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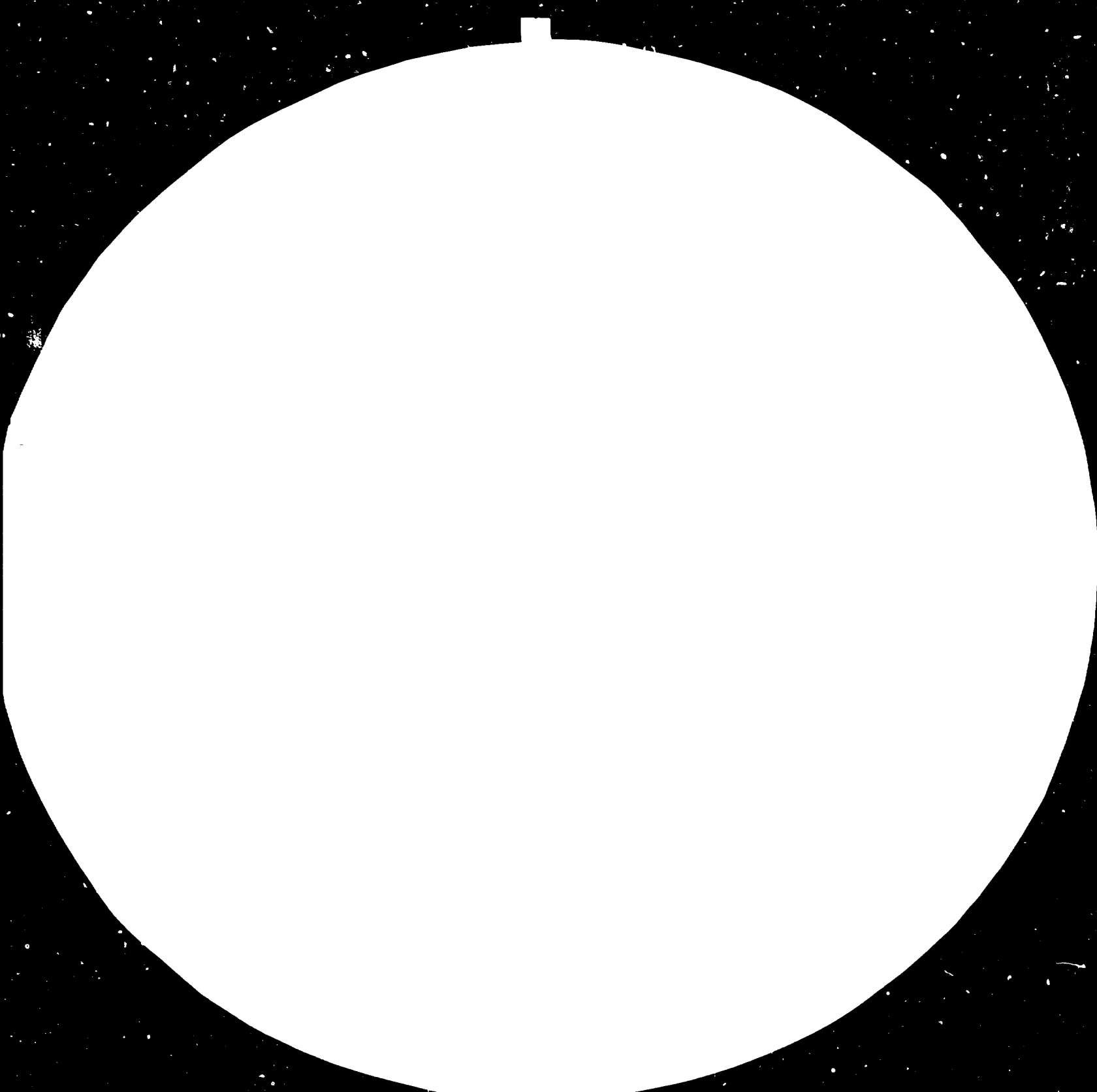
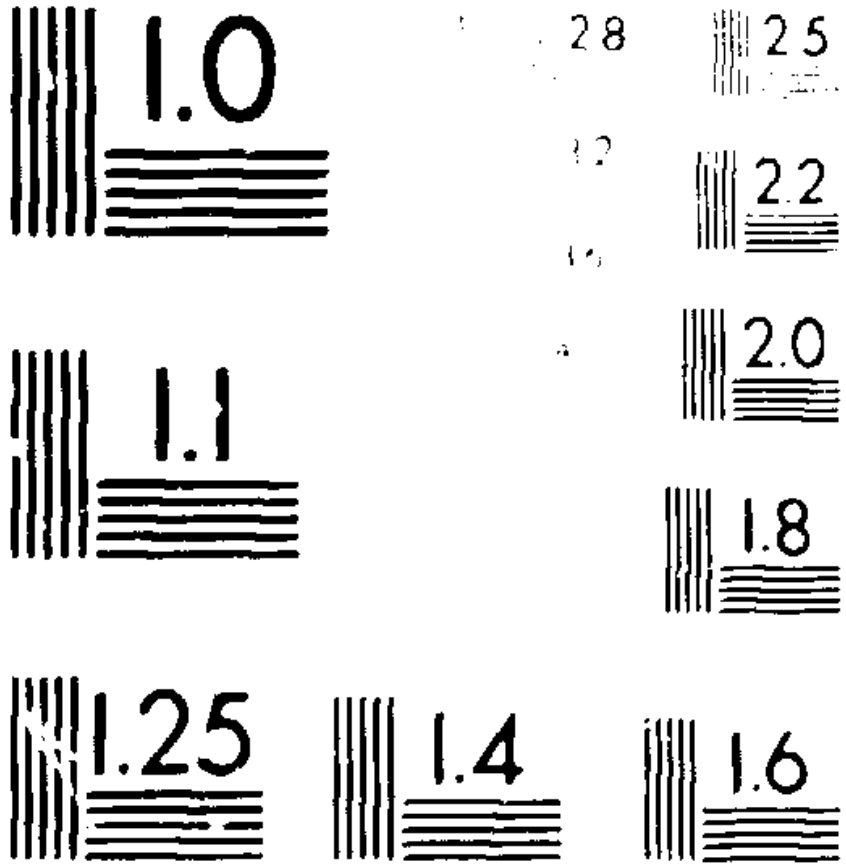
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org





12973

Distr.
LIMITED

UNIDO/IO.356
5 September 1983

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ENGLISH

FIRST REGIONAL DEMONSTRATION WORKSHOP ON MANAGED MAINTENANCE SYSTEMS IN METALLURGICAL INDUSTRIES FOR AFRICAN COUNTRIES

26 March - 15 April 1983

Proceedings of the workshop *

* This report has been prepared by the co-organizers of the Workshop, the Egyptian Iron and Steel Company, Helwan, Egypt and does not necessarily reflect the views of the Secretariat of UNIDO. This Report has been reproduced without formal editing.

V.83-61457

Contents

NOTE

This report has been prepared covering the proceedings of the 1st Regional Demonstration Workshop on Managed Maintenance, under Project No. UC/UD/RAF/82/092, which was jointly organised by U.N.I.D.O. and the Egyptian Iron and Steel Co. at Helwan, Cairo.

The Project Management would like to record its hearty appreciation and thanks for the sustained support and guidance it has received from the UNIDO Headquarters and in particular from Prof. G.D. SURGUCHOV, Senior Industrial Development Officer, Industrial Operations Division, UNIDO, VIENNA in organising the workshop successfully, and also Mr. A.K. Mitra Regional Adviser, of UNIDO in E.C.A. at Addis Abbaba for his active participation in the workshop, and assistance in coordinating the activities of the workshop. In addition the Project Management greatly appreciates the extensive help and well organised support given by the Rector of El-Tabbin Institute and his assistants in organising the workshop in the premises of the Institute.

The Project Management is also deeply thankful to the Technical, Financial and Administration sections of UNDP/Cairo for their extensive help and support, and in particular Mr. Tharwat Sabry, Senior National officer, U.N.D.P. for his sustained advise and support, which made it possible to organise the workshop successfully and without any difficulty.

1. INTRODUCTION

1.1 The Egyptian Iron and Steel Co. has been receiving UNDP/UNIDO assistance since 1975 to establish a well organised centre within the company to develop and implement an integrated modern maintenance management system using computers, and during the last two years this centre in E.I.S. Co., has been actively engaged in spreading the concept and implementing similar systems in other industries within Egypt. A beginning has also been made by the company to render such assistance to the industries in the neighbouring developing cuntries of the region, by taking up a consultancy sub-controct in the UNIDO project in Somalia. The E.I.S. Co., has been willing to share their experience with other African developing countries.

1.2 Since necessary infra-structure facilities and technical capabilities have been generated in E.I.S Co., for this type of work an Inter-country project for Managed Maintenance in Metallurgical / Foundry Industries [Project No.UC/UD/RAF/82/092] was approved for implementation, to strengthen the TCDC activities of the centre by assisting E.I.S. Co., to organise Demonstration workshops, training programmes and study tours for participants from the developing countries of the region.

2. BACKGROUND INFORMATION

2.1 The Inter-country project for Managed Maintenance in Metallurgical / Foundry Industries, PROJECT No. UC/UD/RAF/82/092 has been evolved with the main development objective to render technical assistance to the African developing countries to establish and operate efficient maintenance systems in the metallurgical industries. In order to achieve this, the following major project activities have been planned under the scope of work of the project.

- Conducting three weeks demonstration workshop in the Egyptian Iron and Steel Co., in order
  i) to demonstrate the results / achievements of the Managed Maintenance system implemented in E.I.S. Co., and
  ii) to identify and discuss the maintenance problems which are existing in the metallurgical / foundry industries in the African countries participating in the workshop.

- Follow-up missions by Egyptian experts to the countries concerned to carry out necessary studies and render the assistance required to develop / implement / improve the existing maintenance systems and practices.

2.2 The above activities are considered to be key factors, which would cater to overall improvement of performance of Iron and Steel and other metallurgical / foundry industries which form the core of the industrial development field of high priority within the programme targets of the African Development Decade. It is in this context that the Regional Demonstration Worshop was organised from 26th March to 15th April 1983 jointly by UNIDO and the Egyptian Iron and Steel Co., Helwan, Egypt.

