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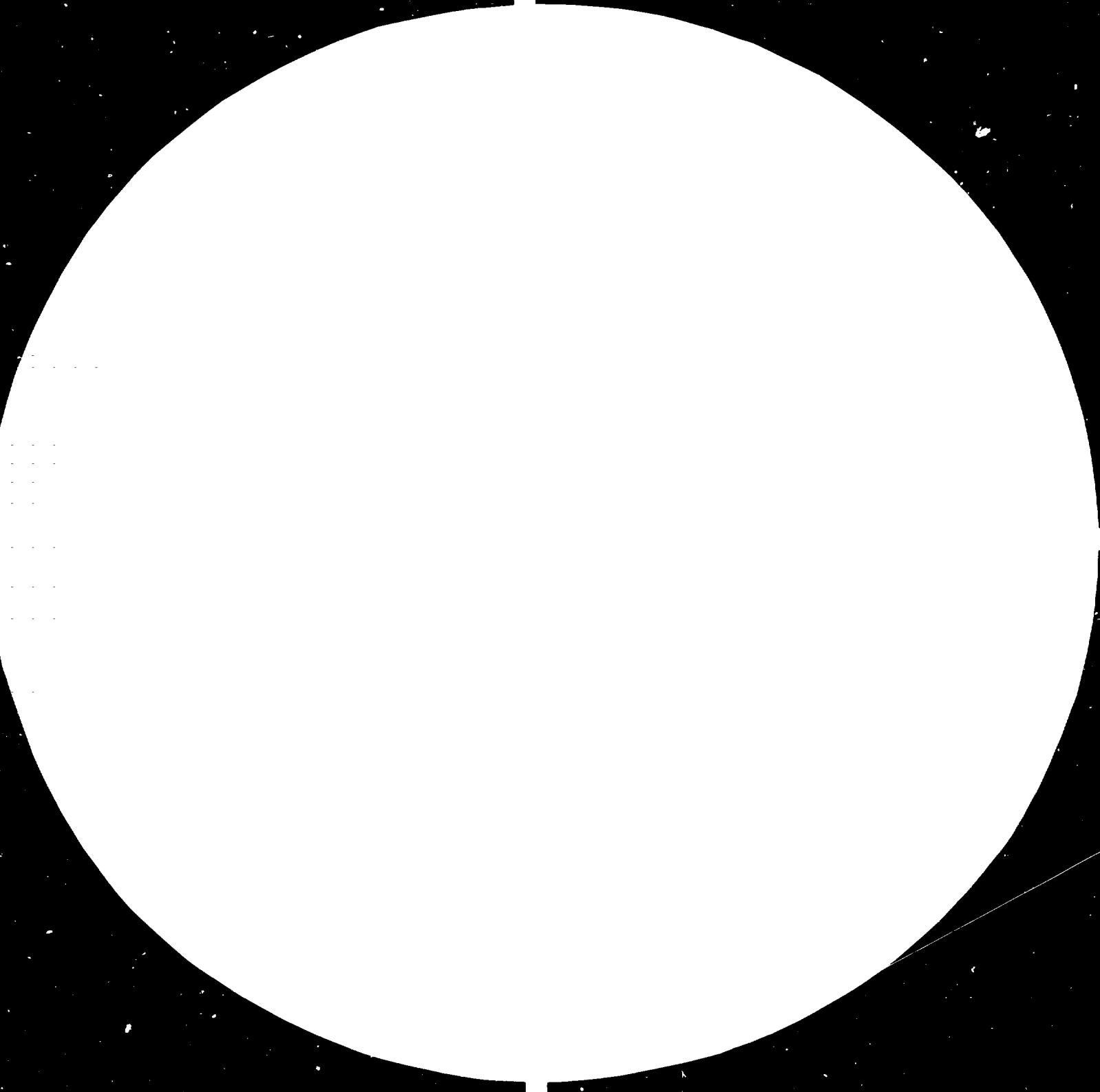

