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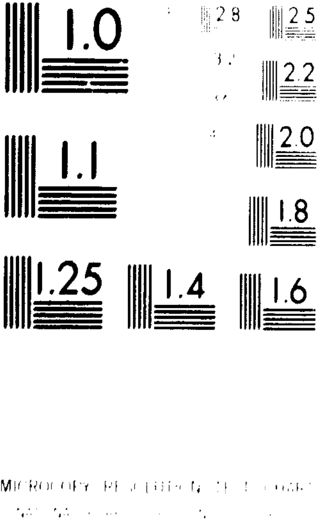
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(1 of 3)

ASSESSMENT OF THE PRESENT CAPACITY OF THE METALWORKING INDUSTRY IN ANGOLA AND PROJECTION TO EXPAND THIS INDUSTRIAL SECTOR

FINAL REPORT

VOL I: MEMORANDUM

TECNIBERIA

MADRID - SPAIN

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

ASSESSMENT OF THE PRESENT CAPACITY OF THE METALWORKING INDUSTRY IN ANGOLA AND PROJECTION TO EXPAND THIS INDUSTRIAL SECTOR

FINAL REPORT

VOL I: MEMORANDUM

UNIDO PROJECT NO. DP/ANG/80/007

CONTRACT NO. T 81/35/IS

TECNIBERIA

April 1982

This final report was prepared by a Tecniberia team of experts composed of the following persons, listed in alphabetical order:

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SUMMARY

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1. INTRODUCTION

1.1. BACKGROUND

This ~~three~~-volume report (Annexes and Drawings), corresponds to TECNIBERIA's contract with UNIDO to make an analysis of the actual production capacity of the metal-mechanics industry of the People's Republic of Angola, in light of future plans to expand this industrial sector (Contract No. T81/35/IS Project No. DP/ANG/80/007).

The objectives of the task are the following:

a) Analyze the present state of the metal-mechanics industry, as well as existing repair facilities, training levels of staff, facilities, equipment, and machinery, type of products manufactured, existing repair and maintenance services, etc.

b) Based on the afore-mentioned analysis, to develop concrete plans to increase local manufacturing, repair and maintenance volume in a systematic way. Said plans should include staff training, additional facilities, and specialized experts.

1.2. CARRYING OUT THE TASKS

1.2.1. Collecting the information

The analysis of the present state of the metal-mechanics industry has been made based on information gathered by a two-member team, who were in the People's Republic of Angola for one and a half months, and visited a total of 30 firms located in the provinces of Luanda, Huambo, and Benguela, with the following breakdown:

LUANDA:	15
HUAMBO:	8
BENGUELA:	7
TOTAL	30

The selection of the firms was made by the Ministry of Industry, acting directly through the National Direction of Heavy Industry for the firms located in Luanda, and through the Provincial Delegate's offices for the firms located in the provinces of Huambo and Benguela.

The greatest problem encountered by the TECNIBERIA team was that of an almost total lack of statistics, both in general regarding statistics about material imported, and specifically at individual firms. This fact hindered them in making a detailed study of current and future demands for raw materials, products and accessories needed for the metal-mechanics industry based on statistical information for this sector. The information gathered in these areas is based on first-hand study of the firms.

From a financial point of view, the analysis is by necessity incomplete, since many of the firms visited do not keep a record of manufacturing costs, or only keep a partial record. In general, the only records available are those of salary costs, with no information for raw material and other costs.

1.2.2. Analysis of the information and criteria necessary to carry out the tasks

The metal-mechanics firms visited have very different characteristics in regards to the type of products manufactured, production capacity, legal status, dimensions, and number of productive units making up each firm.

In order to make a coherent analysis of the firms, they have been grouped together into subsectors according to the type of products manufactured. This analysis deals principally with the firms in each subsector taken into consideration as a group.

The scope for developing the plans to increase production at the firms is different for those firms with only one productive unit with specific problems, than for those with several productive units in which some problems occur more frequently than others.

While concrete solutions are apparent for the firms of the first type, firms in the second group will require more in-depth technical and economic studies before definitive solutions can be found.

The legal status of each firm has been mentioned, where applicable.

1.3. CONTENTS OF THE REPORT

This report consists of three volumes:

VolumeI (Memorandum) is made up with six sections:

Section 1: Taken up by the present introduction.

Section 2: Devoted to conclusions and recommendations.

Section 3: Analysis of the technical, economic, and management aspects of the metal-mechanics firms visited.

Section 4: Projected technical assistance plans for the re-organization, transformation, and expansion of existing facilities. For co-ordination and assistance in carrying out these plans, the creation of an Engineering Department has been proposed. Its objectives and suggested set-up are also included.

Section 5: Most revelant information about the new dies and special tools Center that has been proposed.

Section 6: Project documents corresponding to the Engineering Department and Dies and special tools Center proposed in Sections 4 and 5 respectively.

Volume II (Annexes 1 and 2) contains two annexes which respectively summarize the information collected from the firms visited and tables.

Volume III (Drawings) contains drawings and charts.

The tables and diagrams are numbered according to the part in which they are referred to; an independent order having been established for the tables and diagrams of each section.

The economic statistics are represented in U.S. dollars and in Kwanzas. The official exchange rate during the team's visit to the People's Republic of Angola was $1 = 29.62 Kwanzas (Kz).

2. SUMMARY AND CONCLUSIONS

2.1. GENERAL ASPECTS OF THE COUNTRY

In order to point out and explain certain aspects connected with the currently-existing problems of the firms visited, a list of general circumstances of the country follows:

1. Before gaining independence, Angola had a very high level of industrialization in comparison with other African countries.

2. The presence of the Portuguese in Angola before de-colonization was a very important factor. They held not only all the administrative and technical positions, but nearly all the skilled labor positions as well. Nearly all of the Portuguese have now left the country.

3. The firms reached maximum production levels in 1973; from that time on, production dropped sharply, and at some firms came to a complete halt, although little by little these firms have been put into operation again.

4. There are still not enough sufficiently-trained people country to cover the multiple needs at all levels.

5. In order to partially solve the problem of lack of technical staff, some qualified foreign advisory staff have been contracted, as consultants.

6. the need for qualified staff is much greater than shat the foreign consultants who have already been contracted can handle.

7. At the present time, the government is making a great effort to improve the literacy rate of the country, with good results.

8. As far as professional training is concerned, little has been done as yet, even though there are some centers connected with the firms and with the Ministry of Education.

9. In the metal-mechanics sector, the training centers of EMIN (Luanda), F.MUTEKA (Huambo), and SOREFAME (Lobito) were visited.

10. Higher education programs exist for mechanical, civil, mining, electro-technical, and chemical engineering. However, these programs requiere several years for experienced high-level technicians to be trained.

11. In order to accelerate training and gain experience, there are 4000 people who currently have grants to study abroad. The conditions of these grants vary.

12. In light of the great difficulties of the country, it will be several years before the problems of training specialized workers are solved.

13. The financial resources of the country are very limited; for this reason, foreign purchases are restricted, and it takes anywhere from months to years to obtain authorization for these purchases.

14. A result of the civil war, and of guerrilla activity (still a problem in the country) has been the partial destruction of internal transport ways, specially the railroads, which are practically in disuse at the present time.

15. The Port of Luanda is supersaturated, with unloading delays that can sometimes be more than six months. This situation greatly influences the supply of raw materials and imported components.

2.2. PRESENT SITUATION OF THE METAL-MECHANICS FIRMS

1. 30 firms, with their productive units, were visited (a total of 52 plants). Total staff numbers 5540.

   The visits took place in Luanda (15 firms, 2837 employees), in Huambo (8 firms with 909 employees), and in Benguela (7 firms with 1794 employees); however, 911 employees in Benguela work at the shipyard, which does not enter into the scope of this project.

2. The firms visited have been divided into 9 different groups, according to the type of business activity involved:

   - Metal furniture
   - Aluminum kitchenware
   - Metal containers (cans, drums and cisterns), and bottle caps
   - Bicycles and motorcycles
   - Screws and nails
   - Foundry
   - Equipment manufacture and repair
   - Farming tools
   - Other busines activities

   a) The metal furniture manufacturing group is made up of 5 firms with 22 different productive units and 1,413 employees. Average invoicing per person per month is 19,308 Kz.

      These units produce different types of furniture, with an estimated actual production of 110,000 items per year, equivalent to 48% of the yearly planned production figure.

There are only two units with an organized work system and adequate equipment.

The specific problem of this subsector stems from the fact that the productive units are widely scattered geographically.

b) In the subsector for aluminum kitchenware manufacture, information has been collected from 5 units, which have a total of 270 employees and have an average invoicing figure of 23,754 Kz per person per month.

Actual production is 247 tons per year of aluminum kitchenware, equivalent to 45% of annual planned production, and 36% of annual production capacity.

c) The group of metal container and bottle caps manufacturers is made up of: 2 firms which manufacture cisterns, 3 units belonging to 2 firms, which make cans and steel drums, and 1 firm which makes bottle caps. There are a total of 780 operators, and average invoicing is 29,173 Kz per person per month.

One of the firms which manufactures cisterns is very modern; this firm alone will be able to handle all of the country's market demand for this product when it reaches full production levels in 1982.

Actual production for small tin cans is 53% of planned production and 45% of production capacity. Actual production for large tin cans is 34% of planned production and 29% of production capacity.

The firm which makes bottle caps produces them at a rate of 62% of production capacity, and 100% of planned production.

Specific problems in the manufacture of cans, and bottle caps are those related to the fact that the machinery and equipment are very old, with frequent breakdowns.

d) There are two factories which handle the manufacture and assembly of bicycles and motorcycles, in Luanda and in Huambo, with a total of 564 operators. Average invoicing is 53,557 Kz per person per month.

3,600 bicycles are manufactured per year, equivalent to 11% of production capacity and 60% of planned production.

8,800 motorcycles are assembled per year, equivalent to 54% of capacity.

Specific problems: one of the factories is shut down because of a lack of equipment, and the second suffers from outdated technology and very old-fashioned equipment.

e) For the manufacture of nails and screws, there are two firms with 99 employees and an average invoicing figure of 81,300 Kz per person per month.

336 tons per year of screw products are manufactured, equivalent to 15% of production capacity and 57% of planned production.

Nail manufacture reaches 1,320 tons per year, equivalent to 68% of production capacity and 88% of planned production.

The basic specific problem is a lack of machinery needed to complete the range of products manufactured.

f) There are 8 firms which handle ferric and non-ferric foundry with 179 employees and an average invoicing figure of 13,480 Kz per person per month. There is an already-existing UNIDO project specifically for this subsector.

Actual production is estimated at 800 tons per year, equivalent to 20% of production capacity.

An important problem in this subsector is the fact that one of the major foundries has been shut down since it was set up.

g) Three firms in the area of equipment manufacture and repair were analyzed; these firms have a total of 478 employees and an average invoicing figure of 21,200 Kz per person per month.

Repair capacity expressed in hours per year, is estimated at 505,000 hours; at the present time only 27% of these hours are actually utilized.

One of the firms in this group is the object of an expansion project.

h) There are 5 firms which manufacture farming tools and implements, employing 326 people.

These firms manufacture plows, plowshares, and hoes, with an annual production fo 5,499 plows (50% of planned production), 43,150 plowshares per year (80% of planned production), and 252,000 hoes per year (88% of planned production). Present production rates fall far short of the country's needs for the next few years.

i) In the miscellaneous group, there are 10 firms with a wide range of product manufactured. These firms employ 818 people, and have an average invoicing figure of 40,548 Kz per person per month.

The most important products manufactured by this group are welded pipes, and pumps.

Specific problems: in the welded pipe area, a lack of manufacturing equipment for water pipes, and in the pump area, a lack of modern technology and quality control means.

3. Common to all the firms in the sector are the problems concerning lack of raw materials, lack of skilled, qualified personnel, lack of technology and equipment, and lack of dies, special tools, and spare parts.

2.3. PROPOSED TECHNICAL ASSISTANCE PLAN

1. The specific technical plans have been arrived at based on a study of the specific problems of each subsector, and are as follows:

   a) Metal f..niture. A technical-economic planning study is needed in order to regroup these roductive units.

   b) Aluminum kitchenware. No special assistance is needed, except the solution of the raw material supp.y problem.

   c) Metal containers. The firm which makes tin cans and bottle caps needs new equipment.

   d) Bicycles and motorcycles. A prior facility analysis and rehabilitation study is needed in order to arrive at a solution for this subsector's problems.

   e) Nails and screws. For this subsector, the solution lies in obtaining additional equipment in order to increase the range of products manufactured, which at the present time is insufficient.

   f) Foundry. The shut-down foundry should be put into operation, by means of the currently-existing UNIDO project.

   g) Equipment manufacture and repair. There is also a specific UNIDO project aimed at expanding one of the firms. the experience obtained during the course of this project should be applied to the rest of the firms.

h) Farming tools and implements. The governing Party has specific plans to strengthen this industrial activity. The consequences of these plans should be analyzed, especially at the firm which is best equipped to handle this program.

i) Other sectors. The basic steps to be taken are the installation of equipment for the manufacture of water pipes, and the installation of a testing bench for water pumps.

2. The solution of general problems common to all the firms (such as raw material supply, staff training, and technology) can be achieved by means of an Engineering and Consulting Department, within the Ministry of Industry.

   This department must also handle the specific plans for the firms in each subsector, in such areas as forming the plans, co-ordination, and technical assistance in carrying these plans out.

3. Another problem which is shared by practically all of the firms is a lack of dies, special tools, and special spare parts. The solution of this problem lies in the creation of a Manufacturing Center specializing in these components.

3. ANALYSIS OF THE INDUSTRIES VISITED

3.1. SELECTION OF THE FIRMS

The selection of the firms to be analyzed was the responsability of the Ministry of Industry of the People's Republic of Angola, through the following government organizations:

- Firms located in Luanda: Selected by the Technical Department of the National Administration of Heavy Industry.

- Firms located in Huambo and Benguela: Selected by the Provincial Delegate's Office of the same Ministry. In summary, TECNIBERIA'S work team visited a total of 52 units, with the following breakdown:

Metal-mechanics firms:	45 units
Firms in other sectors:	2 units
Maintenance and repair centers:	4 units
Staff-training centers	1 unit
Total..................	52 units

These 52 units are distributed among 30 firms, with the following breakdown:

LUANDA	15 firms
HUAMBO	8 firms
BENGUELA	7 firms
TOTAL	30 firms

The information gathered from the firms visited is summarized on the statistics sheets in appendix 1. The firms have been grouped into 9 categories, according to their business activities, classified as follows:

GROUP	BUSINESS ACTIVITY
1	Manufacture of metal furniture
2	Manufacture of aluminum kitchenware
3	Manufacture of metal containers (cans, drums, and cisterns),and bottle caps.
4	Manufacture and/or assembly of bicycles and motorcycles.
5	Screw and nail manufacture
6	Iron and non-ferric foundry
7	Manufacture and repair or maintenance of equipment.
8	Manufacture of farming tools and implements.
9	Other business activities

In table 3.1., the business activities of the units and firms visited are summarized. Obviously, because of the fact that there are some firms, and even some units, whose activities encompass two or more different areas, the number of the units and firms visited (52 units belonging to 30 firms) does not match the total that appears in table 3.1. (70 units belonging to 47 firms).

In the following section, the most significant technical, management, and financial aspects of these firms are analyzed; for this reason, they have been grouped into the above-mentioned 9 categories.

3.2. TECHNICAL ASPECTS

3.2.1. Manufacture of metal furniture

3.2.1.1. Composition of the group

The group comprising the metal furniture manufacturing firms is made up of the following entities:

Location	Firm	Unit	No. of workers
Luanda	EPMEL	SERRALHARIA ANGOLANA FAGOL IRMAOS RIBEIRO LINHA DE MONTAGEM	127
	ENMEL	EDAL SADIL FAMA INDUSTRIAL ANFIBAR M. VALENTE ROULOTES MAQUINAG FANCOL PADINHA GUIMADEX	1.007
Luanda Subtotal	2	14	1.134
Huambo	UNIDADE METALICA	OASIS INDUSTRIAL METALURGICA METALURGICA DO PLANAO B.LOPES MARQUES SERRALHARIA ANGOLANA SERRALHARIA JOTAL	153
Huambo Subtotal	1	6	153
Benguela-Lobito	LUMEL (Lobito) INDUMEC (Lobito)	LUMEL INDUMEC	126
Lobito Subtotal	2	2	126
TOTAL	5	22	1.413

3.2.1.2. Facilities and equipment

Those units devoted to the manufacture of metal furniture produce a variety of different kinds of furniture, ranging from all-metal products (such as beds, military bunks, wardrobes, etc) to furniture with non-metal components (tables, chairs, etc) and even those which are made completely of non-metal components (armchairs, easy chairs) manufactured in the adjoining carpentry, upholstery, and finishing sections.

The equipment that is normally used consists of sheet-cutting shears, sheet or pipe-cutting saws, bending presses (for sheet), pipe-bending machines, welding outfits (nearly all are electric), and a painting division.

Although this list is not complete, the following machinery and equipment have been accounted for in this area:

Cutting shears: 18
Presses and bending machines: 50
Welding outfits: 86

3.2.1.3. Production capacity

Production capacity varies from one unit to the next as far as the kind of goods manufactured and as far as the degree of automation involved in the different steps that make up the manufacturing process are concerned.

Based on the figures for actual and planned production, it can be estimated that this area currently produces an average of 110,000 units per year, with a 48% output. The breakdown by provinces is as follows:

Province	% ouptut
Luanda	42
Huambo	84
Benguela	65
Total	48

3.2.1.4. Raw Materials

The principal metallic raw materials are imported steel sheet (thicknesses of 0.50 to 1.25 mm), steel angles and bars, 30 x 3 mm. (also imported) and piping (½" to 3/4") (usually domestic, from FATA). Based on the above-mentioned average production of 110,000 units per year, estimated raw material requirements are as follows:

Steel sheet: 740 tons per year
Steel angles and bars: 1,900 tons per year
Steel pipe: 780 tons per year

Large amounts of plywood, synthetic leather, and fabrics are used as well.

3.2.1.5. Labor

In this area, labor is basically unskilled; there is a shortage of specialists and middle-management personnel.

A total of 1,413 people work in this area, broken down by provinces as - follows:

Province	No.of people	%
Luanda	1,134	80
Huambo	153	11
Benguela	126	9
Total	1,413	100

8% of these employees are administrative staff, while the rest work in the manufacturing area.

3.2.1.6. Manufacturing techniques

Of the 15 units visited, only in two of them (FAMA INDUSTRIAL in Luanda and LUMEL in Lobito) was there an organized step-by-step manufacturing process, with adequate equipment and roomy building facilities. The rest of the units are based principally on manual production, and some even have a lack of space for storing raw materials and partially-finished products.

3.2.2. Manufacture of aluminum kitchenware

3.2.2.1. Facilities and equipment

Of the 4 units visited, three of them (METALVI, SIAL, and SOALUMINIO) manufacture aluminum kitchenware and household furniture, using a manual process of sheet turning. The fourth (JOBA) makes aluminum kitchenware using a sand casting process. METALVI also manufactures aluminum plates by a countersinking process. SIAL and JOBA have fuel-oil smelting furnaces for sheet cuttings to use in sand-casting the handles used on different kitchen utensils.

3.2.2.2. Production capacity

The average weight of the different utensils manufactured varies, from 90 g. for the plates, to from 5 to 20 Kg, for the pots and pans.

The production capacity of the 4 units visited, plus that of a fifth unit in Luanda (STAMEL, which belongs to the ENMEL group) is estimated at 657 tons of aluminum per year, equivalent to 1,500,000 items per year (based on an estimated average weight of 440 g. per utensil). The breakdown of this combined production capacity is as follows:

METALVI	400 tons per year
SIAL	50 tons per year
STAMEL	75 tons per year
JOBA	60 tons per year
SOALUMINIO	72 tons per year
Total...........	657 tons per year (54.75 tons per month)

Planned and actual production, expressed in tons per month and calculated as average figures for the period of January to September, 1981, were as follows:

	Planned production tons per month	%	Actual production tons per month	%
METALVI	33,3	71	8,7	42
SIAL	3,0	7	2,7	13
STAMEL	2,6	6	3,0	15
JOBA	3,0	7	2,3	11
SOALUMINIO	4,2	9	3,9	19
Total	46,1	100	20,6	100

In other words, actual production output is 38% of production capacity and 45% of planned production.

3.2.2.3. Raw Materials

The principal raw material used is aluminum sheet, with thicknesses from 0.5 to 1.9 mm.

3.2.2.4. Labor

A total of 270 workers are employed in this area; none of them are technicians or qualified staff (holders of academic degrees). The breakdown by provinces is as follows:

Province	No.of workers	%
Luanda	210	78
Huambo	60	22
Benguela	-	-
Total	270	100

3.2.2.5. Manufacturing techniques

Included among these techniques is the sheet-cutting process, which is done manually with shears, followed by manual shaping of the cut aluminum sheet on lathes. The last step is to fit handles onto those utensils which need them. This process is the same at the METALVI, SIAL, STAMEL, and SOALUMINIO units; at JOBA, large pots and pans are sand cast.

3.2.3. Manufacture of metal containers (cans, cisterns and drums) and bottle caps.

3.2.3.1. Composition of the group

The following firms are included among those that manufacture metal containers:

Location	Firms	Products manufactured	No.of workers
Luanda	CAPSUL	Bottle caps	51
	METANGOL EMB.VAN LEER	0.5 to 5 liter cans 25, 50 and 200 liter steel drums	220 80
	SOMETAL COMETA II	Cisterns,up to 20 m^3 Cisterns,from 5 to 60 m^3	91 150
Subtotal Luanda	5		592
Benguela	METANGOL	1/4 to 5 kg. cans	279
TOTAL	6		871

The COMETA II plant is very modern (operations began in May, 1981); the assembly and actual putting into operation were done with French technical assistance.

The rest of the plants are very old.

.2.3.2. Facilities and equipment

For the manufacture of cans, steel drums, and cisterns, the following machinery and techniques are used: Sheet-cutting equipment, contour machines (for shaping the container or cistern), lengthwise welding, and welding or edging the bottoms. Prior to the manufacture of the cans, the tinplate is photolithographed and varnished.

CAPSUL uses tinplate varnished at METANGOL (Luanda), and makes the bottle caps by using a press; cork liners are put in later.

.2.3.3. Production capacity

The range of metal containers manufactured at the different units visited is as follows:

CAPSUL: Bottle caps, 26 and 29 mm. Ø

METANGOL: (Luanda) Cans ranging in size from 1/4 to 5 liters (for oil, varnish).

METANGOL: (Benguela) Cans ranging in size from 1/4 to 5 kg. (for tomatoes, pineapple).

EMB.VAN LEER: Steel drums (25, 50 and 200 liter)

SOMETAL: Cisterns and tanks, up to 20,000 liters

COMETA II: Cisterns, up to 60,000 liters

The 1981 statistics (annual) for production capacity, planned production, and actual production, and the projected figures for 1982, are as follows:

Product	Production Capacity	Planned Production	Actual Production	% of capacity	% of planned production
Cans (units per year)	11.310.000	9.570.000	5.111.000	45	53
Steel drums (units per year)	435.000	369.600	125.082	29	34
Cisterns (m^3 per year) (1)	34.000	23.800	17.000	50	71
Bottle caps (units per year)	300.000.000	180.000.000	186.000.000	62	103

(1) Projected figure for 1982.