2.3 The Regional Demonstration Workshop was organised by the Project Management of E.I.S. Co., headed by the National Project Manager, and assisted by the Techincal Adviser and one more Expert of UNIDO, assigned to the project. Preparatory arrangements were made in consultation and with the advise of Prof. G.D. Surguchov, Senior Industrial Development Officer DIO, UNIDO, Vienna, In addition he was also present during the closing sessions of the workshop as observer and participated in the discussions and formulation of the findings and recommendations. In addition, Mr. A.K. Mitra, Regional Adviser , UNIDO in E.C.A. Addis Ababa attended the workshop from 27th March to 19th April 1983 and was actively involved as observer / coordinator in the various discussions and review sessions and also in finalising the findings and recommendations of the workshop. Other senior staff members from UNIDO / UNDP also participated in different sessions.

2.4 Based on preliminery discussions, between UNIDO / UNDP and E.I.S. Co., official invitations were sent to about 26 countries in Africa, through the Ministry of Foreign Affairs, Government of Egypt and UNIDO, Vienna, enclosing an Aide-Memoire and calling for nominations for participation in the workshop. Since contacts had to be established and followed up to get the nominations in time, intensive follow-up was necessary. The workshop was planned for 20 participants. 2 persons out of the originally approved list of participants did not turn-up and 2 nominations which were received late could not be accepted. In all 19 participants (including 2 from the host country) from 12 countries finally participated in the programme. The final list of participants and the periods they attended the programme are shown in Annexure-I.

3. ORGANIZATION OF THE DEMONSTRATION WORKSHOP

3.1 GENERAL ARRANGEMENTS.

3.1.1 From considerations of social aspects of temporary residence in a historic, and ancient city like Cairo it was decided to accomodate all the participants for the whole duration of the workshop in Cairo city and conduct the technical programmes at HELWAN, 40 Kms away from the metropolis. The participants commuted every day to Helwan and back and this arrangement worked out very well. The duration of 1½ hours for each lecture with ½ hour tea-break in between proved to be optimal. Arrangements made for accomodation and food were good and on the whole the participants responded happily to the general arrangements that were made for the whole workshop, as revealed by the analysis of the course evaluation reports.

3.1.2 For conducting the lectures and the group discussions, the facilities available at the El-Tabbin Institute, Helwan were utilised. The arrangements were very good and the rector of the Institute and his staff generously cooperated and rendered necessary help to conduct the programme in the Institute premises.

3.2 TECHNICAL SESSIONS

3.2.1 The demonstration workshop was organized from 26th March to 15th April 1983,

and the programme was conducted at the El-Tabbin Institute, Helwan on all days except for the periods covered by plant visits. Annexure-II gives the details of the programme of the demonstration workshop. Most of the participants arrived by 25th March, and were accommodated in Hotel AMAN, Cairo. The National Project Manager and UNIDO staff members met the participants on 25th evening and had general introduction, and discussions. The course materials, and the workshop kit were presented to the participants. List of items handed over is shown in Annexure-III.

The workshop was inaugurated by the Chairman, E.I.S. Co., on 26th March 1983 as scheduled. Mrs. G. Hynek, Research Officer from Metallurgical Section UNIDO, Vienna read out the welcome address. The message from His Excellency the Minister of Industries and Mineral Wealth, Government of Egypt was read out by the Chairman. In his inaugural address the Chairman E.I.S. Co. welcomed the participants and gave a brief account of the experiences gained in E.I.S. Co. in Maintenance Management system, and expressed the hope that there will be beneficial exchange of this knowledge and experience as a result of the workshop, paving the way for further cooperation in the future. The programme of the inaugural session is shown in Annexure-II. After inauguration the participants of the workshop introduced themselves and also completed some of the admimistrative formalities required for D.S A. payments and other related items.

3.2.2 The workshop programme was planned to cover all aspects of Maintenance Management System including modern management tools like computer based systems for planning, control and coordination. The programme started with an introduction to the project and the following major topics were covered. The topics were logically developed to cover the whole concept, theory and practice of Maintenance Management as a total system. and applicable to small, medium or large scal dustries.

- Introduction to the project
- Principles of management
- Introduction to computer
- Computers and information processing application of Micro-processors in Maintenance Management
- Data Base Management applied to Maintenance Management
- Concepts of Maintenance Management System
- Maintenance organization and demonstration
- Preventive Maintenance System
- Computer-based P.M. system demonstration
- Planned repair system demonstration
- Technical documentation
- Man-power training and development
- Inventory control system demonstration
- Safety on the job
- Mechanical trouble shooting system
- Spare parts planning and production

- Energy saving
- Process control and maintenance
- Human aspects of management
- Complex maintenance performance monitoring and reporting

The above topics were organised into ten courses consisting of 32 sessions, each of 1½ hours duration. Synopsis of the lectures are given in Annexure-IV.

In addition to the hand-outs of the above lectures, copies of "Profile on Engineering core Industries" prepared by the UNIDO Regional Adviser in E.C.A. were also given to all participants, as part of the course material for reference.

3.2.3 The most important aspect of the programme was its emphasis on practical aspects of the Total Maintenance System and to ensure this, maximum possible number of plant visits were organized, both in Helwan and outside and the participants were given plenty of opportunity to observe the working of the systems in the industry. Brief report on this is included in Annexure IV they were intensively exposed to the practical problems and solutions in developing and implementing such systems. Enough time was provided in each session, for the participants to interact with the instructor by asking questions or supplementing the information.

3.2.4 Special case study was also prepared based on facts collected in respect of the problems faced by the various industries in the region, and the participants worked in 3 groups, to identify common problem areas which need technical assistance as a follow-up of the workshop. The recommendations put up by the three groups for specific follow-up assistance needed in the region are shown in Annexure-V.

In addition the case study solution presented by group II which was adjudged to be the best is also included in Annexure- V. The participants revealed an in-depth and very mature understanding of the problems involved and their recommendations are found to be of substantial importance, needing an urgent follow-up action.

3.3 Concluding Session.

3.3.1 Based on the recommendations of the three working groups of the participants, with regard to the common problems of the industries in the region, separate discussions were held with the groups by the UNIDO staff members and specific technical assistance needed urgently for the industries concerned were identified. These have been grouped under (i) Organizational level and (ii) Regional level requirements and included in the section dealing with Findings and Recommendations. The participants were alse requested to fill up the course evaluation forms (samples at Annexure-VI) which were subsequently analysed and the results of this analysis are shown in Annexure- VI. The whole demonstration workshop has been very positively evaluated with good appreciation. Some of the suggestions for improvement and items for necessary further action are documented in the section on Findings and Recommendations.

The closing session was attended by Eng. Dia Tantawy, Chairman E.I.S. Co., Mr. Aguilar R. Bolanos, Chief / P.P.R.S.,UNIDO VIENNA, Mr. Frank Hartvelt. Dy. Resident Representative, UNIDO. Cairo, Mrs. Mona Hettata, Programme officer UNDP, Cairo, Prof. G.D. Surguchov, Senior Industrial Development Officer, I.O.D., UNIDO, VIENNA, Mr. A.K. Mitra - Regional Adviser, UNIDO/ECA. and all the special invitees addressed the participants.

Mrs. Traklova, Director of INORGA, Prague, Czechoslovakia was present as observer. The certificates were awarded by the Chairman E.I.S. Co., to the participants on their successful and completion of the Demonstration Workshop on Maintenance Management system. Special token prizes were also awarded to Group II for their best performance and report on the case study and recommendations. The Demonstration Workshop concluded on 14th April, 1983 with offer of thanks to all concerned who had actively involved themselves in organising and conducting the programme. On 15th April 1983, further discussions and de-briefing sessions were held with the participants by the UNIDO staff members and National Project Manager. The participants left Cairo on different dates and necessary departure arrangements were completed as scheduled.

4. FINDINGS

4.1 The participants were able to successfully interact in the programme and discuss and identify their immediate problems and areas of assistance needed as a follow-up of the Demonstration Workshop.

4.2 It was observed that the Managed Maintenance System developed and implemented in the Egyptian Iron and Steel Company at Helwan, with UNDP/UNIDO assistance, is successful and could serve as a model for other metallurgical and basic industries, in the countries of the Africa Region.

4.3 It was also observed that necessary infra-structure facilities exist in the E.I. & S. CO. to render necessary training and technical assistance to the countries of the region to help in implementing similar systems in the metallurgical and other related industries of the region.

5. RECOMMENDATIONS

5.1. These recommendations are identified at two levels namely, national and regional levels.

The assistance needed in each country at the national level is enumerated below briefly.

5.2 National Level Projects/Assistance Programmes

5.2.1 Ethiopia

Assistance to Aluminium Utensils Limited:

1) to train two engineers in E.I.S. Co. for three m/m each in the field of non-ferrous foundry maintenance.

5.2.2 Kenya

1) Assistance is required for developing a proper system of planning and production of spare parts for the metallurgical and foundry industries. About 3 man months of expert assistance is needed for this purpose, to put up recommendations.
2) Kenya United Steel Industries having semi-integrated steel plants need training in the E.I.S. Co. on organization of maintenance system. About 6 man-months of fellowship training needs to be arranged.

5.2.3 Nigeria

For improving the maintenance practices in Foundry shops of the Nigerian Sugar Co. technical assistance is required immediately, to cover the following areas:

(i) Pattern making and maintenance;

(ii) Cupola maintenance and operation;

(iii) Spare parts manufacture and inventory control;

(iv) Organize special training programmes in the Polytechnic at KADUNA and or in the college of technology at ILORIN.

Expert assistance of 4 man-months is required to carry out studies in the above areas and put-up recommendations.

5.2.4 Sierra Leone

1) The foundry in the National Engineering Workshop is not working well. Assistance is required to improve the maintenance practices and the quantity and quality of spare parts.

2) Assistance is also needed to establish a good system of inventory management of spares including coding, procurement planning, issues and stock control.

3) Assistance is required to impart training in Maintenance Management and it is recommended that the Workshop should be repeated.

4) Special training programme for foundry maintenance and management is requested.

For items 1 and 2, two man-months of expert assistance is needed.

For items 3 and 4 training programmes to be organized by E.I.S. Co.

5.2.5 Somalia

Foundry Mechanical Workshop

1) Assistance is required to manufacture refractory bricks for foundry with local high grade raw-material (Aluminium Silica Bricks) 6 man/months of expert assistance is required.

2) To train one maintenance engineer in the field of M.M.S. in E.I.S. Co. three man-months of fellowship is required.

3) To train in El-Tabbin Institute one metallurgical Laboratory Technician three man-months of fellowship is required.