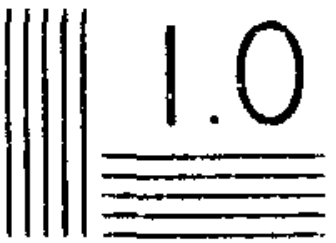
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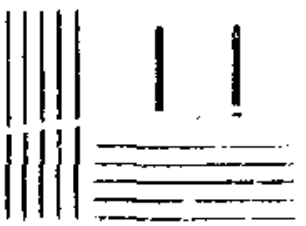
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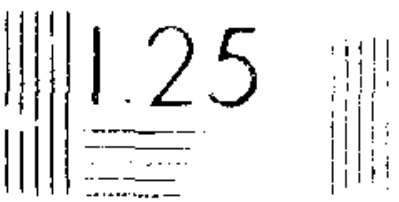
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UNITED NATIONS INDUSTRIAL
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ENGLISH

Angola. SERVICE CENTRE FOR REPAIR AND MAINTENANCE

US/ANG/78/209

PEOPLE'S REPUBLIC OF ANGOLA

Mission Report *

Prepared for the Government of

the People's Republic of Angola

by the United Nations Industrial Development Organization

Based on the work of N.S. Khalilulin

Chief Technical Adviser

Expert in Repair and Maintenance of Industrial Machinery

* This report has been reproduced without formal editing.

TABLE OF CONTENTS

INTRODUCTION

Some new manufacturing industries such as textile, food processing, metal and wood working, steel, chemical, paper, cement, tobacco, sugar etc. had been established in major cities and in Luanda itself before the independence war. The managerial and technical supervisory staff as well as skilled workers for those factories were immigrated from Portugal.

Subsequent to the independence war many of the above mentioned industrial factories were shut down and the Portuguese managers and technicians left the country.

Technical documentation on production facilities were lost or unavailable. The Government, however,succeeded to put practically all the factories back into operation despite of the difficulties and problems encountered in such a situation.

The major problems and constraints in skilled personnel availability, serious shortage of spare parts, practical non-existence of preventive maintenance, poor maintenance and improper repair of machinery, particularly electrical equipment and apparatus, which lead to rapid wearing out of production facilities and low level of productivity because of breakdown stoppages evoked the activity aimed at improving maintenance.

In view of the above mentioned situation to meet wholly or partly the industries' requirements in maintenance the Government has decided to establish the service centre for repair and maintenance.

OFFICIAL ARRANGEMENTS

In line with the Government request and in the light of the Resolution of the General Assembly No. 31/168 of 21 December 1976 on assistance to the People's Republic of Angola, the objectives of the project were formulated.

The Project No. US/ANG.78/209 was approved in 1980 with a donor financing assistance through the Danish International Development Agency (DANIDA).

The Government of the People's Republic of Angola by the Decree No. 77/80 of 29 October 1980 established, within the framework of the National Branch of the Heavy Industry a factory "EMIN".

For this purposes the two buildings situated in the Cuca Industrial Zone have been selected and a number of machine tools have been installed and commissioned (Please see annex No. I).

The activity of the Centre will last 20 months from October 1980. The mission being reported started in July 1981 and will last twelve months.

CONTRIBUTIONS

It was the Danish board for International Co-operation who took a decision by the end of 1979 to finance the first phase of the project through the Danish International Agency with the contribution of US $193,800.

With the budget without overheads the project of US $170,000 foresees 27 man/months personnel component (US $129,600) and equipment component (US $29,000) for purchase of electrical repair and transport equipment.

The rest of the sum (US $11,400) was provided for the project review mission, expert's travel and miscellaneous.

The Government inputs consist of the following items:

- counterparts staff - 27 man/months;
- equipment - US $552,000;
- buildings, land - US $280,000.

The cars of the project are being provided with gasoline.

OBJECTIVES OF THE PROJECT

The original objectives of the project No. US/ANG/78/209 were the following:

I. Establishment of the Industrial Repair and Maintenance Centre:

(a) Preparation of the existing buildings;

(b) Preparation of a plant lay-out;

(c) Installation of the workshop equipment; laboratory; foundry, etc..

2. Workshop activities

The Centre shall:

(a) fabricate, upon request, spare parts for industries;

(b) undertake major repair works of large/sophisticated machine components;

(c) overhaul and/or recondition the machinery.

The project document and its objectives had been jointly scruitinized with the Angolan side to size up the possibilities of the existing facilities, and of manpower and financial resources of the mission being reported, in maintenance and repair as accurately as possible.

As a result it was decided:

- to reformulate the points 2(b), 2(c) as follows:

  2(b) undertake repair works of machine components;

  2(c) repair and/or recondition of machinery.

