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INSTITUTE FOR INDUSTRIAL ECONOMICS  
BELGRADE - YUGOSLAVIA  
M. Tita 16/II

Project Title: Industrial Maintenance Management  
UNIDO Project N°: DP/SOM/008  
UNIDO Contract: 89/34

**DRAFT  
TERMINAL REPORT**

Prepared by:

R. Orović - Team Leader  
M. Gudić - Coordinator  
P. Popović - Coordinator  
CTA DP/SOM/86/034  
M. Radić - Expert  
D. Stanivuković - Expert

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## 1. SUMMARY REPORT

### 1.1. Objectives

Project started on August 15, 1989 and was planned to be executed in 18 months.

Experts component of the Project was subcontracted.

Objectives of the Project were set-up in such a way as to:

- Provide an overall and systematic review of the maintenance needs and practices.
- Elaborate general proposal for the improvement of preventive maintenance practices and more detailed maintenance instructions for the most common groups of equipment.
- Provide formal and on-the-job training of national engineers enabling them to become a core of cadre capable to deal with maintenance problems in Somalia.
- Prepare accordingly a design of an institution-building programme to deal with the maintenance problems in Somalia.

### 1.2. Outputs Sought and Produced

The execution of the project was arranged in such a way as to produce the following outputs:

- (a) - A review of maintenance systems, functions, and staffing and outfitting of work-shops; Classification and state of the equipment and Review of problems and Availability of spares.
- (b) - Formal and on-the-job training of national engineers.
- (c) - Design of an institution capable to deal with maintenance problems in industry.

In order to achieve the objective under "(a)", a team of engineers has been formed and trained for the job, guided and instructed by international expert.

A complete set of data and information has been collected and presented as Annexes of the "Terminal Report" and separate "Report on Industrial Enterprises". The outputs of such an investigation have shown that:

- Situation in the industrial sector in Somalia is critical and urgent changes in the economic and social system are needed.

- Maintenance services are performed at a very low level, if existing at all.
- Generally, number of machines and equipment in the enterprises would be sufficient to match planned production, but poor management, lack of proper organization and poor state of the installed equipment are reducing production sometimes to a lowest level. Frequent brake-downs of electric power supply, shortage of fuel as well as of raw materials and spares are contributing to the present situation. Private enterprises are in far better, if not in "normal", situation.
- Staffing is inadequate in two ways: firstly, the manpower mostly with insufficient technical knowledge and experience, and secondly the lack of an incentive payment system embarrassing the productivity.

In order to contribute to the efforts to push toward solving the maintenance problems, the establishment of an institution at the national level - "INDUSTRIAL MAINTENANCE (MANAGEMENT) CENTER" is suggested. Full details about the "Center" are provided in the ANNEX 8 of the Terminal Report.

*Training of local engineers* to deal with existing maintenance problems has been done through seminars, formal and on-the-job training. Introduction of the maintenance systems has been done through training of three Project national engineers and a number of representatives coming from the maintenance departments belonging to the factories. They are now able to perform most of the organizational and managerial activities on their own.

Nine thematic fields in maintenance and repair have been covered by corresponding seminars and courses attended by 118 participants. Manuals and Handbooks have been provided to each participant for each particular thematic field.

Those young people would be able to move things forward, if provided by proper opportunities and backed by an institution with enough authority. It is also understood that their salaries should be related to the results of their work.

### 1.3. Recommendations and Lessons

Apart from the absolutely needed changes that are out of the scope of this Project, it is recommended to the Government to encourage and support actions of the trained technicians to improve the existing maintenance services in industrial enterprises, but having in mind that no results may be expected unless an incentive system of payment is introduced.

It is recommended to both, the Government and UNDP/UNIDO, to very seriously discuss the possibility of establishing the suggested "Center" as an optimum solution for proper dealing with and solving of the problems in maintenance and repair.

The experience gained during the execution of the Project proves that engagement of national engineers in solving various problems and in finding optimal solutions to these and even more complicated and long term problems is a positive, practical and a recommendable approach.

Cooperation with other projects and certain national and international institutions has resulted in saving the time in learning about local conditions and circumstances.

## 2. INTRODUCTION

This Draft Terminal Report, covering the activities from August 15, 1989 till the end of 1990, has been prepared according to the Project Document of the DP/SOM/88/008 Project. The execution of the project has been subcontracted to the "Institute for Industrial Economics", Belgrade, Yugoslavia. The team of experts from the Institute consisted of six consultants, each specialized in specified thematic field, who, according to the Work Plan, worked in Somalia.

Four Interim Reports, the Training Report, the Report on Detailed Study of the Enterprises and the Project Performance Evaluation Report, prepared for the Tripartite Review Meeting, have been submitted to the Government, UNDP and UNIDO. These documents included all relevant data covering the Project activities.

The very end of the Project's field activities has been interrupted by the internal unrest and struggles causing evacuation of all UN experts from Somalia. At present, the whereabouts and destiny of the Project's national consultants and staff are not known. It is also unknown whether the Project's equipment and documents as well as experts belongings left behind are untouched.

## 3. PROJECT BACKGROUND

Industrial development in Somalia has been slow due to severe under-utilization of capacity and low level of production and productivity. Capacity utilization in some key industries has been below 10%. Many factories work below 50% of available hours. The production in most of the factories is less than 50% of the planned targets which basically were set at modest levels as compared to those achievable from the installed facilities. Production in quantitative terms per manhour has continued to decline, and thus has become a subject for concern in many industries.

The unsatisfactory performance is caused by many problems of which the following could be listed as particularly important and influential:

- Very low managerial and technical know-how
- Poor maintenance systems and practices
- Weak incentives and bonus policies.

The Government policy changes included many positive measures taken in order to improve the existing situation. But to be able to effectively carry out the proposed industrial policies and programs, the country needs to obtain an extensive technical assistance, particularly in view of the shortage of nationals with the necessary qualifications and experience.

Taking into account the lessons learnt in the implementation of SOM/88/013 and SOM/72/007 Projects, the Government, UNIDO and UNDP agreed that the establishment of a national industrial consultancy unit, with the aim to train Somali nationals in the consultancy methodology and practical problems solving techniques, is very important. Therefore, the three year project, DP/SOM/86/034 has been created starting its activities on 15 August 1987. After positive results achieved by the DP/SOM/86/034, during the initial stage of its implementation, it was found necessary to recommend establishment of a new project to deal exclusively with the problems related to the maintenance area.

In this connection, DP/SOM/88/008 - "Industrial Maintenance Management" Project was established. The Project was subcontracted to the "Institute for Industrial Economics" - Belgrade, Yugoslavia and its activities started on August 15, 1989.

#### 4. OBJECTIVES, OUTPUTS AND ACTIVITIES

##### 4.1. Objectives

In the context of the Government's policies toward industrial sector and of the problems of industrial maintenance management in particular, the purpose of the Project was set-up to:

1. Provide, for the first time, an overall and systematic review of the maintenance needs and practices in Somalia.
2. Elaborate general proposals for the improvement of the preventive maintenance practices and more detailed maintenance instructions for most common groups of equipment.
3. Provide formal and on-the-job training for national engineers, enabling them to become a core of a national cadre capable of a more systematic approach in dealing with complex maintenance problems in Somalia.
4. Prepare accordingly a detailed design of an institution building programme to deal with the maintenance management problems and issues in Somalia.

It was decided that the Project would be carried out by covering 18 selected industrial enterprises and that specified investigations and works would be performed. In the table given in "Annex 1" to this report, all specified activities are listed in the form of a Bar Chart giving times for their performance.

The primary function of the project was to establish a group of national experts, permanent staff of the project, who would, after a proper training and instructions, create a backbone of the working team consisting of them and international experts provided by the subcontractor.

It should be noted that the cooperation with already existing DP/SOM/86/034 Project was all the time at the desired level, so that DP/SOM/86/034 has provided the new Project with all necessary support including the complete administration services.

The subcontractor has organized its team of international experts consisting of a Team Leader and five experts in specified thematic fields.

While collecting data, elaborating general proposals for the improvement of existing maintenance practices and carrying out the formal and on-the-job training, the team of experts came to a conclusion that the only promising way to solve the maintenance problems is to concentrate on the objectives related to the corresponding institution building project.