4) Technical assistance from UNIDO/UNDP to set up a plant as an extension of existing factory facilities.

Feasibility study has already been prepared.

5.2.6 Sudan

Foundry shop of Sugar Factory

1) To train two maintenance engineers for establishing preventive maintenance system and manufacture of spare parts. About three man-months of fellowship training in E.I.S. Co. is required.

5.2.7 Tanzania

Aluminium Africa Limited

1) About three man/months of expert assistance is required for the development and manufacture of refractory bricks with local raw-material.

2) To train three quality control engineers/operatives in steel melting in E.I.S. Co. three man-months each i.e. 9 man-months of fellowship training is required.

3) To provide technical assistance for establishment of fettling material processing plant with local available raw-materials and for utilisation of magnesite and manganese ore. Three man-months of expert assistance is needed.

4) Assistance to train one engineer on Foundry Instrumentation is required. About three man-months of fellowship training is required.

5.2.8 Togo

Assistance to improve manufacture of spare parts.

1) The workshop facilities at Société Nationale de Sidérurgie at Lome and at Compagnie Togolaise des Mines du Bénin at Kpeme to be studied and recommend ways and means to improve the same.

2) The feasibility for establishing a central workshop for spare parts production to be studied and recommendations put-up.

3) The feasibility for putting-up small Non-Ferrous and Ferrous foundry at CTMB to meet the needs of the country. Expert assistance of three man-months is required to carry-out the above studies and put-up recommendations.

4) The Demonstration Workshop is to be repeated to train more people.

5.2.9 Uganda

It is necessary to organize a proper system of planning and supply of spare parts needed for the industrial sector, in the UDMA company. About 4 man-months of expert assistance is needed for this purpose.

5.2.10 Zaire

Gecamines, complex at Lumumbashi, Kolweze and Likasi.

1) The capacity of the foundry in the central workshop at Likasi is not adequate and the operation and maintenance of the foundry needs improvement.
2) The existing mairtenance system and practices need to be reviewed and suitable computer based system has to be implemented.
3) Special training programme for foundry maintenance and operation has to be organized.

Three man-months of expert assistance is needed immediately for 1 and 2 to carry out a detailed study and put-up recommendations.

For item 3 training programme in E.I.S. Co., to be organized.

5.2.11 Zambia

1) There is a need to carry out a study of the existing maintenance system and practices in the Zambia Consolidated Copper Mines Ltd. and put-up recommendations. About two man-months consultancy mission is required for this purpose.
2) It is required to organize fellowship training in Foundry operation and maintenance for the Engineers from Railway Workshop for production of spare parts. About six man-months of fellowship is required for this purpose.

5.3 Regional Level

At the regional level the following assistance needs to be organized urgently and on an ongoing basis.

1) The Regional Demonstration Workshop should be repeated to cover more countries and participants, by extending the existing project no. UC/UD/82/092.

2) In-plant Group Demonstration Workshop for 3-4 weeks to be organized to cover the follwing topics:

   i) foundries, ii) machine shop, iii) quality control, and iv) spare parts planning and production.

3) A Regional Centre for Maintenance Management in Metallurgical and Basic Industries should be established to render necessary support for training, assistance and field support as needed in the countries of the region. In this connexion, it is recommended to upgrade the project Inter-country programme for maintenance management in metallurgical and related industries in the countries of the Africa Region, and develop training packages and organize training programmes for medium and smaller industries in the countries of the region.

4) Arrangements will be made to circulate copies of the Workshop papers to all the African countries. It was also recommended that for future courses, the hand-out material may be prepared in French language also.

6. FUTURE FOLLOW-UP

6.1 Based on the findings and recommendations of the workshop, the following action for future follow up needs to be taken.

- The demonstration workshop to be repeated again in 1983.
- Special training programmes for 3 to 4 weeks duration to be organised to cover (i) operation and maintenance of foundries, and machine shop, (ii) quality control, and (iii) spare parts planning and production.
- For the above purpose, Project No.UC/UD/RAF/82/092 to be extended.
- A preparatory assistance programme needs to be formulated to up grade the Inter-country Project for Managed Maintenance in Metallurgical / Foundry industries, Project No. UC/UD/RAF/82/092 and organise the facilities for the Regional Centre.
- Arrangements to be made to translate the hand-out materials into French language.

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ANNEXURE I

Demonstration Workshop on Maintenance Management
(Helwan / Cairo, 26 March - 12 April 1983)
List of Participants

COUNTRY	NAME	POST	COMPANY	ARRIVAL	DEPARTURE	DAYS
ETHIOPIA	MR. GEBREEGZIABHER GEBREMICHAEL	Head Tech. Departm. of National Metal Works	National Metal Works Co.	24 - 3 - 1983	15 - 4 - 1983	23
KENYA	MR. SATPAL UTTAM	Maintenance Manager	Kenya United Steel Co.	25 - 3 - 1983	15 - 4 - 1983	22
	MR. WASHINGTON KARUKU KIIRU	Metal and Engineer. Section Head	Ministry of Industry	25 - 3 - 1983	16 - 4 - 1983	23
NIGERIA	MR. ALHAJI YAKUBU ABDUL	Foundry Superintendent	Nigeria Sugar Co.	24 - 3 - 1983	17 - 4 - 1983	25
SIERRALEONE	MR. RADCLIFFE CECIL AYDELE COLE	Prodution Manager	National Workshop	24 - 3 - 1983	17 - 4 - 1983	25
SOMALIA	MR. ABOULLAHI HUSSEIN ISMAIL	General Manager	Foundry and Mechan. Workshop	25 - 3 - 1983	16 - 4 - 1983	23
	MR. ABOULLAHI MAHMOUD MOHAMED	Financial and Costing Manager	Foundry and Mechan. Workshop	25 - 3 - 1983	16 - 4 - 1983	23
	MISS. SHAMSA HUSSEIN MOHAMED	Lab. Supervisor	Foundry and Mechan. Workshop	25 - 3 - 1983	16 - 4 - 1983	23
SUDAN	MR. ABDALA MAHMOUD ALI AFIFI	Workshop Engineer	Halfa Sugar Factory	30 - 3 - 1983	15 - 4 - 1983	17
	MR. MOHAMED EL-AWAD SANHOURY	Deruty Chief Engineer	Halfa Sugar Factory	30 - 3 - 1983	15 - 4 - 1983	17

Cont. ...

TANZANIA	MR. NICODEMUS DOMINIC MERINYJO SHIRIMA	Production Engineer	Aluminium Africa Limited	27 - 3 - 1983	16 - 4 - 1983	21
	MR. STEPHEN KAJUNA BUREMILE TILUGULILWA	Electrical Engineer	Aluminium Africa Limited	27 - 3 - 1983	16 - 4 - 1983	21
TOGO	MR. KAMLAGA SEENAM DZOTSI	Production Chief in Departm. Acier	Societe Nationale de Siderurgie	24 - 3 - 1983	20 - 4 - 1983	28
UGANDA	MR. GABRIEL OTUDA ETOU	Senior Mech. eng. Rolling Mill	East African Steel Co.	24 - 3 - 1983	19 - 4 - 1983	27
ZAIRE	MR. MPIANA MATALA	Eng. of the Furnace Service	Gecamines / ACP	25 - 3 - 1983	16 - 4 - 1983	23
ZAMBIA	MR. ELIJAM KACENJE	Plan metallurgist	Zambia Consolidated Cooper Mines LTD.	25 - 3 - 1983	18 - 4 - 1983	25
	MR. NAZARIOUS SAJENI PHIRI	Assistant Superintendent	Zambia Consolidated Cooper Mines LTD.	25 - 3 - 1983	19 - 4 - 1983	27
EGYPT	MR. MAGDY ABD EL-AZEM HASSAN	Maintenance Engineer	El-Nasr Glass Factory	--------	--------	--
	MR. MOHAMED ABD EL-KHALEK	Maintenance Engineer	El-Nasr Glass Factory	--------	--------	--

Note: Stopovers are not included.

ANNEXURE I
(Contd).

Demonstration Workshop

On

Maintenance Management

(Helwan / Cairo, 26 March - 15 April 1983)

A) PARTICIPANTS

ETHIOPIA	Mr. Gebreegziabher Gebremichael
KENYA	Mr. Washington Karuku Kiiru
	Mr. Satpal Uttam
NIGERIA	Mr. Alhaji Yakubu Abdul
SIERRALEONE	Mr. Radcliffe Cecil Aybele Cole
SOMALIA	Mr. Abdullahi Hussein Ismail
	Mis. Shamsa Hussein Mohamed
	Mr. Abdullahi Mohmoud Mohamed
SUDAN	Mr. Abdalla Mohmoud Ali
	Mr. Mohamed El-Awad Sanhouri
TANZANIA	Mr. Nicodemus Dominic Merinyo Shirima
	Mr. Stephen Kajuna Buremile Tilugulilwa
TOGO	Mr. Kamlaga Seenam Dzotsi
UGANDA	Mr. Gabriel Otuda Etou
ZAIRE	Mr. Mpiana Matala
ZAMBIA	Mr. Elijam Kacenje
	Mr. Nazarious Sajeni Phiri
EGYPT	Mr. Magdy Abd El-Azem Hassan
	Mr. Mohamed Abd El-Khalek

B) GOVERNMENT

Mr. Dia Tantawi, Chairman of E.I.S. CO.,

Mr. Abd El-Rauf Radwan, Rector, Tabbin Institute,

Mr. Mahmoud Selim, Vice Rector, Tabbin Institute.

C) UNDP

Mr. Frank Hartvelt, Deputy Resident Representative,

Mr. Tharwat Sabry, International Professional Officer,

Mrs. Mona Hetata, Programme Officer,

Mrs. El-Henedy Soha, Administration Officer,

Mrs. Samya El-Benary, Training Officer.

D) E.I.S.CO. STAFF

Mr. Ashraf Hamdy, National Project Manager,

Mr. Salah Aidarous, Computer Technical Adviser,

Mr. Adel Hussein, Maintenance System Adviser,

Mr. Samir Muktar, Maintenance System Adviser.

E) UNIDO STAFF

Mr. R. Aguilar-Bolanos, Chief, P.P.R.S.,

Mr. German Dmitrievich Surguchov, Senior Industrial Development Officer,

Mr. Krishnaswamy Ramaswamy, Technical Adviser,

Mr. Slavoj Chladek, Technical Assistant Expert,

Mr. Aloke Kumar Mitra, UNIDO Regional Adviser,

Ms. Gertrude Hynek, Research Assistant, Metallurgical Industries Section

F) OBSERVERS

Mr. Trkalova, Director INORGA, CSSR,

Dr. Krouzek, N.P.M, CSSR.