3.2.3.4. Raw Materials

a) Manufacture of cans and bottle caps: Tinplate, 0.20 to 0.25 mm. thick.

b) Manufacture of drums: Steel sheet, 0.5 to 1 mm. thick.

c) Cisterns: Steel sheet, 5-6 mm thick

3.2.3.5. Labor

Only COMETA II has technical staff specially trained for this area. The combined number of people employed for this business activity is 780, with the following breakdown by provinces:

Province	No.of workers	%
Luanda	501	64
Huambo	-	-
Benguela	279	36
Total	780	100

11% of these are administrative personnel, and the rest work directly in production.

3.2.3.6. Manufacturing techniques

COMETA II has 2 production lines, made up of sheet cutting and bending machines, and continuous welding machines using copper wire.

The rest of the facilities are very old--in some cases the machinery and equipment date back to 1963. This means that the manufacturing processes, which are very similar for the production of cans and steel drums, is often interrupted by breakdowns. The same problem exists in the manufacture of bottle caps; of the original 14 machines used to put in the cork liners, only 7 are left the rest are irreparably damaged.

3.2.4. Bicycles and motorcycles

3.2.4.1. Facilities and equipment

Of the two factories in the country (FABIMOR in Luanda-SUZUKI permit, and ULISSES in Huambo-YAMAHA permit), the former currently manufactures bicycles and assembles motorcycles, while the latter only handles motorcycle assembly.

A great deal of equipment and machinery is needed for the manufacture of bicycles, especially lathes, milling machines, presses, drills, saws, welding outfits, grinders, and painting and chrome-plating equipment. At FABIMOR there are a total of 235 machines, of which 207 are in good condition, 25 are damaged but reparable, and 3 are damaged beyond repair.

Both at FABIMOR and ULISSES, the motorcycles are assembled from imported parts, and then painted. The machinery and equipment used includes spot-welding outfits, painting equipment, and chrome-plating equipment.

3.2.4.2. Production capacity

a) Bicycles (units per year), based on 1980 statistics

	capacity	planned production	actual production
FABIMOR	22,000	6,000	3,600
ULISSES	11.500	-	-
TOTAL	33,500	6,000	3,600

b) Motorcycles (units per year), based on 1980 statistics

	capacity	planned production	actual production
FABIMOR	2,600	2,000	1,800
ULISSES	13,700	8,000	7,000
TOTAL	16,300	10,000	8,800

3.2.4.3. Raw materials

a) Bicycles: Calibrated pipe, metal flats, and imported accessories.

b) Motorcycles: Nearly all parts are imported from Japan

3.2.4.4. Labor

FABIMOR has a total of 217 employees, of which 9 are technicians (electricians, mechanics, milling-machine operators, and designers).ULISSES has a total of 347 employees, of which 20 are production foremen; their staff have YAMAHA qualifications.

3.2.4.5. Manufacturing techniques

a) Bicycles are manufactured entirely at the FABIMOR factory.The frame welding process is very antiquated (inmersion in molten bronze), as is the process of manufacturing the wheels (from metal bands). At ULISSES, manufacture has been suspended because of a lack of needed machinery.

b) Motorcycles

At both plants, motorcycles are manufactured from parts.

ULISSES is installing presses for stamping fuel tanks and frames; the objective of this plan is to import only engines by the end of 1982.

3.2.5. Screws and nails

3.2.5.1. Facilities and equipment

Both factories visited (CODUME in Huambo and LUPRAL in Benguela base their manufacture on rod for wire-drawing, and screws and nuts are made by a cold stamping process, which does not produce metal shavings. Threading is done later by rolling (for the screws), and on a nut-tapping machine (for the nuts).

The principal equipment at both plants is the following:

CODUME:
- 2 wire-drawing outfits
- 5 automatic cold presses
- 1 annealing furnace
- 1 hardening furnace (in water and in oil)
- 1 set of galvanizing and phosphating equipment lathes, milling machines, threading machines

LUPRAL:
- 2 wire-drawing outfits
- 3 automatic cold presses
- 2 threading machines
- 1 set of equipment for thread-rolling
- 9 nail-making machines
- cleaning and nickel-plating facilities

3.2.5.2. Production capacity

The statistics of CODUME are expressed in units of weight, while those of LUPRAL are expressed in number of units manufactured. Using 30 g. per unit as the average weight of the screw, nut, and washer group with measures ranging from M3 to M14, both factories have the following production capacities and actual production (tons per year and tons per month).

	Production capacity		Planned Production		Actual production	
	t/yr	t/mo	t/yr	t/mo	t/yr	t/mo
a) Screws						
CODUME	1.970	165	509	42.4	264	22
LUPRAL	300	25	252	21.0	72	6
Total	2.270	190	761	63.4	336	28
b) Nails						
LUPRAL	1.950	160	1.500	125	1.320	110

3.2.5.3. Raw materials

Both for nail and screw manufacture, the raw material used is imported rod for calibration, with carbon content of 0.10 to 0.35% diameters 5.5; 8;13; and 16 mm.

3.2.5.4. Labor

The total number of employees in this sector is 99, with the following breakdown:

CODUME:	51
LUPRAL:	
screws	22
nails	26
Total	99

The only technicians are at CODUME (three, of Italian origin), with experience in the use of stamping machines.

3.2.5.5. Manufacturing techniques

The manufacture of screws is made up of 6 steps:

1. Cutting the calibrated rod by stamping
2. Upsetting the head, by stamping
3. Shaping the head, by stamping
4. Hexagonal shearing, with a chipping hammer (press)
5. Beveling the point, with a point-making machine
6. Threading, by rolling or chasing

The manufacture of nails uses asimilar process, except steps 4.5. and 6 are omitted.
The manufacture of nuts is made up of the 5 following stamping procedures:

1. Cutting the piece of metal
2. Formation of one side
3. Formation of another side
4. Definitive shaping of the nut
5. Punching the hole

Once the nut is manufactured by this stamping process, it goes on to be tapped.

3.2.6. Foundry

3.2.6.1. Introduction

This sector was studied in 1979 and 1981 by two UNIDO commissions. The second study gave rise to Project Document No. DP/ANG/005/A/01/37, entitled "Foundry Industry Development - Phase I ", with a projected duration of one year and a UNDP input of US $ 397,000.

Of the 8 foundries visited, one (METALVI) has been shut down since its installation in 1974; this plant was to have manufactured fittings. All the other foundries visited are auxiliary plants for others in the metal-mechanics industry, where metal is cast for products or equipment manufactured in the main units.

3.2.6.2. Facilities and equipment

The following is a list of the foundry equipment:

METALVI: (Viana-Luanda): 2 induction furnaces, 1.5 t/h, with 800 Kw commutable fusion equipment.

SOMETAL (Luanda): 2 cupolas, 1.5 t/h each

JOBA (Huambo): 1 cupola, 1.5 t/h
3 crucibles for smelting aluminum ,50 kg. capacity.

FADARIO MUTEKA (Huambo): 2 cupolas, one of 0.7 t/h and the other 2.1 t/h; 800 Kg. induction furnace (to be moved to COMANDANTE JIKA in Benguela).

FUNDIÇÃO MARCAO (Huambo): 1 cupola, 0.5 t/h
1 fuel-oil crucible, 100 Kg.

COMANDANTE JIKA (Benguela): 1 cupola, 1.8 t/h
600 kg., 300 Kw induction furnace
2 crucibles for smelting bronze and aluminum

MATEC (Benguela): 2 cupolas, one of 2 t/h and the other 1 t/h
1 crucible for smelting bronze

LUPRAL (Benguela): 2 cupolas, 2.5 t/h

3.2.6.3. Production capacity

Based on the existing foundry facilities, the following production capacities are estimated: Iron foundry, 4,000 tons per year; non-ferric foundry (basically aluminum and bronze), 110 tons per year; and steel foundry, 150 tons per year. The breakdown is as follows:

a) Iron foundry

METALVI	1,500 tons per year
SOMETAL	1,000 tons per year
F.MARCAO	800 tons per year
JOBA	70 tons per year
F.MUTEKA	60 tons per year
C.JIKA	250 tons per year
LUPRAL	300 tons per year
MATEC	20 tons per year
Total........	4,000 tons per year

b) Non-ferric foundry

JOBA	60 tons per year
MATEC	40 tons per year
C.JIKA	10 tons per year
Total........	110 tons per year

c) Steel foundry

C.JIKA 150 tons per year

Actual production is on the order of:

iron foundry: 740 tons per year (18% of production capacity)

non-ferric foundry: 44 tons per year (40% of production capacity).

Steel foundry: 10 tons per year (7% of production capacity).

3.2.6.4. Raw materials

The principal raw materials used are: iron, aluminum, and non-ferric scrap (domestic) and coke, ferroalloys and binders (imported).

3.2.6.5. Labor

In this sector, there is a total labor force of 179 people, with the following breakdown:

Luanda	-
Huambo	56
Benguela	123
Total	179

One problem shared by all units in the sector is a shortage of mold-makers.

3.2.6.6. Manufacturing techniques

In all cases considered, the manufacturing process is as follows:

smelting the liquid metal, followed by sand casting (using wooden molds and steel plates that were imported before 1975).

The sortage of pattern molders causes severe difficulties in obtaining quality items, since if there is no mold for one item, the item itself is used indirectly, and shrinkage is compensated for by the addition of cardboard.

3.2.7. Equipment manufacture and repair

3.2.7.1. Facilities and equipment

Included in this category are the firms and units that usually manufacture or repair equipment for outside markets, but not those entities which have a maintenance workshop for repairing their own equipment.

Three firms (FADARIO MUTEKA, COMANDANTE JIKA, and MATEC) have their own foundries, analyzed in point 3.2.6.

The other facilities of these and the rest of the firms consist of mechanical workshops with machine tools, a list of which follows:

Lathes:	49
Milling machines:	6
Drills:	26
Benders:	4
Drifting machine:	3
Filing machine:	9
Rectifiers/grinders.	8
total.........	105 machine tools

3.2.7.2. Production capacity

Due to the enormous difference between the acts of manufacturing and repairing equipment, it is very difficult to estimate production capacity in units manufactured or repaired per year. For this reason, production capacity has been expressed using available hours per year as the basis.

Luanda	150,000 hours per year
Huambo	170,000 hours per year (not including SOREFAME)
Benguela	185,000 hours per year
Total	505,000 hours per year

At the present time, it is estimated that only 25 to 30% of these available hours are actually used, and with low yields, because of the lack of skilled labor.

3.2.7.3. Raw materials

There is a wide range of raw materials used, since these may be anything from casting materials and special steels, to various kinds of pieces and spare parts.

3.2.7.4. Labor

This sector has been greatly affected by decolonization, since most of the specialized workers were Portuguese.

The total number of employees in this sector, not counting SOREFAME, is 478, with the following breakdown:

Technicians or consultant technicians	19
Specialized operators of machine tools	54
Other operators	405
Total	478

3.2.7.5. Manufacturing techniques

FADARIO MUTEKA in Huambo continues using the manufacturing techniques of the old factory (MAQUINAS PINHEIRO). Similary, COMANDANTE JIKA in Benguela (formely ALFREDO GUERRA) continues with the previously-used techniques. The rest of the units were set up as new facilities, and suffer from an almost total lack of workshop planning and organization staff, as well as a lack of technical departments for design and/or sketching of parts.

3.2.8. Farming tools and implements

3.2.8.1. Facilities and equipment

Included in this group are the following units: ALFAG (Luanda), F.MARCAO (Huambo), C.JIKA and LUPRAL (both in Benguela).

The farming tools and implements manufactured at the 4 units visited are:

Harrows and plows: Electrowelded, made from imported parts, at ALFAG, F.MARCAO, and LUPRAL.

Plowshares: Cast (cast at F. MARCAO and COMANDANTE JIKA, see point 3.2.6.)
Hoes: By a stamping process, at LUPRAL.
Thus, the only specific equipment is that used at LUPRAL for the manufacture of hoes, consisting of:

2 soaking furnaces (for bars)

1 forging mill

4 stamping presses

3.2.8.2. Production capacity

In units per year, planned production and actual production are as follows:

Type of product manufactured	Planned production	Actual production
- Harrows (ALFAG)	480	-
- Plows		
-F.MARCAO	4.800	1.889
-LUPRAL	6.000	3.600
Total plows	10.800	5.489
- Plowshares		
-C.JIKA	24.000	12.000
-F.MARCAO	30.000	31.150
Total plowshares	54.000	43.150
- Hoes (LUPRAL)	288.000	252.000

The production capacity for hoes at LUPRAL is 489,000 units per year.

3.2.8.3. Raw Materials

For the manufacture of plows and harrows, imported parts are assembled and painted in Angola.

For the manufacture of hoes, imported carbon tool steel, type AISI/SAE W 10.65 C.

3.2.8.4. Labor

It is estimated that a total of 326 operators work in this area.

The breakdown is as follows:

ALFAG	79
F.MARCAO	109
C.JIKA	41
LUPRAL	97
TOTAL	326

Only 15% (48) ot these operators are truly skilled.

3.2.8.5. Manufacturing techniques

For harrows and plows, the manufacturing process consists of assembly and painting of imported parts; plowshares are manufactured within the country.

The manufacturing process fo hoes involves the following steps:

1. Heating in forging furnace
2. Forging

3. Stamping a small-diameter hole
4. Stamping the claws
4. Second heating
6. Rolling mill (2 steps) for section reduction
7. Forming press
8. Cutting leftover material
9. Calibration of the hole for the handle

3.2.9. Other sectors

3.2.9.1. Facilities and equipment

Due to the wide range of plants included in this group, it is not possible to compare their facilities and equipment.

The most important equipment and machinery is as follows:

Manufacture of welded piping (FATA):

- Resistance-welding machine for pipe manufacture.
- Induction-welding machine for pipe manufacture.

Manufacture of corrugated sheet metal (METANG)

- Equipment for continuous rust-removal, drying and immersion galvanizing.
- Equipment for corrugating the sheet.

Manufacture of flatware (INCUTAL)

- Stamping presses

Builder's hardware (IAF)

- Injection machine

3.2.9.2. Production capacity

	Capacity	Planned production	Actual production (1.981)
FATA (welded pipe) tons/year	10,000	9,000	5,000
METANG (sheet metal) tons/year	12,000	8,000	5,000
API (cardboard) tons/year	4,800	2,400	1,200
INCUTAL (flatware) pieces/year	5,300,000	3,000,000	1,300,000
METALVI (cooking stoves and other items) units/year		604,000	89,300

TRAB.JORGE (vehicles for the handicapped) units/year		8,500	1,500
IAF (builder's hardward) units/year	1,100,000	521,700	52,800
MATEC (water pumps) units/year	100	85	53
LUMEL (exhaust pipes and mufflers) units/year	6,000	-	4,800
LUMEL (feeding troughs for chickens)	240,000	-	204,800
LUPRAL (Chains) tons/year	96	-	60

3.2.9.3. Raw materials

The chief raw material in this group is imported steel sheet, used by FATA, METANG, METALVI, IAF, and LUMEL, around 12,000 tons were needed for 1981 production.

3.2.9.4. Labor

The labor force of this group (except for SOREFAME, which has a staff of near 1,000) numbers 818, of which 10 are technicians or consultant technicians, and 46 are specialized employees.

3.2.10. Summary of production capacity

Tables 3.2,3.3 and 3.4 respectively summarize actual production (as a percentage of production capacity) in the different firms in Luanda, Huambo, and Benguela, as well as actual production as a percentage of planned production.

Both yield figures have been calculated based on the information gathered during the visits made, and correspond to the periods indicated in tables 3.2 to 3.4.

Comparisons of the firms will be looked at later in section 3.4.,based on invoicing figures. According to the information in tables 3.2,3.3 and 3.4,the following average yield figures can be estimated:

Province	Actual production (% of production capacity)	Actual production (% of planned production)
Luanda	35–40	45–50
Huambo	35–40	60–65
Benguela	60–65	65–70

These figures show better work yields in Huambo and Benguela than in Luanda.

3.3. MANAGEMENT ASPECTS

3.3.1. Relationship and legal status

The metal-mechanics industries of the People's Republic of Angola fit into the framework of the National Direction of Heavy Industry of the Ministry, of Industry subject to this National Direction directly or through the Provincial Delegate's Offices of the Ministry of Industry, according to whether the manufacturing units operate within one province or within national limits.

Or thew 30 firms described in Annex 1 vol.II,22 operate within national limits, and the rest operate within one province. 1 The breakdown is as folows:

a) Firms operating within national limits:

a.1. Luanda

FATA
METANG
ALFAG
API
CAPSUL
ENMEL
SOMETAL
METANGOL
FABIMOR
COMETA II
EMBALAGENS VAN LEER
INCUTAL
METALVI
TRABASSOS AND JORGE

a.2. Huambo

ULISSES

FADARIO MUTEKA

CODUME

FUNDIÇÃO MARCAO

a.3. Benguela

COMANDANTE JIKA

SOREFAME DE ANGOLA

METANGOL

LUPRAL

b) Firms operating within one province

b.1. Luanda

EPMEL

b.2. Huambo

UNIDADE METALICA

JOBA

SOALUMINIO

IAF

b.3. Benguela

MATEC

LUMEL

INDUMEC

As far as the legal status of the firms is concerned, the 30 firms analyzed may be grouped in the following categories:

Province	Government-owned or operated	Composite (mixed)	Private	Total
Luanda	4	3	8	15
Huambo	7	1	-	8
Benguela	6	-	1	7
Total	17	4	9	30
%	57	13	30	100

In other words, the firms are predominantly government-owned or composite rather than private. Most of the privatley-owned firms are located in Luanda.

3.3.2. Management of the firms

Since the People's Republic of Angola has a strictly-planned economic system, with fixed prices for raw materials and products, and fixed salaries, management of these firms is only concerned with achieving planned production, which is agreed on by the Planning Ministry and the firm itself.

In adition, the operations of raw-material buying and product-selling are, in general, centralized through the Foreign and Domestic Trade Departments respectively; for this reason, management of the firms is also very limited in these areas.

3.3.3. Training levels of management personnel

One of the main problems in the country is that of lack of training for the management personnel in metal-mechanics firms.

In general, except for a few cases, the firms or units visited were run by directors or foremen with very low levels of technical and economical knowledge, who in many cases had no education past the fourth grade of elementary school.

The following table gives a breakdown of the management personnel of the 52 productive units of the 30 firms analyzed:

	Holders of academic degrees (university,etc)	Holders of Academic degrees (high school,etc) trade school	No degree	Total
Luanda	8	2	22	32
Huambo	1	2	10	13
Benguela	2	1	4	7
Total	11	5	36	52
%	21	10	69	100

In other words, 69% of the productive units are run by people with no academic degrees whatsoever.

3.4. FINANCIAL ASPECTS

3.4.1. Introduction

The object of this section is to analyse the information gathered about the different financial aspects of the firms, such as manufacturing costs (including raw materials, salaries and other costs), sales volume and results

Unfortunately, the analysis can not be complete since a great number of the firms visited do not keep an account of manufacturing costs or only partially keep them. In general, only the money paid out in salaries is accounted for; no record is kept of raw material and other costs.

In table 3.5. a list is given of the firms in which it has been possible to obtain information about costs and invoicing. From a total of 30 firms visited, salary costs have been obtained in 19 of them, raw material and other manufacturing costs in 10 of these 19 and invoicing in 21 firms.

The calculation of the results obtained anually by the different firms (profits or losses), is very difficult under these conditions, especially bearing in mind that in general no record is kept of amortizations either.

3.4.2. Manufacturing Costs

In table 3.6. there is a breakdown of monthly manufacturing costs (salaries, raw materials and other costs) of the 10 firms that information has been obtained from.

In 5 firms, raw material costs are grouped under the heading "other costs".

From total production costs, the cost per unit of the product has been calculated, in which only the cost of FABIMOR and ULISSES can be compared, although FABIMOR's costs are lower because production includes bicycles and motorcycles while ULISSES only manufactures motorcycles.

Likewise, the percentage of employee costs in the total of production costs has been obtained, which varies from a minimum of 10% in ULISSES to a maximum of 77% in COMANDANTE JIKA.

3.4.3. Relation between invoicing and employee costs

a) Statistics broken down by Province

In tables 3.7, 3.8 and 3.9 employee costs (determining mean salary per person) and total monthly invoicing per person (obtained from average statistics for the period analyzed in each firm) are listed for the provinces of Luanda, Huambo and Benguela respectively as well as the percentage of salaries on total invoicing.

Summarizing these tables, it can be said that:

- In Luanda the salaries are highest (8,476 Kz/person/month as an average), followed by those of Benguela-Lobito (7,474 Kz/person/month) and the lowest are those of Huambo (6,609 Kz/person/month).

- The average invoicing per person per month obtained in the firms in Luanda and Benguela-Lobito are very similar (27,059 Kz/person/month in Luanda and 22,768 Kz/person/month in Benguela-Lobito). In the firms in Huambo the average invoicing per person per month is higher (41,687 Kz/person/month).

- The percentage of total invoicing paid out in salaries ranges between a minimum of 16% in Huambo to 31-33% in Luanda and Benguela respectively.

b) Statistics broken down by activities

The statistics for the various firms broken down one by one in tables 3.7 to 3.9, have been grouped within each province by activities in 8 groups. The first 7 correspond to the same groups mentioned in 3.1. The 8th is grouped under the heading "various" in the manufacture of farming tools, since information is only available from one firm (LUPRAL in Benguela).

This group is listed in tables 3.10, 3.11 and 3.12 for the firms located in the provinces of Luanda, Huambo and Benguela respectively. Projected monthly invoicing as a percentage of planned manufacture has also been included in order to be able to compare the percentage of planned production actually realized between groups and establish average percentages by groups and by provinces.

For the same group of activity, noticeable differences can be observed from one province to another in invoicing as well as in salaries.

Special notice should be taken of the fact that the % actual/planned production in each province estimated in 3.2.10. comes very close to that calculated from statistics on actual and projected invoicing according to planned production which are the following:

Luanda:	46% actual/planned production
Huambo:	67% actual/planned production
Benguela:	64% actual/planned production

In order to determine actual average production taking as an average planned production in the 3 provinces, table 3.13 has been made up where the totals in each province are listed, as well as the total of the 8 groups of activity in the 3 provinces.

The average degree of actual production obtained in the three provinces is 53% which varies from a minimum of 34% in the manufacture of aluminum kitchen wares to a maximum of 88% in the manufacture of bicycles and motorcycles.

In actual invoicing per person and per month the average is 29,030 Kz/person/month, varying from a minimum of 13,480 Kz/p/m in the foundry industry to a maximum of 81,300 Kz/p/m in the screw and nail industry.

The average salary obtained is 7,881 Kz/month, with a minimum of 6,176 Kz/month in the group aluminum kitchenwares and a maximum of 9,360 Kz/month in the production of metal containers.

c) Employee and invoicing distribution percentages

With the statistics summarized in table 3.13, table 3.14, which lists the distribution in percentages has been made up.

