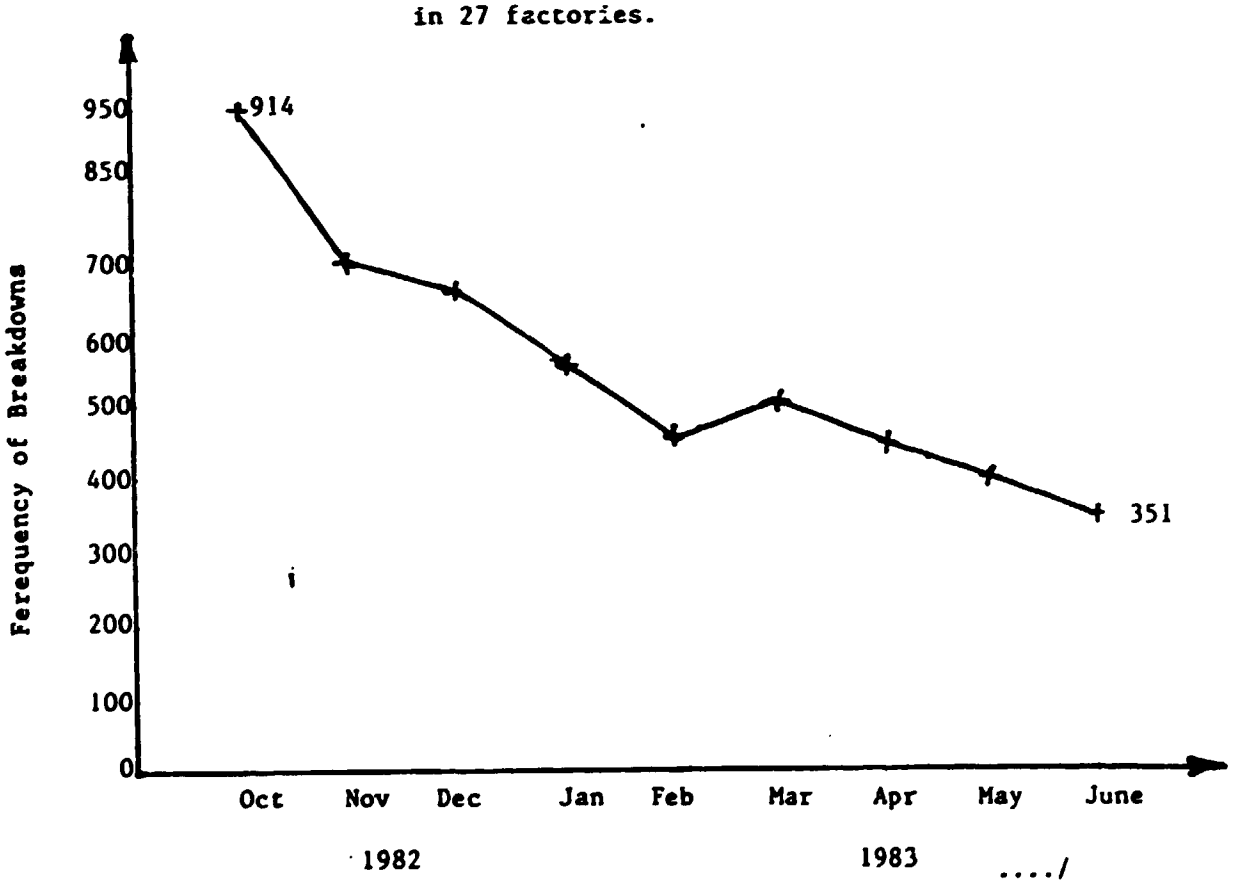
3.2.3 Reliability Increase:

Production loss due to several hours of downtime can be easily calculated, but due to frequent breakdowns of short duration may be difficult to quantify. Nevertheless, it has a big impact on production and it is a good measure of reliability as well as the performance of the maintenance department. Proper inspection followed by a timely maintenance action were the contributors to the reduction of breakdown incidents from 914 to 351 per month. The graph below shows this frequency of breakdown reduction of 173 priority-1 machines in 27 factories.