Practically the objectives of the project were attained. In accordance with the objectives of the project the following project outputs have been achieved:

1. Establishment of the organization chart and major production units;
2. Strengthening of the centre through employment of the additional staff (the number of workers has increased from 20 to 100), selection and installation of locally available machine tools and welding equipment;
3. Physical inventory of industrial equipment and machinery available in the centre;
4. Working out of preventive maintenance programme;
5. Selection and training of the centre's technical staff in repair of electrical and mechanical equipment. The team of eight workers for maintenance and repair of industrial

equipment was established. Twelve workers were trained in electrical equipment repairs. The training is continuing.

6. A programme and manual (being finalized) for training in electrical equipment repairs was drawn up and two stands for training were assembled.

7. Definition of major spare parts needed and start-up of fabrication programme.

8. Work section on repair and maintenance had been established.

   For this purpose:

   - Six workers (mentioned in the point 5) were gathered from different sections and another two workers were newly employed.

   - New benches for workers and racks for spare parts and manufactured devices had been fabricated in the centre from available materials by the workers of the newly established section.

9. Assembling of wood processing equipment from parts and units available and produced in the centre for sale.

10. Provision of maintenance and repair services in-situ and to some enterprises namely:

- "ELA"	- consultative service in preventive maintenance of electrical equipment.
- Factory on production of electrical cables in Viana	- electrical and mechanical repair works.
- "Pepsy-Cola", Luanda	- repair of main driver of the automatic line.
- "Comandante Jika"	- repair of two pcs of equipment.
- Bread factory "Monte Sinay"	- repair of the hydraulic system of a banding press.
- Furniture factory "M. Valente"	- repair of the hydraulic and electric system of a banding press.

- etc. (please see annex No. 2).

In the centre itself a number of equipment of both the Centre and of other factories have been repaired (Please see annex No. 3).

In addition, electric repair section has started to repair electro-motors. To date three electro-motors have been repaired (including rewinding of bobbins).

Number of factories and projects in Luanda, N'Gunza and in Malange have been visited. The main task of those visits was to clarify the future development of the Centre to meet demands of enterprises in maintenance and repair.

On the basis of material gathered during the visits phase II of the project has been drawn up.

During the working out of a project document phase II, the project has been conciliated with all parts concerned (please see annex No. 4).

To work out a preventive maintenance plan it was necessary to undertake the following preparatory activities taking into consideration the local conditions:

- to determine repair and maintenance intervals in a preventive maintenance plan;
- to calculate on a basis of some standards the quantity of steel and non-ferrous metals and lubricants;
- to accept these standards.

The work was done.

On the basis of this material, the Preventive Maintenance Plan of the machine tools installed in the Service Centre for Repair and Maintenance for 1982/83 has been drawn up.

To fulfil this Preventive Maintenance Plan the quantity of steel and non-ferrous metals, lubricants have been calculated and listed.

Technical data on lubricants being produced in Angola were obtained from the national firm "SONANGOL" ot use it in the daily work on lubrication of equipment of the centre.

Proposals on earth system of existing equipment were drawn up to up-grade protection, and practical work in this field was done

for only the big machine-tools for there is a shortage of required materials. There was no earth system for the equipment.

After collecting sufficient material the work on earthing of the equipment will be completed.

TRAINING

A group of 14 persons to be trained was selected for electrical repair section.

The programme, in collaboration with the Angolan side, for a 48-week course was drawn up.

The course covers the following areas:

- some basic elements of mathematics;
- electrical technology;
- electrical measuring;
- technology of materials;

  etc. (please see annex No. 5).

There was organized a short course (4 weeks) for three workers on lubrication of equipment, on lubricants produced in Angola.

The workers of the mechanical repair section have being mainly on-the-job trained. In addition, since March 1932, training on designing has been undertaken for the workers. The main purpose is to train the workers to be able to read drawings and to draw simple sketches when required.

The success of the training is evident in the practical activity on maintenance and repair of both electrical and mechanical equipment being fulfilled by the Angolan workers of the newly established sections.