ANNEXURE II.

Shedule of

Regional Demonstration Workshop

On Maintenance Management

(26 March - 15 April 1983)

General Information

1. Daily lectures are arranged at the El Tabbin Institute at Helwan.
2. Detailed Schedule of Technical sessions are enclosed.
3. Following time schedule will be observed on all working days for commuting from Cairo to Helwan and back every day.

7.00 - 7.35	Breakfast
7.45 - 8.30	Transfer to Helwan
10.30 - 11.00	Tea Break
12.30 - 13.00	Snacks
14.40 - 15.30	Transfer Back to Cairo
15.45	Lunch at Hotel & Free Time

4. Transport will be available for group visits for evening sight-seeing / shopping from 17.30 Hrs. to 22.00 Hrs.

Participants are requested to cooperate in adhering to the above time schedules.

x

1st Regional Demonstration

Workshop

Inaugural **session at El-Tabbin Institute**

(26th March 1983)

10 - 30 Hrs. **Inaugural session.**

- **Welcome address by Mrs. G. Hynek / UNIDO, VIENNA.**
- **Speech by Dr. Radhwan Rector, El-Tabbin Institute.**
- **Inangural address by Eng. Dia Tantawi, Chairman, E.I.S. Co.**
- **Speech by Eng. A. Hamdi, National Project Manager.**

11 - 45 Hrs. **Tea with Participants.**

12 - 30 Hrs. **Programme briefing and introduction of participants.**

14 - 00 Hrs. **Departure to Cairo.**

1st Regional Demonstration Workshop

On Maintenance Management.

(26th.March - 15th. April 1983)

Date & Time	Location	Course No.	Lecture No.	Subject	Speakr	Coordinator
Sunday 27/3	El Tabbin Inst.					
9.00-10.30		I	1	Introd.to the project	Eng. Ashraf Hamdy	Mr. K.Ramaswamy.
11.00-12.30	- Do -	I	2	Priciples of Management	- Do -	- Do -
13.00-14.30	- Do -	II	1	Introd.to Computer	Dr.Bhardessy	Mr. K.Ramaswamy
Monday 28/3						
9.00-10.30	- Do -	II	2	Computers and Information Processing.	Dr.Salah Aidarous	Dr.S.Chladek
11.00-12.30	- Do -	III	1	Introduction To Microprocessors and their application	- Do -	- Do -
13.00-14.30	- Do -	III	2	Data Base Management Applied to Maintenance	Dr.Salah Aidarous	Dr.S.Chladek
Tuesday 29/3						
9.00-10.30	- Do -	IV	1	Concepts Of Maintenance Management Syst.	Eng.Adel Hussein	Eng. Ashraf Hamdy
11.00-12.30	- Do -	IV	2	Concepts of Maintenance Management Syst.	- Do -	- Do -
13.00-14.30	- Do -	V	1	Discuss Questionnaire & form Working Groups	Eng. Ashraf Hamdy	- Do -

Wednesday 30						
9.00-10.30	- Do -	VI	1	Maintenance Organisation & Demonstration.	Eng. Adel Hussein	Eng. Ashraf Hamdy
11.00-2.30	___	___	___	Visit to Plant and Computer Centre	___	- Do _
Thursday 31/3	___	___	___	Study tour to Alexandria Ship yard.	___	Eng. Ashraf Hamdy
Friday 1/4	___	___	___	Free	___	___
Saturday 2/4						
9.00-10.30	El Tabbin	VI	2	Maintenance Organisation & Demonstration.	Eng. Adel Hussein	Eng. Ashraf Hamdy
11.00-12.30	- Do -	VI	3	Preventive Maintenance.	- Do -	- Do -
13.00-14.30	- Do -	VI	4	- Do -	- Do -	- Do -
Sunday 3/4						
9.00-10.30	- Do -	VII	1	Computer Based P.M. System-Demonstration.	- Do -	- Do -
11.00-12.30	- Do -	VII	2	- Do -	- Do -	- Do -
13.00-14.00	- Do -	V	2	Discussion of Model Problem.	Eng. Ashraf Hamdy	Mr.K.Ramaswamy

Monday 4/4						
9.00-10.30	- Do -	VIII	1	Planned Repair System Demonstration.	Eng. Ali Malatawy	Mr.K.Ramaswamy
11.00-12.30	- Do -	VIII	2	- Do -	- Do -	- Do -
13.00-14.30	- Do -	VIII	3	Technical Document.	Dr. Samir Mukthar	- Do -
Tuesday 5/4						
9.00-10.30	- Do -	IX	1	Man Power Training & Development.	Mr.A.F. Metwally	Eng. Ashraf Hamdy
11.00-12.30	- Do -	IX	2	Inverntory Control System-Demonstration	Mr. Mustafa Hamed	- Do -
13.00-14.30	- Do -	IX	3	- Do -	- Do -	- Do -
Wedensday 6/4 to Friday 8/4	---	---	---	Study tour Upper Egypt Aluminuim Complex at Naaga Hamadi	---	Eng. Ashraf Hamdy
Saturday 9/4						
9.00-10.30	El Tabbin Inst.	IX	4	Safety on the job.	Dr.Samir Mukhtar	Dr.S.Chladek
11.00-12.30	- Do -	IX	5	- Do -	- Do -	Dr.S.Chladek
13.00-14.00	- Do -	IX	6	Discussion and Comments	Eng. Ashraf Hamdy	- Do -

Sunday 10/4						
9.00–10.30	- Do -	X	1	Spare Parts Planning & production.	Mr.K. Ramaswamy	Eng. Ashraf Hamdy
11.00–12.00	- Do -	III	3	Introduction to Micro-Processors and their Applications.	Dr. Aidarous	- Do -
13.00–14.30	- Do -	X	2	Energy Saving	Eng. Saied Salam	- Do -
Monday 11/4						
9.00–10.30	- Do -	X	3	Process Control and Maintenance	Dr. S. Chladek	Mr.K. Ramaswamy
11.00–12.30	____	X	4	Human Aspect of Maint.	Dr. M.F. Sakr	Eng. Ashraf Hamdy
13.00–14.30	- Do -	X	5	Complex Maintenance Performance & Monitoring and Reporting	Dr. Jan Krouzek	Eng. Ashraf Hamdy
Tuesday 12/4						
9.00–10.30	- Do -	X	6	Complex Maintenance Performance & Monitoring and Reporting	Dr. Jan Krouzek	Dr. S. Chladek
11.00–12.00	- Do -	V	3	Solutions to Model & Discussion & Comments.	Groupleaders	Eng. Ashraf Hamdy Prof. G.D.Surguchov Mr. A.K.Mitra Mr.K. Ramaswamy Dr.S. Chladek
13.00–14.00	- Do -		4			

Wednesday 13/4					
9.00-10.30	El Tabbin Inst.	___	___	Review and Discussion on Recommendations	Eng. Ashraf Hamdy
11.00-12.30	- Do -	___	___	1. Selection of Best Team. 2. Course Enaluation & Recommendations. 3. Award of Certificates	Group Activity
Thursday 14/4					
9.00-11.00				Official Conclude	

ANNEXURE III.

Demonstration Workshop on Maintenance Management
(Helwan / Cairo, 26 March - 15 April 1983)
Course Material *

Title of Paper	Author	Topics covered
1 Welcome to Cairo	—	General Information
2 Project for development of Workshop area	—	Introduction to the Project.
3 Basic Management Principles (1)	Eng. A.Hamdy	Principles of Manag.
4 To Organize People Ongoing Work	Eng. A.Hamdy	- Do -
5 The importance of communication in Maintenance & Production Manag.	Eng. A.Hamdy	- Do -
6 Introduction to Computer	Dr. S.Bardisy	Introduction to Comp.
7 Computers and Information Processing	Dr. S.Aidarous	Computers & Informat. Processing
8 Introduction to Micro-Processors in Maintenance	Dr. S.Aidarous	Introd. to Micro-Proc. in Maintenance
9 Data Base Management Applied to Maintenance	Dr. S.Aidarous	D.B.M. Applied to Maintenance
10 Concepts and Practise of Preventive Maintenance System (1)	Eng. A.Hessein	i) Concept of MMS ii) Maint. Organization & Demonstration iii) Preventive Maint. iv) Computer based P.M.S
11 Planned Repairs & Technical Documentation	Eng. A.Malatawy & Dr.S.Muktar	i) Planned Repair System ii) Technical Document.

Cont. ..

* Course material was made avaiable to participants in the Demonstration Workshop during their stay in Egypt.

12	Man Power Planning & Training	Dr.A.F.Metwally	Man Power Planning & Documentation
13	Inventory & Purchase System	Mr.M.Hamed	Inventory Control System Demonstration
14	Safety of the Job	Dr.S.Mukhtar	Safety of the Job
15	Mechanical Troubleshooting System	Dr.A.Moomen	Mechanical Troubleshooting System
16	Spare Parts Planning and Produc	Mr.K.Ramaswamy	Spare Parts Planning and Production
17	Process Control & Maintenance	Dr.S.Chladek	Process Control & Maint.
18	Human Aspects of Management	Dr.M.F.Sakr	Human Aspects of Manag.
19	Complex Maintenance Perform. Monitoring and Reporting	Dr.J.Krouzek	Complex Maint. Performance Monitoring and Reporting
20	Profile on Engineering Core Industries	Mr.A.K.Mitra	—

A) Integr. foundry & machine shop
B) Forging and heat treatment
C) Metal cutting & Machine shop
D) Cold forming & metal fabrication
E) Tool room
F) Metal coating

All the above papers along with the workshop kit consisting of the following items were given to the participants:

- Brief case,
- Folders,
- Writing material,
- Stickers.

ANNEXURE-IV.

SYNOPSIS OF PAPERS DISCUSSED IN THE DEMONSTRATION WORKSHOP
ON
MAINTENANCE MANAGEMENT
(Helwan/Cairo, 26 March - 15 April 1983)

Course I. Lecture 1 & 2.

INTRODUCTION TO THE PROJECT
&
PRINCIPLES OF MANAGEMENT
by
ENG. ASHRAF HAMDI / E.I.S. Co.