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3.2.4 Cost Reduction

The fourth objective of a maintenance department is to achieve high availability, maintenance of capacity and high reliability with the least cost possible. In the 27 factories the direct maintenance cost was reduced by 12%

	IVQ 82	IVQ 83	DIFFERENCE	REDUCTION IN PERCENT
Direct MAINTENANCE COST	2,140,000	1,890,000	- 250,000*	- 12%

This happned mainly due to savings in spare parts consumption inspite of the increase of maintenance crew from 1348 to 1386.

Other contributors to cost reduction are reduction of rejected production due to well adjusted machinery and machine productivity increase as shown in RESULT-I. Machine productivity due to reduction of downtime and capacity was increased by 11%, and waste was reduced by 2%

Contribution to profit may be estimated as follows:

Due to reduction of direct maintenance cost	236,000
Due to waste reduction	477,000
Due to machine productivity increase=11.8x0.2**	236,000
	964,000

* F.E. saving shown in page 9 is higher because there is local input involved in the cost there was also some difficulty in costing.

** Profit margin for improvement is higher than for the normal margin.

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4. ROM-M APPROACH (RESULT - ORIENTED MANAGEMENT - MAINTENANCE)

You may wonder whether the results presented earlier are true, and if true why aren't other trainers using the Methodology which has succeded at PIC ? Our reply to the first question is that the figures may not be 100% correct and they don't have to, and the reason we believe they are true is the testimony of the production managers and the plant managers. In any enterprise there is "a healthy enemity" between production and maintenance. If the maintenance manager claims so much success publicily, the production manager will be the first person to protest if there are any untrue statements. However, during our on-spot evaluation of the factories, all the production managers had only words of praise for the efforts of the maintenance crew.

The reply to the second question is that the methodology used by EMI/PIC to help the factories achieve these results is not difficult, but it requires more effort and discipline of trainer-consultants. In classical training after a few weeks certificates of attendance are issued, and most likely there is no follow-up. But the ROM-M approach involves long contact of trainees and trainers from problem identification upto evaluation of formal implementation and evaluation of results. Classroom lectures take a fraction of the whole programme, and trainees get certificates of accomplishment after months of hard work of bringing changes in their organizations.

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4.1 Concept of ROM-M

Experts from EMI/PIC at the office of the D/Minister

D/Minister: "Why do you come to me? The administrator is responsible for training"

Expert: "Your excellency, we came to you not to speak about training but about RESULTS which can be achived in your Ministry. We know availability of of your machinery is only 50% , and your spare parts consumption is excedingly high compared to the value of your fixed assets in machinery. We have a proven approach ROM-M that will guarantee you the achievement of RESULTS such as availability increase for production increase, and saving of of foreign exchange on spare parts".

Can you guess the reply of the D/Minister ?

D/Minister: In that case I will not delegate such activity to any one. I will personally supervise your proposed campaign".

(NOTE: THE ABOVE DIALOGUE IS TRUE)

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ROM-M is a training- consultancy-search methodology for a planned and systematic change. The management of the enterprises are the once who bring change, and the role of the trainer-consultant is that of a facilitor. In ROM-M approach all management have to be involved, especially top management. Without top-management involvement the RESULTS will not be satisfactory.

The success presented earlier is a clear manifestation of the need of involvement of top management. In this case the Minister sent his deputies in the opening of the training seminars and personally awarded prozes and certificates to the successful factories.

On the other hand, there was a certain corporation manager who felt that implementing planned maintenance was only an order of the Ministry. He thoughthis job was finished when he wrote a letter to EMI G.Manager requesting that ROM-M be implemented in his factories. He never had time to open seminars not to listen to the presentations of the findings of his staff trained by EMI. The result was predicatably low, inspite of the high caliber of technicians and engineers in that corporation.