THE BODY OF THE REPORT

I. The Project Manager's main duties in the job description are the following:

(i) Establishment of the Centre:

(a) Assistance in the preparation of administrative and functional set-up of the centre;
(b) Assistance in the inventory, diagnosis and repair of machine tools which are collected by the Government from various factories which shall be installed in the centre;
(c) Preparation of the lay-out, power-network diagrams, etc. of the centre;
(d) Assistance to the installation of machine tools and other equipment, power lines, ware-houses, etc.;
(e) Specification of additional equipment items and accessories which are to be provided by UNIDO;
(f) Assistance in the day-to-day operation of the centre.

(ii) Services to the Industries

(a) Assistance to industrial plants to write up full physical and technical inventory of their machinery and equipment;
(b) Inventory of spare-parts which would be feasible for production by the Centre;
(c) Organizaiton and operation of spare-parts production (series production as well as special order) by the centre;
(d) Extension services to industries to establish and implement preventive maintenance programmes.

(iii) Recruitment and Training of Technical Staff

Assistance in selection and training of counterpart technical staff.

(iv) Project Management

To be responsible for all administrative and technical management functions covering UNIDO contributions and activities in the project.

(i)(a) By July 1981 this aim had been fulfilled by the Angolan side to some extent. Further development of the administrative and functional set-up of the centre will be needed.

(i)(c) Preparation of the power network diagrams was entrusted to the expert in electrical repair works. The rest of the point is fulfilled.

(i)(d) Assistance was given partly for major part of the centre's equipment had been installed.

(ii)(a) Assistance was provided at present time because of the lack of opportunity to do so. Shortage of data, documentation, absence of required specialists in factories and shortage of time were the main obstacles.

Points (ii)(b), (ii)(c) and (ii)(d) would be only partially fulfilled, since these objectives would remain during all stages of phase II. By increasing production facilities of the centre and qualifications of the workers, the effectiveness in implementing these objectives would be increased.

The remaining points have been implemented accordingly.

II. Expert in preventive maintenance (3 months)

He was expected to assist the centre in the following tasks:

- to organize and operate a mobile team of specialists who will assist industrial factories in all relevant maintenance engineering works;
- to assist industrial plants to write up full physical and technical inventory of their machinery and equipment;
- to train the counterpart staff.

Taking into consideration experience gained during the visits to the enterprises, it was decided, together with the Angolan side,:

- The first point had to be replaced by another objective, namely, to study the situation in lubrication of equipment of the centre, to prepare recommendations, to improve lubrication and to train some workers.
- The mobile shop was not available.
- The resting two objectives framed in the scale of the centre.

The referred to obligations were implemented.

III. Expert in repair and maintenance of electrical equipment

He was expected to assist the centre in the following tasks:

- to organize and operate the electrical repair shops;
- to assist industrial plants in all related electrical repair and maintenance works;
- to train counterpart staff.

All the tasks have been implemented.

UTILIZATION OF PROJECT RESULTS

As a result of all the above mentioned activities the two newly established sections (mechanical and electrical) have started practical work in maintenance and repair.

FINDINGS

1. Practical maintenance system was at a very low level in the visited enterprises. This resulted in a shortage of skilled maintenance personnel, absence of technical documentation and of any registration of breakdowns, shortage of financial resources even in major factories visited, no precautions for maintenance activity.

The lack of separate control of maintenance records and costs would not reveal the real size of the maintenance problem year after year.

2. The existing poor maintenance system in some industries could be divided into two major groups, these are in particular:

(a) control through production supervision or operator maintenance;
(b) breakdown maintenance.

The system controlled through production supervision or operation maintenance is a system largely confined to small industries where supervisors and employees possess the qualifications necessary to control and perform maintenance work and are expected to perform maintenance of their own equipment. This system of maintenance is

obviously the most elementary one and is perhaps not applicable to anything other than very small factories.

Breakdown maintenance is intended to imply that maintenance staff act only as an emergency repair service summoned by the production staff when interruption or restriction of production have actually occured.

It is obvious that in industries with modern equipment even this system can be satisfactorily operated in very special conditions and for a limited period.

This method is generally found over the long term to reduce machine availability and give a lower overall mechanical efficiency for production machinery.

3. The lack of a sufficient number of spare parts, especially complicated ones, is a great obstacle to the availability of production facilities. For instance: deterioration of the spiral gear (indicated below) of the main driver of the automatic line installed in the factory "Pepsy-Cola", Luanda, was the cause of the stoppage of the total line. There were no sufficient facilities for production of different types of gears. Usually such type of spare parts is not available in the free market, e.g. ball-bearings.