Objectives concerning data collection, formal and on-the-job training have been very successfully achieved. Elaboration of general proposals for the improvement of preventive maintenance practices and more detailed instructions for maintaining industrial equipment have also been done. However, the implementation of the given instructions and recommendations due to the existing circumstances turned to be a long term goal that can be achieved through a long process requiring at the same time physical and financial rehabilitation of enterprises, improved institutional set-up and better overall economic conditions in the country.

#### 4.2. Outputs and Activities

According to the Work Plan, based on the Project Document, and target dates set-up in the bar-chart, all objectives have been achieved. The "Annex 1" provides the mentioned Work Plan - Bar Chart showing achieved v.s. planned objectives' target dates.

Training of the Project's nationals together with factories engineers and technicians has been organized through appropriate seminars and courses consisting of theoretical and practical parts (formal and on-the-job training). Formal training has been performed in the Project's premises, while the on-the-job training has mostly been done in industrial enterprises and institutions.



All details about training activities are given in the "TRAINING REPORT - Activities between August 15, 1989 and December 1990", submitted to UNIDO.

It should be noted that the initial courses have been oriented toward organizational matters of the maintenance services in order to give to the participants a general view on the requirements of a proper maintenance organization. At the same time, a team of national engineers has been trained for the job of reviewing the existing maintenance systems and functions in selected enterprises and for collecting relevant data and information.

As a result of the training, a national team consisting of three Project's engineers and the maintenance department representatives from the factory has been organized to work (under the guidance of the international expert at the beginning) on problems mentioned above. All collected data and information are presented in the following Annexes:

- Annex 3/1 - Maintenance outfitting in Somalia Industry
- Annex 3/2 - Maintenance staffing in Somali Industry
- Annex 4 - Structure of employees in Somali Industry
- Annex 5 - Condition of machines and available spare parts
- Annex 6 - ABC - Analysis of the origin of machines
- Annex 7 - Histogram of age of machines

All details on reviewing and surveying of the present situation in selected industrial enterprises in Somalia are provided in the "REPORT ON DETAILED STUDY OF THE ENTERPRISES".

Collected data and information suggest the following conclusions:

- The maintenance and repair services are not properly organized in most of industrial enterprises, if they exist at all, and there is a lack of recognition of the importance they should have in production.
- The working condition of most of machines, both in maintenance and production shops, is not satisfactory or even poor.
- Experience of the majority of employees working in maintenance and repair services needs upgrading.
- Administration, records and flow of information are at a low level.
- Wages and salaries are so low and depressive that employees are not stimulated to work. No proper incentive system of payment is employed.
- There are frequent brake-downs in electricity supply and shortage of fuel, both creating additional problems in already weakly organized production.

- Shortage of hard currency causes lack of raw material, spare parts and technical know-how.
- Generally, privately owned enterprises are much better standing in all aspects than the Government belonging ones.

The data and information collected not only proved the background information in the Project Documents but even more they warn that the situation was worst and was further deteriorating.

Through seminars, prepared manuals and handbooks and through direct contacts and discussions with professionals concerned, the management of selected enterprises has been provided with proposal concerning the organization of Maintenance and Repair services in their organizations. All aspects of required changes and actions have been discussed and mutual understanding on those have been reached. The proposals have been issued in a form which covers all aspects of M&R activities (organization, administration, information flow, store keeping, preventive maintenance, spare parts providing and recording etc.) and adjusted in such a way as to suit local circumstances in selected enterprises and also in those similar to them.

As already mentioned Project's national engineers have been thoroughly trained and through the field work with international experts they have gained sufficient experience to be able to transfer their knowledge to the counterparts in factories, to collect necessary data and information and to elaborate them in a suitable way as well as to participate in organizing proper M&R services in industrial enterprises.

Working on the question of the institution building project, a broad circle of interested and influential officials (factory's managers and engineers, Government high ranking officials etc.) have been contacted. Actual situation and existing data and information have been discussed in order to find a solution most appropriate to local conditions. Common opinion has been reached in a form of a suggestion to establish an institution such as - the INDUSTRIAL MAINTENANCE (MANAGEMENT) CENTER. Generally speaking, the main duties of the Center would be:

- to organize production of certain spare parts
- to render services in organizing and upgrading M&R departments in factories
- to do repair of industrial equipment and machines.

More detailed information concerning the Center are provided in the "Annex 8" of this Report in the form of "DRAFT-PROJECT DEFINITION". The copies of the "Draft" has been handed over to the UNDP Resident Representative Office in Mogadishu - Somalia; to the Director General of the Ministry of Industry and to UNIDO as a part of the "Third Interim Report". On the request of the Vice Minister of Industry the idea was discussed with him. Full understanding and support to the idea has been obtained from him. We have been

informed that Authorities in charge were going to request UNDP and UNIDO for services in formulating Project Documents.

In addition, a Draft of the Project Document has been drafted in order to facilitate future work and discussions.

Starting with August 15, 1989, the training of the Projects engineers, followed by formal and on-the-job training of the staff from the selected enterprises took place. Nine seminars, covering 7 thematic workshops/fields have been accomplished. Additional three seminars have been completely prepared but not carried out since, following the UNDP instructions, all UN Experts have been withdrawn from Somalia, thus postponing accomplishment of the remaining courses for some time.

On-the-job training has been carried out in the Training Centers near to the Project premises using their facilities as well as at the Project premisses and at those of some appropriate enterprises.

Formal training was performed in the premises of ICU (Project DP/SOM/86/034).

It should be noted that according to the Terms of Reference the Subcontractor was obliged to provide formal and on the job training for the Project Engineers and staff from selected enterprises covering at least six thematic workshops.

One hundred and eighteen participants coming from selected enterprises attended training courses. They came mostly from maintenance departments. In addition to formal and on-the-job training each of them was supplied with manuals on the subject of training.

A short-term seminar covering the maintenance managerial problems was organized for the engineers at managerial level coming from the Ministry of Industry.

Manuals and Handbooks have been published accordingly for each course and seminar and handed over to each participant. They are composed to back-up lectures on formal and on-the-job training and also to serve as manuals for managerial and organization problems of maintenance services and for actual maintenance and repair work.

In "Annex 2" the courses and seminars accomplished and the Handbooks and Manuals published are listed.

All details about training activities could be found in the "TRAINING REPORT - Activities between August 15, 1989 and December 1990" handed over to UNIDO.

The "PROJECT PERFORMANCE EVALUATION REPORT" has been prepared as a material for Tripartite Review Meeting and handed over to UNIDO.

It is obvious that elimination of technical problems depends to a greatest extent on the steps and actions imposed by general Government policy. Therefore, when discussing the ways in which to assist Somali industry in the best possible way, all aspects should be treated in the same way and at the same time.

Proposed UNDP/UNIDO assistance in establishing Industrial Maintenance (Management) Center is, according to common opinion, the optimum way in solving the maintenance problems. However, it may turn to be a "black hole" for the investment unless a full care is given to the general problems of the country. It is worth mentioning that the Government has realized the necessity of changes in policy concerning existing systems and that first steps have already been taken.

Recent events in Somalia will definitely further deteriorate the performances of industrial enterprises and affect the weak infrastructure. No doubt, one can expect that equipment and machines have suffered damages and losses. Therefore, the importance of Maintenance and Repair services are getting the highest possible importance.

## 5. LESSONS

When discussing the factors influencing industrial sector in Somalia it should be taken into account that:

- the country is in an early stage of industrialization, lacking educated and experienced manpower and natural resources, except for reasonable possibilities in agriculture, and with pretty poor national transport network
- free market economy is hardly existing, with majority of industrial enterprises owned by the Government suffering therefore of many problems, starting with weak management, lack of incentives, low productivity, missing responsibility at all managerial levels, deteriorating condition of industrial equipment and machinery, etc.
- poor infrastructure is badly influencing even industries with some tradition (like textile, food processing and similar).

Concerning the maintenance of machines and equipment, two different, but interconnected, groups of problems are apparent. The first one concerns the economic and social system in the country. It is hardly to expect improvement in any sector of the national economy unless free market economy and the private ownership are introduced controlled by social security laws and regulations and appropriate fiscal policy. The second group consist of technical (managerial, organizational) measures and steps to be undertaken in order to build-up such a maintenance and repair organization able to keep production machines and equipment in working condition in a profitable manner (minimum investment toward maximum production readiness).

## 6. FOLLOW-UP RECOMMENDATIONS

In order to organize and upgrade Maintenance and Repair services in industrial enterprises it is recommended as follows:

### (a) Organization of M&R

In the provided manuals and handbooks basic types of organization of M&R services are presented covering preventive maintenance, flow of documents, records, spare parts handling and job description of main functions.