To achieve results on has necessarily to be results-oriented. Kenneth R. Junkins and John O'Meara from the Junkins Group Inc. in an article in the Magazine TRAINING wrote this about result orientedness:

> Managers who"think performance" differentiate between the process of work and the results of work. One way to tell whether a manager is process-oriented or results oriented is to listen to employees when the boss comes around.

> If you hear, "Look busy, the boss is coming, you are probably dealing with a process manager. This manager likes people moving and doing things- it's reassuring sight. Exceptional managers, while aware of activity, always place more value on what is accomplished than on appearances.
>
> A process-oriented manager uses language that focuses on activities- Sharon types part, Clris talks onthe phone, Ron is never in office- whereas a results- oriented manager talks in terms of accomplishments- reports completed, orders taken, customers visited.

Incidentally. Junkins and O'Meara are writing about the need for result orientedness in all fields of management. We had some difficulty in convincing collegues in other departments to apply ROM-M methodology. The excuse was that the performance improvements in their fields were impossible to measure. Junkins and O'Meara say however, that

> Performance is observable. It can be seen, heard and in most cases touched. Generlly, if performance is observable it is also measurable, i.e., it can be counted or quantified in some way and compared to past performance.

A process- oriented maintenance managers boasts of the fact that mechanics are always busy, infact they work a lot of overtime. They count the number of repairs done and so on. But a result-oriented maintenance manager compares the frequency of breakdowns before and after implementation of improvement. He does the same with downtime, production increase and spare parts consumption.

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4.2 The Eight Steps of ROM-M Approach

STEP	OBJECTIVE
1. PROBLEM CHECKING & DATA COLLECTION	To help trainer- consultants do design appropriate programme.
2. PROBLEM SOLVING SEMINAR	To prepare participants to solve their enterprises' problems.
3. EXTERNAL WORK ASSIGNMENT	To practice and strenthen problem solving capacity of participants.
4. INTERNAL WORK ASSIGNMENT	To generate solutions for own enterprise problems.
5. SEMINAR ON IMPLEMENTATION	To present findings of step 4 and strengthen implementation capability.
6. ACTUAL IMPLEMENTATION AND MONITORING	Clear from name of step.
7. EVALUATION OF FORMAL IMPLEMENTATION	To find out extent of formal implementation of solutions.
8. EVALUATION OF ACHIEVED RESULTS	To find out the difference in performance before and after implementation.

4.3 The Process of ROM-M approach (Short Description)

To simplify the work involved, for each step forms designed by EMI/PIC are dispatched. The process is so structured that doing the work assignment, monitoring and reporting is uniform and inter-factory comparison becomes easy.

4.3.1 Step 1 (2-4 weeks duration)

Check-list of typical maintenance problems are sent out and after they are collected.The trainer- consultant analyses them to see how to allocate time in the seminar in step- 2. Most serious problems are given more time.

Relevant data are also collected concerning the future participating enterprises. Often the participants see the picture of their maintenance department for the first time, and they get shocked.

Interviews are also conducted with responsible persons to find out indicators for performance measurement. These indicators differ from industry to industry eventhough the object of maintenance is basically mechanical equipment. Therefore, the consultant-trainer has to aquaint himself with these,in order to be able to design formats for forecasting of results to be achieved in the particular industry. Result-orientedness starts from the beginning!

4.3.2 Step -2 (1-2 Weeks)

The seminar consists of lectures, exersises, group studies and whenever relevant films. The content of the seminar is based on 31 steps developed at EMI/PIC

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which guide step by step how to shift from breakdown maintenance to planned maintenance.

Participants are given opportunity to compare their existing system with elements of a good planned maintenance system. In the group study they discuss what problems they are facing as a consequence of the lack of these elements. In these discussions they are also given the opportunity to meet people who are in the same boat but could not see each other because of factory walls.