The spiral gear of the main driver of the automatic line for blotting Pepsy-Cola.

4. It took some time for the mission to settle and to adopt to the local conditions.

In this aspect UNDP in Angola and the Resident Representative, Mr. G. Asplund were very helpful.

Clearly it is of the utmost importance that experts should direct their efforts towards fulfilling their main job obligations and not others.

RECOMMENDATIONS

1. The necessity of having a maintenance engineering organization is not questioned any more by today's managements and the proper implementation of the maintenance function and the rightful place of importance which the maintenance function should occupy in an organization,is not recognized by all.

With the growing complexity of processes and equipment, and with the growing magnitude of potential losses suffered in production due to breakdowns, managements can no longer look upon the maintenance function as a subsidiary of production but as one of the main tools of planned productivity which must be effectively used to obtain the highest availability of the production equipment commensurate with the total maintenance cost.

This concept has extended the role of maintenance to include close and active contact during the design stage, full involvement in process selection and continuous co-ordination with the operation of the plant and has been responsible for modern techniques being developed to improve the performance of the maintenance function itself.

The maintenance functionwould embrace the following activities:

(a) Inspection, lubrication, repair and maintenance of all equipment.
(b) Maintenance of existing buildings and structures.
(c) Alterations to existing equipments and buildings.
(d) Installation of new equipment.

In order to fulfil those primary functions, there are a number

of secondary functions which maintenance staff of industries are called upon to perform. These are:

(a) Store keeping

(b) Plant protection

(c) Pollution and noise abatement, etc..

The above-mentioned services could be entrusted to maintenance organizations in different plants.

Consideration should also be given to the costs which a factory incurs as maintenance expenditure. Generally this cost is expressed as a percentage of the total factory budget or as a percentage of the total equipment cost at the time of installation.

The more complex the equipment the greater is the percentage of expenditure for maintenance, expressed as percentage of the equipment cost. This expenditure should be purely on the running of a maintenance organization, i.e. the expenditures on maintenance staff, maintenance materials and spare parts and overheads.

2. Gradual introduction of modern maintenance system is to be one of the main tasks of management.

The first stage in the approach to modern maintenance is scheduled maintenance. This involves joint discussion in advance by production and maintenance staff of annual production and maintenance programme. In this way the "where" and "when" of the maintenance programme can be approximately fixed and the most efficient use made of any idle time.

It is almost a rule that no piece of equipment or machinery will fall into total breakdown without having earlier shown signs of malfunctioning.

The scheduled maintenance depends on these signs rather than total stoppage. It operates on the principle of "A stich in time saves nine".

3. Detailed organization and facilities for maintenance would depend on the individual needs of industries which could be divided into the following groups:

(a) small size factories;

(b) medium size factories with relatively close-knit and type units;

(c) large factories with different type of equipment and processes.

Production of some spare parts for industries indicated in the points (b) and (c) is desirable to be incorporated in the industries themselves.

Production of spare parts (gears, some tools and tamplets, dies etc.), the production of which requires skilled personnel, special processes heat treatment, finishing), special materials and complicated equipment, should be centralized in such plants as the centre.

4. It is obvious that modern industry cannot run without skilled personnel. This is especially ture of the project mission being reported on since a maintenance engineering activity is at present the most complicated and important.

There is no question that it takes more time for maintenance skilled workers to be trained than for operators, and for establishment of sufficient maintenance facilities to meet requirements of different kinds of industries.

The project review meeting which took place in Luanda from 26-30 April 1982 positively evaluated the achievements of Phase I.

In accordance with the Government request, the DP/ANG/79/010 - project of the Maintenance and Repair Centre - US $1,000,000 being a follow-up of project US/ANG/78/209, is included in the Country Programme 1982-86.

ANNEX № I.

List of machine-shop equipment provided by the Government and installed in the Centre.