1 - The following details were covered:

- Background information about the experiences of E.I.S. CO. in implementing Maintenance Management system
- Objectives of the Demonstration Workshop
- Systems and Training of Management
- Management by Objectives
- Behavioral aspects of Management
- Utilisation of Human Resources
- Levels of Management
- Recriutment, training and utilisation
- Importance of communication in Management
- Communication Road Blocks
- Use of computer in Management

2 - Participants interacted by asking questions on span of management control, application of Management theory in E.I.S. Co., control of raw material quality, management of spare parts and criteria for motivation.

Course II Lecture 1.

Introduction to Computer

by

Dr. Bhardessy

El-Tabbin Institute

1 . The following details were covered :

- Introduction to computer hardware
- Components of computer system
- Input and output devices
- Modular architecture of computers
- Introduction to the numbering system and logic circuits
- Training of computer personnel

2 . Participants interacted by asking a number of questions on hardware, computer memory types and peripherals, their capacities, and differences between different types of hardware.

Course II. Lecture 2. **Computers and Information Processing**

by

Dr. Salah Aidarous / Ein-Shams University

1 - The following details were covered :

- Over-view of developments in the fields of computer electronics and semi conductors and computer architecture
- Terminologies and definitions used in data processing
- Generations of computers and modern systems
- Basic elements of data processing systems, and use of input/output devices
- Computer file organizations and techniques, applied to data processing
- Importance of data logging its accuracy and timeliness
- Discussions of typical application needs
- Types of software languages and their usage
- Concepts of ON-LINE data processing

2 - Participants interaction covered, use of computers in different management areas, relative merits of different types of file organization and processing, programming concepts, and programming languages.

Course III Lecture 1. **Application of Micro-Processors in Maintenance**

by

Dr. Salah Aidarous / Ein-Shams University

1 . The following details were covered :

- Evolution of main frames, mini-computers and micro-processors
- Impact on user applications due to price trends, size and performance of systems
- Basic difference between micro-processors, mini-computers and main frames and their functional capabilities
- Architecture of micro-processors and their instruction sets
- Input / output facilities
- Development of high-level, user oriented programming languages
- Software / Hardware trade-offs in choosing a computer.
- Trends in the use of micro-computers in industry particularly in the area of maintenance management

2 . Participants interacted by asking a number of questions particularly covering choice of computer system and possible usage of micro-computers in quality control, and also in maintenance.

Caurse III Lecture 2. **Data Base Management Applied to Maintenance**

by

Dr. Salah Aidarous / Ein-Shams University.

1 . The following details were covered in the lecture:

- Introduction to Data Base System
- The component parts of Data Base System
- Soft-ware functions required for Data Base
- Advantages and Disadvantages of Data Base Manangement System
- Use of distributed system for D.B.M.S
- Discussion of Data Base Manangement system Packages and comparison
- Application of Data Base System for Maintenance Management and integrated approach

2 . Participants interacted by asking a number of questions on possible benefits in using softuare packages for Maintenance Planning and coordination.

Course IV Lectures 1 & 2. **Concepts of Maintenance Management System**

by

Eng. Adel Hussein / E.I.S. Co.

1 . The following major topics were covered in this course

- Introduction to maintenance management concepts
- System approach to maintenance and objectives
- Different types of maintenance organization, and their advantages / disadvantages
- Classification of maintenance work
- Preventive maintenance system
- Classification of repairs
- Preparatory steps for introducing the system
- Development of preventive maintenance system

2 . The participants interacted in depth, by asking questions on various aspects of planning for the system and by comparing their existing methods with the system approach which was discussed.

Course V - sessions 1 to 5.

Technical Questionnaire and Case Study / Recommendations
Group Exercise
by
K. Ramaswamy
Technical Adivser / UNIDO.

Course Coordinators.
1. Eng. Ashraf Hamdy / National Project Manager.
2. Prof G.D. Surguchov / UNIDO, Vienna.
3. Mr. A.K. Mitra / ECA / UNIDO. Addis Ababa.
4. Mr. K. Ramaswamy / UNIDO. Cairo.
5. Dr. S. Chladek / UNIDO. Cairo.

1. In this course the main objective was to involve the participants in discussions covering the concepts of maintenance management systems suitable for the industries in the developing countries of the region, and enable them to identify the most urgent problems that are faced in the industries in improving the maintenance and thereby the plant production. The group exercise also aimed at a consensus in identifying specific areas of assistance needed, as a follow-up action of the Demonstration Workshop.

A technical questionnaire was circulated to the participants to collect the information about their respective industry / plant and based on this a case study was prepared and circulated (copy enclosed). The participants were organised in three groups and they discussed at length the case study problem and then presented their recommended solutions. Part I covered the case study as an exercise. Part II covered the more important aspect of the assistance needed by the industries in the developing countries of the region. Group II was adjudged to be the best, in this exercise. Recommendations presented by the gronps are shown in Annexure V.

REGIONAL DEMONSTRATION WORKSHOP
CASE STUDY PREPARED BY
K. RAMASWAMMY
TECHNICAL ADVISER

U.N.I.D.O
(PART I.)

One of the developing countries in Africa embarked on an ambitious programme ot agricultural and industrial development in the mid 60s. A semi-integrated steel mill of 100000 tons capacity per annum of semi-finished steel was established at a distance of about 100 kms, from the capital and the plant has a township of its own. The steel mill has the following facilities.

1. Steel making shop-2 Nos of 20 T Electric Furnaces
   1 No. of 10 T Electric Furnace
2. Continuous casting machine section
3. Rolling Mills
4. Pipe fabrication shop
5. Galvanising section
6. Small central workshop with foundry, forge and machine shops for spare parts production
7. A central stores department with facilities to stock and handle about 30,000 to 40,000 stock items

The plant was designed to produce 40,000 Tons of reinforcement bars, 20,000 Tons of other sections, 10,000 Tons of welded pipes and structurals out of which 50% is to be glavanised and 20,000 Tons of flat rolled products. The plant has a total man power of about 4000 out of which 3500 are employed in the plant.

The main source of power supply is a major thermal power-house which was established much earlier than the steel mill.

The steel mill was not able to achieve its design capacity and has been always working at 40 to 50% level. Reasons for this poor performance has been due to inadequate operational skills, neglected maintenance due to non-availability of spare parts and high cost of essential spares of proprietory nature, poor control of quality of input raw matreials and finished products, and also migration of experienced workers.

Furthermore drawings and technical documents for a large number of equipments and spares were not available. In addition the plant has been having problems of frequent power supply failures, since the power house was also facing similar problems and in a bad condition.

In order to develop the agricultural sector, the government had set up, immediately after independence in the mid 60s, about ten foundries (ot a capacity of 1,500 to 2,000 tons per annum) with attached machine shops and other facilities, including heat-treatment facilities, to produce small pump sets and farm implements. These units were supposed to be self-contained to meet the requirements of the country at remote locations. But these units were also not working well, due to same problems.

After nearly 20 years of independance, the development and progress was found to be very slow and hardly any infrastructure for industrial development was available. Most of the units set-up were becoming sick units.

The government set up an expert committee consisting of Economist, Technologist, Cost Control Adviser, Man Power Development Adviser, and a Management Consultant to carry out an in-depth study of the problem and put up their recommendations to correct the situation. The terms of reference were to:

(i) Recommend a proper system of maintenance covering organisational structure, system of working and good system of spare parts management as a short term measure for the steel Mill, and foundries, and

(ii) Recommend long term measures to cover proper infrastructure facilities and develop good back up support to the production units, existing as well as planned in the future.

As usual with such expert committees, the members could not come to an agreed set of recommendations.

One group suggested that all smaller foundries should be closed and a Central Foundry and Engineering Workshop should be set up which will meet the production needs of the agricultural sector and also serve as a central workshop for spare parts for the steel mill and the power house. While there were arguments in favour of this proposal, the cost of providing such a workshop would be very high, and there is also no guarantee that such an unit could be managed and run properly without repeating the same problems as already experienced.

Further this will also cause local unemployment, since people working in the smaller foundries will lose their jobs. They cannot be re-located.

The other group suggested that the existing facilities in the steel mill should be reorganised and improved and a few specialised services including improved Maintenance Management system should be established. They strongly suggested that modern management techniques should be introduced. They were of the opinion that the foundries should be brought under one central Administration, with necessary technological support. They also strongly suggested standardisation of equipments and facilities. While this alternative appeared to be less expensive, implementing these measures would take more time, particularly since habits die hard.

One point on which both groups were agreed was to introduce drastic changes in the maintenance system and introduce improvements.

Which alternative would you recommend ? It is necessary to identify in detail all the major activities and corrective measures to be taken to achieve the main objectives namely:

(i) introduce an effective system of Maintenance Management and

(ii) establish a strong base for infra-structure for further industrial development and growth.

Since this is a controversial situation please present your recommendations with full details and justification.

REGIONAL DEMONSTRATION

WORKSHOP

CASE STUDY

(PART II)

From the replies furnished to the questionnaire it is observed that in almost all the cases, there is an urgent need to improve the maintenance practices, supply and stock control of essential spare parts and man-power skills, so that the plants are able to achieve rated capacity.

One of the principal objectives of the workshop is to identify these problems precisely and find out the ways and means to correct the situation and improve the productivity of the organisations, by developing necessary supporting facilities for mutual cooperation in the region.

The groups are requested to discuss this problem and put up their suggestions and recommendations covering the urgent needs of the region and the facilities and support needed as a follow-up action of this workshop. In case this support is to be organised on a regional basis, this may be justified.

The group leaders are requested to present their cases and submit the recommendation of the group.

UNIDO

Demonstration Workshop
on
Maintenance Management

QUESTIONNAIRE

Name : Name of Co.: COUNTRY:

DESIGNATION : Address :

==========

I. PRODUCTION

(a) Description of main Product

	Description of main Product	Annual Capacity	Present Production Level in % of capacity
1.			
2.			
3.			
4.			

(b) Quality of Production

	Description of Product	Percentage Rejection Due To			
		Bad Workmanship	Out of Specif.	Poor Quality of Raw Material	Others Reasons
1.					
2.					
3.					
4.					