1. Employees: Distribution of total of workers and of salaries.

2. Actual and planned invoicing. Distribution percentages of real and projected invoicing and invoice indexes, considering 100 as the basis for the average invoicing of the 3 provinces.

In the area of actual invoicing per person, the metal containers group is the one of the 8 groups which comes closest to the average. The highest invoicing index per person corresponds to the Screws and Nails Industry (an increase of 180.1% over the average) and the lowest corresponds to the Foundry Industry (-53.6% over the average).

Considering invoicing according to plan, the highest invoicing index per person is also obtained in the Screws and Nails Industry, with an increase of 141.7% over the projected average in the case of each group producing 100% of planned production. In this case, the group which comes most closely to the average is the Bicycle and Motorcycle Unit and the groups with higher and lower invoicing per person coincide with the percentages obtained in actual invoicing.

3.5. CONCLUSIONS AND SUGGESTIONS BY GROUP OF ACTIVITIES

3.5.1. Manufacture of Metal Furniture

The problems very according to the firm, and are described in 3.2.1.

a) EPMEL (Luanda)

Consists of 4 units situated in different areas with a total of 127 workers, 3 of these units handle only part of the manufacturing processes and the 4th handles assembly, with one warehouse between them.

The most important problems are the following:

- Lack of technology in mass production.
- Use of a limited number of devices and cut off, drawing and bending dies.
- Complete lack of technical staff and middle management.
- Low qualification in working staff.
- Insufficient means of transportation from one unit to another.
- Lack of material supply.

EPMEL has made up a plan to group all of these units into one in a large building which they consider suitable. In order to develop this plan, the following should be taken into account:

- Development of technology in mass production, with a staff training program.

- Utilization of existing machinery, using cut off dies tube bending devices, rolled steel and plates.
- Welding and assembling devices.
- Study of work positions and staff qualification.

b) ENMEL (Luanda)

Consists of 10 units with a total of 1,007 workers, each of which handles complete phases of production, three of these units (EDAL, SADIL and FAMA) have 63% of these employees and another four (ROULLOTES, FANGOL, PADHINA and GUIMADEX) have 14% of total employees.

This is as a result that ENMEL took over these already existing factories in 1975 but maintained their previous structure. For this reason units such as FAMA INDUSTRIAL, with very good work organization exist side by side with totally disorganized units such as EDAL and SADIL.

The following problems exist in the group of units in ENMEL:

- Lack of storage space for raw materials, semi-finished and finished products.
- Bad use of existing machinery because of:

  . Lack of raw materials.
  . Equipment which is shut down because of the lack of spare parts.
  . Lack of dies and devices.
  . Poor work organization

- Lack of technicians.
- Lack of specialized workers.
- Low staff efficiency.

Using FAMA INDUSTRIAL as a model of work organization and using the existing buildings, facilities and equipment, a plan for the restructuring of the different units should be carried out.

c) UNIDADE METALICA (Huambo)

Is made up of 6 small units that partially manufacture goods and have a total of 153 workers.

In general, greater activity and a faster work pace were observed in Huambo than in the firms in Luanda, in spite of the fact that the firms in Huambo have fewer means and greater problems in the supply and transport of raw materials.

The largest percentage of work is done manually.

The suggestion in this case is oriented around the re-grouping of the existing units, reducing them to a maximum of 3, keeping the characteristics of the various facilities currently being used.

The reorganization project should improve manufacturing techniques while using as much as possible the already existing equipment in the area and other parts of the country, especially Luanda.

d) LUMEL (Benguela)

This unit which has a total of 76 operators may be considered an example of the proper use of human and technical resources, in spite of the lack of raw materials and tools which have caused a change in planned production, but not a shut down.

In the reorganization programs recommended for EPMEL, ENMEL and UNIDADE METALICA, the production techniques and efficiency obtained in LUMEL should be adopted.

e) INDUMEC (Lobito)

This unit can not be compared to the ones previously mentioned since before 1975 it produced concrete mixers, bus bodies, hydraulic jacks etc...

It was reopened provisionally in May of 1981 to produce military bunks hopes to regain the former employees who are currently relocated and be able to carry out the existing project of taking advantage of the extensive existing facilities, using them for the production of elevators and freight elevators.

f) Significant Statistics for the sector:

Firms	No. of operators	Invoicing Kz/per/month	Average salary/Kz/ month	% of salary on invoicing
EPMEL	127	21,850	8,482	39
ENMEL	1,007	16,524	8,071	49
UNIDADE METALICA	153	18,642	6,479	35
LUMEL	76	54,276	6,578	12
INDUMEC	50	17,817	7,000	39
Total	1,413	19,308	7,986	41

Because of the low salaries in the country, the metal furniture group should produce a quantity large enough so that the participation of salaries on invoicing is a maximum of 14%, which means tripling current production once the following problems are overcome:

- Regrouping of the units
- Production organization
- Technical staff contracted
- Dies and devices
- Raw material supply
- Maintenance

3.5.2. Manufacture of Aluminum kitchewares

The production capacity of the 5 units that statistics have been obtained from amounts to 1,500,000 parts per year, equivalent to almost 660 t/year of aluminum. Planned production amounts to 550 t/year.

Actual production is 38% of production capacity, the principle problems being the following:

a) METALVI

The percentage of actual/planned production is 26% due to the lack of raw material supply (imported aluminum sheet.)

b) SIAL and STAMEL (From the ENMEL group)

Both groups considered together meet their planned production goal; it is the section in SIAL that produces handles that requires reorganization.

c) JOBA

Only meets 77% of the planned production goal because of the lack of aluminum scrap supply.

d) SOALUMINIO

Because of the lack of supply of raw materials, (aluminum sheet) and handles, actual production only meets 93% of planned production. With more regular deliveries of these supplies, the difference between % of actual/planned production could easily be overcome.

Even though the units have manually operated equipment, mainly lathe benches, except for the problems of raw material supply, the planned production goal can be reached and even exceeded.

The modernization of facilities with countersinking presses is not advisable since it would require a large investment and would mean an important loss of jobs which are so necessary for the country at this time.

3.5.3. Manufacture of metal containers (cans, cisterns and drums) and bottle caps.

The problems in this group center around the manufacturing units of cans, steel drums and bottle caps, since large capacity cisterns are manufactured in a modern plant put into operation with technical assistance from the French group TITAN.

a) Manufacture of cans

These are manufactured in two units in METANGOL situated in Luanda and Benguela. In the former most of the production is of oil and varnish cans ranging in volume from 1/4 to 5 l. In the latter cans ranging in size from 1/4 to 5 Kg. for canning tomatoes, pineapples etc... are produced.

The correlation between production capacity and actual production is the following:

	Capacity (units/year)	Actual production (units/year)
Luanda	1,950,000	775,000
Benguela	9,360,000	4,336,000
Total	11,310,000	5,111,000

The unit in Luanda has three lithographic lines in good condition, with an efficient photo-lithography department. The principle problems are:

- Manufacturing technology due to discontinuance of operation.
- Lengthwise welding of cans is done manually with tin. This technology is not adequate if production in large quantities is desired.
- The equipment is very old and therefore causes maintenance problems.
- There are no special manufacturing process techniques.

Most of the problems in this unit would be solved by mechanizing the welding of cans using semi-automatic machines which would at the same time eliminate the current problem of lack in the supply of tin.

The unit in Benguela has automatic equipment which is in bad condition, partly because it was installed second hand in 1965. Therefore, part of the operations which should be done on assembly lines are done one by one.

This factory has lost the technology needed for mass production which is very suited to the type of can produced.

If one bears in mind the age of the machinery, it is neither recommendable nor in many cases practical to put the existing production lines into operation because of the lack of spare parts. The best solution would be to makes certain changes within the factory in consecutive stages.

Other problems that need to be solved are:

- Lack of technicians
- Dies supply

b) Steel drums factory

Only one private factory exists which produces steel drums ranging in volume from 25.50 to 200 l. It is situated in Luanda, but since the equipment is very old, even though production capacity is 435,000 units/year actual production is only 125,000 units/year (EMBALAGENS VAN LEER).

The problems due to the age of the equipment are such that the factory can not manufacture for more than 15 days in a row without some kind of breakdown.

The situation is worsened because of the firm's private problems; at the moment the firm's future is being discussed with the Government. As long as these problems remain unsolved the firm will not make any investments.

Independent of any solution arrived at from the negotiations with the Gov't, and bearing in mind the country currently imports about half a million 200 l. steel drums per year, this factory must be reorganized in order to increase production capacity to 1 million units per year.

c) <u>Manufacture of bottle caps</u>

The bottle caps used to close bottles with are manufactured in CAPSUL (Luanda) from tin-plate varnished in METANGOL.

Based on a production capacity of 300 million units per year (in one turn), only 186 million are actually produced and about 100 million units/ year are imported.

Of the two basic manufacturing procedures which are:

- 1. Cutting and shaping of tin-plate.
- 2. Cork joining.

enough equipment is available for cutting and shaping. The problem arises in cork joining.

From a total of 14 assembling machines which were usable in 1973, only 6 are currently in working order and use parts from the remaining 8.

The technique which was once used to make cork bottle tops has been replaced by the use of plastics. By using plastics, a decrease in cost and more sanitary conditions can be obtained.

The substitution of cork joining for plastic joining is recomended. This would balance the cutting and stamping procedures with the joining procedures.

3.5.4. Bicycles and motorcycles

This group includes 2 factories: FABIMOR in Luanda and ULISSES in Huambo. The former currently manufactures bicycles and assembles motorcycles with a production permit from SUZUKI, the latter only assembles motorcycles with a production permit from YAMAHA.

Specific problems:

a) Bicycles

a.1. FABIMOR

- Lack of qualified staff
- Dated technology
- Broken-down machinery
- Long waits between deliveries of raw materials
- Lack of method controls in warehouses

a.2. ULISSES

- Does not manufacture bicycles because it has lacked the necessary means for over a year.

b) Motorcycles

In both factories motorcycles are only assembled from components imported from Japan and the principle problem is the length of time between deliveries of these parts.

Possibilities for improvement:

a) Bicycles

a.1. FABIMOR

With the techniques and equipment being used today neither great increases in production nor even profitable production can be obtained.

Bear in mind that self-financing does not exist and that the amortizations applied are very low. For this reason there hasn't been any reform of industrial equipment.

The need for bicycles in the country is much greater than even 21,000 units produced in 1974 which was the highest production level ever reached.

The plans for reorganization should not be considered only to obtain the maximum production figure ever reached in this factory, but rather to anticipate much higher figures.

A modern and profitable unit, taking into consideration the conditions of the country, should have a production capacity of at least 40,000 units/year.

This can only be achieved through counselling by a foreign firm that can facilitate the design, assembly, and putting into operation of the unit, as well as train staff.

Reorganization should begin on the painting and assembly lines by importing parts at first. Then the tire rim, mudguard and frame sections should be expanded, modifying the present welding system which is immersion in a brass bath. Nowadays a pitting system using brass dust welded with propane ending with rod welding is being used.

After this the stamping and mechanization sections should be modified.

a.2. ULISSES

Here things should begin practically from zero. The plan proposed by the Japanese which provides for an initial production of 2,000 bicycles/month should be studied.

In order to obtain maximum efficiency in the use of equipment the plans for manufacture and distribution of various parts should be co-ordinated between the two factories.

That way each factory will have assembly and production lines able to manufacture components for both.

As a comparison, the following information is given showing the enormous difference in efficiency per employee. It is as follows:

	Bicycles/year	Motorcycles/year	Employees
European factory	180,000	50,000 (1)	550
FABIMOR	3,600	1,800 (2)	217

3.5.5. Screw and Nail Industry

Both factories visited (CODUME in Huambo and LUPRAL in Benguela) produce screws and nuts with diameters of 3 to 14 mm. using similar manufacturing processes.

CODUME has an annealing furnace as well as zinc and phosphate-plating facilities; LUPRAL only has stripping and nickel-plating facilities.

The problem in both CODUME and LUPRAL consists of the excess capacity for screws with regard to that of nuts, in the former because of the lack of machinery and in the latter because the machinery is out of date.

This comes down to a rate of 13% actual/planned production in CODUME and 24% actual/planned production in LUPRAL, even though the production capacity in both is quite different:

CODUME	1,970 t/year
LUPRAL	300 t/year
	2,270 t/year

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(1) Manufacture and assembly included.

(2) Only assembly.

The suggestion here is an increase in producticn capacity of nuts through the adquisition of stamping machines.

Nails are only produced in LUPRAL with an 88% actual/planned production rate (110 t/month actual production/125 t/month planned production). The problem in this case arises from insufficient wire-drawing capacity because of a lack of dies.

3.5.6. Foundry Industry

The foundry sector has been the subject of the following studies:

1. Energoprojekt-Commision-Belgrade, for the Minist y of Industry of the People's Republic of Angola-National Administration of Heavy Industry (16-12-78 to 15-1-79).

2. SI/ANG/80/802, for ONUDI. A study of the metallurgic industry's development made by Dr. B. Balkay from November 26- December 14, 1980.

3. DP/ANG/81/005 for ONUDI. A study of the foundry industry's development made by Mr.Cabezudo Sánchez, an expert in the field, from January 25- February 9, 1981.

   After several adjustments, the latest document prepared by Mr. Velev (Industial Development Officer, Metallurgical Industries Section), dated June 15, 1981 provides the following breakdown of the one and a half million U.S. dollars initially granted for Foundry:

DP/ANG/81/005- Foundry Industry Development
($ 396,000)

DP/ANG/81/xxx Assistance to the Siderurgica National
($ 186,700)

DP/ANG/81/xxx Establishment of a National System of Scrap Collection and Processing.
($ 309,300)

Therefore, $ 528,000 remain and how they will be spent is as yet unknown.

Project DP/ANG/81/005 anticipates assistance to the Government in a plan for the co-ordination and supervision of all the activities in the Foundry Industry and its later development and modernization.

Of the documents related to this theme, none has been found which specifically mentions the casting works in METALVI.

METALVI has the best facilities as far as smelting. casting, sand preparation, plug production, granulated metal strip and thermal treatments is concerned even though it is shut down without having ever been put into operation.

The initial design provided for the manufacture of malleable fittings. The corporation METALVI (private) has abandoned this production objective but intends to put it into operation at some point with the help of Portuguese firms, after having presented a proposal to start production to the National Administration of Heavy Industry dated July 17, 1981. The team of TECNIBERIA has not been able to obtain this document --- although it has been repeatedly requested from the administration of METALVI.

The plan to follow should be:

1. Development of what was anticipated in Project Document DP/ANG/81/005/A/01/37 whose initial phase provides for a complete study of the market.

2. To include METALVI as the principle industry in this project.

3.5.7. Manufacture and Repair of Equipment

Visits have been made to the following units:

- EQUIPAMIENTOS TECNICOS (EPMEL) Luanda.
- EMIN (Luanda).
- FADARIO MUTEKA (Huambo).
- COMANDANTE JIKA Y MATEC (Benguela).

EMIN has not been analyzed since its expansion plan is being run by ONUDI: "Services Centre for Repair and Maintenance", Project # UF/ANG/78/209.

This center has been provided with local facilities and has a staff training center. It would be advantageous to construct a laboratory in order to analyze steel chemicals (using an atomic absorption spectograph) and metallographs.

The following problems are present in the rest of the maintenance and repair units:

- Lack of technical staff.
- Lack of specialized machinery, especially precision milling machines and gear cutters.
- Lack of equipment for steel analysis.
- Lack of adequate furnaces for thermal treatment.
- In some cases the lack of orders shows that there are not enough mercantile channels even though the market is extensive.

Based on the experience adquired in EMIN, two other regional centers in Huambo (FALARIO MUTEKA) and Benguela (COMANDANTE JIKA) could be opened since a professional training center already exists in Huambo and is training qualified staff.

However, the units in Huambo and Benguela do not have the adequate means to efficiently solve the problem of spare parts.

3.5.8. Farming Tools Factory

a) Tools

This group includes the following units:

- ALFAG (Luanda)
- FUNDIÇÃO MARCÃO (Huambo)
- COMANDANTE JIKA (Benguela)

a.1. ALFAG

This unit was originally planned to handle harrow assembly, but it does not produce any at the moment because it lacks the necessary imported parts.

At the same time, two model harrows have been made using a large percentage of nationally made parts. This has not meant, however, that they have been mass produced, and judging from the equipment and staff that are currently available, mass production will not be possible in the near future.

The problem concerning harrows assembled from foreign parts arises because of the lack of co-ordination between manufacturer and retailer. This has meant that the delivery of components has been incomplete and therefore assembly has not been able to be completed.

In view of the current state of this unit, its production level can not be judged since it is almost completely shut down.

a.2. FUNDIÇÃO MARCAO

This unit produces plows and plowshares and a building has been constructed (MARCÃO-NOVA) as part of the initial plan in the study of the Foundry Industry Development (DP/ANG/81/005).

However, in the Project Documents which were made up after the stay of Mr. Cabezudo Sánchez (who is an expert in the field), this project which was at first considered to be an excellent example of casting works, has been abandoned.

The current problems within FUN.MARCÃO are:

- Lack of qualified staff.
- Lack of imported raw material, especially rolled steel.
- Improper use of technology.
- Equipment which is out-dated.
- Lack of buildings.

F.MARCÃO can not appreciably increase current production, which is approx. 1,900 plows and 31,000 plowshares per year with the existing facilities, which is why it is necessary to re-establish the project MARCAO-NOVA, once the current period of development and modernization of the Foundry Industry study has been concluded, included in Project DP/ANG/81/005.

a.3. COMANDANTE JIKA

This firm is fundamentally planned as a unit for maintenance and repair of industrial equipment. However, since the unit also has smelting facilities (cupolas and induction furnaces) which can be used whenever the maintenance work load is not too great, plows and plowshares are also manufactured with a planned production of 24,000 units/year which actual production does not completely meet.

At the moment there is not enough work to justify casting in the 2 t/h cupola, which is normally shut down.

A separate plan for template plowshare production should be established, independent of the maintenance and repair plan. This could guarantee 100% actual/planned production for plowshares.

b) Farming tools

The only factory in the country with the capacity to manufacture farming tools (plows abd shovels) is LUPRAL (Benguela) with a total production capacity of 300,000 european hoes and 190,000 traditional hoes per year. Current production is 160,000 european hoes/year. Production of traditional hoes began in October of 1981 and 7,000 units were made between the 1st and 21 st of that month.

The tools are made by stamping in two production lines. Because they both lines have a cutting press, it is impossible to work both lineas at the same time.

If a second press were installed, production capacity would reach a level of 400,000 european hoes and 300,000 traditional ones anrually.

At the moment axes can not be manufactured because they require a 150 t. press.

The orientations given by the last Congress of the MPLA Work Party for the metalmechanics industry, refer primarily to promoting the manufacture of farming tools that are used with the help of animals. This being the case, the facilities in LUPRAL should be taken advantage of as much as possible since they have excellent manufacturing resources and adequate technological know-how. Likewise, the production level reached by the workers is also very high.

During one meeting held, Mr. Henriques de Silva (National Director of Heavy Industry) pointed out the necessity for 2,5 million units/year of various agricultural tools.

With proper investment, LUPRAL could cover a large part of these necessities since it has the staff, technology and part of the production means which are needed.

In order to set up a manufacturing plan to trust to LUPRAL, and to acquire the necessary economic endowments and equipment, the Ministries of Agriculture, Industry and Construction (LUPRAL presently depends almost completely on the Construction Industry) have been asked to participate in the planning.

3.5.9. Other activities

This group included units which have not been considered previously. They are:

- FATA (Luanda). Manufacture of welding tubes.
- METANG (Luanda). Manufacture of corrugated sheet metal.
- INCUTAL (Luanda). Manufacture of flatware.
- TRABASSOS AND JORGE (Luanda). Vehicles for the handicapped.
- IAF (Huambo). Builder's hardware.

The following are included within the units already analyzed:

- METALVI. Manufacture of kitchens.
- MATEC. Manufacture of water pumps.
- LUMEL. Manufacture of exhaust pipes, mufflers and feeding-troughs for hens.
- LUPRAL. Manufacture of chains.

The specific problems in each of these units are:

a) <u>FATA</u>

Very low production if the country's needs are taken into account. Only ungalvanized tubing (black class) is produced.

Based on a production capacity of 10,000 t/year in one shift, only 5,000 t were produced in 1981 because of various breakdowns in equipment. This in turn slowed down metal furniture manufacture which depends on FATA'S tubing to a great extent.

The are two existing machines and the older one which produces tubes with a diameter of 1 to 4 inches uses a system of resistance welding. This system is not used much anymore and should be changed to induction welding.

Water tubes can not be produced because the galvanizing line has not been installed and because there is no equipment available to test for watertightness with. These tubes are currently being imported.

A completely new water tube production line should be installed.

Moreover, the lack of qualified staff and supply of spare parts are two more problems that should be solved.

b) METANG

METANG'S biggest problem arises from the great length of time between deliveries of sheet. This problem is due to the unloading procedures at the ports where wastes caused by rusting amount to 7% of total supply at times.

The facilities, even though they are old, are capable of producing more than the 5,000 t/year currently manufactured and should try to reach the maximum production level of 1973 which was 12,000 t/year.

c) INCUTAL

Based on a production capacity of 5,300,000 units/year and a production plan of 3,000,000 units/year, only 1.3 million pieces are being produced at the present time.

The primary problems are:

- Lack of supply of imported raw materials.
- Lack of qualified staff.
- Lack of stamping dies.
- Old equipment.

With the assistance of the Portuguese firm CHROMOLIT, INCUTAL made up a plan to increase production based on the import of semi-finished products and technical staff.

Increased production from raw materials and not semi-finished products is possible if the problem of raw material supply and die preparation can be solved.

d) TRABASSOS AND JORGE

Before 1973 this firm had a large factory which was dismantled.

At the moment, the firm has a small workshop with only twelve employees who assemble vehicles for the handicapped and the volume of production does not satisfy the country's needs.

A new facility in a large building where galvanoplastics which are currently should be assembled, is anticipated for 1983.

e) IAF

This unit currently produces locks, hinges and towel racks manually.

IAF acquired a machine for casting by injection but has been unable to use it because the injector and moulds were missing when it arrived.

IAF also has a chrome-plating line which can not be put into operation because of the lack of technical staff.

This firm has excellent possibilities since it has injection equipment and could make automobile and motorcycle parts, function as an auxiliary industry for aluminum and light alloys like zamak, as well as produce the locks, hinges and towel racks now being produced.

What is considered most important at the moment is putting the casting machine and chrome-plating line into operation by acquiring the missing parts. In order to achieve the latter, Italian technicians who are now working in CODUME, are expected to help.

The possibilitites for increased production are great if cutting and countersinking devices can be used.

f) METALVI

The current production of kitchens and other items which fall under the metal mechanics category in this firm constitute an alternative in the original project for foundry works wich was established because of the problems mentioned in other sections of putting facilities into operation.

METALVI'S objective should be to put these foundry facilities into operation.

g) MATEC

MATEC'S efforts to achieve water pump manufacture have been noteworthy although the following problems have yet to be solved:

- Lack of qualified staff and a technical design office.
- Lack of imported raw material.
- Lack of tools and accesories.
- Lack of a testing bench to determine whether or not the pumps are functioning.