№	Machine-shop equipment	Unit	Country of origin.	Technical specification	Documentation: a- available, n- not avail..
I	2	3	4	5	6
I.	Universal Lathe GURUTZPE N2 3000	I	Spain	Max.diam.: 500 mm Max.length: 3I00 mm of workpiece machined	n
2.	Universal Lathe NCSOTTI T250/2000	2	Italy	Max.diam.: 320 mm Max.length: I400 mm of workpiece machined	n
3.	Lathe GURUTZPE B 6000	I	Spain	Max.diam.: Iooo mm Max.length: 6000 mm of workpiece machined	n
4.	Universal Lathe GURUTZPE N2 2000	I	Spain	Max.diam.: 400 mm Max.length: 2000 mm of workpiece machined	n
5.	Universal Lathe LABOR AGIPE I050	I	Spain	Max.diam.: 340 mm Max.length: I600 mm of workpiece machined	n
6.	Universal Lathe TOS KURIM SU 50A	I	CSSR	Max.diam.: 500 mm Max.length: 2000 mm of workpiece machined	n
7.	Universal Milling Machine TOS KURIM FHK-25	I	CSSR	Dimensions of the table: 290 x I250 mm	n
8.	Universal Milling Machine LAGUN VD6	I	Spain	Dimensions of the table: 350 x I600 mm	n
9.	Universal Milling Machine LAGUN VD-6A	I	Spain	Dimensions of the table: 350 x I600 mm	n
I0	Radial Driller CSEPEL PF 22/B	I	RPH	Max.diameter of drilling: 40 mm	n
II.	Boring Machine TOS H-63A	I	CSSR	Dimensions of the table: 900 x 800 mm	a
I2.	Boring Machine JUARISITI	I	Spain	Dimensions of the table: I000 x 800 mm	n
I3.	Boring Machine CERUTI ABC 75	I	Italy	Dimensions of the table: I000 x 800 mm	n
I4.	Shaping Machine SEPA LE-600	I	Spain	Dimensions of the table: 530 x 530 mm	n

1	2	3	4	5	6
15.	Shaping Machine CEMAF	I	Portug.	Dimensions of the table: 700 x 400 mm	n
16.	Surface Planer TOS HOBLM HD - 12 BFL	I	CSSR	Dimensions of the table: 1100 x 4200 mm	a
17	Surface Planer MAS HD 120-FZ	I	CSSR	Dimensions of the table: 685 x 3360 mm	n
18	Gear Cutting Machine CELTA C-2	I	Spain	Max.diameter of the processing: 250 mm	n
19	Slotting Machine MAS HOV 25A	I	CSSR	Motion of the slotter: 320 mm	n
20	Press H-100	I	Sweden	Max.power: 100 T	n
21	Press WITCO	I	-	Max.power: 100 T	n
22	Gate Shears D-3	I	Germany	Max. thickness of the cut: 2 mm	n
23	Gate shears	I	-	Max. thickness of the cut: 6 mm	n
24.	Hack-Saw Machine SEGATRICI	I	Italy	Max.diameter of cut: 350 mm	n
25.	Roll-Bending Machine	I	-	Dimensions of the bar: 2000 x 10	n
26.	Bench Grinding Machine	I	-	Rotation: 3000 rot/min	n
27.	Bench Grinding Machine	I	Italy	Rotation: I -1400 rot/min II -2800 rot/min	n
28.	Bench Grinding Machine PEUGEOT TM200IC	I	France	Max.diam.of the circle:200mm Rotation: 3000 rot/min	n
29.	Bench Grinding Machine	I	-	-	n
30.	Sawing Machine	I	-	Max.diam.of cut: 300 mm	n
31.	Vertical Drilling Machine PEUGEOT PS 23,01 x B	I	France	Max.diam.of drilling: 23 mm	n
32.	Bench Grinding Machine PEUGEOT TM 30,01C	I	France	-	n

Note: In addition to this 31 pcs of different types of machine tools are installed in the training school of the Centre.

ANNEX Nº 2.

LIST OF FACTORIES

WHERE MAINTENANCE AND REPAIR SERVICES WERE GIVEN

1. AVILA - Electric Cable Factory
2. CORAL - Paint Factory
3. IARPUL - Flourescent Lamp Frame Factory
4. FABAL - Furniture Factory
5. EMPAM - Industrial Bakery in Luanda
6. DECORANG - Paint Factory
7. DINAUTO - Secretaria de Estado
8. C.E.E.L. - Milck Factory

ANNEX Nº 3.