Suggested principles should be applied taking into account actual situation in each enterprise.

### (b) Spare Parts Production

Certain variety of spare parts could be produced in local private workshops and also using free capacities in public factories. National Project's engineers are capable to organize such a production provided raw materials are made available and incentive payment for technicians and workers is safeguarded.

Establishment of the INDUSTRIAL MAINTENANCE MANAGEMENT CENTER would greatly facilitate solving the critical situation regarding the spare parts.

### (c) Equipment and Machines

State of machines and equipment in general is far below a satisfactory level. It should be kept in mind that statement given in the review of outfitting of industrial enterprises, that certain machines are in working condition does not automatically mean that they could perform accurate and quality work. Collected data are based on visual observation only, since accuracy measuring is a very specialized job, involving special metrology equipment and it is time consuming operation. Thus, it is logical that the great percentage of machine tools and equipment need to be repaired.

Records introduced by Project's staff in many factories should be kept up-to-date and actions concerning preventive maintenance strictly followed.

Regular and in-time repair of equipment should be done as soon as the faults are discovered.

Introduction of incentive payment connected to the proper maintenance of machines is strongly recommended.

### (d) Staffing

Generally speaking, technical staff, both in production shops and in M&R departments, need upgrading in their technical knowledge and experience.

Project's engineers are able to organize training courses in most thematic fields within the Project's activities. While assisting in organizing maintenance services in the factories they should transfer their knowledge and experience to the factory personnel. All necessary manuals and handbooks are available in the

ICU (DP/SOM/86/034 Project) library and they should be at the disposal of the interested technical staff.

(e) Industrial Maintenance (Management) Center

Establishment of the Institution INDUSTRIAL MAINTENANCE (MANAGEMENT) CENTER at the national level is strongly recommended. The existence of such an organization is so vital for the industrial sector of the economy that all parties concerned e.g. the Somali Government UNDP and UNIDO should give to it a first priority.

(f) General Remarks

Recent developments in Somalia have created the situation that following UNDP instruction, UN Experts were withdrawn from the country. All equipment, documents and archive have been left behind. Until so far there have been no information about national experts and staff working in the Project and the equipment.

The list of the received equipment is given as "Annex 9" of this report. It should be compared with the corresponding UNIDO documents, having in mind that due to very long delivery and transportation terms and time and endless complicated custom procedures at Mogadishu Port differences are possible.

The equipment has been left in custody of the national project's coordinator who may or may not be kept responsible for it taking into account mentioned development in Somalia.

Project's car was taken over by the Ministry of Industry and they have been taking care of it.

## 8. BUDGET

The inputs for the Project were provided by UNDP as well as by the Government of Somalia.

The latest status of expenditure dated December 5, 1990 based on the available documents and data in Mogadishu is given as "Annex 10" of this Report. The form from Project Performance Evaluation Report is used for this purpose.

All documents backing the listed figures are left behind in Somalia so that UNIDO documentation should be regarded as the only existing official trace.

# WORK PLAN - BAR CHART

ANNEX I

| ITEM | ACTIVITY  | MONTH |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|      |   | Av    | S     | O     | N     | D     | J     | F     | Mt    | Ap    | My    | Jn    | Jy    | Av    | S     | O     | N     | D     |
| 1    | Introductory Discussion<br>Basic Information                      | ==    | ==    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2    | Detailed Planning   | ==    | ==    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 3    | Formal Training   |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 4    | Review of Maintenance<br>Systems and Functions                    |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 5    | Review of Staffing and<br>Outfitting of Workshops                 |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 6    | Classification and State<br>of Equipment - Review                 |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 7    | Review of Problems and<br>Availability of Spare Parts             |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 8    | On-the Job Training   |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 9    | General Proposals for Improving<br>Maintenance Management         |       |       |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 10   | Preparation of Manuals  |       |       |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 11   | Interim Reports   |       |       |       | ==    |       |       |       | ==    |       |       |       | ==    |       |       |       | ==    |       |
| 12   | Design of an Institution-<br>Building Project                     |       |       | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 13   | Final Report (Draft and Final)                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       | ----- | ----- | ----- |
| 14   | Coordination and Synhronisa-<br>tion with Other Relevant Projects | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |

----- Actual Work
- - - - Preparatory Activities
- . . . . . Work Done

**SEMINARS ACCOMPLISHED AND HANDBOOKS  
AND MANUALS PREPARED**

The following seminars have been accomplished:

1. Industrial Maintenance Management
2. Service and Repair of Diesel Engines
3. Maintenance of Synchronous Generators
4. M&R of Diesel Fuel Injection Equipment
5. Maintenance Organization and Management
6. Technical Diagnostics (Industrial Equipment and Machines)
7. Preventive Maintenance of Electric Motor Drives and Installations
8. Welding and Repair Welding
9. Steam Boilers

Three seminars have been prepared but due to temporary departure of all UN Experts from Somalia they have been postponed. They are:

- Maintenance and Repair of Reciprocating Compressors
- Maintenance and Repair of Mobile Hydraulic Components
- Corrosion Fighting and Protection

The following Manuals and Handbooks have been prepared:

1. Maintenance Management Handbook
2. Maintenance Management Manual
3. Manual on Preventive Maintenance, Repair and Technical Diagnostic of Steam Boilers
4. Manual on Measurements of Water Hardness
5. Manual on Welding and Repair Welding
6. Manual on Maintenance, Repair and Regeneration Technologies
7. Manual on Service and Repair of Diesel Engines
8. Manual on Repair of Diesel Engines Electrical Systems
9. Rotating Electrical Machines - Manual on Operation and Maintenance of Synchronous Generators
10. Manual on Service and Repair of Diesel Fuel Injection Equipment
11. Manual on Technical Diagnostics (Industrial Equipment and Machines)
12. Manual on Rotating Electrical Machines and Maintenance of Electric Motors
13. Operation and Maintenance of Electrical Installations
14. Electrical Equipment Preventive Maintenance and Schedules of Regular Inspection and Maintenance
15. Manual on Operation and Maintenance of Electric Motors Ancillary Equipment
16. Manual on Maintenance and Repair of Reciprocating Compressors
17. Manual on Maintenance and Repair of Mobile Hydraulic Component



**Remark**

The Manuals and Handbooks listed above, prepared for seminars, in majority cases are covering broader fields than necessary to cover seminars only. Therefore they could be used as schoolbooks for technical schools and workshop guides when organizing and doing repair works.