(c) Major Causes for less Production and high Rejections

		YES	NO			YES	NO
1.	No demand			6.	Irregular Power Supply		
2.	Irregular material supply			7.	Equipment capacity overrated		
3.	Inadequate man-power			8.	Raw Material not of good quality		
4.	Absenteeism			9.	Poor skills of work-man		
5.	Equipments not in good order			10.	Combination of all the above		

II. MAINTENANCE

		Workers	Supervisors
(a)	Total man-power in the factory		
(b)	Man power engaged in maintenance		

(c) Type of Maintenance Organization

		Yes	No
i)	centralised		
ii)	Departmental		
iii)	Combined		

(d) Composition of Maintenance Gang

		Mechanical	Electrical	Others
i)	What is the average strength			
ii)	Is this adequate ?			
iii)	Is the supervision enough ?			

(e) Scheduling of Maintenance Work

i) Is there a system of Planning the Maintenanse schedule for :

	Yes	No
- Preventive Maintenance		
- Planned Repairs		
- Medium/Capital repairs		

ii) Is there any difficulty in getting the equipment shut-down for maintenance

(f) Spare Parts

	Yes	No
i) Is there a good coo ing system for spares		
ii) Are the spares readily available		
iii) What percentage is produced within the factory		

		Yes	No
iv)	Is the quality of the spares satisfactory		
v)	In case of purchased items are they available in time		
vi)	Is the quality satisfactory		
vii)	Is there a system of identifying critical spares and keeping them always available		
viii)	Are drawings available for spares		
ix)	Is there a centralised drawing section/department		
x)	Is the level of inventory cosidered very high		
xii)	Is there a Plant engineering department to improve spare parts performance		

(g) EQUIPMENT AVAILABILITY

i)	Is the equipment availability as per norms		
ii)	If no, how much below norms		
iii)	What are the reasons		
	- Age of equipments		
	- Poor Maintentenance skills		
	- Poor quality of spares		
	- Poor supply of spares		
	- Inadequate Man Power		
	- Poor planning of maintenance work		
	- Bad operation		

III. MAN POWER

	YES	NO
a. Is there adequate training facility within the works		
b. If this is outside, is the arrangement satisfactory		
c. Is full sanctioned man-power operated		
d. Is there adequate motivation of staff		

e. If answer is NO, is this due to

- Poor monetary compensation		
- Poor growth oppurtunities		
- Poor delegation of authority		
- Absence of proper job descript.		

f. List any special skills in which training is to be improved or well organized :

IV. ANY OTHER COMMENTS

==========

Place : _____

Date : _____ Signature : _____

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Course VI Lectures 1 & 2.

Maintenance Organization and demonstration

Lectures 3 & 4.

Preventive Maintenance

by

Eng. Adel Hussein / E.I.S. Co.

1 . In this course, the following details were covered

- Organizational set-up required for large, meduim or small plants, for Maintenance work
- Functional responsibilites
- Problems of coordination and planning
- Trade-off between excessive and miminum maintenance
- Considerations for optimum cost of maintenance, in organizing Preventive Maintenance system

2 . The interaction of the participants was good and a large number of questions were asked and clarified in all the major topics which were discussed, with special reference to the existing situation in respective countries.

Course VII Lecture 1 & 2.

Computer Based Preventive Maintenance System Demonstration

by

Eng. Adel Hussein E.I.S. Co.

1. In this course the following details regarding developmentof computer based P.M. system were discussed
   - Advantages of computer based P.M. system for large plants
   - Input data required for the system and File organizations
   - Output reports
   - Formats for input and coding system
   - Data control and feed back reports
   - System implementation and review

2. The participants were actively involved in the discussions and asked a number of questions on using computers particularly for meduim and small size plants

   Practical demonstration of the system was arranged by visits to the UNIDO computer centre and the varions departments inside the Egyptian Iron and Steel Co.

Course VIII Lectures 1 & 2. **Planned Repair System Demonstration**

by

Eng. Ali Malatawy/ E.I.S. Co.

1. In this course the following topics were covered :

   - Importance, scope and definition of Planned Repair System
   - Types of repair and maintenance budgetting
   - Recurrence and duration of running and major repairs
   - Planning, organising and conducting repairs
   - Progress reports and repair records
   - Set-up of shop maintenance services
   - Discussions on schedules and durations
   - Practice adopted in E.I.S. Co

2. The participants interacted in depth by asking a number of questions in respect of planning for repairs and spare parts and also control of expenditure.

Course VIII Lecture 3. Technical Documentation

by

Dr. Samir Mokthar

El-Tabbin Institute

1. The following major areas were covered in this lecture:

   - The need and importance of technical documentation for Maintenance Management system
   - Organisational requirements
   - Grouping and classification of equipments and facilities
   - Occurrence and duration of repair schedules
   - Annual / Half-yearly / Quarterly / Monthly scheduling
   - Different forms for planning and for progress reporting
   - Equipment and spares history documentation

2. Participants asked a number of questions on responsibility for documentation, review procedures and recording of spare parts history.

Course IX Lecture 1. Manpower Training & Development

by

Mr. A.F. Metwally / E.I.S. Co.

1. The following topics were covered in this lecture:

   - Importance and need of man-power planning
   - Major considerations and objectives in man-power planning programmes at different levels
   - Man-Power planning function in Egyptian Iron and Steel Co.
   - Long term planning on 5 years basis
   - Short term planning for gaps and special skills
   - In-plant training programmes
   - Management Development and training programmes
   - Skill up-grading, refresher courses and special training facilities, eg., in Hydraulics and Instrumentation etc.
   - Training facilities extended to other companies and countries

2. Participants interacted by asking a number of questions with regard to training facilities available in the E.I.S. Co.

Course IX Lecture 2 & 3.

Inventory Control System

Demonstration

by

Mr. Mustafa Hamed./ E.I.S. Co.

1. In these lectures, the following major aspects of the system were discussed.

   - The scope of work and items covered by the system in E.I.S. Co.
   - Main objectives and functions covered.
   - Classification of materials and coding system.
   - Criteria and fixation of stock levels.
   - Recoupment planning.
   - Inventory control performance norms.
   - Computer based stock control and accounting.
   - Purchase order follow-up system.
   - Experience gained in E.I.S. Co. in the above areas.

2. The participants discussed various aspects of planning for spares and problems relating to purchases, particnlarly imported items.

Course IX Lecures 4 & 5.

Safety on the Job

by

Dr. Samir Moktar

El-Tabbin Institute

1. The following major areas and points were covered in these lectures:

   - Importance of Safety Engineering and its relevance to Maintenance Management
   - Labour regulations and statutory obligations for industrial safety
   - Causes and classification of accidents
   - Registration, reporting and investigation of accidents
   - Discussion of varions contributory causes to accidents
   - Safety precautions
   - Monitoring of maintenance and operating practices with special reference to safety
   - Follow-up of safety recommendations and inspection procedures

2. A number of questions regarding safety regulations and their implemtation were asked by the participants.

Course IX Lecture 6

Mechanical Trouble-shooting System
knowledge-Engineering approach

by

Dr. A. Aziz Moomem
AIN-SHAMS UNIVERSITY

1. The following topics were covered in this lecture:

   - Need for engineering approach
   - Component structure of machine and failure patterns
   - Trouble-shooting procedures
   - Computer simulation
   - Study of variables contributing to failures

2. There were a few questions from the participants about predictive analysis of variables which are likely to cause failures.

Course X Lecture 1. **Spare Parts Planning and Production**

by

Mr. K. Ramaswamy / UNIDO

1. The following major areas were covered in this lecture:

   - Major objectives of a good system of planning and control
   - Importance of proper grouping and classification of spares to facilitate procurement and stock control
   - Linkage with Planned Repair system and role of spare parts planning in Total Maintenace Management System
   - Quality control of spare parts
   - Planning for local manufacture of spares, in E.I.S. Co.
   - Completion date of work orders and determination of critical factor for priorities
   - Long term and short term loading of work orders in Workshops, in E.I.S. Co.
   - Norms of production and incentive schemes
   - Capacity planning and machine-loading considerations and practices in E.I.S. Co.
   - Advantages of computer based system of planning and control in large organisations
   - Importance of standardisation and Value Engineering studies.

2. The participants interacted largely in the areas of norms of production, planning of spares and standardisation of spare parts.

Course X lecture 3.

Process Control and Maintenance

by

Dr. S. Chladek / UNIDO.

1. The following major points were covered in this lecture:

   - Scope of process control
   - Concept of Automatic Control System
   - Realization of A C S
   - Maintenance system in E.I.S. Co.
   - Scope of simulation and its usage in production function
   - Use of diagnostic system for operation and maintenance

2. The participants inter-acted by asking questions on process control system, type of computers and their usage and scope, and about data collection.

Course X lecture 4.

Human Aspects of Management

by

Dr. M.F. Sakr

Cairo University

1. The following topics were covered in this lecture.

   - Qualities of good leadership in organisation:
   - Role of Engineers in Management
   - Role of Managers in dealing with the people in the organisation
   - Styles of functioning of managers
   - Why Engineers fail as Managers
   - Management knowledge and skills
   - Factors of motivation

2. The participants asked a number of questions relating to motivation and behavioural aspects with special reference to brain-drain and large turn-over of experienced people, a common problem in most of the countries.

Course X Lecture 5.

Complex Maintenance Performance Monitoring and Reporting

by

Dr. J. Krouzek / INORGA

1. The following topices were covered in this lecture:

   - Introduction to the Maintenance Management system Project in Czechoslovakia
   - Project objectives and benefits achieved
   - Activities of the project
   - Maintenance monitoring and performance evaluation
   - Idle Time, Down Time and Break-down recording and analysis
   - Maintenance order, job progress monitoring and spares planning / control
   - Job standards
   - Drawings and upto date documentation
   - History files and analysis
   - Spare parts history
   - Human resources planning

2. The participants inter-acted by asking questions on Data Bank, updating, configuration of computer system used, operation of terminals, training of operators and saving in man-power by using computer system.

Report on plant visits

Visit to E.I.S. Co.,

The participants visited all the major production departments of the E.I.S. Co., complex. They also went around on a detailed visit of the Foundry, Machine Shop and other facilities in the complex, for local manufacture of spare parts. They also visited the UNIDO computer centre and studied in detail the computer based maintenance planning, reporting, spare parts planning, shop loading and production planning systems in operation in the E.I.S. Co. The participants asked a number of questions during their visit to the various departments and inter-acted in depth and extensively.

Visit to the Copper Works in Alexandria

The participants had a detailed study visit of the works and saw the production and maintenance facilities and had detailed discussions with the shop floor Managers.