This factory needs to be reorganized in order to increase the current production figure of 53 pumps per year.

h) LUMEL

Car muffler and exhaust pipe production is no problem in this firm. Furthermore, a plan exist to constructa second unit in order to fully supply the market with exhaust pipes and mufflers for trenks and buses.

i) LUPRAL

The chain production line in LUPRAL presents only one problem; the lack of qualification of the 6 present operators. With a production capacity of 8 t/month, only 5 t/month of 3-20 mm. diameter butt-welded chains are actually produced.

3.6. FINAL CONCLUSIONS

a) 30 firms with a total of 52 productive units have been visited and a technical and economic analysis has been made of 21 firms, with 43 units.

b) Production efficiency is estimated at 53% of annual planned production and at 35% of production capacity.

c) The total number of employees from the firms visited are 5,540 and approximately 90% of these employees have no special training.

d) 69% of the firms are managed by people with no professional degree.

e) Actual invoicing in the 30 firms (using the 21 firms which statistics have been taken from as a basis) is estimated at approximately 160 million Kz/month, that is to say, 1,930 million Kz/year (approx. 64 million U.S. dollars/year).

f) If 100% of annual planned production had actually been reached, invoicing would have amounted to 300 million Kz/month, or 3,600 million Kz/year (approx. 120 million U.S. dollars/year).

g) The reason the actual production does not equal planned production is due to various problems and difficulties which are listed in tables 3.15, 3.16 and 3.17 for the units in the provinces of Luanda, Huambo and Benguela respectively.

h) The most important problems encountered are: Lack of qualified staff, lack of imported raw material supply, use of inadequate technology and antiquated machinery, and lack of dies and special tools.

i) In order to solve some of the problems and difficulties, 21 of the 30 firms visited have submitted definite plans to the National Administration of Heavy Industry.

j) The metal-mechanics industries report to the Ministry of Industry which will evaluate and approve plans.
Then steps will be taken to get authorized importation permits and in many cases investment financing.

k) The Ministry has not got the technical staff or financial advisers necessary to classify the investments. Given the current lack of resources in the country, priority should be given to those projects which avoid the need for imports or solve fundamental problems.

l) The problems which affect the metal-mechanics sector can be classified in two large groups:

- Lack of management and evaluation of inventory necessities, technological equipment and professional qualification.
- Lack of dies, special equipment and special spare parts.

m) The first group of problems would be solved by the establishment of a co-ordination and management center within the Ministry of Industry. This center is planned as an engineering and consulting department which at the same time will serve to co-ordinate and assist in carrying out the expansion and reorganization projects.

n) The problem of lack of dies, special tools and special spare parts would be solved by the establishment of a center with the necessary means to design and manufacture them.

4. ASSISTANCE FOR THE ESTABLISHMENT OF AN ENGINEERING DEPARTMENT

4.1. INTRODUCTION

The preceding section discussed the advisability of setting up an Engineering Department to assist the firms in co-ordinating and carrying out the reorganization and expansion programs.

At the same time, this Department should act on a consulting basis to aid in the solution of technical problems and to advise the metal-mechanics firms about their economic problems.

This Department will have long-and short-term objectives, described in the following sections.

4.1.1. Long-term objectives

The long-term objective of this Department is the development of local engineering and consulting services, in order to advise the firms in the following areas:

Production plans
Technology
Staff training
Costs and investments

a) Production plans

It will be necessary to co-ordinate the production plans of the firms, always bearing in mind the production possibilities of each subsector once the modernization and expansion plans have been carried out.

This department will analyze the national market situation on a permanent basis, modifying the products manufactured and production levels according to demand, and determining future needs as far as production levels or new products are concerned, far enough in advance to allow for adequate preparation.

It will also co-ordinate the raw material supply by scheduling inventories, and will see that the schedule is adhered to.

It will give advice concerning the best type of raw materials to use, keeping in mind the possibility of future standardization of stored material.

b) Technology

It will be necessary to raise the technological level of manufacturing in the different subsectors.

The Engineering Department will be in charge of putting this plan into effect; its task will be to maintain permanent contact with technologically advanced countries in order to be able to update manufacturing processes constantly.

This contact will be maintained in the following manner:

- Attending international monographic fairs
- Publications
- Conventions
- Study trips
- Visiting factories, etc.

c) Staff training

The country's national educational programs need to be accommodated in order to encompass the area of professional training, both for top management and for middle management and skilled labor.

The Department should counsel the Ministry of Education in the following areas connected with professional training:

- Necessary specialties, at all levels
- Planning for increasing staff needs
- Training programs for presently-employed staff
- Development of training programs in foreign countries, and study-exchange programs with countries with similar technologies.

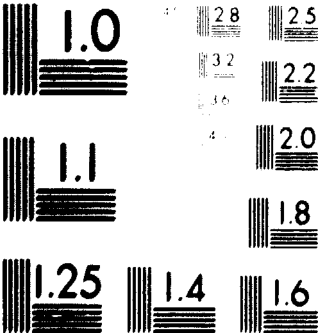
d) Costs and investments

Finally, another of the Department activities should be that of cost and investment control counselling.

The Department, as a specialized organization working in co-operation with different governmental departments, should study the income-yield capacity of the firms in this sector, giving advice in all specific activities from an economic and management point of view.

4.1.2. Immediate objectives

One of the immediate objectives of the Department is the rehabilitation of



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current industrial capacity in order to raise present production levels to those that the existing manufacturing structure could potentially achieve. This figure approximates 1973 production.

A prior market study is fundamental if these objectives are to be met in order to try to balance demand and adapt production to the needs of the country, to try to replace imported products with domestic ones that would serve the same purpose and that might be feasible within the present industrial infrastructure, with only minimal investments in machinery and equipment.

As this is the most important objective of the Department, the following sections present a detailed analysis of the procedures to be followed.

4.2. BACKGROUND INFORMATION

In order to determine the immediate function of the Department, the following sections provide a prior analysis of the planned procedures (dealt with in section 3) for the 9 categories into which the metal-mechanics sector has been divided.

4.2.1. Metal furniture

Grouping together and reorganizing the ENMEL and EPMEL productive units (both firms are in Luanda), as well as those of UNIDADE METALICA in Huambo; supplying dies and other special tools.

4.2.2. Aluminum kitchenware

Solving the supply problems of imported aluminum sheet.

4.2.3. Metal containers (cans and drums) and bottle caps

Solving the specific problems of the METANGOL (Luanda and Benguela), EMBALAGENS VAN LEER (Luanda) and CAPSUL units, by means of replacing certain equipment and machinery.

4.2.4. Bicycles and Motorcycles

Making a technical study about the possibilities of rehabilitating bicycle manufacture at FABIMOR (Luanda) and ULISSES (Huambo).

4.2.5. Nails and screws

Installation of new machinery for the nut-manufacturing divisions of CODUME (Huambo) and LUPRAL (Benguela).

4.2.6. Foundry

There are specific plans for the foundry sector, based on the DP/ANG/81/005 project, which proposed to assist the Government technically during a one-year period in planning, co-ordinating and controlling all steps needed for the development and modernization of the foundry industry. While these actions constitute the main objective of the plan, its secondary objectives are to raise production levels to take full advantage of currently-existing production capacity and of the new equipment to be installed; to initiate staff-training programs; and to meet all local casting demands.

The foundry facilities at METALVI (Luanda), which have been shut down since they were built in 1974 and which need a technical assistance program in order to begin operations, should have top-priority in this project. In order to carry out this technical assistance program, the services of a foundry consultant should be used for 6 months.

4.2.7. Equipment manufacture and repair

Since there is already an expansion program for the EMIN (Luanda) repair and maintenance Center (project no. UF/ANG/78/209), the experience gained during the course of this project, should be applied for the re-organization and modernization of the existing repair and maintenance centers in Huambo (FADARIO MUTEKA) and Benguela (COMANDANTE JIKA); this latter project will use the services of a consultant for a 6-month period.

4.2.8. Manufacture of farming tools and implements

Bringing production levels closer to production capacity for tool manufacture at LUPRAL (Benguela).

4.2.9. Other business activities

Solving the specific problems of the FATA and INCUTAL units in Luanda, the IAF unit in Huambo, and the MATEC unit in Benguela, by means of updating facilities to more adequate standards.

4.2.10. Conclusions

In summary, and not counting those plans which are included in already-existing or anticipated projects, which can be carried out by consultants based on these projects (such as the planned technical assistance to the foundry sector, in particular putting the METALVI unit into operation, as well as the application of experience gained during the EMIN project to the maintenance and repair centers at F. MUTEKA and C.JIKA), the rest of the recommended steps for the expansion of the metal-mechanics sector fall into three basic categories:

a) Recommendations on the need for reorganization and for rehabilitation; for this project it is necessary to make a background study with the aid of experts. The metal-furniture and bicycle-manufacturing plants fit there circumstances.

b) Recommendations for individual firms, where specific manufacturing equipment is needed. METANGOL, CAPSUL, CODUME, LUPRAL, FATA, IAF, and MATEC are in this category.

c) Firms where it is only necessary to solve such currently existing problems as lack of: raw material supply, dies, and special tools. Specifically, the raw material supply problem affects the manufacture of aluminum kitchenware and flatware; nevertheless, in general terms, the solution of the supply problem for raw materials, dies, and special tools directly affects the rest of the country's metal-mechanics firms as well.

The following sections study in detail those plans which require background studies, as well as the installation of new machinery, or updating presently-existing facilities to more adequate standards.

The solution of the raw material supply problem should be based on keeping in mind which of the raw materials must be imported when purchasing is being planned; it must be taken into account that much time may be lost through delays in unloading and transportation to the plants, and time limits must be strictly observed.

The inventory problems for domestic raw materials will be partially solved by the re-structuring program proposed in a later section.

The supply problem for dies and special tools will be solved by means of the creation of a manufacturing center; the technical assistance program for this center is dealt with in section 5.

4.3. TECHNICAL-ASSISTANCE PLANS FOR REHABILITATING EXISTING INDUSTRIES

4.3.1. Metal furniture

A re-grouping and re-organizing study has been proposed for this sector, according to the terms of reference that are presented in Appendix 1 of this section.

This study can be carried out by a team made up of 1 Mechanical Engineer, specializing in the areas of planning and analysis for metal-mechanics industries, and 1 Industrial Engineer, specializing in the area of project development for the same industry. These two engineers will work with local assistance during a four-month period.

4.3.2. Aluminum kitchenware

The recommendations in this sector are geared toward solving the imported raw material supply problem as discussed in point 4.2.10.c).

4.3.3. Metal containers (cans and drums) and bottle caps

Specific recommendations for the plants in this group are as follows:

4.3.3.1. METANGOL (Luanda)

The main problem at this plant is the lack of tin to be used for welding.

The use of a sheave welding machine is suggested, with characteristics and productions as outlined in Appendix 2 of this section.

Technical assistance from a foreign expert is also required during a three-month period for the installation of the outfit, for putting it into operation, and for training the staff in its use.

4.3.3.2. **METANGOL** (Benguela)

The installation of an entire production line is recommended for this firm, since the currently-existing machinery and equipment is very old and breaks down frequently. In many cases, a great loss of production capacity has occurred because certain manufacturing steps had to be done manually.

This line should handle the manufacture of cans with capacities ranging from 1/4 to 1 Kg, for food and for other uses. These can capacities are equivalent to diameters of between 50 and 100 mm., with heights ranging from 40 to 130 mm.

Sheet thicknesses should be between 0.2 and 0.25 mm.

A reasonable production rate would be 70 cans per minute, equivalent to a yearly total of 6,930,000 cans all types included. This figure is based on 75% output from the equipment.

An appropriate line for this manufacture and volume, with a degree of mechanization corresponding to present technology, would be made up of the components described in Appendix 3 of this section.

Technical assistance from a foreign expert would be required for a 6-month period, to handle the installation and to put the line into operation, as well as to train staff.

4.3.3.3. EMBALAGENS VAN LEER (Luanda)

The re-organization of this firm is subject to a decision to be arrived at in the negotiations currently going on between the firm and the Government. Supposing that in the future this unit continues to belong to the VAN LEER group, expansion plans could be carried out, as VAN LEER has enough technological know-how and the means to develop this project. If the firm's ownership should change, foreign assistance would be needed for this expansion project.

4.3.3.4. CAPSUL (Luanda)

The main difficulty at this firm is inferior production capacity for the cork-liner assembling machines in the specific area of the stamping press. This problem exists because the condition of the equipment has deteriorated with time, and neither repairs nor replacements have been made.

The use of PVC is recommended, instead of the cork currently used for lining the bottle caps. The advantages of this type of material, and the characteristics of the equipment to be used, are discussed in Appendix 4.

Technical assistance from a foreign expert will be necessary during a 3-month period for installing and putting the new system into operation, as well as for staff training.

4.3.4. Manufacture of bicycles and motorcycles

For this subsector, a rehabilitation plan for bicycle manufacture has been proposed, by means of a technical study made according to the terms of reference presented in Appendix 5 of this section.

This study could be carried out by a team of two experts (one Mechanical Engineer and one Industrial Engineer), with local assistance, over a 4-month period.

4.3.5. Nail and screw manufacture

Specific recommendations for the plants in this category are as follows:

4.3.5.1. CODUME (Huambo)

The main problem at CODUME stems from a lack of sufficient equipment for the manufacture of nuts with metric threads (M4 to M10) (thread diameters from 4-10 mm, equivalent to 5/32" and 3/8" respectively).

At the present time, the monthly production of 1,300,000 pieces (equivalent to 20.2 tons per month) meets only one-tenth of the needs for nut manufacture.

The installation of two nut-stamping machines is recommended; these machines should have characteristics set down in Appendix 6 of this section.

Technical assistance from a foreign expert is needed in order to install these machines, put them into operation, and train the staff; this should take place over a 3-month period.

4.3.5.2. LUPRAL (Benguela)

The problems encountered in screw and nut manufacture at LUPRAL are similar to those of CODUME, since the stamping presses for screws and thread-rolling machines were installed 1972 and 1974, and since production capacity for screws is much greater than for nuts.

Nevertheless, in this case the problem arises from the fact that the threading machine is more than 60 years old; its substitution by two automatic threading machines has been suggested. These new machines should have the characteristics listed in Appendix 7 of this section.

Technical assistance from a foreign expert is needed to install these machines, put them into operation, and train the staff, over a 2-month period.

4.3.6. Foundry

Section 3.5.6. analyzed the recommendations for this subsector. The proposed Engineering Department should coordinate the aspects pertaining to putting the METALVI foundry into operation, following the general lines of project DP/ANG/81/005.

4.3.7. Equipment manufacture and repair

The recommendations for this subsector are that the Engineering Department apply the experience gained from the work at F. MUTEKA and C.JIKA. with project.UF/ANG/78/209.

4.3.8. Manufacture of farming tools and implements

As discussed in section 3.5.8. paragraph (b), LUPRAL has the equipment and technological know-how for the manufacture of certain farming tools.

Keeping in mind the important role that the manufacture of tools and animal-drawn equipment will play in the near future, it is necessary to use LUPRAL's facilities to their fullest extent; in order to achieve this, an expert from the Ministry of Agriculture must supervise LUPRAL's planned production to ensure that it meets the country's needs.

The Engineering Department should take care of the management of raw material inventory and put the expansion plans set up by the firm into effect (acquisition of new equipment and machinery).

4.3.9. Other business activities

Specific recommendations for the plants in this category are as follows:

4.3.9.1. FATA (Luanda)

There are two specific problem areas at FATA:

a) Inability to manufacture water pipes because of a lack of hydraulic testing equipment, and because the galvanizing line has not been set up.

b) Actual production is well below production capacity, since the production line equipment is very old, and nowadays it is impossible to get replacement parts. The recommendations for FATA include the installation of a complete pipe manufacturing line with the characteristics specified in Appendix 8 of this section, as well as setting up the currently-existing galvanizing line, in order to make possible the manufacture of water pipe. Technical assistance for the installation of this new equipment, for putting it into operation, and for staff training, will be necessary in the form of 2 experts (1 in the mechanical area and 1 in the electrical area), whose services will be required over a 6-month period.

Since FATA has no experience in the area of setting up a galvanizing line, the suppliers of this equipment (WALTER KORN, West Germany) should be contracted to set up the line and put it into operation, as well as to train the staff. Both the new production line and galvanizing line should be put into operation at the same time.

Technical assistance will be required for setting this line up and putting it into operation, as well as for staff training. Two experts should be on hand for a 6-month period.

4.3.9.2. INCUTAL (Luanda)

Recommendations for this plant are geared toward the solution of the imported raw material supply problem (according to the suggestions in point 4.2.10.c), as well as the solution of the die supply problem, by means of the Center proposed in section 5.

4.3.9.3. IAF (Huambo)

The specific problems of this firm revolve around putting the injection molding machine and the chrome-plating line into operation.

In the first case, the following steps should be taken:

a) Get a current estimate from the manufacturers of the molding machine (ITALPRESS, Italy) for the missing parts (injector and 6 molds), as well as for the technical assistance necessary to put the machine into operation.

b) Once this information has been received, the necessary procedures should be followed to put this molding machine into production as soon as possible.

As far as the chrome-plating line is concerned, negotiations have already begun with the Italian technicians who are advising CODUME, to see if they will put this line into operation. Therefore, no additional recommendations are necessary in this area, except to suggest that these negotiations be facilitated as much as possible.

4.3.9.4. MATEC (Benguela)

A plant which manufactures water pumps should have the following departments:

a) Foundry for pump casings and runners

b) Mechanization workshop

c) Warehouse for partially-finished products

d) Assembly equipment

e) Testing bench

f) Finishing operations

g) Warehouse for finished products

Except for the testing bench, MATEC already has all these departments. What is needed is the basic reorganization of the warehouse for partially-finished products and of the assembly equipment, as well as a design for a testing bench, in order to increase pump manufacturing and to ensure quality control for the pumps manufactured.

Appendix 9 deals with characteristics and descriptions of the steps to be taken for the warehouse for partially-finished products and for the assembly equipment, as well as proposals for the testing bench.

Technical assistance from a mechanical engineer, specializing in pump design and assembly, will be necessary at MATEC for a two-month period.

4.4. REQUIREMENTS OF THE PROPOSED ENGINEERING DEPARTMENT

4.4.1. Staff

In order to carry out the immediate objectives of the Engineering Department, which were specified in point 4.3., specialized assistance is needed for the technical and economic aspects of the proposed plans.

The technical area must encompass the study of the present technology and currently-existing manufacturing equipment, state of repair of the machinery, and professional training of the staff. The assistance of a mechanical engineer is needed to make this analysis.

The economic area calls for an analysis of market demand, knowledge of manufacturing costs, and counselling the Government on the financing of the investments that will be required; the aid of an economist will be necessary for these activities.

Therefore, the basic team of experts that will be needed to establish this proposed Department will be made up of a mechanical engineer and an economist.

These experts will need to work with an Angolan counter part, who will help them with their duties and at the same time gain the experience he will need to take charge of running the Center in the future.

This team of experts will be assisted by specialized consultants for each of the different industrial activities.

In summary, the initial staff of the Department would be made up of:

- 1 National Project Co-ordinator
- 1 foreign Mechanical Engineer
- 1 foreign Economist
- 1 Angolan Mechanical Engineer
- 1 Angolan economist
- 1 four-member consultant team, made up of an economist, an engineer specializing in mechanical technology, a planning engineer, and an industrial maintenance engineer.
- 9 Angolan mechanical engineers, each one assigned to one of the categories into which the metal-mechanics sector has been divided.
- 2 Draftsmen
- Auxiliary administrative staff for management, filing, and typing, made up of a minimum of 5 people.

Staff activities:

a) National Project Co-ordinator

He will be in charge of liaison work between the Department and different ministries and government organizations, especially the Ministry of Industry, to which this Engineers Department will report directly.

He will co-ordinate the activities of the rest of the staff, in conjunction with the co-ordinator of the foreign team of experts.

b) Foreign Mechanical Engineer

He will act as co-ordinator and leader of the foreign team of experts. His general duties will be related to the technical area of the analysis to be made of the situation of the metal-mechanics firms.

Specifically, his duties will include:

- Reports on raw materials
- Terms of reference for contracting consultants
- Terms of reference for acquiring equipment and contracting the experts necessary to put it into operation and train staff.
- Advising the Government about the purchase of equipment
- Preparation of the Final report, once the different technical assistance projects have been carried out.

c) Foreign Economist

His general duties will be those related to the economic and market aspects of the analysis to be made of the situation of the metal-mechanics firms. In particular, he will carry out the following activities:

- Market studies, prior to the development of rehabilitation plans, in order to adapt manufacturing to market demand.
- Economic make-up of rehabilitation plans
- Advising the Government of possible sources of financing for the investments.
- Give advice on possible management systems for the firms.

d) Counterpart staff

Each of the foreign experts will have an Angolan counterpart, with the same educational experience, who will at the same time complete their training and gain experience, in order to be able to take charge of these activities in the future.

e) Consultant team

a) Rehabilitation studies

A total of 6 consultants is anticipated; 4 of them assigned to the study of problems in the metal furniture and bicycle sectors and the other 2 assigned to adapt the existing foundry and equipment maintenance workshop projects.

b) <u>Assistance in assembling and putting equipment into operation, and in training staff</u>

A total of 7 technical specialists is anticipated for each new piece of equipment acquired.

An organizational chart of foreign staff is included in appendix 10 of this section. On this chart, the activities that can not be decided upon until a detailed study of them has been made, are represented by a broken line.

f) <u>Angolan technical staff</u>

This team, made up of 9 engineers, will be in charge of the different categories into which the metal-mechanics sector has been divided. The objective of this team is to obtain specialized knowledge and solve the specific problems of each group.

Once the immediate objectives of the Department have been met (the rehabilitation of the metal-mechanics sector), this team will have gained enough experience to operate independently with a national staff.

4.4.2. <u>Cutfitting</u>

The projected location of the Department is in Luanda. The National Administration of Heavy Industry will be entrusted with the task of providing necessary office facilities and other equipment necessary to carry out operations.

4.4.3. Required investments

The breakdown of investments in Table 4.1. is a summary of the amounts arrived at in each of the appendices 1 to 9.

The total amount needed for the development of rehabilitation plans is U.S.$ 4.242.700, and does not include the equipment needed to rehabilitate the metal furniture, bicycle, foundry, maintenance workshop and agricultural tools subsectors. These investments which are not included in the above-mentioned figure, will be decided upon once the rehabilitation plan has been completely carried out.

In order to meet this investments, it is necessary to provide for adequate financing program and set up a schedule of payments based on the plan.

4.4.4. Work plan

The time chart included in appendix 11 shows a schedule of the different activities, with the time periods needed to carry out each one.

APPENDIX 1

TERMS OF REFERENCE FOR AID TO THE METAL FURNITURE MANUFACTURING FIRMS

1. Background

Three firms exist which handle the manufacture of metal furniture: EPMEL, and ENMEL in Luanda and UNIDADE METALICA in Huambo. This group contains a total of 20 productive units (4 in EPMEL, 10 in ENMEL and 6 in UNIDADE METALICA) that mainly manufacture tables, chairs, school desks and beds. An analysis manufacturing capacity among the 3 firms of 100,000 units/year, only 48,000 units/year are currently being produced because of the existence of the following problems:

- Lack of technological means best suited to mass production.