## MAINTENANCE OUTFITTING IN SOMALI INDUSTRY (25-th January 1990.)

| Nb. | Enterprise                   | Mainten.<br>work-<br>shop<br>exist | Maintenance equipment quantity<br>(workshop) |     |     |     |     |     |      |      |      |      |      | Energy supply |            |       |            |                       |                     |
|-----|------------------------------|------------------------------------|--|-----|-----|-----|-----|-----|------|------|------|------|------|---------------|------------|-------|------------|-----------------------|---------------------|
|     |                              |                                    | yes  | no  | L   | M   | H   | G   | PG   | CG   | BD   | AW   | GW   | O             | electrical |       | steam      | compr.air             |                     |
|     |                              |                                    |  |     |     |     |     |     |      |      |      |      |      |               | m          | o     | kW         | t/h                   | L,m <sup>3</sup> /h |
| (1) | (2)                          | (3)                                | (4)  | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15)          | (16)       | (17)  | (18)       | (19)                  |                     |
| 1.  | ALBA - Mogadishu             | x                                  | -  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | x             | x          | 80    | -          | -                     |                     |
| 2.  | Brick factory - Afgoi        | x                                  | -  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    |               | x          | 850   | -          | 49 l/h                |                     |
| 3.  | Cigarettes Match f. - Mog.   | x                                  | -  | 2   | -   | -   | -   | -   | -    | 2    | 2    | 1    | 1    | x             |            |       | -          | 341 l/h               |                     |
| 4.  | Coca-Cola Co. - Mog.         | x                                  | -  | -   | -   | -   | 1   | -   | -    | 1    | -    | 1    | -    | x             | x          | 600   | 1.35 t/h   | 627 l/h               |                     |
| 5.  | Somali bag Co. - Mog.        | x                                  | -  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | x             | x          | 200   | -          | 100 l/h               |                     |
| 6.  | ENSEE - Mogadishu            | x                                  | -  | 6   | 2   | -   | -   | -   | -    | 1    | 2    | 2    | 4    | suppl.        | -          | 5 MW  | 75 t/h     | 73 m <sup>3</sup> /h  |                     |
| 7.  | Flour and Pasta - Mog.       | x                                  | -  | 1   | 1   | -   | 1   | -   | -    | 4    | 4    | 1    | 3    | x             | x          | 896   | 950 kcal/h | 191 m <sup>3</sup> /h |                     |
| 8.  | Foundry & Mech. Wk. - Mog    | x                                  | -  | 8   | 3   | -   | 3   | -   | -    | 5    | 15   | 3    | 17   | x             | x          | 100   | -          | -                     |                     |
| 9.  | Hassan Migooyi Tyres - Mog.  | x                                  | -  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    |               |            |       | -          | 25 l/h                |                     |
| 10. | ICS (Ball) - Mogadishu       | x                                  | -  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | x             | x          | 200   | -          | 43 m <sup>3</sup> /h  |                     |
| 11. | ITOP - Afgoi                 |                                    |  |     |     |     |     |     |      |      |      |      |      |               |            |       |            |                       |                     |
| 12. | Milk factory - Mogadishu     | x                                  | -  | -   | -   | -   | -   | 1   | -    | 1    | 1    | 1    | 2    | x             | x          | 160   | 0,9 t/h    | 100 l/h               |                     |
| 13. | Sharo bros. - Mogadishu      |                                    | x  | -   | -   | -   | -   | -   | -    | -    | -    | -    | -    | x             | x          | 80    | -          | -                     |                     |
| 14. | Cooling unit - Mogadishu     |                                    | x  | -   | -   | -   | 1   | -   | -    | 1    | 1    | 1    | 3    | x             | x          | 100   | -          | 25 l/h                |                     |
| 15. | Somali pharmacy - Mog.       | x                                  | -  | 1   | -   | -   | -   | -   | -    | 1    | 1    | 1    | 1    | x             | x          | 625   | -          | -                     |                     |
| 16. | Smalter - Balad              | x                                  | -  | 3   | 2   | -   | 2   | -   | -    | 2    | 3    | 1    | 5    |               | x          | 4.160 | -          | -                     |                     |
| 17. | Tannery and Shoe km 7 - Mog. | x                                  | -  | 1   | -   | -   | 1   | -   | -    | 1    | 2    | 1    | -    | x             | x          | 706   | 2,8 t/h    | -                     |                     |
| 18. | W.D.I. - Mogadishu           | x                                  | -  | 8   | 4   | 1   | 3   | 4   | 1    | 5    | 4    | 1    | -    | x             | x          | 750   | 0,5 t/h    | 292 l/h               |                     |

Total:

Legenda: L - Lathe, P - milling mach, H - hobbing mach, G - grinders, PG - pedestal grinder, CG - column grinder, BD - bench drill.m., AW - arc weld.set, GW - gas weld set, O - other equipment, m - main, o - own

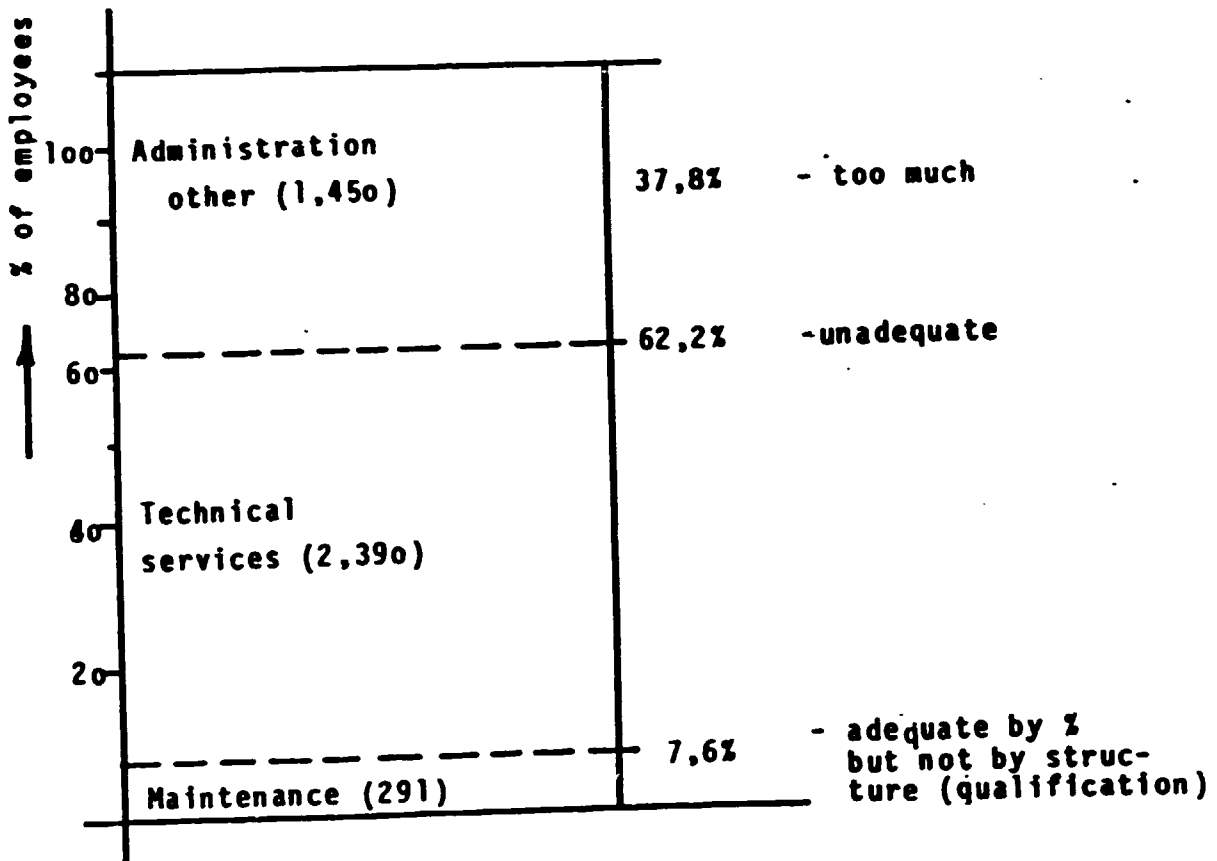
MAINTENANCE STAFFING IN SOMALI INDUSTRY  
(25-th January 1990)

| No. | Enterprise                 | Total number of employees |                      | Total number of employees in |                       | Number of employees by skill degree (in maintenance dept.) |     |     |      |      |      | Ratio (6):(5) |
|-----|----------------------------|---------------------------|----------------------|------------------------------|-----------------------|--|-----|-----|------|------|------|---------------|
|     |                            | technical services        | administr. and other | enter-prise                  | maintenan-<br>ce dept | BS   | TS  | HS  | IS   | ES   | NE   |               |
| (1) | (2)                        | (3)                       | (4)                  | (5)                          | (6)                   | (7)  | (8) | (9) | (10) | (11) | (12) | (13)          |
| 1.  | ALBA - Mogadishu           | 21                        | 2                    | 23                           | 2                     | -  | -   | -   | -    | -    | 2    | 8,7           |
| 2.  | Brick factory - Afgoi      | 19                        | 22                   | 41                           | 4                     | 1  | -   | -   | -    | -    | 3    | 9,8           |
| 3.  | Cigarette & Match f.Mog.   | 237                       | 59                   | 256                          | 3                     | 1  | 2   | -   | -    | -    | -    | 1,0           |
| 4.  | Coca Cola Co. - Mog.       | 40                        | 22                   | 62                           | 9                     | 1  | -   | -   | 4    | 2    | 1    | 14,5          |
| 5.  | Somali bag Co. - Mog.      | 200                       | 11                   | 211                          | 2                     | -  | -   | -   | -    | 2    | -    | 0,9           |
| 6.  | ENEE - Mogadishu           | 600                       | 424                  | 1,024                        | 110                   | 7  | 20  | -   | 19   | 30   | 27   | 10,7          |
| 7.  | Flour and Pasta - Mog.     | 36                        | 240                  | 276                          | 12                    | 2  | 1   | -   | 5    | 2    | 2    | 4,3           |
| 8.  | Foundry & Mech.Work.-Mog.  | 48                        | 32                   | 80                           | 3                     | 1  | -   | 2   | -    | -    | -    | 3,8           |
| 9.  | Hassan Wagooyi Tyres- Mog. | 12                        | 2                    | 14                           | -                     | -  | -   | -   | -    | -    | -    | 0,0           |
| 10. | ICS (Bail) - Mogadishu     | 38                        | 46                   | 84                           | 6                     | -  | 2   | 2   | -    | -    | 2    | 7,2           |
| 11. | ITOP - Afgoi               | 60                        | 30                   | 90                           | 10                    | -  | 2   | 1   | 3    | 4    | -    | 11,1          |
| 12. | Milk factory - Mogadishu   | 98                        | 39                   | 137                          | 23                    | 3  | 3   | -   | 4    | 1    | 12   | 16,8          |
| 13. | Shamo bros.-Mogadishu      | 22                        | 3                    | 25                           | -                     | -  | -   | -   | -    | -    | -    | 0,0           |
| 14. | Cooling unit - Mogadishu   | 4                         | 7                    | 11                           | 4                     | -  | 1   | 1   | 2    | -    | -    | 36,4          |
| 15. | Somali pharmacy - Mog.     | 20                        | 180                  | 200                          | 19                    | 2  | 13  | -   | -    | -    | 4    | 3,3           |
| 16. | Somaltex - Balad           | 652                       | 218                  | 860                          | 65                    | 4  | 20  | -   | 39   | 2    | -    | 7,6           |
| 17. | Tannery and Shoe km 7-Mog. | 183                       | 33                   | 216                          | 13                    | 2  | 3   | 2   | 2    | 3    | 1    | 6,0           |
| 18. | W.D.I. - Mogadishu         | 100                       | 80                   | 180                          | 6                     | -  | 2   | 1   | -    | -    | 3    | 3,3           |