Visit to the Aluminium complex at Naaga Hamadi

All the participants were taken on a study visit to the Aluminium complex at Naaga Hamadi in Upper Egypt, and were shown around the factory, township and facilities. The plant visit covered all facilities for production and also the workshop facilities for local manufacture of spare parts. They were shown around the machinc shop and foundry and had detailed discussions on various aspects of the operation and maintenace practices in the complex.

ANNEXURE V.

REGIONAL

Recommendations

Of

Participants.

Submitted by

Group I

ETHIOPIA - Mr. G. MICHAEL.

ZAMBIA - Mr. E. KACENJE. (GROUP LEADER)

TANZANIA - Mr. D.M. SHIRIMA.

SOMALIA - Mr. A.H. ISMAIL.

SIERRALEONE - Mr. R.C.A. COLE.

Note: This has reference to Case study Part II copy enclosed. Please see Annexure IV-7.5.

Recommendations for the Region

Case Study - Part II

Pattern Shops

There is a lack of manpower in the pattern shops and there are no facilities to train pattern makers.

All the countries concerned have design/drawing offices where design work can be carried out. The National Workshop in Sierra Leone requires a wood milling machine. Otherwise other patternshops have the required machines.

FOUNDRY SHOPS

Raw Materials

Sierra Leone has a problem of obtaining limestone, coke, and ferro-silicon. The alloying elements like ferrosilicon and ferrochrome are generally imported from Europe and Asia for all countries. However it is pointed out that Zimbabwe could prove a good source for most alloying materials.

Moulding sand does not pose a problem for the region except in case of Sierra Leone where it is imported from UK when required. All binders are imported in all cases, however cassava powder may be used as a binder (2-4%) but this has not yet been proved commercially yet. Additives are also imported.

In general except in the case of foundries in Tanzania, sand testing equipments are lacking in most of the foundries.

Refractories

These are mainly imported in all cases but in case of Luanshya smelter foundry, the industry has no problem in importing refractories from Europe or South Africa.

Crucibles have generally proved to be a problem to import in all cases.

Fettling Materials

These are imported. However these have proved to be a problem to obtain in the region since only Republic of South Africa supplies the region. In case of North Africa these are mainly obtained from Europe.

Training

This should cover patternmakers, moulders, laboratory technicians and foundry technologists.

Associated machine shops

Ethiopia requires to develop the machineshop at National Metal works. In Tanzania Aluminum Africa has no basic workshops but the National workshops do cater for the requirements.

Heat Treatment Facilities

Somalia has recently received heat treatment furnaces. The other foundries have smaller furnaces that can cope up with small castings. There is an urgent need to develop facilities in this area.

Maintenance

Ethiopia uses wood for the moulds for spinning lathes but have been advised to use mohagony wood which is hard wood. Another suggestion was to use/try aluminium but this may create problems of heat treatment. Assistance is required in this area.

In all cases training of manpowers in maintenance for foundry machinery is lacking.

Suggested methods for assistance in the region

1) Training for manpower in the foundry trades especially pattern-making.
2) A common data bank for material resources and information on foundry materials used.
3) Making it known to the foundries in the region as to what facilities are available in the region and organize to assist in running and maintaining the units.

REGIONAL

Recommendations

of

Participants

BY

GROUP II

DELEGATES

KENYA - Mr. SAT PAL UTTAM (GROUP LEADER)

TOGO - Mr. K.S. DZOTSI

ZAIRE - Mr. MPIANA MATALA

SOMALIA - Miss. SHAMSA HUSSEIN

TANZANIA - Mr. S.K. TILUGULILWA

SUDAN - Mr. ABDALLA M. ALI

Recommendations for the Region

CASE STUDY

Part II

During the first Regional Demonstration workshop held at Cairo for the developing countries of Africa there were exchange of views of mutual interest at all levels namely,

1) Between delegates and the experts from the host country.
2) Between delegtes themselves.
3) Between delegates and UNIDO experts.

During this exchange of views, it was found out that most of our plants in the African region are under identical conditions and also suffer from very similar problems like,

a) Non availability of spare parts and raw materials because of strict control of foreign exchange.
b) Non availability of trained personnel and as such operating under complicated conditions.
c) Need to improve the maintenance management systems.
d) Need for better control of essential spare parts.
e) Not standard, but similar equipments.

In the light of the above facts it is recommended that the following assistance should be made available at the regional level,

1) Central workshop for making spares.
2) Central Training Institute for imparting training to supervisors in specialised fields like hydraulics, maintenance management, pneumatic controls, instrumentation etc.

3) Central material bank for ferrous, non-ferrous and refractory materials specially casting bay refractories, lining refractories, stopper rod heads etc.

4) Central research institute.

5) Central Design office for desiging the expansions of the existing plants, plant equipments modifications, design of new equipments required etc.

6) Standardisation of various similar equipments to reduce inventory of spares and eventually money blockage.

REGIONAL

Recommendations

Of

Participants

Submitted

By

Group III

SOMALIA - Mr. A.H. MOHAMED.

UGANDA - Mr. G.D. ETOU. (GROUPLEADER).

KENYA - Mr. W.K. KIIRU.

ZAMBIA - Mr. N.S. PHIRI.

NIGERIA - Mr. A.Y. ABDUL.

Recomendations For The Region

Case Study - Part II

(a) There is no information available to operating technical managers concerning facilities available in their neighbouring countries. This necessitates importation of spares, and technologies from distant countries eg Europe. A list of all facilities in the region should be compiled and made available to all concerned.

(b) In order to support sister countries in the region, when a need for importation of spares from abrood arises, the countries in the region with the facilities should be asked in the first instance to supply them.

(c) A forum for technical managers in industries should be set up. Mutual exchange of ideas and information will enlighten the managers on the latest techniques, products, equipments and raw materials available in the region.

(d) Technical managers should indirectly and directly participate in the council of ministers meetings.

(e) Consultancy and feasibility studies by E.C.A, UNIDO etc. are available virtually free of charge. These bodies also organise workshop for technical managers at relatively how cost. But it would oppear that the countries which are entitled to these facilities do not make full use of them. They are therefore to be encouraged to obtain full benefits from these very useful and less expensive studies and training programmes.

To facilitate this, the international institutions concerned should widely publicise their activities so as to reach all industries.

(f) Gaps in the manufacturing industries in the region should be identified by UNIDO and/or E.C.A who should then make feasibility studies. A follow up programme also to ensure completion of these projects is essential.

Solution To Case Study

Part I

(This has reference to Case study Part I- Annexure IV-7. to 7.4.)
Submitted By Group II

(Adjudged As Best Report Of Case Study Exercise By Participants)

Salient Features of the Steel Mill:-

1.1 Semi - Integrated Steel Mill

Capacity : 100,000 Tons/Annum.

Products : Semi finished steel

Location : 100 kms from the capital and having its own township.

1.2 Facilities available at steel mill

a) Steel making shop-

i) 2 Nos of 20 T electric furnaces.

ii) 1 Nos of 10 T electric furnace.

b) Continuous casting machine section.

c) Rolling mills.

d) Pipe fabrication shop.

e) Galvanising section.

f) Small central workshop with foundry, forge and machine shops for spare parts production.

g) A central stores department with facilities to stock and handle about 30,000 to 40,000 stock items.

1.3 **Production**

a) Reinforcement bars 40,000 Tons

b) Other Sections 20,000 Tons

c) Welded pipes and structures 10,000 Tons each

(50% to be galvanised)

d) Flat rolled products 20,000 Tons

1.4 Manpower

Total man power ---------- 4000

Employed in plant --------- 3500

1.5 Source of Power Supply

Thermal power-house established much earlier than the steel mill, but in bad condition.

1.6 Present Production

40 to 50% of the full capacity.

2.0 PROBLEMS FACING THE STEEL MILL

2.1 Inadequate operational skills.

2.2 Neglected maintenance due to non-availability of spare parts and high cost of essential spares of proprietory nature.

2.3 Poor control of quality of input raw materials and finished products.

2.4 Migration of experienced workers.

2.5 Drawings and technical documents for large number of equipments and spares not available.

2.6 Frequent power supply failures.

Agricultural Sector

3.0 To develop the agricultural sector the following facilities were set up in mid 60s.

3.1 No of foundries --------- 10

with attached machine shops and other facilities including heat-treatment facilities.

3.2 Production:- Small pump sets and form implements.

3.3 Facing the same problems as steel mill.

Recommendations

4. In order to correct the situation for an initial better production and ultimately the rated production the following proposals are recommended.

4.1 Changes in Organizational Structure

These changes should be carried out with a view to clearly define the line of responsibility for better and effective control.

4.2 Introduction of Maintenance Management systems

Before introduction of an effective maintenance management system it is recommended that the following data should be recorded.

i) For every department delay reports for each shift.

ii) Total monthly delays for each equipment and their causes.

iii) History card for every equipment item for future reference.

After introduction and collection of the above data, a suitable maintenance system should be set up for

a) Preventive Maintenance, and

b) Planned repairs

which will ensure a high rate of equipment availability and thus more production.

The maintenance system will minimize total operating cost by controlling maintenance costs. It will ultimately improve life of the plants and equipment to predetermined level.

4.3 Introduction of Inventory Control

A coding system should be introduced so that all the items can be identified and classified. Critical or insurance items non-availability of which can stop the plant to a grinding halt should be given an additional signalling indicator. Separate recording of the Imported items is necessary. Inventory control will ensure economical order levels by indicating the high level and low level stock positions.

4.4 Introduction of spare part planning

In the maintenance system it is recommended that

i) special emphasis should be given to spare parts planning, and

ii) standardisation of spares wherever possible.

iii) Import substitution / Local manufacture to be taken in hand for a few parts to begin with.

4.5 Establishment of a drawing office

As and when an equipment is put down for repairs, the opportunity should be availed for making the component drawings and the assembly drawings of the parts for which the drawings are not available. By this process slowly all drawings will be made and a full set of drawings will be availabe.

4.6 Requesting the suppliers for drawings and technical documents

It is recommended that letters should be posted to all suppliers of the equipments requesting for component and assembly drawings, manufacturing drawings and technical documents. Requests can be sent for any other additional information required.

4.7 Introduction of documentation

It is recommended that a system of documentation should be introduced at all levels. This will ensure passing on the information from one person to the other. This will also ensure keeping of records. This will ultimately bring in standardisation of procedures.

4.8 Setting up of Quality Control Department.

A quality control department should be set up with an adequate number of inspectors for

i) inspecting the incoming raw material.

ii) incoming spare parts.

iii) inspection of spare parts made in plant.

iv) inspection of the finished goods manufactured by the plant.