4.3.3 Step-3 (5-6 Weeks)

Teams of participants go to volunteer enterprises as consultants to investigate maintenance problems and propose solutions. To guide the team a weekly consultation meeting of the team leaders is held at EMI/PIc.

At the end of the assignment a justification report is written, and to ensure its implementation the team have to convince the enterprise manager and get his approval confirmed by his signing of the report. Finally findings of the consultancy work are presented in the presence of higher supervising authorities, EMI/PIC experts and participants of the seminar of Step-2.

4.3.4 Step-4 (5-6 Weeks)

The procedure of Step-4 is the same as Step-3 but for own enterprise. Step-3 may be skipped in case participants are from very few interprises. But to be able to do step-4 and bring change a minimum of 10% of the maintenance crew must participate in the programme from each enterprise.

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4.3.5 Step-5 (1-2 days)

The seminar involves lectures and discussions on implementation schedule preparation, how to manage change, human resistance to change etc.

4.3.6 Step-6 (3-6 months)

Actual implementation is probably the most difficult step. But the 10% of the maintenance crew who bring the actual change are not left alone. First we ensure that they get the support of higher supervising bodies, and secondly we conduct a consultancy meeting every two weeks. In these meetings EMI/PIC experts give advice on methodology, and the team leaders exchange experiences.

At the meeting the stage of implementation of each enterprise is also described, and is recorded on a wall chart. This is done by a special pointing system, and anybody can find out at a glance how far each factory has gone in implementation. The Ministry people especially loved this monitoring system. Special measures are then taken as necessary with factories who are lagging behind.

4.3.7 Step-7 (2 Weeks)

To find out the extent of implementation Self-Report forms are sent out to the factories. The self-reports are signed by the team leader who is the maintenance head and approved by the plant manger. Copies are sent to PIC.

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4.3.8 Step- 8 (2 Weeks)

The whole objective of the eight steps of ROM-M is to bring change, and finally to achieve tangible RESULTS. Therefore along with the self-report mentioned in step-7, a self-report of achieved results is dispatched. The results mentioned earlier were compiled from such self-report.

The evaluation phase of ROM-M does not end with filling of self-reports. The self-reports are meant to help factories access themselves, and to prepare EMI/PIC experts for the on-spot evaluation.

The objectives of the on-spot evaluation are:

1. To see planned maintenance as praticed in factories, and collect cases for future training,

2. To select factories for recognition by the Ministry or other supervising bodies,

3. To give advice for further improvement to the factories being evaluated.

A standard procedure that takes 2-3 hrs. is used during the evaluation in the factories. The presence of the production manager, the plant manager, participants from other factories and ofcourse the maintenance head is essential.

In these meetings the production manager being the client of the maintenance department gives his opinion on the kind of services he is getting.

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The maintenance head presents the extent of implementation of planned maintenance based on the self-report. He has to support his claim of implementation with actual documents used in the planning and execution of plannned maintenance. Later he presents the achieved result.

A few weeks later certificates of two kinds are awarded. A certificate of accomplishment to the successful factores, and a certificate of attendance to the not so successful.

5.4. Integrated Management and Technical Training

The ROM-M approach was originally developed for management training, but since the establishment of PIC it has been tried in several technical skill training programmes such as machine shop practice for reproduction of parts and vehicle maintenance. However, in the course of these efforts, the need for integrating management and technical training was coming to light.

We found out vehicle maintenance to be specially amenable to this integration. Vehicles, whether they are trucks, tractors or combine harvesters have the same basic operating principles and we had the resources to give both kinds of training. Other production machinery are so diverse in nature it is difficult to give the technical aspect of maintenance at the same time.

Our first client of the integrated approach is the Ministry of State Farms Development. The programme consists of two weeks. The first week is on maintenance management and the second week on high quality inspections of vehicles.

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We stress the inspection part because that is where high discpline is required, and where the results show.

Repairing after breakdown is already too late, and if spares are available most mechanics can replace them easily. But the whole philosophy is to prevent failures by following periodic inspections strictly according to the manufacturer's manuals.