-----  
Total:

Legenda: BS - university, HS- high school, TS - technical school, IS - intermediate school  
ES - elementary school, NE - non-educated

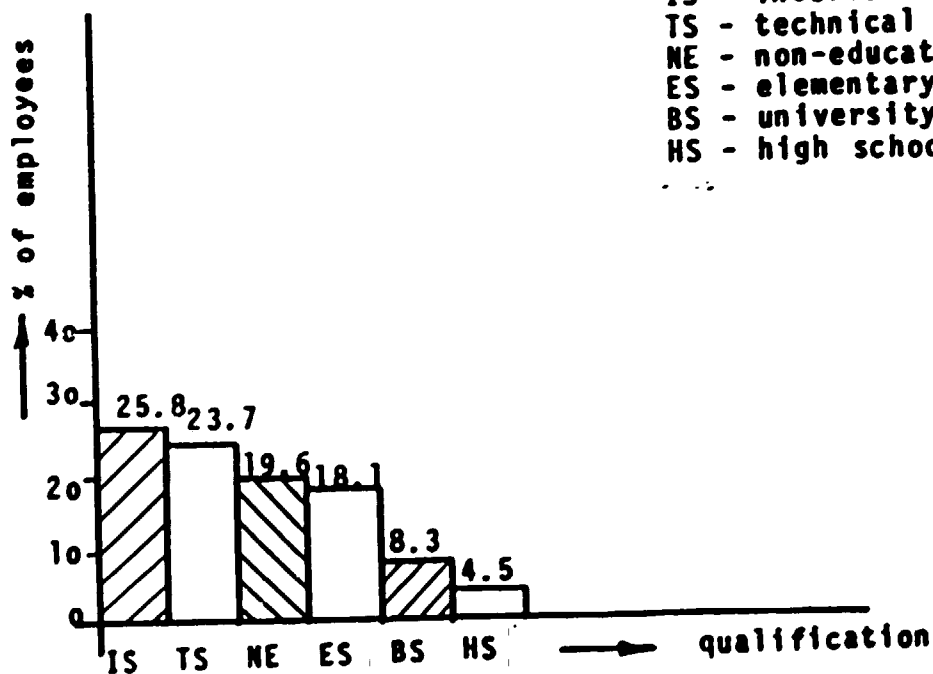
STRUCTURE OF EMPLOYEES  
IN SOMALI INDUSTRY



STRUCTURE OF THE EMPLOYEES  
IN MAINTENANCE DEPARTMENTS

Legend:

- IS - intermediate school
- TS - technical school
- NE - non-educated
- ES - elementary school
- BS - university
- HS - high school