4.9 Introduction of a better communication system

It is recommended that a better system of communication should be established to avoid any lapses at any level.

4.10 Introduction of an Incentive Scheme.

It is recommended that after careful study by the Industrial Engineering department, of all the processes in all the departements an incentive scheme should be introduced. This will ensure high production because of extra money to the workmen for more production above a certain norm set by the Industrial Engineering Departments. All maintenance gangs throughout the plant, should also be taken into consideration for incentive scheme.

4.11 Introduction of a Suggestion Box

Boxes should be set up at important points through out the plant, for inviting suggestions from the workmen for any modification or development in the process or equipment, or any other concrete suggestion. The workmen whose suggestions are accepted and implemented by the management should adequately be rewarded.

4.12 **Establishing a Training Centre**

It is recommended that an in-plant or a central training centre should be established for giving on the job training to the workmen wherever required. Raw hands will also be trained for future requirements. These trained people can fill up the vacuum created by the migrating workmen to a certain extent,.

5. a) All the recommendations listed above also hold good for power plants and all the ten foundries.

b) All the ten foundries should be brought under a common administration called central administration for necessary technological support, but they should be left independent, for their day to day work. Since all the foundries will have a central administration their performance can be easily compared and measured.

c) At a later date all the foundries should work together for standardistion of their spares.

d) At some point of time Steel Mill foundry should takeover the casting of spares from the other foundries and the other foundries should devote their production for the casting of the pump sets and the other farm implements.

e) Since the power plant is not working efficiently it is recommended that power to the Steel Mill should be supplemented from the National Grid till such time the power plant produces full capacity power.

f) At a later date we recommend a computer based maintenance management system to be introduced. For setting this up, help from the outside specalised computer agencies should be taken.

g) Availability of the raw materials for the foundry should be thoroughly looked into, and corrective measures should be taken in advance.

h) Availability of the raw materials for the Steel Mill plant should also be looked into thoroughly. Areas of new availability should be identified and corrective measures taken.

ANNEXURE VI.

COURSE EVALUATION

of the Demonstration Workshop
on Maintenance Management, Helwan, Cairo, A.R.E.
(26 March - 15 April 1983)

The Course has been evalutated on the basis of UNIDO questionnaire filled up by the participants:

I) PRE-COURSE INFORMATION

1) Introductory Information:

Aim of the training	78,5 %	marked as "sufficient"
	21,5 %	marked as "not sufficient"
Content of the programme	71,5 %	marked as "sufficient"
	28,5 %	marked as "missing"
Level of the programme	100 %	marked as "sufficient"

2) The participants received the information before the beginning of the training:

About the programme	From 10 weeks to 2 weeks in advance
Being accepted	About 2 weeks to 1 week in advance

II) PROGRAMME CONTENT AND ORGANIZATION

3) Total Duration:

57	% marked as "too short"
43	% marked as "just right"

4) Daily schedule:

93	% marked as "just right"
7	% marked as "too heavy"

5) Suggestions for changes in the future:

a) More time for discussion - suggested by 29 %
b) More time for visits - suggested by 29 %
c) Less time for travelling - suggested by 20 %

6) The training corresponded with professional needs:

50 % marked as "to a very large extent"

36 % marked as "to a large extent"

14 % marked as "to a sufficient extent"

7) Opinion about study visits:

100 % of participants indicated this as very important and useful. They also suggested:

a) More study visits in E.I.S. Co.

b) Visits of: Refractory Brick Manufacturing Plant, Raw materials Manufaturing Plant, Cement Factory, Smaller foundries and Motor Vehicle Factory.

8) Opinion about general level:

100 % of the participants mentioned this to be adequate.

9) The most valuable subjects were:

a) Preventive Maintenance and Invertory Control - marked by 45 %

b) Safety of the Job - marked by 35 %

c) Maintenance Management System, Basic Management Principles, Human Aspects, Planning Repair. - marked by 20 %

10) The least valuable subjects were:

a) Data Base Management
b) Implementation of Computers
c) Introduction of Computer

11) Subjects adequately covered in 79 % in the programme and 21 % not. The participations recommended to add the following topics in future programme:

a) Project Management
b) PERT and CPM
c) The role of the Manager in M.M.S.

12) The changes preferred in the methods of instructions:

	no changes	more	less
Lectures	98 %	2 %	0
Group Work	66 %	34 %	0
Demonstrations	30 %	70 %	0

13) General standard of the instructors in respect of:

	command of English	methods of instruction
Very good	60 %	70 %
Rather good	20 %	30 %
Fair	20 %	0

14) Sufficient time for professional exchange of views with:

	the programme staff	fellow-particip.
YES	80 %	70 %
NO	20 %	30 %

15) Benefit from exchanges of views with:

	the programme staff	fellow-particip.
A great deal	70 %	4 %
Much	30 %	66 %
Somewhat	0	26 %
Little	0	4 %

III) RELEVANCE AND APPLICABILITY

16) Contents of the programme were relevant:

46 % marked as "to a very great extent"
18 % marked as "to a great extent"
36 % marked as "to a sufficient extent"

17) Participant's feeling regarding the professional benefit to them by participation in the programme:

50 % marked as "to a very great extent"
20 % marked as "to a great extent"
10 % marked as "to a sufficient extent"
20 % marked as "to a small extent"

18) Opportunity of applying new knowledge in their present job:

8 % marked as "to a very great extent"
67 % marked as "to a great extent"
17 % marked as "to a sufficient extent"
8 % marked as "to a small extent"

19) They will be in position to transfer new knowledge to others in their home country.

36 % marked as "to a very great extent"
64 % marked as "to a great extent"

20) The transfer will be done:

50 % marked as "in day-to-day work"
50 % marked as "in specific training"

IV) SOCIAL ASPECTS OF THE PROGRAMME

21) 95 % of the participants felt that the leisure time was organized in a systematic way and useful, 5 % felt that the schedule was too busy. They recommended to add in the future:

a) Games and sports,
b) Demonstrations in more groups, and
c) Organize evening social programme

22) Any comments:

No answers.

UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

VIENNA INTERNATIONAL CENTRE
P.O. BOX 300, A-1400 VIENNA, AUSTRIA
TELEPHONE 26 310 TELEGRAPHIC ADDRESS: UNIDO VIENNA TELEX: 135612

REFERENCE:

GROUP TRAINING PROGRAMME EVALUATION

Name of Participant: Home Country:

Programme: Host Country:

Year:

I. PRE-COURSE INFORMATION:

1. How was the introductory information you received in your home country presented: (please mark an x in the suitable column)

	Sufficient	Not Sufficient	Missing
Aim of the training	☐	☐	☐
Content of the programme	☐	☐	☐
Level of the programme	☐	☐	☐

What, if any, other information do you feel should have been included:

2. How many weeks before the beginning of the training programme did you receive the following information:

Information about the programme ☐ weeks

Being accepted to the programme ☐ weeks

Comments:

II. PROGRAMME CONTENT AND ORGANIZATION:

3. What is your opinion of the total duration of the course:

Too long ☐ Just right ☐ Too short ☐

If not "just right", what, in your opinion, would be the most suitable duration for the course?

☐ weeks

Please comment:

4. State your opinion about the daily schedule:

Too heavy ☐ Just right ☐ Too light ☐

Comments:

5. Would you suggest <u>any changes</u> in the general nature of the training programme?

6. Do you feel that the <u>training</u> corresponded to your professional needs?

To a very large extent ☐

To a large extent ☐

To a sufficient extent ☐

To a small extent ☐

To a very small extent ☐

Please comment:

7. Please give your opinion about the <u>study visits</u> (if any):

Please suggest other study visits that might have been valuable:

8. What do you think of the <u>general level</u> of the training?

Much too high ☐ Too high ☐ Adequate ☐

Too low ☐ Much too low ☐

Comments:

9. Which subjects of the programme did you find most valuable? (please state reason; for example new subject, my speciality, relevant to my work, new information, etc.)

Subject	Reason

10. Which subjects of the programme did you find least valuable? State why (for example too elementary, inadequate instruction, irrelevant to my work, etc.)

Subject	Reason

11. Were there in your opinion any relevant subjects that were not adquately covered in the programme?

Yes ☐ No ☐

If yes, what did you miss?

12. Which changes would you have preferred in the methods of instructions?

	no changes	more	less
a) lectures	☐	☐	☐
b) group work	☐	☐	☐
c) demonstrations	☐	☐	☐

Comments:

13. How did you find the general standard of the instructor with respect to:

	i) command of English	ii) method of instruction
Very good	☐	☐
Rather good	☐	☐
Fair	☐	☐
Poor	☐	☐
Very poor	☐	☐

Please comment:

14. Did you have sufficient time for professional exchange of views with:

	i) the programme staff	ii) fellow participants
Yes	☐	☐
No	☐	☐

Comments:

15. How much did you benefit from these exchanges of views with:

	i) the programme staff	ii) fellow participants
A great deal	☐	☐
Much	☐	☐
Somewhat	☐	☐
Little	☐	☐
Not at all		

Please comment:

III. RELEVANCE AND APPLICABILITY:

16. Did you find the contents of the programme relevant to conditions in your company (institute)?

To a very great extent ☐ To a great extent ☐

To a sufficient extent ☐ To a small extent ☐

Please state why:

17. Do you feel that by participating in this training programme you have benefitted professionally?

To a very great extent ☐ To a great extent ☐
To a sufficient extent ☐ To a small extent ☐
To a very small extent ☐

Please state why:

18. Do you think you will have an opportunity to apply your newly acquired knowledge and experience in your present job?

To a very great extent ☐ To a great extent ☐
To a sufficient extent ☐ To a small extent ☐
To a very small extent ☐

Please state the difficulties that you expect to meet if any:

19. Will you be in a position to transfer your acquired knowledge to others in your home country?

To a very great extent ☐ To a great extent ☐
To a sufficient extent ☐ To a small extent ☐
To a very small extent ☐

20. How will this transfer be done?

a) In day-to-day work with colleagues and subordinates ☐
b) In specific training activities inside present employment ☐
c) In specific training activities outside present employment ☐

What difficulties, if any, would you expect to meet?

IV. SOCIAL ASPECTS OF THE PROGRAMME:

21. Please state your opinion about the leisure time activities organized by the programme staff:

What additional activities would you have appreciated?

22. Please give any comments you choose on aspects not adequately covered by this questionnaire:

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