- Use of a limited number of devices and cut off, drawing and bending dies.

- Complete lack of technical staff and middle management.

- Low qualification level of workers.

- Manufacturing processes carried out in different productive units in many cases with the subsequent problem of transport from one to another.

- Lack of raw material supply.

In order to increase production in these firms, various units must be reorganized and merged with the purpose of creating a more efficient production process and centralizing raw material supplies.

2. Immediate project objectives

a) Analyze the present state of units that manufacture metal furniture; the qualification of staff, condition of building, machinery and equipment used, kinds of products manufactured, manufacturing techniques used, repair and maintenance services, sources of raw material supply and means of transport.

b) Based on the analysis made, develop specific reorganization and regrouping plans of the manufacturing units, consolidating all of the plans into one or several projects for each firm.

3. Work Scope

a) Analysis of the firms

The analysis of the firms, made from a study of the various productive units which they are part of, should include:

- Manufacturing program and raw material used.

- Sources of raw material supply.

- Manufacturing techniques and equipment used.

- Inventory of equipment used, its present condition and repair possibilities in the case of being broken-down.

- Qualification of staff.

- Buildings, with directions about how much space is to be allotted to warehouses and manufacturing workshops.

- Existing electrical and compressed air facilities, their present condition and repair possibilities in case of being broken-down.

- Raw material costs. Salaries and manufacturing costs. Selling prices.

b) Reorganization and re-grouping plans

The analysis of the firms will result in one or more reorganization and re-grouping projects for each and should include:

1. Prior decisions: Minimum capacity from a technical and economical point of view.

2. Suggestion of how best to use the existing buildings.

3. Proposal of which existing facilities and equipment should continue to be used.

4. New machines and facilities needed including specifications and operational costs for the new equipment.

5. Preparation of equipment set up plans.

6. Investments and operational costs of new equipment.

7. List of a two year supply of spare parts.

8. List of raw materials to last for two years.

9. Number of staff necessary and a description of their duties.

10. Staff training courses.

11. Phases of project development and dates of by what time they must be carried out.

12. Necessary investments.

4. Team of experts and time necessary to carry out the plans

The proposed reorganization and regrouping plan is expected to be able to be carried out by a mechanical engineer (expert in the analysis and planning of the units in the metal-mechanics industry), and a industrial engineer responsible for making up the project, during a four month period.

APPENDIX 2

CHARACTERISTICS OF THE PROPOSED WELDING MACHINE FOR METANGOL. LUANDA

Two types of sheave welding technology exist in the market. One of these does not require an auxiliary electrode for welding processes; the other requires recoverable copper wire.

The first type of machine has the advantage of being independent as far as raw material supply is concerned, but has a serious problem which is the fact that the welding accesory needs almost constant attention since the deposits accumulated on the sheave produce defects in the welding connection. If this machine were not being constantly watched over, rejections would occur frequently. This is why a new type of machine (which will be discussed below), is currently preferred to the above-mentioned machine.

The inconvenience of the welding machine using copper wire is the necessity of importing wire coils, but their advantage is that the welding they do is very reliable.

Since the quality of production is of primary importance, this copper wire welding machine is highly recommended.

The most efficient machine, considering the necessities of this factory, would have to have the following basic characteristics:

Maximum production 40 cans/minute
Production range from 1/4 to 5 liters
Thickness from 0.2 to 0.28 mm.
Overlapping 2.5 mm.

A machine of these characteristics requires a comsumption of:

Electrical power 40 A, 380 Volts.
Cooling water 6 l/min. to 4 bar
Maximum water entrance temperature 12°C

Number of staff needed

The machines should be handled by an unskilled operator who will receive any necessary training from the expert sent by the supplier of the equipment to assemble and put it into operation.

The length of the expert's stay in order to assemble and put the equipment into operation as well as train staff is estimated at about three months.

Investments

An investment of approximately 93,000 U.S. dollars is estimated in equipment.

APPENDIX 3

CHARACTERISTICS OF THE PROPOSED MANUFACTURING LINE FOR METANGOL. BENGUELA

1. <u>Technical characteristics</u>

The line should be formed by two groups; one of them for cylinder manufacture and the other for bottom and lid manufacture.

A. <u>Cylinder manufacture group</u>

Cylinder manufacture will begin with sheet cutting and will end with container testing. It should be formed by the following machines:

a) 1 shear for cutting sheet.

This machine will cut raw materials to the size needed for each product

It will have a feeding system for the sheet.

Cutting capacity will encompass sheet sizes of up to 1,100 x 1,100mm.

b) 1 cylinder shaping machine:

This machine will carry out the following steps:

Preparation of the cylinder sheet, cutting of the angles of the piece, lengthwise bending, preheating of the piece to be welded, welding and cleaning.

c) 1 flanging machine

This machine will form the edges at both ends of the already welded cylinder.

d) 1 sealing machine

This machine will complete the manufacture of the can, passing it on to the testing machine.

e) 1 testing machine

Its purpose is to test for watertightness of the can.

f) Transfer system

A means of co-ordinating the cylinder shaping, flanging and sealing machines must be found.

B. Bottom and lid manufacture group

Bottom and lid manufacture requires the following machinery.

a) 1 shear to cut sheet slabs to the right dimensions.

It will have a system to feed the sheet.

The cutting capacity will encompass slab sheets of up to 1,100 x 1,100 mm.

b) 1 bottom and lid manufacturing press

Is fed with the cut material coming from the machine before it and shapes the bottoms and lids.

c) 1 flanging machine

This machine will be used to flange the bottoms and lids and will be connected to the one before it.

d) 1 gumming and drying machine

This machine applies rubber to the bottoms and lids that have been flanged, dries them and leaves the piece ready for use.

2. Power needs

The total amount of electrical power needed to operate this production line, including cylinder, bottom and lid manufacture, is 125 KW and the break-down is as shown below:

Cylinder manufacturing group:

Shear with feeding system	11 KW
Cylinder shaping machine	28 KW
Welding machine	17 KW
Flanging machine	4 KW
Sealing machine	6 KW
Testing machine	3 KW
Co-ordinating system	4 KW

Bottom and lid manufacturing system:

Shear with feeding system	10 KW
Press	12 KW
Flanging machine	2 KW
Gumming and drying machine	16 KW
Total................................	113 KW

- Engine output 0.9
- Nominal power $\frac{113}{0.9}$ =125 KW

Demands

The demand required for a manufacturing line of this type will be:

A. Electrical Power demand

Based on the figure for nominal power arrived at in the section before this one, the following information is obtained:

Nominal power	125 KW
Yearly use factor	65%
Number of work hours/year	2,200
Yearly demand:	125 x 2,200 x 0.65= 178,750 Kwh

B. Propane

The quantity of propane needed for pre-heating and post-heating of cylinders during the welding phase is 6 m^3/h. Yearly demand will be:

Hourly consumption 6 m^3

Yearly use of facility factor: 65%

Number of work hours per year: 2,200

Yearly demand

$$6 \times 2{,}200 \times 0.65 = 8{,}580 \text{ m}^3$$

4. Number of staff needed

The complete line, including the cylinder, bottom and lid manufacturing groups will require 5 unskilled operators.

The duties of these employees will be:

a) Supervise the operation of the whole group of machines and the co-ordinating system.

b) Carry raw material to the shear in the cylinder manufacturing group.

c) The same for the bottom manufacturing group.

d) Transfer of the cut material to the bottom and lid press.

e) Removal of the bottoms from the gumming/drying machine and feeding of the sealing machine.

f) Removal and storage of finished containers.

Instructions for the handling of the manufacturing line will be given to the staff by the expert sent by the manufacturer of the equipment to assemble it and put it into operation.

The period of time the expert will need to stay in order to assemble and put machinery into operation as well as train staff is estimated at about 6 months.

5. Space occupied by the machinery

The total surface area of the manufacturing line will be approximately 480 m^2.

The group of machines which are used to shape the cylinders will take up approximately 30 m x 10 m (equivalent to 300 m^2) of space.

The group of machines which manufacture bottoms and lids will take up approximately 18 m x 10 m (equivalent to 180 m^2) of space.

Existing warehouses will be used to store raw materials and finished products

A layout with each individual equipment is shown in drawing 4.1.

6. Necessary investments

An investment of approximately 665,000 U.S. dollars is estimated in equipment.

APPENDIX 4

CHARACTERISTICS OF THE PROPOSED EQUIPMENT FOR CAPSUL. LUANDA

1. Advantages of PVC use over cork use

The substitution of PVC for cork in assembling machines is suggested for the following reasons.

a) Cork bottle caps need to be higher than PVC caps (6.75 mm. height for cork caps as opposed to 5.97 or 6.16 mm. for PVC caps). This results in greater sheet weight and therefore higher price in this type of cap.

b) Cork is more expensive than the PVC which is currently being used.

c) Both reasons cited mean a lower cost in bottle caps made with PVC. In Europe the cost is about 4.5 U.S dollars/1,000 caps made with PVC compared to 5.1 U.S dollars/1,000 caps made with cork. In other words, the cost is 13.3% lower for caps made with PVC than for caps made with cork. The current cost in CAPSUL is 242.6 Kz/1,000 units or 8.2 U.S dollars/ 1,000 caps.

2. Types of assembling machines on the market

There are basically two types of assembling machines which use PVC. The first requires granulated PVC with cold molding which is put into the cap after already being heated by induction. The second requires hot PVC molding which is done in a propane combustion furnace.

Cold molding results in reduced PVC consumption (190 mg/cap compared to 220 mg/cap with hot molding). In other words, 15.8% less PVC per cap.

Production capacity of the assembling machines ranges from 950 to 2,000 bottle caps/minute. The best set up is one in which one stamping press supplies two assembling machines.

CAPSUL has two stamping presses used for Ø 26 mm. bottle caps and a third which is shut down, for Ø 29 mm. caps.

The suggestion here is to initially install a PVC assembling machine with a capacity to produce 1,400 caps/minute (Annual production of 138 million caps/year, assuming that machines are used to 75% of total capacity). This assembling machines would operate using 6.75 mm. high caps which is the standard for cork caps. In the future, a second assembling machine and a stamping press could be installed;this would enable production of the standard height PVC cap (5.97 mm in the United States or 6.16 mm. in Europe).

3. Characteristics of the assembling machine

Assuming that the type of assembling machine with cold molding is used, the general characteristics are as follows:

Capacity:	1,400 caps/minute
Plastic consumption:	190 mg/cap
Electrical power:	25 KVA
Amount of cooling water consumed:	20 l/min. to 3 Kg/cm^2
Amount of compressed air consumed:	60 l/min. to 3 Kg/cm^2

4. **Number of staff needed**

Two operators are needed to handle the machines and should receive any neccessary instructions from the supplier of the equipment for a three month period, including assembly and start up of the machinery.

5. **Necessary Investments**

An investment of approximately 120,000 U.S dollars is estimated in equipment.

APPENDIX 5

TERMS OF REFERENCE FOR AID TO THE FIRMS THAT MANUFACTURE BICYCLES

1. Background Information

There are two firms in this group, FABIMOR in Luanda and ULISSES in Huambo that manufacture bicycles. An analysis made by UNIDO in 1981/1982, determined that from a total production capacity of 33,500 bicycles/year between the two firms, only 3,600 bicycles/year are currently beign produced in FABIMOR. ULISSES is shut down because it lacks the necessary production means since most of the equipment is broken down.

Because of the lack of public transport in Angola, a large amount of individual transport is necessary and bicycles could play an important part in solving this problem.

2. Immediate Project objectives

a) Analyze the present condition of the two factories; staff qualification level, builddings and equipment, manufacturing technology used, sources of raw material and component supply, receipt dates for these raw materials and components, raw material and semi-finished product warehouses and warehouse control.

b) Develop specific rehabilitation plans for both factories based on the analysis made previously which will be combined into two projects. Both of these projects should be set up with the purpose of repeating to the smallest degree possible the duplication of the manufacturing process in both firms.

Therefore, each factory is projected to have component assembly and production lines for both firms.

3. <u>Work scope</u>

a) <u>Analysis of the firms</u>

The analysis of the firms, carried out through the study of the two existing productive units, should include:

- Present raw material and component demand and sources of supply.
- Manufacturing techniques and equipment being used, specially in the frame, tire rim, mudguard, grinding, phosphate plating, chrome-plating, painting and assembly sections.
- Inventory of existing equipment; its present condition and repair possibilities if broken down.
- Qualification level of staff.
- Buildings, with specification of area to be used for warehouses and manufacturing/assembling workshops.
- Existing warehouse control means.
- Electrical and compressed air facilities, present condition and possibilities for repair if broken down.

- Raw material costs, salaries and manufacturing costs.

- Selling prices.

b) Rehabilitation Plans

The analysis of both firms will result in two co-ordinated rehabilitation plans which should include:

1. Prior decisions: Minimum capacity from a technical and economic point of view. Designation of components to be manufactured in each factory.

2. Suggestions based on the necessity of expanding existing buildings.

3. Proposal of existing equipment and facilities to be used.

4. New equipment and facility needs, including any specifications made concerning the adquisition of the same.

5. Preparation of set up plans for equipment and facilities.

6. Investments in new equipment and facilities and operational costs.

7. A list of any spare parts needed for two year of normal manufacture.

8. A list of a two year supply of usable raw materials.

9. Amount of national staff needed and the duties to be performed by them.

10. Staff training courses.

11. Number of foreign experts needed with a description of the duties they are to perform.

12. Project development phases and time required to carry them out.

13. Necessary investments.

4. Team of experts and time specified to carry out duties

The proposed rehabilitation plan can probably be carried out by a team of two experts, one mechanical engineer and one industrial engineer, and their duties will be divided up in the following way:

Mechanical Engineer

He will be in charge of gathering information, analyzing and compiling it and will set up the basis for rehabilitation programs.

Industrial Engineer

He will be responsible for making up the project and the following will be included within it: Analysis of training level of staff, facilities and technological expertise that are required and the plans necessary to carry out the project.

The time necessary to carry out the proposed rehabilitation plans should be about four months.

APPENDIX 6

CHARACTERISTICS OF PROPOSED EQUIPMENT FOR CODUME. HUAMBO

1. **Manufacturing process and characteristics of the proposed machinery**

Nut production by stamping is only done in one machine which cuts the metal piece, forms one side, forms the other side, makes the definitive shape of the nut and, punches the hole, according to the outline given in 4.2.

Nut tapping is done in another machine and the one in CODUME has tapping capacity able to handle the production of nuts even if the level reaches the production level for screws.

Two machines are needed with the following characteristics:

a) Stamping machine for nuts (M4 to M8)

Production: 450 pieces/minute

Power: 25 CV

b) Stamping machine for nuts (M8 to M10)

Production: 300 pieces/minute

Power: 50 CV

2. Number of staff needed

Each machine should be handled by one unskilled mechanic. This mechanic will receive special training from the expert hired by the manufacturer of the equipment to assemble and put it into operation.

3. Necessary Investments

An investment of approximately 665,000 U.S. dollars is estimated in equipment.

APPENDIX 7

CHARACTERISTICS OF PROPOSED EQUIPMENT FOR LUPRAL. BENGUELA

1. Characteristics of the Nut tapping machines

a) Thread diameter M4 to M8

Production: 4,300 to 2,800 pieces/hour (1)

Power: 1 CV

b) Thread diameter M8 to M12

Production: 2,400 to 1,700 pieces/hour (1)

Power: 2 CV

2. Number of staff needed

Both machines can be handled by a total of four people who will receive special training from the expert hired by the manufacturer of the equipment to assemble and put it into operation. The period of time that the expert will stay in order to complete assembly, machine start up an staff training will be approximately two months.

3. Necessary investments

A total investment of 29,500 U.S dollars is estimated in equipment.

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(1) As far as the diameter to be manufactured is concerned, the largest manufacturing figure corresponds to the smallest diameter.

APPENDIX 8

CHARACTERISTICS OF THE PROPOSED PIPE MANUFACTURING LINE FOR FATA. LUANDA

1. Manufacturing range and volume

The following nominal diameters measured in inches: 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1½, 2, 2½, 3, 3½, and 4, should be manufactured with the new and existing lines with certain specifications. They are:

Material: St-oo, according to DIN 1,629
Measurements: according to DIN 2,440 maximum lengths of 6 m.
Thread: Thread gas, according to DIN 2,999
Tolerances and testing pressure: according to DIN 1,629

This factory should produce enough black piping now and in the future used to make furniture and other items. Moreover, it should handle the manufacture of galvanized piping which at the present time is imported in its entirety.

The Engineering Center will be in charge of finding new markets for these products, researching possible piping demands in the bycicle, light boilermaking and light metal structure sectors in order to substitute the rolled steel sections currently brought in from abroad.

Total market demand is estimated to be between 10-15 thousand tons/year. As far as the characteristics of the proposed line are concerned, a production capacity of 10,000 tons/year has been considered feasible.

2. Characteristics of the Production line

It is assumed that the metal bands are already prepared in coils of proper width from the cutting line which are currently available.

Based on the manufacturing range and volume mentioned in the last section, the line should consist of the following items:

a) A hauling machine.

This machine will be placed between the coil and the production line. Its purpose will be to feed the metal bands into the shaper.

b) A shaping machine (with any necessary equipment) which will encompass the entire production range.

c) An automatic high frequency welding machine.

d) A cooling area.

e) A gaging machine.

f) A machine for cutting pipes to commercial lengths.

g) A table for storing

h) A straightening machine.

i) A transfer table to change the direction of the line.

j) A grinding and chamfering machine.

k) A hydraulic testing machine to check welding.

After this, any products that need it can be passed along to the galvanizing line.

Any product which does not require this treatment as well as galvanized piping will pass through to the finishing phase made up of:

1 tapping machine

Plan 4.3 shows the set up for the items described above.

3. Power needs

Total power needs will be about 800 KVA

4. Auxiliary Services

A compresor is needed to blow and clean cylinders with a capacity of approximately 30 m^3/h.

The heat which comes out of the high frequency welding circuit is emptied out into water which is being circulated through a closed circuit. This water should be cooled through the use of an interchanger.

The characteristics of the water in the closed circuit should be the following:

- Minimum volume of flow	12 m^3/h
- Maximum temperature	60°C
- Nominal pressure	4 bars

5. Number of staff needed

In order to manufacture efficiently, the following staff will be needed for each shift:

Continual feeding or shaping of metal bands	1
Shaping machine	1
Cutting and straightening machine	1
Grinding machine	1
Control machine	1
Galvanizing	2
Tapping machine	2
TOTAL	9 men

These employees will be chosen from the staff presently working in the manufacturing line for resistance welding piping and will participate in a special training program concerning the assembly and start up of equipment for a period of time estimated at a minimum of six months.

6. Investment

An investment of approximately 1,270,000 U.S dollars is estimated in equipment.

APPENDIX 9

CHARACTERISTICS OF PROPOSED WAREHOUSE FOR PARTIALLY FINISHED PRODUCTS ASSEMBLY DIVISION AND TESTING EQUIPMENT FOR MATEC. BENGUELA

1. Warehouse for partially finished products

This warehouse is expected to have a surface area of about 200 m^2 and will store the engines as they arrive and any pieces prepared in the mechanics workshops.

Entry and testing controls should be established and the properly labeled parts in boxes or pallets placed on shelves.

The testing section will reject any parts which cannot be assembled because of manufacturing defects and return them to the mechanization workshop to be re-made.

2. Assembly division

This division will have a surface area of approximately 400 m^2 and should include a bench used to balance rotors. The rotors should be arranged so that they can be mounted on the rest of the pump cylinder.

The parts that are used daily to assemble the pumps should be placed on shelves near the assembling benches. These benches (minimum of 2) will be used to assemble all parts and that is why drawing similar to those of 4.4 should be made up where the numbers given correspond to the list of materials and number of pieces per pump:

Number on the drawing	Items	Material	Number of items in the pump
1	Press	Bronze	1
2	Coupling machine	Cast iron	1
3	Hexagonal nut	Steel	1
4	Gasket Platform	Steel	1

Number on the drawing	Items	Material	Number of items in the pump
5	Cup support	Cast iron	1
6	valve	Steel	1
7	Axis	Steel	1
8	Socket axis	Cast bronze	1
9	Joint	Leather	1
10	Cylindrical screw	Brass	1
11	Priming cup	Bronze	1
12	Gasket	Brass	1
13	Nut	Brass	1
14	Hexagonal screw	Steel	8
15	Rotor	Bronze	1
16	Horizontal cap	Cast iron	1
17	Hexagonal screw	Steel	1
18	Joint	Leather	1
19	Valve disk	Steel	1
20	Horizontal body	Cast iron	1
21	Pivot fastening	Steel	1
22	Gasket platform	Steel	3
23	Hexagonal screw	Steel	3
24	Bearing	Stainless Steel	1
25	Packing		

Once the pump is assembled an engine will be placed in it, it will pass on to the testing bench and there each pump and engine will be tested individually.

3. Testing bench

It should be set up as illustrated in drawing 4.5 whose numbers correspond to the descriptions given below:

1. Pump and engine group. Where the pump is placed in order to test it. For supported pumps, it is useful to have an engine and an elastic coupling system.

2. Dispersing cone. (a set of cones is needed for each type of pump)

   The cone's interior should not have any sharp angles and the divergence angle should be 7°

3. Rectilinear pipe with a pressure gauge connection. It is necessary that the pressure gauge connection be made perpendicularly to the current in order to keep the gauge from influencing the current. Likewise, there must be no rough seams since this would alter the reading.

   Drillholes should be small (from 2 to 3 mm) and it is advisable to make several holes at the same height and cover them in a casing which permits communication between them and allows pressure to be regulated.

   The gauge should not be placed too close to the dispersing cone 2 (the minimum distance between the end of the difusing cone and gauge should be three times the diameter of pipe 3).

4. Pressure gauge. (Eventually with a valve in order to avoid a sudden rush of pressure when the machine is turned on).

5. Suction cone. (A complete set of cones is needed for the different pump outlets). The maximum height of the interior should not exceed the highest point in the suction nozzle.

6. Rectilinear pipe with pressure gauge connection.It is preferible to make the gauge connection sideways. The height of the center of the vacum gauge should not exceed the height of the highest part of the pipe although this condition is not absolutely necessary. A valve should not be used in the vacuum gauge because it is too easy for air to get into the gauge in that case.

   It is recommendable for the diameters of the rectilinear pipes, vacuum gauge and pressure gauge to be the same.

7. Vacuum gauge

8. Suction pipe. Sharp bends should be avoided as much as possible along the length of this pipe.

9. Foot valve

10. Discharge pipe. The diameter of this pipe need not be identical to that of the pressure gauge connection. However, it is a good idea to avoid any sharp changes in size and bends in the pipe.

11. Nozzle. A set of nozzles is necessary for each pump that is going to be tested.

12. Return side tank

13. Tank lid (prepared in such a way as to avoid slatters).

14. Bottom of return side tank (eventual arrangement) for the rupture and absorption of the water.

15. Divider-Drain between the tanks (12) and (16).

16. Suction side tank

17. and 18. Stretch of connecting pipe between the tanks (12 and 16)

19. Isolation valve

20. Pipe protecting valve (21)

21. Level vial, with an adjustable scale.

This test is based on the principle of making the pump work under different volume of flow and pressure conditions in order to prove that its operation is ajustable to the characteristic bends of that pump.