**CONDITION OF MACHINES AND AVAILABILITY OF SPARES**  
(in selected enterprises)

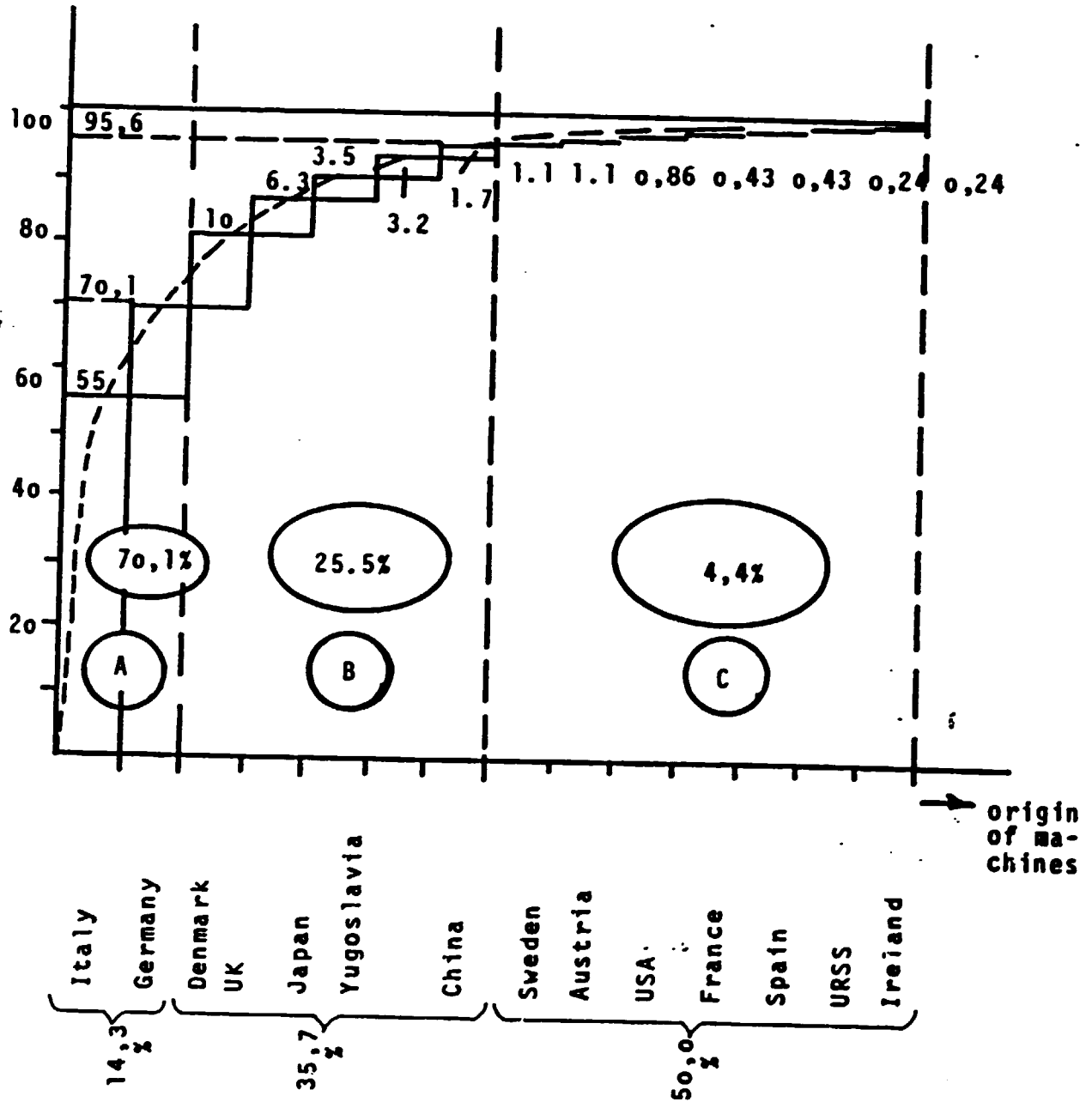
ANNEX 5/1

| No. | Enterprise                         | Total Number<br>of main machines<br>and equipment | Condition |              |         | Spares  |             |
|-----|------------------------------------|---|-----------|--------------|---------|---------|-------------|
|     |                                    |   | % good    | % for repair | % Scrap | % avail | % not avail |
| 1.  | ALBA-Mogadishu                     | 24  | 92        | -            | -       | 43      | 57          |
| 2.  | Brick Factory-<br>Afgoi            | 24  | 92        | 8            | -       | 12.5    | 87.5        |
| 3.  | Cigarette and<br>Match Fac. Mog.   | 39  | 66.6      | 33.4         | -       | 40      | 60          |
| 4.  | Coca-cola Co.<br>Mogadishu         | 31  | 97        | 3            | -       | 95.8    | 3.2         |
| 5.  | Somali Bag Co.<br>Mogadishu        | 15  | 100       | -            | -       | 73.3    | 26.7        |
| 6.  | ENEE -Mogadishu                    | 44  | 59        | 25.1         | 15.9    | 5       | 95          |
| 7.  | Flour & Pasta<br>Factory -Mog.     | 26  | 77        | 15           | 8       | 50      | 50          |
| 8.  | Foundry & Mech.<br>Workshop - Mog. | 34  | 71        | 29           | -       | 5       | 95          |
| 9.  | Hassan Waqooyi<br>Tyres- Mogadishu |   |           |              |         |         |             |
| 10. | ICS(Bail) Mog.                     | 14  | 79        | 14           | 7       | 21.4    | 78.6        |
| 11. | ITOP - Afgoi                       | 53  | 66        | 25           | 9       | 9.4     | 90.6        |
| 12. | Milk Factory<br>Mogadishu          | 50  | 92        | 2            | -       | 46      | 54          |
| 13. | Shamo Eros. Mog                    | 12  | 100       | -            | -       | 95      | 5           |
| 14. | Cooling Unit. Mog                  | 17  | 65        | 35.3         | -       | 41.2    | 58.8        |
| 15. | Somali Phar. Mog                   | 64  | 59        | 33           | 9       | 14.1    | 85.9        |
| 16. | Somaltek - Balid                   |   |           |              |         |         |             |
| 17. | Tannery & Shoe<br>Km7. Mogadishu   | 25  | 92        | 17           | -       | 52      | 48          |
| 18. | W.D.I. Mogadishu                   |   |           |              |         |         |             |

| No     | Enterprise                 | Total<br>No of<br>main<br>mach's | % of machines by age |           |           |           |           |
|--------|----------------------------|----------------------------------|----------------------|-----------|-----------|-----------|-----------|
|        |                            |                                  | <5y<br>%             | <10y<br>% | <15y<br>% | <20y<br>% | >20y<br>% |
| 1      | Alba, Mogadishu            | 14                               | 14,3                 | -         | 7,1       | 28,6      | 50,0      |
| 2.     | Brick factory, Afgoi       | 24                               | -                    | -         | -         | 91,7      | 8,3       |
| 3      | Cigarette & Match f., Mog. | 39                               | -                    | 25,6      | 48,8      | 25,6      | -         |
| 4      | Coca Cola, Mogadishu       | 31                               | 93,6                 | 3,2       | 3,2       | -         | -         |
| 5      | Somali bag, Mogadishu      | 15                               | 100                  | -         | -         | -         | -         |
| 6      | ENEE, Mogadishu            | 44                               | 11,4                 | 31,8      | 25,0      | 4,5       | 27,3      |
| 7.     | Flour & Pasta f, Mog.      | 26                               | 27,0                 | 27,0      | -         | 46,0      | -         |
| 8.     | Foundry & Mech. workshop   | 34                               | 11,8                 | 11,8      | 58,8      | 17,6      | -         |
| 9.     | Hassan Wagooyi, Mog.       |                                  |                      |           |           |           |           |
| 10.    | KS (Bail), Mogadishu       | 14                               | -                    | 7,15      | 85,7      | 7,15      | -         |
| 11.    | ITOP, Afgoi                | 53                               | 3,9                  | 22,6      | 37,7      | 35,8      | -         |
| 12.    | Milk factory, Mog.         | 50                               | -                    | 100       | -         | -         | -         |
| 13.    | Shamo bros, Mog.           | 12                               | 41,6                 | 58,4      | -         | -         | -         |
| 14.    | Cooling unit, Mog.         | 17                               | -                    | 100       | -         | -         | -         |
| 15.    | Somali pharmacy, M.        | 64                               | 7,8                  | 92,2      | -         | -         | -         |
| 16.    | Somaltex, Balad            |                                  |                      |           |           |           |           |
| 17.    | Tannery & Shoe f, M.       | 25                               | -                    | -         | 100       | -         | -         |
| 18.    | WDI, Mogadishu             | 32                               | 100                  | -         | -         | -         | -         |
| Total* |                            | 462                              | 16,0                 | 39,4      | 23,6      | 16,5      | 4,5       |

\*) WDI is not counted since it is new factory

ABC - ANALYSIS OF THE  
ORIGIN OF MACHINES

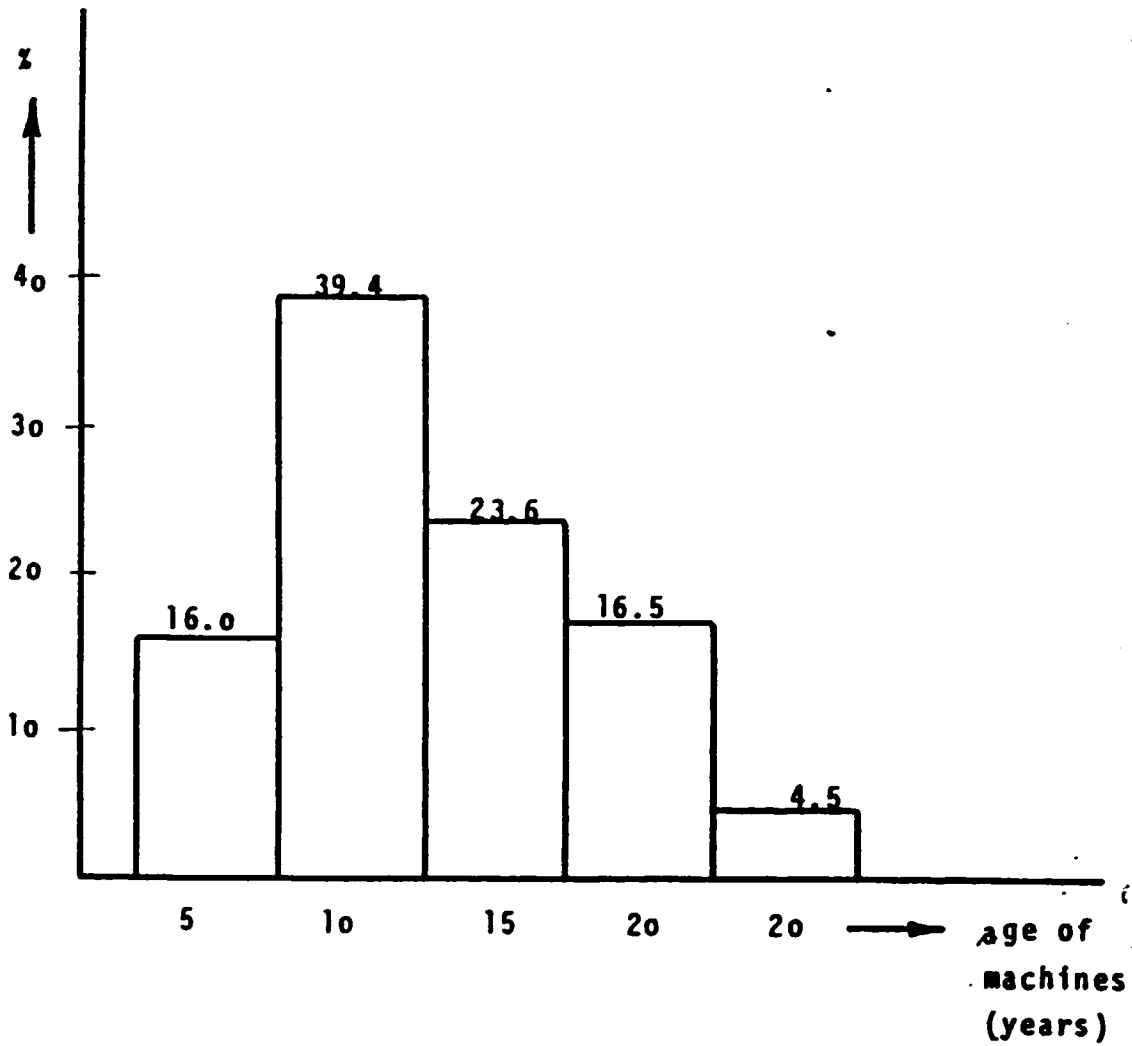


WORKING CONDITIONS OF MACHINES

81% - good (visual estimation)

19% - for repair or scrap

HISTOGRAM OF AGE OF MACHINES



79% of machines are "younger" than 15 years  
(that is a normal life cycle)

21% of machines are "older" than 15 years  
(16.5% are between 15 and 20) - it is  
not a "deep" age.