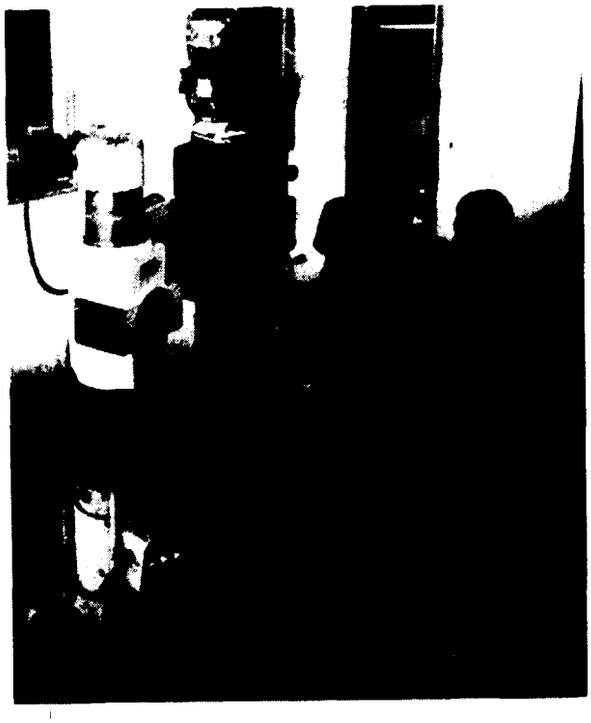
I. Shaping Machine SEBA LE-60 installed in the Centre. Hydraulic system of the machine had been repaired.

2. The Paint-Mill Machine from factory of pigments is under reparation in the newly established section's area.

3. Roll-Bending Machine. Major repair works had been done.
After repair the machine was installed and commissioned in the Centre.

4. The sawing Machine had been repaired and now is under unloaded test.

5. The wood processing machine had been assembled from the parts both available in the Centre and newly produced in the Centre based on drawings designed.



6. The Radial Drilling Machine had been repaired for another factory. The customer had brought the machine to the Centre two years ago. The device of the spindle of the machine had been modernized.

7. Some devices of the Surface Planer MAS HD I20-F2 CSSR had been repaired.

8. The Lathe "GURUTZPE" Spain had been repaired.

ANNEX Nº 4.

DATE	SUBJECT	PARTICIPANTS	DECISION
1	2	3	4
24 July I98I	Office of SIDFA Consideration of the Total volume of the Budget for the Phase II.	SIDFA - N.Krainov Director of the Centre (EMIN) - M.Subtil CTA - N.Khalilulin	Taking into consideration that the formulation of the proposals for the Phase II were done in I978 it is recommended to work out the Project Document with a Budget more than I 000 000 US$ but not more than I 500 000 US$.
25 Sept. I98I	The Centre on Maintenance and Repair (EMIN). Analizing the draft proposals on the Phase II with the Budget amounting to US$ I 500 000.	SIDFA - N.Krainov Director of the Centre - M.Subtil Técnico Superior de Departamento dos Organismos Internacionais - Kayombo Zeca Técnico Superior de Departamento de Análise e Acompanhamento de Projectos - Mbala R.Fernando CTA - N.Khalilulin Expert - P.Savino Expert - V.Nechiporenko	The draft proposals have been accepted. CTA N.Khalilulin should complete the Project in accordance with analised proposals.
I2 Oct. I98I	Office of SIDFA Report on the course of the Project documentation development.	SIDFA - N.Krainov CTA - N.Khalilulin Interpr.- A.Pravdzivyi	N.Khalilulin was informed that for the Phase II US$ I 000 000 had been provided.