In the case of the pump having a higher dispersion level than is advisable, it will be subject to complete inspection.

Once the pumps have been checked, they will be taken to the bench of already checked pumps and will remain there until the final steps are taken.

The last steps are a surface cleaning and painting of the engine and pump, and finally the finishing which consists of placing a brand name identification plate on the pump and retouching the final finish.

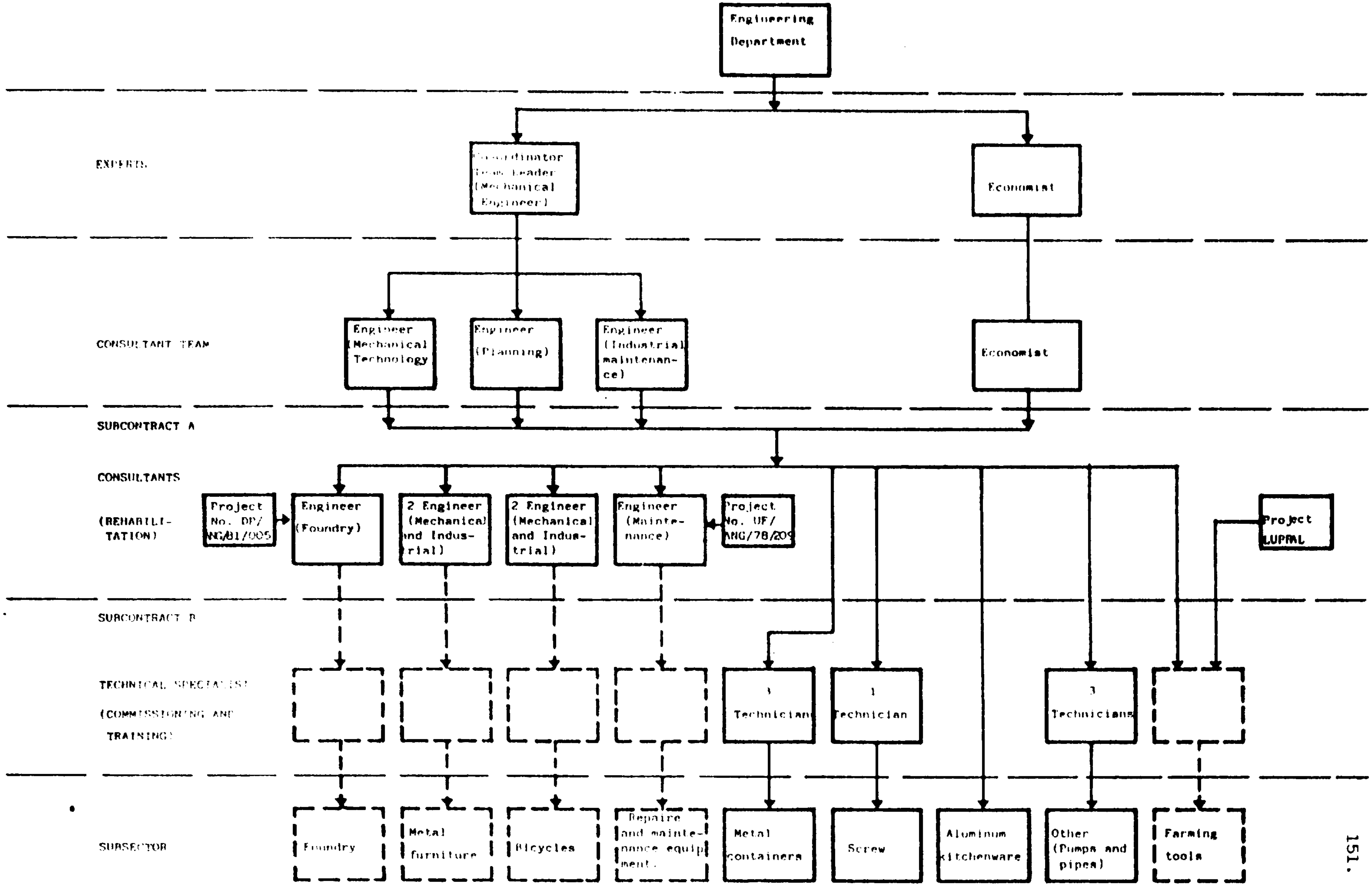
4. Necessary investments

A 20,000 U.S dollars investment is estimated for the warehouse, assembly division and testing bench and the advice of a mechanical engineer who is an expert in assembly of pumps will be sought to give a training course to the staff as well as advise in the design and plans for division into component parts of the pumps. This expert's stay in MATEC should last a minimum of two months.

APPENDIX 10

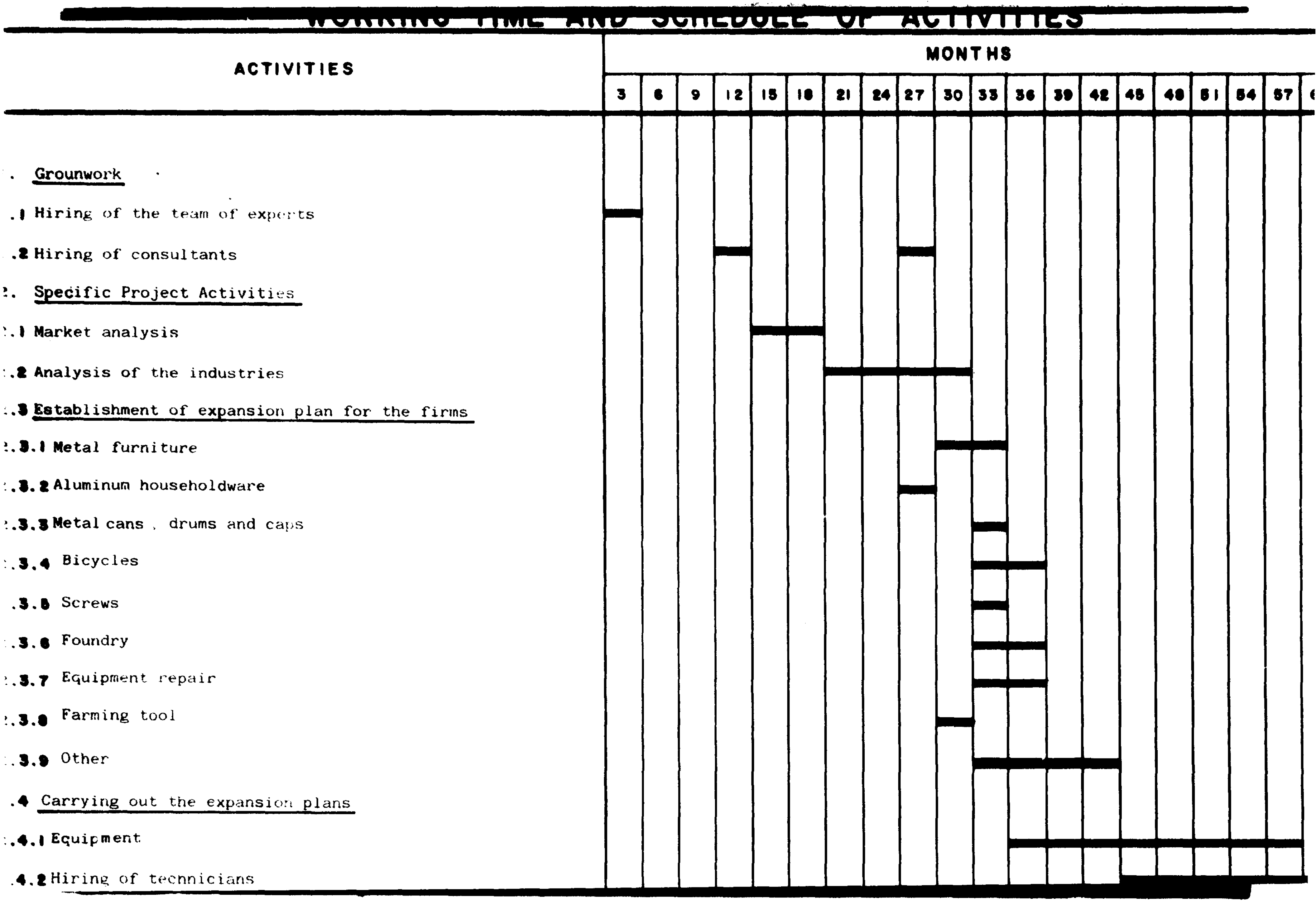
ORGANIZATIONAL CHART OF FOREIGN STAFF

ORGANIZATIONAL CHART OF FOREIGN STAFF



APPENDIX 11

WORKING TIME AND SCHEDULE OF ACTIVITIES


WORKING TIME AND SCHEDULE OF ACTIVITIES
ACTIVITIES
MONTHS
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
48
51
54
57
. Grounwork
.1 Hiring of the team of experts
.2 Hiring of consultants
2. Specific Project Activities
2.1 Market analysis
2.2 Analysis of the industries
2.3 Establishment of expansion plan for the firms
2.3.1 Metal furniture
2.3.2 Aluminum householdware
2.3.3 Metal cans , drums and caps
2.3.4 Bicycles
.3.5 Screws
2.3.6 Foundry
2.3.7 Equipment repair
2.3.8 Farming tool
2.3.9 Other
.4 Carrying out the expansion plans
2.4.1 Equipment
.4.2 Hiring of tecnnicians

5. ASSISTANCE IN THE ESTABLISHMENT OF A DIES AND SPECIAL TOOLS CENTER

5.1. INTRODUCTION AND ORIGINS

The project included in this section has as its mission to establish the basic technical and economic conditions that must be gathered in a Center, be used principally for the design and manufacture of dies and, secondarily, for the design of special tools (devices, jigs and fixtures) capable of meeting the requirements of the country, basically those in the metal-mechanics sector.

Because of the specialized nature of the technology and machinery that are required in this Cen er, it would also be possible to handle production of critical spare-part due to special mechanization characteristics, type of the needed steel or required heat treatment, these parts cannot be made in the already existing maintenance workshops.

The necessity of the establishment of the above mentioned Center has been pointed out in the explanation in section 3 "ANALYSIS OF THE INDUSTRIES VISITED".

Within the heavy industry of the country in general, and in the metal-mechanics industry in particular, there are factories which include, cutting, press forming stamping and stamping in dies, sheet drawing and mechanization phases in their processing. A subsection devoted specifically to repair and maintenance of equipment is also included. Also is needed a variety of jigs and devices to pre-mounting and welding.

The production of dies and the special tools needed for these operations requires:

- Strict tolerance in their manufacture
- Complicated mechanization
- High grade surface finish
- For some components, the use of special hard steel
- Heat treatments and finally
- A complete design technology.

The above requires that the manufacture of there elements take place in a specialized unit, specialized both in the machinery to be used and its use as well as in the design technology.

At the present time the country does not have a sufficiently qualified Center in this field. Therefore, practically all dies and other spec... equipment must be imported.

The following is an analysis of the fundamental aspects of the project (basic information and features), going on to describe the completion and starting up phases as well as required investments.

5.1.1. Project Document

In seccion 6.2. is included the Project Document of this Center.

5.2. BACKGROUND INFORMATION

5.2.1. Introduction

In order to determine the production capacity of the Center, a prior analysis of the market demand is made in this section, based on the data collected by the TECNIBERIA team during the visit made to the country.

According to the results of this analysis the range and volume of production will be determined.

5.2.2. Analysis of the Market

Within the group of factories that have been visited in the metal-mechanics sector, the highest demand for dies and special tools is to be seen in the following subgroups:

- Manufacture of metal furniture
- Manufacture of metal containers (cans, drums) and caps
- Manufacture of bicycles
- Manufacture of screws and nails
- Manufacture and maintenance of equipment.

The necessities of this items in each case will be determined by the analysis of the machinery used according to number and function, as well as by the anticipated annual production. Production figures which will serve as a point of reference, will corresponde to production plans anticipated for the year 1981, which, as it has been seen, are approximately 217% of actual production.

a more detailed analysis of the market leads to the following conclusions, as far as possible consumers of dies and special tools are concerned.

5.2.2.1 Metal-mechanics sector

a) Manufacture of metal furniture subsector

The following companies are included:

- EPMEL of Luanda
- ENMEL of Luanda
- UNIDADE METALICA of Huambo
- LUMEL of Benguela
- INDUMEC of Lobito

The production figure to be used as a point of reference for these five firms is 220,000 pieces of metal furniture/year.

Basically there is a call for cutting dies for steel-sheet shearing machines, for bending dies for sheet-bending machines, for shaping and devices for pre-assembly and welding.

b) Manufacture of aluminum kitchenware subsector

The demand will be light in this subsector due to the machines and the technology used in this branch of the industry.

c) Manufacture of metal containers and caps subsector

The following companies are included:

- CAPSUL of Luanda. Manufacture of bottle caps; with a production reference figure of 180 million pieces/year. The demand in this industry will be basically for dies-small dies for cutoff and drawing, as well as dies for assembling machines to put on cork liners.

- METANGOL of Luanda and Benguela. These two companies, devoted to the production of cans with capacities of ¼ to 5 liters have a production reference figure of 9,570,000 pieces/year. Their basic needs are for small and medium sized cutoff and drawing dies.

- EMBALAGENS VAN LEER of Luanda. Devoted to the production of 25, 50 and 200 liter drums with an planned production of 369,000 pieces in 1981. The demand is for medium and large-sized cutoff and drawing dies.

d) Bicycle manufacture and assembly subsector

This subsector is made up of two firms:

- FABIMOR of Luanda and
- ULISSES of Huambo

The production capacity figure of these two firms reaches 33,500 bicycles/year.

Their necessities are basically for small and medium-sized cutoff and stamping dies as well as devices for pre-assembly and welding.

e) Manufacture of screws and nails subsector

The following two companies are included:

- CODUME of Huambo and
- LUPRAL of Benguela

The combined production reference figure for the two companies amounts to 761 tons/year of screws, etc., equivalent to approximately 25.4 million pieces/year. This supposes a combined production of rod for wire-drawing of approximately 900 tons/year.

These two companies will need small sized cutoff and stamping dies, as well as drawplate.

f) Iron and non-ferrous foundry subsector

The demand in this subsector will be light.

g) Equipment manufacture and repair or maintenance subsector

This subsector is made up of several companies whose equipment is based solely on machine tools.

The recorded number of machines is 105, with a production capacity of 505,000 hours/year.

The demand in this subsector will be for specialized tools and critical spare-parts.

h) Farming tools and implements subsector

The only company in this subsector that practically makes up the market is:

- LUPRAL of Benguela whose production reference figure of hoes reaches 288,000 pieces/year.

The demand is for large-sized hot swaging dies.

i) Miscellaneous subsector

Among the various industries that make up this subsector, the following stand out:

- INCUTAL of Luanda. Devoted to the production of flatware with a planned production of 3 million pieces for the year 1981.

  Its basic need is for small-sized stamping dies.

- IAF of Huambo. Devoted to the manufacture of builder's hardware, it has a production reference figure of 521,700 pieces/year (locks and hinges).

The basic needs will be for small-sized cutoff and drawing dies, as well as dies for injection molding machinery.

- LUMEL of Benguela. Production of exhaust pipes and mufflers. It has a maximum production capacity of 6,000 pieces/year.

Its demand is for installation elements for cutting and shaping and die by stamping.

- LUPRAL of Benguela. Production of chains, with a prodution reference figure of 92 tons/year.

  Its basic need is for small-sized stamping dies.

  In this same subsector, besides the above-mentioned industries, there are other factories devoted to the production of scales and platform scales, vehicles for the handicapped, water pumps, stove (for cooking), aluminum plates, etc. whose needs require cutting dies for steel-sheet shearing machines, cutoff dies stamping dies, bending dies and shaping tools.

5.2.2.2. Other sectors

Besides the needs analyzed in the metal-mechanics sector, it is necessary to consider the demand that arises from other industrial groups.

In fact, there is a need for special tools, drawplate and cutoff and stamping dies in industries such as:

- Production of electric cables
- Ship-building and repairs
- The chemical industry
- Electric appliances and cooling equipment

5.2.2.3. Other tasks

Finally, another possible market exists in the area of manufacture of spare parts for special equipment, that, because of its mechanization conditions or because of the quality or treatment of the steel that is needed, cannot be manufactured in the existing workshops in the equipment maintenance and repair subsector.

Neither the quality nor the quantity of the needs that may arise in this area can be determined at the present time.

5.2.3. Determination of the range and volume of production

In order to determine the production capacity that the dies and special tools Center should handle, a classification of the material must be made according to its function, and the anticipated annual work volume on which the production capacity is based must be determined.

5.2.3.1. Range of Production

Based on the market analysis made in section 5.2.2., it can be concluded that the production range must include the following types of elements:

a) Cutting tools of different lengths for shearing machines (for steel-sheet and other sheet metal)

b) Bending tools for steel-sheet bending machines

c) Cutoff and punching dies

d) Bending and winding dies

e) Stamping dies

f) Drawing dies

- Plain drawing dies
- Drawing and cutoff dies
- Cutoff - drawing - recutting dies
- Cutoff - drawing and perforating dies

g) Devices for pre-assembly and welding

h) specialized spare parts

Finally, tools and dies in use must also be repaired.

5.2.3.2. Volume of production

With the data that is available, it is not feasible to do an exhaustive study of the types, function and size of the necessary tools in order to determine the volume of work. To get around this difficulty, we have used the following indirect procedure, based on the use of statistical ratios of similar companies whose results are perfectly valid for the effects of production volume.

a) Estimate the number of dies and specialized tools needed for each factory within each subsector of the industry, in terms of its production lines and production capacity reference figure.

b) Classify these elements within the range stablished section 5.2.3.1.

c) Classify these elements within the range in terms of its size, taking into consideration the following groups:

Group 1 - small size
Group 2 - medium size
Group 3 - large size

The small size will include dies with a total surface area no larger than 575 cm^2.

The medium size will include dies with a surface area of between 575 cm^2 and 3,200 cm^2.

The large size will be for dies with surface area greater than 3.200 cm^2.

d) Set an average weight for the dies in each one of the groups.

e) Calculate in terms of this information the weight of the material to be processed for each one of the groups in each specific production range and for each size within each group.

The results obtained are included in tables 5.1 and 5.2.

5.2.4. Criteria for selection of raw materials and machinery

Based on the results obtained in the previous section and by the application of ratios taken from similar workshops the following results have achieved·

5.2.4.1. Raw materials

The raw materials can be broken down as follows, referring to one year's demand, equal to, according to tables 5.1. and 5.2, 55,755 kilos of steel to be processed, in other words, about 56,000 kilos, broken down as follows:

a) Material for base plates	8,000 Kg.
b) Material for anchor plates and dollies	6,000 Kg.
c) Material for intermediate plates	5,000 Kg.
d) Material for guide columns	2,500 Kg.
e) Material for punch base plates	4,500 Kg.
f) Material for punches, rings, blades cutting	5,500 Kg.
g) Material for die plates	8,000 Kg.
h) Material for ejectors, intermediate rings and rods	4,000 Kg.
i) Material for special elements	12,500 Kg.

Springs and mounting screws are also needed.

The quality of the material to be used will be discussed in section 5.3.3.4.

5.2.4.2. Machinery

The annual "machine hours" can be broken down as follows:

a) Roughing	1,600 hours
b) Lathing	1,550 hours
c) Milling	3,900 hours
d) Grinding	3,200 hours
e) Electro-erosion	2,000 hours
f) Fitting	5,900 hours
g) Mounting and welding	3,800 hours

These machine hours include shut-down time as well as the time to repair the dies and tools used.

The machine hours shown here and the range of production described in section 5.2.3.1 determine the selection of machine tools needed according to types and characteristics.

The complete report on the machinery is found in appendix 1.

5.3. CHARACTERISTICS OF THE PROPOSED CENTER

Once the background information which permits us to determine the needs for raw material, machinery and staff has been obtained, we can begin to discuss the technical and economic aspects and organization in its broadest sense.

5.3.1. Location

It has been decided that the Center should be situated in Luanda because this is where the highest industrial concentration is found.

In Luanda the buildings at the corner of Avenida Norte and 3ª Avenida have been chosen (see Drawing 5.1.) and of these buildings, those shown darkly. These buildings have been selected because their surface area and availability are suitable for the location of the Center and there is sufficient surrounding space for possible later expansion.

5.3.2. Organization

5.3.2.1. General Aspects

The Center should function as an autonomous unit within the industrial sector of the country and therefore it will have all the basic elements in the structure of this type of company. Taking into consideration that the areas of design, production, administration and raw material planning must be included, it must be noted at the same time, that direct management of raw material acquisition and commercial management will follow the same course as the rest of the goverment controlled firms of the country. For this reason these last two areas of organization will not be dealt with in this project.

Basically the Center will consist of the following units:

a) Technical office
b) Production workshop and dependent areas
c) Administrative office

Two adjacent structures, that can be perfectly adapted to its necessities, have been selected for the location of the Center. The decision has been based not only on the dimensions of the structures but also on the communication of materials and coordination between the areas.

The location and distribution can be seen in Drawing 5.2.

One of the structures is a shop, 78 m. log and 11 m. wide, with access to the outside at the two ends. This shop will be used as a production workshop and warehouse.

The other structure is 17 m. long and 10 m. wide. It is next to the first one, and has two floors. The technical and administrative offices, quality control, locker rooms and employee service area will be located in this building.

The organization of a) b) and c) above, as well as the scope of their assigned duties, will be described in detail in the following sections.

5.3.2.2. Technical office

This section will deal with the operations, personnel, area and equipment of the technical office.

A. Operations and scope of the activity to be developed

The operations handled by the technical office will be:

a) The design of all equipment according to the market demand and the preparation of constructive documentation needed for production. The specific tasks in this area are:

- Geometric, dimensional and operational study of the dies.
- Determination of the number and quality of needed tools to obtain a decided process.
- Geometrical breakdown so that construction may be technically possible as well as economically acceptable.
- Preparation of joint plans and nomenclature to be used for the mounting of elements and for the easy identification of spare parts.
- Development of dies components and preparation of drawings for workshop production.
- Determiration of tolerances and finishings of surfaces.
- Establishment of types of steel or adequate heat treatment for each piece according to its use, strength of the material to be worked with, and speed of operation.
- Selection of the most suitable measurements of the raw material for each piece in order to minimize trimming away the material.

b) Time control by mechanized phases in order to obtain suitable statistical parameters for use in cost control bid evaluations and especially in assigning appropriate machinery according to the task to be performed.

c) Study of the transporation of materials: from raw materials to finished product, in order to minimize costs and space occupied.

d) Establishment of quality control systems and material testing methods.

e) Testing and research in the use of different design systems, use of materials or heat treatments in order to improve the quality and type of tools.

f) Anticipation of raw materials needed in the workshop.

g) Continuation of contacts with product consumers in order to keep up to date with whatever defects the dies might have, to advise clients on the appropriate way to employ the equipment or to improve some phase of its operations.

h) Establishment of permanent contact with technically advanced countries, enabling the Center to be up to date with systems, materials, machinery and standardized procedures.

B. Staff personnel

The previously determined volume of work will demand a staff of personnel able to carry out the operations established in the above section. These necessities will require a crew made up of:

a) A Technical Director, with mechanical engineering training.