D R A F T

## PROJECT DEFINITION

Project Title : "Industrial Maintenance Centre"  
Primary function : Institution-building  
Secondary function: Direct support  
Sector : Industry  
sub-sector : Metal working and processing industries  
Government Implementing Agency : Ministry of Industry  
Executing Agency : UNIDO  
Estimated starting: January 1992  
Duration : 36 months  
UNDP classification: 0520.....  
Manufacturing industry  
Est.government inputs in cash: 60,000,000 So.Shs. \*  
Est.government inputs in kind: 325,000,000 " \*  
Est. UNDP inputs: 3,221,200 US \$

\* REMARK: The amounts are given having in mind constant March 1990 rate of exchange of 1180 So.Shs. for 1 US\$.

They are subject to be adjusted according to the current rate at the time of implementation.

A. DEVELOPMENT OBJECTIVES

The development objectives of the Project are:

- to contribute to the country's economy in strengthening the industrial sector through organizing, supporting or improving maintenance and repair services of existing industrial equipment thus increasing the productivity.
- to increase the working life of the installed machines and equipment through good and efficient maintenance services and in this way to extend their life thus saving in foreign exchange needed to replace them earlier than necessary.
- to assist the country in efforts to attain the optimum degree of self-reliance and self-support in spare and replacement parts for industrial equipment, thus economizing in out-flow of foreign exchange.

B. IMMEDIATE OBJECTIVES

The immediate objectives of the Project are:

- to assist the establishment of the "Industrial Maintenance Centre"
- to organize the Centre in such a way to be able to render to the industry managerial, organizational and technical services in strengthening, supporting or organizing the repair and maintenance services.
- to organize within its premises and within existing factories production of needed spare and replacement parts and to provide necessary know-how for their manufacturing.
- to do repair of various machines and equipment in its own shops using such work as on-the-job training for technicians and workers coming from the factories.
- to serve as a place for formal and on-the-job training of national technicians and workers working in the Repair and Maintenance Departments within industrial enterprises.

- to organize technical library, standardization and information system concerning maintenance practices to be at the disposal of people concerned.

C. PROJECT STATUS

Industrial Maintenance Centre is foreseen to be Government owned enterprise during the initial period of its existence. Gradually it should become profit making and financially self-supporting organization.

Privatization of the Centre should be considered in due time.

Ministry of Industry is to implement the Project

The duration of the UNDP/UNIDO assistance to the Centre is planned to last 3 years.

D. PROJECT ACTIVITIES

Project activities to be performed are:

- Prepare necessary premises and commission machines and equipment
- Select the core of Project's technical and administrative personnel and give to them necessary training
- Provide formal and on-the-job training to the maintenance personnel coming from the selected plants
- Provide services in the field of repair and maintenance to those enterprises not having their own resources.

**E. PROJECT JUSTIFICATION AND BACKGROUND**

Since mid 1970s, the performance of the industrial sector in the Democratic Republic of Somalia has been declining. Capacity utilization in the public enterprises has come down to an average of 26%.

Main problems which are besetting the industrial enterprises performance are as follows:

- underdeveloped industrial infrastructure such as extension services, research activities and repair and maintenance activities including spare and replacement parts production.
- lack of managerial and technical skills, particularly in repair and maintenance sectors.
- shortage of hard currency for spare parts and raw materials procurement
- low motivation of industrial workers and employees due to extremely low level of wages and salaries.

The Government has embarked on new economic liberalization policies which remove price and import controls, providing greater financial and managerial autonomy to public enterprises. In addition, the Government has adopted the policy of focussing rehabilitation and productivity improvement activities such as training programmes and extension services. Full encouragement has been given to the private sector.

This Project addresses one of the many problems facing domestic industries i.e. the lack of experienced repair and maintenance personnel, equipped and efficient corresponding shops and the lack of maintenance management procedures. Local maintenance personnel have to be equipped with more knowledge concerning repair technologies, diagnostic technique and managerial know-how in order to reduce equipment breakdown and extend the useful life of capital assets. The establishment of a maintenance centre with its repair and trouble shooting equipment as well as with a mobile workshop will be able not only to render training services but also to do repair and consultancy assistance.

This Project should be a continuation of the DP/SOM/88/008 Project on Industrial Maintenance Management in Somalia. One of main outputs of DP/SOM/88/008 Project was to assess the maintenance situation of the local industries and suggest measures for improvement.

The main conclusion, based on data and information collected, is that the creation of a National Institution to take care about repair and maintenance activities among industrial enterprises is of the crucial importance. Therefore establishment of the "Industrial Maintenance Centre" was strongly recommended.

F. FINANCING

Financing of the Project's activities is planned to be done through two sources:

1. Government Inputs and
2. UNDP and donor country inputs

Very rough estimation of needed inputs is given further on.

Country: Somalia  
 Project Number:  
 Project Title: Industrial Maintenance Center

| B/L | Description                  | Total |           | 1992 |           | 1993 |           | 1994 |         |
|-----|------------------------------|-------|-----------|------|-----------|------|-----------|------|---------|
|     |                              | M/M   | US \$     | M/M  | US \$     | M/M  | US \$     | M/M  | US \$   |
| 10  | PROJECT PERSONNEL            |       |           |      |           |      |           |      |         |
| 11  | Experts and Consultants      |       |           |      |           |      |           |      |         |
|     | Experts (3)                  | 96    | 1,152,000 | 30   | 360,000   | 36   | 432,000   | 30   | 360,000 |
|     | Short-term Consultants       | 24    | 288,000   | 3    | 36,000    | 12   | 144,000   | 9    | 108,000 |
|     | Component total              | 120   | 1,440,000 | 33   | 396,000   | 48   | 576,000   | 39   | 468,000 |
| 13  | Administrative Support       |       |           |      |           |      |           |      |         |
|     | Administrative Staff         | 72    | 50,400    | 24   | 16,800    | 24   | 16,800    | 24   | 16,800  |
|     | Component total              | 72    | 50,400    | 24   | 16,800    | 24   | 16,800    | 24   | 16,800  |
| 17  | National Staff               |       |           |      |           |      |           |      |         |
|     | National Experts (4)         | 144   | 144,000   | 48   | 48,000    | 48   | 48,000    | 48   | 48,000  |
|     | Technical Staff (35)         | 1,080 | 324,000   | 240  | 72,000    | 420  | 126,000   | 420  | 126,000 |
|     | Admin. Support Personnel (8) | 264   | 52,800    | 72   | 14,400    | 96   | 19,200    | 96   | 19,200  |
|     | Component total              | 1,488 | 520,800   | 360  | 134,400   | 564  | 193,200   | 564  | 193,200 |
|     | SUB-TOTAL                    | 1,680 | 2,011,200 | 417  | 547,200   | 636  | 786,000   | 627  | 678,000 |
| 30  | FELLOWSHIPS                  | 30    | 90,000    | 15   | 45,000    | 10   | 30,000    | 5    | 15,000  |
|     | Component Total              | 30    | 90,000    | 15   | 45,000    | 10   | 30,000    | 5    | 15,000  |
| 40  | EQUIPMENT                    |       |           |      |           |      |           |      |         |
|     | Expendable Equipment         |       | 60,000    |      | 30,000    |      | 20,000    |      | 10,000  |
|     | Non-expendable Equipment     |       | 1,010,000 |      | 800,000   |      | 150,000   |      | 60,000  |
|     | -Component Total             |       | 1,070,000 |      | 830,000   |      | 170,000   |      | 70,000  |
| 50  | MISCELLANEOUS                |       |           |      |           |      |           |      |         |
|     | Sundries                     |       | 50,000    |      | 15,000    |      | 25,000    |      | 10,000  |
|     | Component Total              |       | 50,000    |      | 15,000    |      | 25,000    |      | 10,000  |
|     | PROJECT TOTAL                | 1,710 | 3,221,200 | 432  | 1,437,200 | 646  | 1,011,000 | 632  | 773,000 |