The target group for this training are foremen and senior mechanics. Previously our vehicle maintenance experts were busy upgrading skills of 15-20 semi-skilled workers from three to four months in repair methods. When management of PIC proposed to the experts that they stop this long programmes and take-in skilled people for refresher course, they had doubts whether they have anything new to tell them. However to the surprise of all the one week was full of lively discussions.

Now the question was how to reach the junior mechanics, helpers and drivers. PIC does not have enough capacity to reach them all. To solve this problem the Guided Transmission Training (G.T.T.) concept was created. Its objective is to train the last group through the foremen and senior mechanics. Therefore, one week of instruction-skills training was added to the two-week programme.

When they start the training of their collegues the participants are supplied with handouts in Amharic (the national language of Ethiopia). PIC also supplies other teaching aids such as portable overhead projectors, transparencies etc To motivate the foremen to perform the GTT, contracts are signed with their organizations for payment purposes. A foreman is expected to train at least 10-20 people.

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This way a multiplying effect with tremendous impact can be achieved. The GTT is on trial stage, and we are doing a very close supervision and follow-up.

5. IMMEDIATE PLANS CONCERNING SPARE PARTS

The spare parts question is so crucial to the economy that two very important decisions have been taken. One is to construct a spare parts factory and the other is to establish about twenty reclamation workshops.

5.1 Spare Parts Factory

The Factory which will start operation by mid-1987 is under construction. Besides alleviating the existing spare parts problems of the Ethiopian industries and saving of foreign exchange the establishment of the factory has " laying the basis for engineering industries " as its other objective.

The project idea was started in 1986. but due to various reasons the feasibility study was started in 1980 and completed in 1982 with the help of SIDA. The construction will be financed with Italian aid, and a turnkey contract was signed with an Italian Firm in June 1984. The project is estimated to cost 176 Million Birr, and annual production of 30 Million Birr, worth of spare parts.

Over 10,000 types of parts were collected, and initially 3600 are selected for production. The criterial were technological possibility and quantity requirment for optimal batch quantity production. Workshop drawings as well as production process are being prepared.

5.2 Reclamation Workshops

The EMI/PIC in cooperation with ILO conducted a survey on reclamation of parts in May 1985. In the survey, which took one month, it was found that about 40 Mil. Birr worth of spare parts could be reclaimed at a cost of 10 Mil. Birr bringing in a net saving of 30 Mil. Birr annually. This is even a rather conservative estimate.

It is roughly estimated that one typical work shop in the various economic sectors identified to benefit from the reclamation technology requires an investment of arround 150,000 Birr. This is for additional equipment as a typical work shop already is equiped with general purpose machine tools welding machines and compressors. The foreign exchange saving from each work shop is estimated at 2 Mil. Birr. That means 15 work shops will be required to achieve a saving of 30 Mil. Birr.

The ILO has agreed to finance the establishment of the first work shop which will have more equipment than the other work shop. The work shop is expected to give training to the enterprises who will establish work shops of their own, and reclamation services to the smaller ones. ILO has also agreed to help in consultancy and manpower development of the EMI/PIC workshop. Already five EMI/PIC engineers and technicians have taken a three-months course in Poland. Altogether the project will cost about 700,000 Birr.

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6. UNRESOLVED PROBLEMS

Many unresolved maintenance problems remain in Ethiopia, but the most serious are incentive for maintenance workers and the lack of their appropriate grading and payment.

We have heard of incidents where the net monthly pay was reduced of maintenance workers because maintenance was so well managed that breakdowns were reduced and the need for overtime eliminated ! Later this was corrected, but no system has yet been created to link wages of maintenance workers and their productivity.

Maintenance workers come from various kinds of schools, and there are even many without formal schooling. They do nearly the same jobs, but their pay is as varied as their background. The solution is of cource a proper grading system based on certirication. The certification part has been given as the responsibility of EMI/PIC, but we found it is easier said than done.