He will be in charge of the Center and will be responsible for the subsequent following general activities.

- Maintain relations with the Ministry of Industry in order to make an appropriate analysis of the development of demand and to anticipate any need to expand the Center.
- Plan the operation of the Center and stablish work plans that will assure coordination between the technical office and the workshop.
- Be in charge of establishing any outside contacts necessary to keep the Center up-to-date.
- Maintain contact with the buyers of the material and advise them on its use and thereby make improvements on production methods.
- Select and hire personnel.

b) Technical Office Manager, with mechanical engineering training, specialist in die design. He will be in charge of the technical office and will have the following responsibilities:

- Design of tools and dies.
- Time and method study.
- Determination of quality of material and heat treatments.
- Organization of technical office, as far as standards, records, and procedures are concerned.
- Supervision of quality control in collaboration with workshop manager
- Contact with the administrative office for cost control.

c) Tool Designer

This individual will have engineering training at an associate-degree level.

His duty will be to assist the Technical Office Manager in his responsibilities and under his direction will carry out the following specific tasks:

- Develop the designs and prepare sets of or individual sketches to be drawn up by the staff of draftsmen. Revise and supervise these activities.
- Method and time control in the workshop.
- Manager work standards and tolerances.
- Prepare cost estimates for financial studies and offers.

d) 2 draftsmen

Their duties will be:

- Completion and revision of the sketches made by the designer.
- Classification and maintenance of the drawing and catalogue files.
- Preparation of copies of plans and lists of materials.
- Anticipation of materials needed in the technical office.

C. Office area and equipment

The area to be used for the technical office will be 40 m^2 and will have an additional area for files and copy machine.

Its initial equipment will consit of the following:

- 3 drawing boards with technigraph
- 1 desk for the Technical Office Manager
- 1 copy machine for plans with complete necessary components
- 3 calculators
- File cabinets for plans, standards and catalogues
- Technical office materials, drawing paper, etc.

The technical office area will include space for two new drawing boards in anticipation of future expansion.

5.3.2.3. Manufacturing workshop

Auxiliary services of the workshop area include warehouse space for raw materials, finished products, tools as well as quality control. The organization will be as follows:

A. Activities and scope of work to be undertaken

The general activities of the workshop will be the production of dies and specialized tools based on the construction plans, mechanization instructions, material quality and heat treatments provided by the technical office.

The specific activities of the workshop will be:

- Production of dies, tools and eventually spare parts, corresponding to the planned production based on instructions given by the technical office.

- Control of raw materials warehouse.
- Control of finished products warehouse.
- Responsibility for quality control of raw materials and finished products.
- Development of procedures or technologies as planned by the technical director.

B.Machinery and quality control equipment

In order to carry out the taks assigned to the workshop, the area will be provided with all the elements needed to complete operations.

There will basically be five types of equipment:

- Mechanized machine-tools
- Heat treatment equipment
- Welding equipment
- Metrology equipment

Complementary to the general listing of machinery in this section, appendix 1 includes a detailed description of the equipment.

a) Machine-tools

- Elements for cutting preparation of raw materials.

The following intems will be available: two oxycutting to cut up sheet and rolled steel sections, a cross-cut disk to cut up to 60 mm. Ø or squares of 55 mm. sides; a horizontal reciprocating band saw to cut larger sized rolled steel sentions up to 300 mm. Ø or squares of 250 mm. sides.

- Roughing equipment

The roughing equipment will consist of a reciprocating filing machine.

- Milling equipment

The equipment will consist of two milling machines. One of them will be used in small general operations and the other, bed type milling, to be used for fast, precision operations, will be fitted with a numerical control and will be adaptable for use with an electronic copier.

- Lathing

An appropriate lathe will be provided for in the workshop according to the necessities of work volume.

- Drilling

In this area two radial drills will be available.

One of them is to be used for small jobs for drill bits up to 17 mm. Ø; the other is for larger jobs with bits up to 40 mm. Ø.

- Grinding

The surface finishing will be done by two grinding machines. One of them is for honing flat surfaces and the other is for cylindrical surfaces.

- Machanicalization of punching tool and perforationg of dies plates

For these jobs there will be a vertical band saw and a reciprocating vertical power file, both for the production of models and mechanization of the interior forms.

An electro-erosion machine has been chosen as an instrument of high precision and efficiency with numerically controlled starting power. Because of its special characteristics this machine will be able to carry out the most widely varied mechanizations with extreme precision.

- Duplicating

A copy milling pantograph will be used for duplicating models in the production of stamping dies.

In addition, for more important jobs an electronic copying device can be installed in bed type milling.

b) Auxiliary workshop machinery and equipment

The workshop will be autfitted with:

Four sharpeners for general use (tools, saws, etc), a demagnetizer and hand tools for general use.

- Fitting and Mounting

For fitting and mounting of dies there will be five work benches complete with screws and their own accessories for these operations.

- Heat treatments

For the parts fo the dies that require heat treatment, the workshop will include an electric resistance furnace with automatic temperature control, with an interior capacity of 15,000 cm^3. The maximum working temperature will be 1,200 ºC.

- Welding

The workshop will have two electric welding outfits for general use in addition to the outfits needed for silver and copper controlled atmosphere welding.

- Transport of material

Material within the production workshop, and between the workshop and the raw material and finished product warehouses, will be transported by a light travelling crane with a capacity of 3 tons.

- Compressed air

The workshop will be outfitted with an air compressing network fed by a reciprocating compressor for cleaning and feeding.

- Metrology

The equipment for checking tolerance levels and measures in the different phases of production will be made up of the usual elements in this type of work: gages, micrometers and depth meters, etc.

c) Quality control

Quality control of raw material as well as of the finished product is essential in order to obtain adequate security and yield in dies production.

For this reason, the control laboratory must be as complete as possible. The laboratory will include:

1 contour magnifier
1 microscope
1 durometer or microdurometer

C. Warehouses

The manufacturing workshop will need two warehouses: one for raw materials and another for finished products.

- Raw material warehouse

The raw material warehouse will be built around a central passageway, in order to provide access for supply trucks which will be unloaded by the travelling crane, and will have two side wings for storage.

The raw material (to be dealt with later) consists basically of sheet and rolled sections which should not exceed 6 m. in length. To store these rolled sections, hangers will be placed at different levels in the side wings, in order to organize the material according to size and quality.

- Finished product warehouse

This warehouse will have lateral shelves for the storage of medium-sized packages, light jigs and small dies. Medium-sized and heavy tools will be stored on moveable platforms. The loading of finished products will be handled by the travelling crane.

6. Staff personnel

The workshop operation, following the plan that has already been outlined, will be run by the following crew:

a) A Workshop Manager with training in mechanical engineering, specialized in the machine tools workshop area. His duties will include:

   - Distribution and organization fo workshop operations.
   - Control of the raw material and finished product warehouse.
   - Co-ordination of quality control
   - Care and maintenance of the workshop.

b) Quality Control Specialist

He will be in charge quality control testing.

He will examine and check raw and finished materials, and under the supervision of the technical office, will research new materials and treatments.

c) The workshop crew will consit of the following group of especialists:

- 1 lathe operator
- 2 milling-machine operators
- 1 electro-erosion machine operator
- 2 grinder-machine operator
- 5 fitters
- 1 mechanic-electrician

d) The rest of the crew will consist of:

- 5 unskilled operators

These workers will be responsible for cutting up raw material, roughing operations, loading and unloading raw materials and finished products at the warehouses, and warehouse and tool stock.

E. Surface area and its set up (Drawing 5.2.)

The manufacturing, as discussed in this project, will cover an ara of 429 m^2 and will have another 100 m^2 for future expansion.

The warehouses for raw materials and finished products will be located at either end of the workshop.

The first one will have a surface area of 130 m^2, 75 m^2 set aside for possible expansion. Street access for trucks will be directly onto 3ª Avenida.

The warehouse for finished products will occupy the other end of the premises and its 88 m^2 area will provide for present necessities as well as for future expansion. Truck entrance will be located at the opposite end.

In addition to the warehouse area, the ground floor of the adjacent structure, with a surface area of 170 m^2, will be used for tool storage, the laboratory, quality control and staff locker rooms and restrooms.

5.3.2.4. Administrative Office

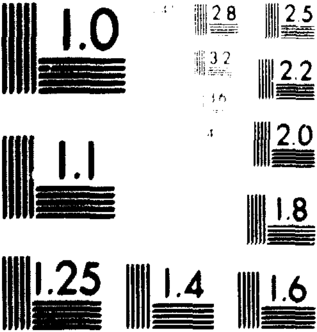
A. Operations and scope of the task to be undertaken

The administrative office will be responsible for the following operations:

a) Preparation of bids based on the information provided by the technical office.

b) Staff control: salaries, work schedules and payrolls.

c) Accounting department: Cost control: raw materials, salaries, utilities and indirect costs.



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU

d) Processing of outgoing correspondence and distribution of incoming correspondence.

e) Processing of official documents and taking necessary administrative steps concerning raw material inventory.

B. Staff Personnel

The staff assigned to the administrative office will be:

- 1 Office Manager with administrative training.

  His responsibility will be the administration and supervision of the duties described in section A. He will maintain contacts with the technical office in such areas as cost control, bids, delivery terms, etc.

- 2 administrative assistants whose responsibility will be to assist the Office Manager in the preparation of bids, costs and payrolls and in handling the company accounting.

- 1 typist responsible for handling correspondence and filing.

C. Office area and equipment

The administrative office will be located on the first floor of the adjacent building.

It will occupy a surface area of 50 m^2.

The needed equipment will include:

- 4 tables
- File cabinets
- 2 typewriters
- 3 calculators
- Office supplies

5.3.3. General technical aspects

This section will deal with general technical aspects on which the production criteria of the Center are based.

5.3.3.1. Types of dies to be produced

The first phase of setting up this Center must occur simultaneously with the rehabilitation of the metal-mechanics industry. It is also necessary to give attention to staff training and co-ordination and to establish contact with dies markets. For these reasons, until adequate experience has been obtained, the die-making plan must be limited to the production of simple dies, in other words, those which can be produced in a single pressing step.

Once the metal-mechanics industry begins to develop and the Center itself has obtained a work crew with experience in this type of work, the Center must devote itself to the production of progressive die systems, with the lowest possible costs and highest outputs. The Center will be responsible for informing the buyer of the advantages of the succesive cutoff and drawing die systems.

5.3.3.2. Use of standardized material

In order to lower manufacturing costs as much as possible, and to reduce the time needed for delivery, it would be advisable to begin production based on the use of standardized material.

Base for small and medium-sized dies may be standardized. In this way a large variety of items may be used with a group of bases. However, because large-sized dies are not so commonly used, acceptable standardization is impossible.

Columns and column guide sleeves may also be standardized.

Where possible, it is more economical to use materials, such as screws, springs, punches, die bases, column sleeves, bushings, etc., prefabricated by specialized companies.

All of this material is available on the foreign market and can be imported.

For further information, appendix 2 lists the standardized equipment which can be brought in form abroad.

5.3.3.3. Standards

Appendix 3 list some DIN standards related to die production.

5.3.3.4. Steel quality and heat treatments

The qualities and heat treatments of different components can be seen in Table 5.3.

5.3.3.5. Calssification of raw material according to section

The classification of steels by section used as raw material, which will serves as a basis for stock supplying, must be in accordance with the shapes and uses of the tools.

The following classification gives a general idea:

18,000 Kg. 2000 by 1000 mm. sheet
13,000 Kg. steel flat, 6000 mm. lengths
9,500 Kg. 6000 mm. rod bars of varied diameters
5,000 Kg. 6000 mm. squared bars in varied sections
6,000 Kg. Other hot-rolled sections
4,500 Kg. Other

5.3.3.6. Electric power installation

electric powet needed for the Center will be 180 KVA which includes a 30% reserve for possible expansion. This figure was arrived at based on the following information.

1 crosscut disk	10.00 HP
1 horizontal band saw	4.60 HP
1 filing machine	13.00 HP
1 radial drill	.50 HP
1 radial drill	3.00 HP
1 lathe	15.00 HP
1 milling machine	3.00 HP
1 bed type milling machine	25.00 HP
1 surface rectifier	25.00 HP

1 cylinder hone	8.00 HP
1 copy milling machine	0.80 HP
1 band saw	1.00 HP
1 vertical filing	1.00 HP
4 sharpeners	1.00 HP
1 compressor	10.00 HP
1 travelling crane	15.00 HP
Total..................................	135.90 HP

Average power factor 0.85

Motor yield 0,90

$$\text{Nominal power} = \frac{135.90 \times 0.736}{0.85 \times 0.90} = \quad 131 \text{ KVA}$$

1 electro-erosion machine	12 KVA
welding equipment	12 KVA
lights	15 KVA
others	5 KVA
Total nominal power	175 KVA
Future expansion reserve 30%	50 KVA
Total nominal power with reserve	225 KVA

Use factor 0.80

Average power 225 x 0.80 = 180 KVA

5.3.3.7. Bibliography

The following bibliography presents some titles relative to the field of die making. Spanish language publications have been selected because they will be easily understood by those who speak Portuguese.

- HERRAMIENTAS DE TROQUELAR, ESTAMPAR Y EMBUTIR
  Author: Oehler-Kaiser. Publisher: Gustavo Gili,S.A. Barcelona

- TROQUELADO Y ESTAMPACION
  Author: T. López Navarro. Publisher: Gustavo Gili,S.A. Barcelona

5.3.4. General economic aspects

This section gives an explanation of operating costs of the Center and will serve as a guide to determine profits and to predict amortization time.

Costsare broken down into the following areas:

- Raw materials
- Electric power
- employees
- Indirect costs

One-year production figures are given.

5.3.4.1. Raw material costs

Calculation of costs of raw materials will be made based on average quality of each of the components discussed in section 5.2.4.1.

Unit prices for each grade of steel will be established based on an average of the prices corresponding to the different types of rolled sections.

The results are given in Chart 5.4., where an average cost for steel to be used is shown as 48.86 Kz/Kg. and a total of 2,736,000 Kz/year for raw materials.

5.3.4.2. Electric power costs

Calculation of electric power costs follows:

- Number of work hours per year 2,240
- Average power installed:

  From section 5.3.3.6, the following calculations can be made:
  Nominal installed power 175 KVA
  Average power factor 0.85
  Use factor 0.8
  Average power 175 x 0.85 x 0.8 = 119 KW
- Yearly consumption

  119 x 2,240 = 266,560 Kwh

- Estimated unit price: 1 Kz/Kwh
- Total cost of energy

266,560 Kwh x 1 Kz/Kwh = 266,560 Kz/year

5.3.4.3. Staff costs

This section gives the yearly cost for maintaining the 28 employees who will make up the staff. A list of positions and corresponding costs follows:

	Kz/year
- Technical Director (1)	480,000
- Technical Office Manager (1)	420,000
- Tool Designer (1)	360,000
- Workshop Manager (1)	420,000
- Administrative Office Manager	300,00
- Quality Control Manager (1)	360,00
- 2 Draftsmen	312,00
- 2 Administrative assistants	252,00
- 1 Typist	108,00
- 12 Specialized operators	2,088,000
- 5 Unskilled operators	480,000
Total..	5,580,000

5.3.4.4. Other costs

Transportation, packing, maintenance, etc. come to a total cost of 1,500,000 Kz/year.

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(1) This cost is refered only with national staff.

5.3.4.5. <u>Total costs</u>

Total costs amount to 10,082,560 Kz with the following breakdown:

- Raw materials	2,736,000 Kz/year
- Electricity	266,560 Kz/year
- Staff	5,580,000 Kz/year
- Other costs	1,500,000 Kz/year
Total..................................	10,082,560 Kz/year

In other words, estimated cot per item is 10,082 Kz, equivalent to U.S. $ 340. On the international market the approximate cost is U.S.$ 750. per item for dies similar to the ones proposed for production at this Center.

5.4. PLAN FOR PUTTING CENTER INTO OPERATION

5.4.1. Introduction

Due to the specialized nature of the Center in the areas of technology and equipment, and to the lack of sufficiently qualified nationals, it will be necessary to hire a team of foreign specialists capable of planning and carrying out all phases of the project.

Since the technical management personnel needed at the Center must be hired abroad (according to the criteria set down in section 5.3.), the same team would be able to take charge of supervising project development and staff training; this would make the actual operation much simpler.

The team would be made up of:

a) A local co-ordinator whose principal duty would be to liaise between the work team and the Ministry of Industry.

b) A staff made up of the same proposed directors for the Center, as follows:

- Technical Director
- Technical Office Manager
- Workshop Manager
- Tool Designer
- Quality Control

5.4.2. Scope of duties of the team

Since the same team will be in charge of the actual putting into operation phase, and running the Center once it is established, their duties in each of these phases will be as follows:

5.4.2.1. Project development and putting into operation

The work to be undertaken at this time will be:

- A study of the annual demand for different types of dies and specialized tools for this industry within the country, from a purely technical and economic viewpoint.

  This work may be supervised by the Technical Director and carried out by the Technical Office Manager and the Tool Designer.

- Setting up and equipping the Center, according to the results obtained.

  This will be done by the entire team, under the supervision of the Technical Director.

- Hiring the rest of the qualified staff.

  The selection of these staff members will be made by the Workshop Manager, the Technical Office Manager, and the Quality Control Manager.

- Development of staff-training programs within the country and orientation on the necessary foreign expansion.

The Technical Director, aided by the Workshop Manager will set up the training, selection and scheduling of workshop personnel abroad.

The Technical Office Manager and the Tool Designer will train the draftsmen in the country, while at the same time this team will be preparing the designs of the different types of dies and special tools to be manufactured at the Center. In this way, once all documents are prepared, the Center will be able to operate at almost full production capacity as soon as it is put into operation.

- Project development, selection of machinery and preparation of the terms of reference for contracting. Advising the Government on buying, follow-ups on orders and delivery of machinery.

  The entire team will participate in this activity.

- Preparation of the terms of reference for subcontracting the services necessary to remodel the buildings and auxiliary installations needed to house the Center. These would include: civil construction, foundation laying, etc., electrical facilities, water and compressed air.

- Preparation of a two-year raw materials supply.

  This activity will be the responsibility of the Technical Director.

- Supervision of mounting, testing and putting the Center into operation.

  The entire crew will participate in the above mentioned activities.

5.4.2.2. Operating the Center

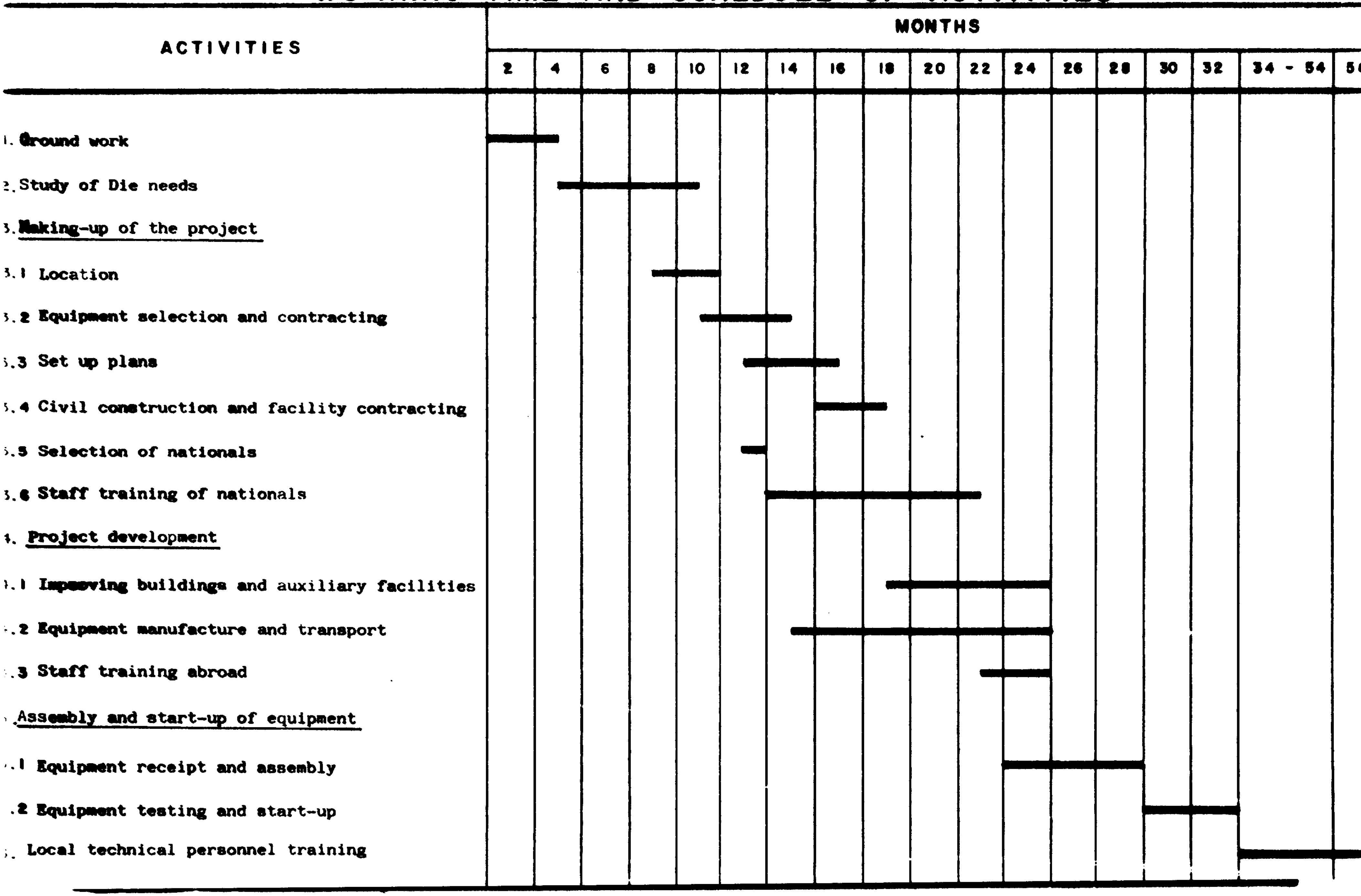
After the Center has been put into operation, the management team will be responsible for training a staff of nationals with educational experience approximating their own, so that this team of nationals can take over their duties after a minimun of two years.

This training program will be in addition to the management team's regular manufacturing and design responsibilities, as described in point 5.3.

5.4.2.3. Time schedule

In the attached time chart, the necessary time periods for the implementation of the obove activities are summarized.

WORKING TIME AND SCHEDULE OF ACTIVITIES



5.5. INVESTMENT

The estimated cost to implement the Center is as follow:

Machine-tools	13,365,000 Kz
Auxiliar workshop equipment	480,000 Kz
Laboratory	450,000 Kz
Facilities	525,000 Kz
Civil construction	645,000 Kz
Office equipment	375,000 Kz
Total.......................	15,840,000 Kz

APPENDIX 1

CHARACTERISTICS OF THE MACHINERY

CHARACTERISTICS OF THE MACHINERY

This appendix serves as a guide to the basic characteristics that the machine tools, the compressor, and the travelling crane should have.

These descriptions should aid in the selection of each type of machine.