GOVERNMENT INPUTS IN CASH  
(In Sh.So. 000) /\*

Country: Somalia  
Project Number:  
Project Title: Industrial Maintenance Center

R/7

| Description                      | Total      |               | 1992       |               | 1993       |               | 1994       |               |
|----------------------------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|
|                                  | M/M        | Amount        | M/M        | Amount        | M/M        | Amount        | M/M        | Amount        |
| <b>PROJECT PERSONNEL</b>         |            |               |            |               |            |               |            |               |
| Supporting Personnel (18)        | 648        | 12,960        | 216        | 4,320         | 216        | 4,320         | 216        | 4,320         |
| TRAINING EXPENSES AND ALLOWANCES |            | 10,000        |            | 3,000         |            | 6,000         |            | 1,000         |
| RUNNING EXPENSES                 |            | 22,000        |            | 10,000        |            | 8,000         |            | 4,000         |
| MISCELLANEOUS                    |            | 16,000        |            | 6,000         |            | 6,000         |            | 4,000         |
| <b>TOTAL</b>                     | <b>648</b> | <b>60,960</b> | <b>216</b> | <b>23,320</b> | <b>216</b> | <b>24,320</b> | <b>216</b> | <b>13,320</b> |

/\* REMARK: All amounts are based on rate of exchange of Sh.So. 1,180 for 1 US \$. They are subject to adjustments according to the current rates ruling at the time of Project implementation.

GOVERNMENT INPUTS IN KIND  
(In Sh.So. 000) /\*

9/8

Country: Somalia  
Project Number:  
Project Title: Industrial Maintenance Center

| Description                | Total            | 1992             | 1993            | 1994            |
|----------------------------|------------------|------------------|-----------------|-----------------|
| Buildings (cca 1,000 sq.m) | 230,000          | 180,000          | 40,000          | 10,000          |
| Office Equipment           | 30,000           | 25,000           | 2,500           | 2,500           |
| Shop Furnishing            | 25,000           | 20,000           | 2,500           | 2,500           |
| Training Equipment         | 15,000           | 10,000           | 2,500           | 2,500           |
| Miscellaneous              | 25,000           | 15,000           | 5,000           | 5,000           |
| Total                      | 325,000<br>===== | 250,000<br>===== | 52,500<br>===== | 22,500<br>===== |

/\* REMARK: All amounts are based on rate of exchange of Sh.So. 1,180 for 1 US \$.  
They are subject to adjustments according to the current rates ruling  
at the time of Project implementation.



LIST OF RECEIVED EQUIPMENT

ANNEX 9

| P.O.N°       | Description   | Qty |
|--------------|---|-----|
| 15-90554 N-  | - Magnetic Powder Crackdetection kit                            | 1   |
|              | - Portable Vibration meter with accessories                     | 2   |
|              | - Electrical multimeter, Fluks 37                               | 1   |
|              | - Metric socket 8-32 mm plus accessories                        | 1   |
|              | - Infrared thermometer Model 500 complete                       | 1   |
| 15-9-626 N   | - Portable vibration analyzer complete                          | 1   |
| 15-9-01363 N | - Lubri sensor  |     |
| 15-9-01363   | - Hydroil sensor  | 1   |
| 15-9-01363 N | - Krautkramer digital wall thickness gauge<br>Mold DM3 complete | 1   |
| 15-9-367 N   | - Phillips multimeter PM 2118/2                                 | 1   |
| 15-9-1366 N  | - Krypton model 50 battery charger/engine<br>starter            | 1   |
| 15-9-1366 N  | - Cylinder leakage tester                                       | 1   |
| 15-9-1364 N  | - PH meter 2300   | 1   |
|              | - Flue gas analyzer   | 1   |
| 15-9-1365 N  | - Smoke meter sampling pump                                     | 1   |
|              | - Smoke meter evaluating unit                                   | 1   |
|              | - Nozzle tester   | 1   |
|              | - Compression loss tester                                       | 1   |
| 15-9-1423 N  | - Computer supplies   |     |
| 15-9-1532 N  | - Office equipment/supplies                                     |     |
|              | - Electrician's toll kit  | 1   |
|              | - Motor checker EMC-11  | 1   |
|              | - Lubrication oil indicating papers (set)                       | 1   |
| 15-9-1298 N  | - Leak detector LDE and accessories                             | 1   |
| 15-9-1430 N  | - Water Analyzer 600  | 1   |
|              | - Valve spring tester   | 1   |
|              | - Radiator cap tester   | 1   |
|              | - Diesel compression gauge                                      | 1   |
|              | - Industrial stethoscope (FA COM 779)                           | 1   |
|              | - Flexiscope  | 1   |
|              | - Photoelectric tachometer                                      | 1   |
|              | - Battery and regulator tester                                  | 1   |
|              | - Belt tension gauge  | 1   |
|              | - Relay test unit   | 1   |
|              | - Hydrometer for checking battery acid                          | 1   |

## PROJECT PERFORMANCE EVALUATION REPORT

## Part V: Statistical Summary of Project Implementation

(May be used separately for more frequent reporting when required.)

|   |                           |                                       |   |
|---|---------------------------|---------------------------------------|---|
| Project number and title<br>DP/SOM/99/699<br>Industrial Maint. Management | Executing agency<br>UNIDO | Date of last report<br>August<br>1990 | Date of this report<br>December 5, 1990 |
|---|---------------------------|---------------------------------------|---|

## 1. Status of expenditures

| Input item by budget line | Approved budget for current year | Estimated expenditure to date | Projected total expenditure this year | Remarks* |
|---------------------------|----------------------------------|-------------------------------|---------------------------------------|----------|
|---------------------------|----------------------------------|-------------------------------|---------------------------------------|----------|

## UNDP/UNIDO budget In US \$

|       |         |         |         |    |
|-------|---------|---------|---------|----|
| 13.99 | 2,532   | 2,200   | 2,532   |    |
| 16.00 | 5,000   | 0       | 0       |    |
| 17.99 | 15,300  | 31,645  | 31,645  |    |
| 29.99 | 100,000 | 75,000  | 100,000 |    |
| 39.99 | 9,500   | 0       | 0       |    |
| 41.99 | 3,000   | 4,128   | 4,128   |    |
| 42.99 | 8,955   | 8,229   | 8,229   |    |
| 59.99 | 14,511  | 13,886  | 14,511  |    |
| Total | 158,798 | 135,088 | 161,045 | .. |

## Government budget In S. Shs.

|    |           |           |           |    |
|----|-----------|-----------|-----------|----|
| 16 | 1,500,000 | 1,375,000 | 1,500,000 |    |
| 33 | 2,400,000 | 2,200,000 | 2,400,000 |    |
| 41 | 726,800   | 662,800   | 726,800   |    |
| 51 | 1,750,000 | 1,250,000 | 1,750,000 |    |
| 56 | 223,200   | 804,600   | 223,200   |    |
| 99 | 6,600,000 | 5,692,400 | 6,600,000 | .. |

\*See instructions on reverse side.

\*\*Use additional pages if required.

LIST OF CONTRACTOR'S EXPERTS

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| Name   | Project Function                                 |
|--|--|
| 1. Mr. Radmilo OROVIC<br>(Project Team Leader) | Mechanical Engineer                              |
| 2. Mr. Radmilo DUKANAC                         | Electrical Engineer                              |
| 3. Mr. Zoran TASIC                             | Welding Specialist                               |
| 4. Mr. Milan RADIC                             | Mechanical, Diesel<br>Generator Engineer         |
| 5. Mr. Saša MOMČILOVIC                         | Mechanical and<br>Thermal Engineer               |
| 6. Dr. Dragutin STANIVUKOVIC                   | Mechanical and Maintenance<br>Engineer           |
| 6. Mr. Milenko GUDIC<br>(Project coordinator)  | Chemical Engineer<br>Maintenance Management      |
| 7. Dr. Pavle POPOVIC                           | Metallurgical Engineer<br>Maintenance Management |

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\* The experts in the above list slightly differ from those listed in the Contract due to some replacements. All replacements have been made in accordance with the needs of the project implementation and with the written consent of UNIDO provided on request of the Contractor.