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1	2	3	4
2 Nov. I98I	Ministry of Industry. Office of the National Director. Consideration of the early discussed proposals on the 25-th September I98I.	National Director of Heavy Industry of the Ministry of Industry - Henriques da Silva. Director de Intercambio Internacional - José Pedro Júnior. Director of the Centre (EMIN) - M.Subtil SIDFA - N.Krainov. CTA - N.Khalilulin.	It was recommended the following: - UNDP input is US$ I 500 000; UNDP input could be consist of: - a convertible part - US$ I 000 000; - a non-convertible part - US$ 500 000. CTA was recommended to budget in the Project US$ I 500 000 and to complete the Project Document in accordance with this requirement
I3 Nov. I98I	Ministry of Industry. Office of the National Director. Looking through the work plan and the Budget of the Project.	National Director of Heavy Industry of the Ministry of Industry - Henriques da Silva. Director of the Centre (EMIN) F.A.Guedes. CTA- N.Khalilulin. Interpr.- A.Pravdzivyi.	The technical policy of the Project has been accepted. Once more the need of the Project with the Budget amounting to US$ I 500 000 has been emphasized. CTA has been recommended to complete the Project Document within indi ated framework.
I4 Dec.	The Project Document in IO copies has been handed over to SIDFA.		
22 Dec.	The Centre on Maintenance and Repair (EMIN). Summarizing the activity in the Project Phase I for the past period and consideration further actions to be taken in order to ensure a proper continuation of the Phase I.	Resident Representative - G.Asplund. SIDFA - N.Krainov. SIDFA's assistent - A.Tchecaya. Director of the Centre (EMIN) - Deputy Director - Carvalho. CTA - N.Khalilulin. Expert - P.Savino Interpr. - A.Pravdzivyi.	The work was well done. In order to ensure a proper continuation of the Phase I it was recommended: -CTA should work out a project document (the first part for I982-I983) with Budget equal to US$ 391200; -The Document should be handed over to UNDP not later than January I982.

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1	2	3	4
11 Jan. 1982	The Project Document with the Budget equal to US$ 391 200 has been passed on. NOTE: At present the Project Document is approved. UNDP in Angola by the letter of 23 February 1982 has sent the Advance Authorization Document to UNIDO for the purchase of a mobile workshop and US$ 20 000 for purchase of some other equipment.		
6 Apr. 1982	Ministry of Industry. Office of the National Director. Consideration of the Project Document Phase II, Stages I and II, and their Budget.	National Director of Heavy Industry of the Ministry of Industry - Luis Riveiro. Director of the Centre (EMIN) - F.A.Guedes. CTA - N.Khalilulin. Expert - P.Savino. Interpr.- A.Pravdzivyi.	To prepare by 28.04.1982 final proposals on the Stages I and II of the Project DP/ANG/79/010 in the lite of Angolan side requirements.

ANNEX N° 5.

TRAINING COURSES

Subject	Duration	Date started	Date completed	Number of participants
1. Mathematics Basic elements.	120 h	28.09.81	18.12.81	14
2. Electrical Technology.				
- Ohm's law	30 h	12.09.81	30.10.81	12
- series-parallel resistances	30 h	03.11.81	20.11.81	12
- Joule's law	30 h	23.11.81	11.12.81	12
- circuits basic	28 h	14.12.81	31.12.81	12
- power	20 h	04.01.82	11.01.82	12
- basics on transformers, mono and three phases motors	100 h	11.01.82	19.03.82	12
3. Electrical Measuring.				
Measurement of current, tension, power and electrical resistance	138 h	12.09.81	11.01.82	12
4. Technology of Materials				
Copper, tin, zinc, lead and principal isolating materials	25 h	11.01.82	19.03.82	12
5. Electrical circuits	150 h	11.01.82	19.03.82	12
6. Winding	380 h	08.02.82	14.05.82	12
7. Practical Training.	230 h	11.01.82	contin.	12

ANNEX № 6.

LIST OF EQUIPMENT AND MATERIALS
RECEIVED FOR THE PROJECT BY 1 JULY 1982.

1. Two vehicles "Brasilia" of VOLKSWAGEN type.
2. Office stationary (for US$ 2 000 approx.).
3. Varnish and dilutions for varnishing insulated copper (for US$ 2 400 appr)
4. Some measuring instruments and materials for electrical repair section (for US$ 2 500 approx.).

ANNEX Nº 7.

PROJECT STAFF	FROM - TO	COUNTERPARTS
II-01		
Chief Technical Adviser	July 1981	Director of the Centre EMIN
Mr.N.Khalilulin	Nov. 1981	Mr. M.T.Subtil
	Nov. 1981	Director of the Centre EMIN
	July 1982	Mr.F.A.Guedes
II-02		
Expert in Preventive Maintenance	Sept.1981	Chief of the Technical Department
Mr.V.Nechiporenko	Dec. 1981	Mr.F.Pires
II-03		
Expert in Repair and Maintenance of Electrical Equipment	Sept.1981	Deputy Director of the Centre EMIN
	Nov. 1981	Mr.F.A.Guedes
Mr.P.Savino	Nov. 1981	Chief of Mobile Teams of the Centre
	July 1982	Mr. F.J.de Carvalho