1 large crosscut disk saw, with the following basic characteristics:

- Left and right toolhead, from 0° to 45°
- Speed of the disk shaft, 4200 r.p.m.
- 10 H.P motor
- Disk diameter, 400 mm.
- Steel-cutting capacity:
  rod up to 60 mm. Ø
  square up to 55 mm. ⌀
  pipe up to 100 mm. Ø
- Approximate maximum dimensions
  600 x 650 x 15,000 mm.
- Approximate weight 300 kg.

1 Semi-automatic hydraulic band saw machine with the following basic characteristics:

- Cutting capacity
  rod up to 300 mm. Ø

  square up to 250 mm. ⌀

- Band dimensions 3660 x 25 x 0,9 mm.
- Main motor Power 4 H.P.
- Hydraulic unit motor 0,5 H.P.
- Cooling pumps motor 0,1 H.P.
- Variable blade speed from 14 to 129 m/min.
- Aproximate maximum dimensions: 900 x 2000 x 1,300 mm.
- Aproximate maximum weight 850 Kg.

1 shaper/power file, with the following basic characteristics:

- Toolhead travel 1000 mm.
- 9 toolhead speeds
- Toolhead strokes per minute 10-16-24-33-43-56-70-84-100
- Vertical travel of the tool head, 160 mm.
- Automatic tool head feed, 0.2 to 0.6 mm.
- Planing width, 1000 mm.
- Maximum distance between table and toolhead, 460 mm.
- Table dimensions 1000 x 415 x 470 mm.
- Feed range of table 0.14 to 2 mm.
- Maximum tool section, 30 x 50 mm.
- 10 H.P. motor
- Approximate maximum dimensions: 3000 x 1500 x 1600 mm.
- Approximate maximum weight: 4000 Kg.

1 lathe with the following basic characteristics:

- Point height 315 mm.
- Distance between points 1500 mm.
- Turning diameter 600 mm.

- Spindle speeds 18
- Speed range from 18 to 1400 r.p.m.
- Longitudinal carriage:
  drum indexing 1/vernier - 0.1 mm.
- Transverse carriage:
  travel 360 mm.
  drum indexing 0.05/vernier - 0.005 mm.
- Tool carriage:
  travel 215 mm.
  inclination angle ± 90°
  drum indexing 0.05/vernier - 0.005 mm.
- Automatic feeds
  25 longitudinal (0.071 - 1.12 mm)
  25 transverse (0.0355 - 0.56 mm)
- Thread ranges
  89 metric (0.625 - 128 mm)
  96 whitworth (64-35/128)
  89 module (0.3125-64)
  96 diametrical pitch (128-35/64)
- 15 H.P motor.
- Approximate maximum dimensions 3000 x 600 x 1300 mm.
- Approximate weight 3000 Kg.

1 radial drill, with the following characteristics:

- Drill hole capacity 17 mm.
- Drill hole depth 115 mm.
- Distance between spindle and column 470 mm.

- Distance between spindle and table 650 mm.
- Surface area of the table 410 x 510 mm.
- Speeds 300-500-780-1100-1600-2380 rpm.
- 0.5 H.P motor.
- Cooling tank, and pump motor
- Approximate maximum dimensions 600 x 750 x 1300 mm.
- Approximate maximum weight 200 Kg.

1 radial drilling machine, with the following basic characteristics:

- Steel drilling 40 mm. Ø
- Cast iron drilling 50 mm. Ø
- Steel drifting 80 mm. Ø
- Cast iron drifting 100 mm. Ø
- Steel threading/tapping 40 mm. Ø
- Cast iron threading/tapping 50 mm. Ø
- Spindle
  diameter 80 mm. Ø
  travel 310 mm.
  12 speeds, (25-1440
  6 feeds, (0.08 - 1)
  3 H.P motor
- Approximate maximum dimensions 1600 x 700 x 2000
- Approximate maximum weight 2200 Kg.

1 Bed type milling machine with the following basic characteristics

- Table surface 3000 x 700 mm.

- Automatic longitudinal travel 2600 mm.
- Automatic cross travel 1000 mm.
- Automatic vertical travel 1000mm.
- Number of speeds continuons.
- Min/max. speeds 28/1800 r.p.m.
- Min/max. long. cross and vertical feed 3/1000 mm.
- Longitudinal, cross and vertical rapid feed 5000 mm.
- Spindle drive motor C.C. 25 H.P
- 3 motor for feeds C.C 3 x 6 H.P.
- Coolant pump motor 0.25 H.P
- Equipped with regulating cabinet for numerical control
- May be adapted for electronic copier.
- Approximate maximum dimensions 3200 x 1800 x 2900
- Approximate weight 10,000 Kg.

1 Universal precision tool milling machine, with the following basic characteristics

- Spindle
  range of speeds 40-1600 r.p.m.
  feeds

- Number of feeds by variator

	longitudinal	
range	cross	0,8-480 mm/min.
	vertical	

- Traverses

  longitudinal: 450 mm.

  cross: 325 mm.

  vertical: 450 mm.

- Motors
- Spindle 1,8/3 CV
- Feeds and rapid traverse 1,5 CV.
- Approximate maximum dimensions 1600 x 1800 x 1700 mm.
- Approximate maximum weight 1200 kg.

1 dresser/grinder for flat surfaces, with the following basic characteristics

- Maximum dressing lenght 2500 mm.
- Maximum dressing width 650 mm.
- Maximum dressing height 600 mm.
- Usable bearing area 2500 x 550 mm.
- Longitudinal travel, 2600 mm.
- Adjustable table speeds 1-25 m/min.
- Grinder

  dimensions 450 x 203 mm. Ø

  width 50 (100) mm.

  speed 960 rpm.

  maximum transverse travel 600 mm.

  intermittent transverse feed 0.5 - 30 mm.

  continuous transverse feed 0.1 - 5 m/min.

  fine vertical feed (manual) 0.005 mm.
- Adjustable head
- Pantographic device for shaping the grinder

- Motors

  grinder 20 H.P

  hydraulic 7.5 H.P

  rapid grinder lift 2 H.P

  adjustable head 3 H.P

  cooling device 0.25 H.P
- Approximate maximum dimensions 6700 x 2600 x 2700 mm.
- Approximate maximum weight 12,000 Kg.

1 exterior cylinder hone, with the following basic characteristics:

- Maximum rotation on table 265°
- Standard grinder measurements 510 x 50 x 205 mm.
- Honing diameter, with largest grinder 255 mm.
- Length between centers 510 mm.
- Grinder speed 980-1160 r.p.m.
- Work speed from 20 to 300 r.p.m.
- Table speed 980-1160 r.p.m.
- H.P. Motors.

  grinder drive 7.5 H.P.

  workhead drive 1 H.P

  table drive 2 H.P
- Approximate maximum dimensions 3100 x 1955 x 1600 mm.
- Approximate maximum weight 4500 Kg.

1 copying milling machine threedimensional pantograph with the following basic characteristics.

- Master-holding table 470 x 330 mm.

- Master maximum height 250 mm.
- Master-holding table rotation 360°
- Master-holding table travel

  transverse 510 mm.

  vertical 210 mm.
- Worktable 360 x 280 mm.
- Maximum height of the work piece 400 mm.
- Worktable travel:

longitudinal	260 mm.
transverse	510 mm.
vertical	400 mm.

- Reduction ratio

maximum	1:15 mm.
minimum	1:10 mm.

- Cutter-holder

  rapid vertical feed 6 mm.

  sidelong vertical feed 1 mm.

  number of speeds 24

  number of revolutions minimum 750 r.p.m.

  number of revolutions maximum 14,000 r.p.m.

  number of clip tool-holder 6
- Motor power 0.75 CV
- Approximate maximum dimensions 1000 x 1300 x 1500 mm.
- Approximate maximum weight 700 Kg.

1 band saw for cutting steel machine with the following basic characteristics:

- Diameter of flywheels 300 mm.

- Vertical cutting pitch 360 mm.
- Horizontal cutting pitch 650 mm.
- Dimensions of table 610 x 610 mm.
- Table inclination to right and left hand 10°
- Table inclination to and from and viceversa 10°
- Max. length of blade 3850 mm.
- Minm. length of blade 3740 mm.
- Width of blade 4 a 15 mm.
- Number of speeds continuous from min. to max.
- Motor power 1 HP.
- Approximate maximum dimensions 700 x 1200 x 2000 mm.
- Approximate maximum weight 400 Kg.

1 reciprocating filing machine with the following basic characteristics:

- Stroke of the file 40-120 mm.
- Depth of the arm 205 mm.
- Maximum thickness of the work piece 110 mm.
- Table dimensions 440 x 400 mm.
- Table swivels in four direction 10°
- Length of files 100-250 mm.
- Number of strokes per minute 80-260
- Driving motor 1 HP
- Approximate maximum dimensions 680 x 550 x 1620 mm.
- Approximate maximum weight 300 Kg.

1 electro-erosion machine, with the following basic characteristics:

- Electrode-holder travel 200 mm.

- Workbench 650 x 400 mm.
- Longituainal travel 500 mm.
- Transverse travel 250 mm.
- Maximum distance between electrode-holders and bench 400 mm.
- Vernier indexing on spindles 0.02 mm.
- Automatic depth limiter
- Power 120 amp.
- Volumetric erosion with copper electrode 0.2
- Volumetric erosion with graphite electrode 0.1
- CLA rugosity 0.8 microns
- 60 and 150 impulse voltage
- Maximum material intake 1000 mm^3/min.
- Equipment for numerical control operation.
- Dielectric motor pump 1.5 H.P.
- Hydraulic motor-pump 0.25 H.P.
- Hydraulic tank capacity 25 liters.
- Maximum power 12 KVA.
- Approximate maximum dimensions:
  machine 1500 x 2600 x 2300 mm.
  generator 2000 x 1000 x 1800 mm.
  filter equipment 1500 x 1500 x 2100 mm.
- Approximate weights:
  machine 2300 Kg.
  generator 500 Kg.
  filter equipment 400 Kg.

1 alternating compressor, with the following basic characteristics:

- 2 cylinders

- Volume of flow: 1220 liters/min.
- Pressure 8 Kg/cm^2
- Tank capacity 300 liters
- 10 H.P motor
- Approximate maximum dimensions 1600 x 690 x 1180 mm.
- Approximate weight 450 Kg.

1 light travelling crane, with 3-ton tackle, with the following basic characteristics:

- Hook travel 8 m.
- Lift speed 6 m/min.
- Precision lift speed 2 m/min.
- Tackle translation speed 12 m/min.
- Crossbeam translation speed 25 m/min
- Crossbeam length 11 m.
- Total motors power 15 H.P.

APPENDIX 2

STANDARDIZED DIES ELEMENTS

STANDARDIZED DIES ELEMENTS

This appendix gives a detailed description of standard dies elements available in outside markets.

1. **Die Holders**

1.1. Models according to DIN 9819

Manufactured for die sizes between: 50 x 63 mm. and 250 x 315 mm.

1.2. Models according to DIN 9819 A

Manufactured for die sizes between: 80 x 63 mm. and 250 x 200 mm.

1.3. Models according to DIN 9822

Manufactured for die sizes between: 50 x 40 mm. and 250 x 200 mm.

1.4. Models according to DIN 9812 A

Manufactured for die sizes between: 63 x 50 mm. and 315 x 250 mm.

1.5. Models according to DIN 9814 A

Manufactured for die sizes between 80 x 63 mm. and 250 x 200 mm.

1.6. **Models according to DIN 9812**

Manufactured for die sizes between: 40 mm. Ø and 360 mm. Ø.

1.7. **Models according to DIN 9814 B**

Manufactured for die sizes between: 50 mm. Ø and 200 mm. Ø.

1.8. **Models according to DIN 9816**

Manufactured for dies sizes between: 40 mm. Ø and 200 mm. Ø.

2. Chrome-Vanadium Steel Springs

2.1. Maximum compression 50%

Manufactured for drill-hole diameters between 10 and 51 mm.

Lengths range from 25 mm. to 305 mm.

2.2. Maximum compression 37%

For drill-hole diameters between 10 mm. and 51 mm. Lengths from 25 mm. to 305 mm.

2.3. **Maximum compression 30%**

For drill-hole diameters between 10 mm. and 51 mm. Lengths from 25 mm. and 305 mm.

2.4. **Maximum compression 25%**

For drill-hole diameters between 10 mm. and 51 mm. Lengths from 25 mm. and 305 mm.

3. <u>GUIDES</u>

3.1. 10 mm. diameter

Lengths from 18 to 26 mm.

3.2 12 mm. diameter.

Lengths from 18 to 90 mm.

3.3. 16 mm. diameter.

Lengths from 18 to 150 mm.

3.4. 18 mm. diameter

Lengths from 26 to 150 mm.

3.5. 22 mm. diameter.

Lengths from 36 to 175 mm.

3.6. 25 mm. diameter

Lengths from 36 to 175 mm.

3.7. 30 mm. diameter

Lengths from 36 to 175 mm.

3.8. 40 mm. diameter.

Lengths from 90 to 200 mm.

4. <u>Bushings</u>

For diameters of 10-12-14-16-18-20-22-25-30- and 40.

5. <u>Guide stops</u>

5.1. 14 mm. diameter. Lengths from 40 to 150 mm.

5.2. **20 mm. diameter.**

Lengths between 60 and 200 mm.

6. <u>Precision-cutting punches</u>

Material:

- Tool steel, 12% chrome
- High-speed steel, high performance.
- High-speed steel, 5% cobalt

6.1. Model according to DIN 9861, type "D"

Diameters from 0.5 to 25 m., and lengths of 70, 80, 90 and 100 m.

6.2. Model according to DIN 9861, type "C"

Diameters from 0.5/2 mm. to 2.95/3 mm., and lengths of 60 and 70 mm.

6.3. Other items manufactured

Multiple-use countersinking punches are also manufactured.

7. <u>Precision-Cutting Bushings</u>

Diameters of 2.5 to 27 mm., lengths of 20 and 28 mm.

8. <u>Punch Blocks</u>

Material: Case-hardened and tempered C15 (DIN) steel.

8.1. Square blocks

Sizes 45 x 45 mm, 56 x 56 and 63 x 63 mm.

8.2. Rectangular blocks

Sizes 75 x 32 mm. and 85 x 40 mm.

9. <u>Expellers</u>

Material: Carbon steel, alloyed with heat treatment.

9.1. According to DIN 1530, type "D"

Diameters of 1.5 mm. to 16 mm., lengths of 100,125,160 and 200 mm.

9.2. According to DIN 1530, type "B"

Diameters of 2 mm. to 16 mm., lengths of 100,125,160 and 200 mm.

10. **Other products**

The following items are among the other products manufactured: Crotch centers (for lathes), spouts, cooling nozzles, fastening flanges, etc.

APPENDIX 3

DIN STANDARDS FOR DIES

DIN STANDARDS DOR DIES

1. STAMPED PIECES

Numer	
6930	Stamped pieces (curved, with stamped edges and sections, cut from flat rolled steel). Technical supply conditions.
6932	Countersunk and stamped pieces of steel; configuration standards.
6934	Pieces of steel, stamped in the shape of a box, distorted with heat; permissible tolerance levels.
6935	Cold-shaping of edges, and cold-bending of flat rolled steel.
6936	Strips, cut from flat rolled steel. Permissible tolerance levels.
6937	Rectangular and circular pieces, cut from flat rolled steel. Permissible tolerance levels.
6938	Polygonal pieces cut from flat rolled steel, permissible tolerance levels.
6939	Centered holes in flat pieces of flat rolled steel; permissible tolerance levels for centering.
6940	Holes and hole groupings, in flat pieces and rolled sections

of flat rolled steel; plermissible tolerance levels for diameters and distances between centers.

6941	Rolled sections of flat rolled steel, U, L, and Z-shaped. Permissible tolerance levels. Cold-bending or shaping of edges.
6942	As above, cold-swaged
6943	As above, hot-swaged.
6944	Rolled sections of flat rolled steel, previously hot and cold swaged. Permissible tolerance levels.
6945	Cap-shaped pieces, from flat rolled steel, hot drawn; permissible tolerance levels.
7168	Tolerances levels.
7952	Threaded through holes, in sheet metal

2. DIES

655	Cable-holding rod.
9811	Column framework.
9812	Colum framework, with guide columns located in the center
9814	- and mobile deflectors.
9816	- and upper part of the die solid.

9819 Column framework, with guide columns protruding from the corners.

9822 Column framework, with guide columns located in back.

9825 Guide columns and checking rings.

9845 Bushings for cutting and for guiding the punches.

9846 Rectangular cutting punch.

9847 Piece ejector.

9848 Budgest.

9849 Stops for cutoff dies.

9859 Constraint rod.

9861 Cutting punches for diameters of up to 14.4 mm.

9862 Lateral cutters.

9863 Stops for lateral cutters.

9864 Circular section centering pins.

9865 Plates and die marking in the die technique.

9866 Punch heads.

9867 Die boxes.

3. DIE-HOLDING ELEMENTS

508 T-shaped, grooved plugs.

787 T-shaped, grooved screws.

6314 Flat holding iron.

6315 As above, fork-shaped, without holding lug.

6316 As above, with circular holding lug.

6318 Graded bent, for holding pieces.

6319 Ball bearings and cone bearings.

6323 Unattached grooved plugs.

6326 Adjustable supplementary holders.

6330 Hexagonal nuts, height equal to 1.5d, metric thread.

6346 Parallel supplementary pieces.

6. PROJECT DOCUMENTS

6.1. ESTABLISHMENT OF AN ENGINEERING DEPARTMENT WITHIN THE MINISTRY OF INDUSTRY

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

Project of the Government of People's

Republic of Angola

PROJECT DOCUMENT

Title: Establishment of an Engineering Department within the Ministry of Industry.

Number: Duration: 5 years

Primary function: Direct Support

Secondary function: Engineering Design

Sector: (Govt.Class) Industry

UNDP (Class+Code): Industry (35)

Sub-sector: Metal Working Industry

UNDP(Class+Code): Industrial Services and Institutions (3530)

Government Implementing Agency: Ministry of Industry (National Direction of Heavy Industry).

Executing Agency: (UNIDO)

Estimated starting date:

Government inputs: UNDP inputs US $ 1,380,200

Government Cost-Sharing:

Signed:

______________________ Date: ______________

on behalf of the Government

______________________ Date: ______________

on behalf of the Executing Agency

______________________ Date: ______________

on behalf of the United Nations Development Programme (UNDP)

PART I

LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article I, paragraph 1, of the Assistance Agreement between the Government of the People's Republic of Angola and the United Nations Development Programme, signed by the parties on the 18 th February 1977.

The Government Implementing Agency shall, for the purposes of the Standard Basic Agreement, refer to the Government Co-operating Agency described in that Agreement.

PART II

THE PROJECT

A. DEVELOPMENT OBJECTIVES

1. Facilitate the technical and economic development in the metal-mechanics sector, renovating the existing facilities, improving the quality of manpower at every level and achieving the necessary co-ordination among the industries in the sector.

2. Decrease dependence on outside sources for raw material supply.

B. INMEDIATE OBJECTIVE

The Engineering Department should have the following as their immediate objectives:

1. Establish a plan to remodel existing factories in the sector, by substituting, expanding or adapting the available equipment in order to improve quality and increase production in an attempt to cover the current deficit presently caused in part by imports.

2. Obtain the collaboration of specialized staff from the outside who will contribute to putting broken-down equipment into operation and to staff training.

3. Set up plans for revision, repair and maintenance in order to put into operation and assure the upkeep of currently existing equipment.

4. Collaborate with training centers for specialization of labor and training of top and middle management.

5. Determine raw material needs and set up inventory-taking calendars.

6. Provide for flexibility in the distribution methods of imported materials.

C. SPECIAL CONSIDERATION

The decline in productivity in the sector since 1973 has been largely due to the following causes:

a) Lack of spare parts.

b) Lack of maintenance of available equipment=

c) Irregularity in the supply of raw materials.

d) Loss of specialized Portuguese workers and technicians.

e) Lack of professional training in present manpower.

f) Loss of capital and technical assistance from the main offices of the firms.

g) Existence of important but shut down facilities.

h) Lack of a co-ordinated plan of management and solution of problems stemming from the causes mentioned in d) and f).

These conditions generally affect every subsector in the metal-mechanics industry.

The Engineering Department which is the subject of this project, should give special attention to the co-ordination and assistance necessary for the development of the subsector previously mentioned and in general to the whole of the metal-mechanics industry in Angola.

D. BACKGROUND AND JUSTIFICATION

The country's metal-mechanics industry is made up of 40 firms, divided into 4 subsectors which emcompass the following areas of production: light metal machinery, heavy metal machinery, light metal products and assembly of transportation equipment.

Upon request of the People's Republic of Angola, in 1981/1982 UNIDO analyzed the present production capacity of the metal-mechanics industry in Angola and projected a plan to strengthen the indrustrial sector. The project number is DP/ANG/80/007 and was carried out by TECNIBERIA.
This study was made from a sample of 30 firms which, according to the products manufactured by the metal-mechanics sector, can be divided into the 9 following groups:

- Metal furniture
- Aluminum kitchenwares
- Metal containers (cans and drum) bottle caps.
- Bicycles and Motorcycles
- Screws and nails
- Foundry
- Manufacture and repair of equipment
- Farming tools and implements
- Other products

The criteria used for this classification has been the consideration of those products which are manufactured in two or more different firms.

Since 1973, a progressive decline in productivity has occured up to the point where in 1980 production varied between 35% and 65% of 1973 production, according to the geographical location of the firm. The lowest figures generally correspond to the Luanda area.

The most important factors which have contributed to the decline in productivity have been:

a) Lack of spare parts, tools and auxiliary equipment.

b) Lack of maintenance of currently existing equipment, which accounts for the fact that some of it is out of order.

c) Inadequate specialized training of labor and lack of technical preparation in management.

d) Difficulty in raw material supply.

e) Lack of an organization to co-ordinate the firms in each subsector in order to plan and control the adquisition and distribution of raw materials.

The projected plans in the rehabilitation and expansion study plan are the following:

1. Metal furniture: Reorganization and regrouping of the productive units in EPMEL and ENMEL (both in Luanda) and UNIDAD METALICA in Huambo, in the supply of dies and devices.

2. Aluminum household wares: Solution of the problem of imported aluminum sheet supply.

3. <u>Metal containers:</u> Solution of specific problems of units in METANGOL (Luanda and Benguela), EMBALAGENS VAN LEER (Luanda) and CAPSUL (Luanda) through the substitution of certain equipment.

4. <u>Bicycles and motorcycles:</u> Carrying out a technical study of the rehabilitation possibilities of bicycle and motorcycle manufacture in FABIMOR (Luanda) and ULISSES (Huambo).

5. <u>Screws and Nails:</u> Installation of new machinery in the nut manufacturing sections in CODUME (Huambo) and LUPRAL (Benguela).

6. <u>Foundry:</u> Definite plans of action exist for the foundry sector through the project DP/ANG/81/005. This project anticipates Government assistance for one year in the planning, co-ordination and control of the group of activities to be considered in order to develop and modernize the foundry industry which is its primary purpose. The secondary purpose of the project is to consider using the existing and new equipment to its maximum output capacity, train staff and completely satisfy local demand for foundry products.

   The foundry facilities in METALVI (Luanda) which have been shut down since they were set up in 1974, require an assistance program in order to put facilities into running order and should include this program as a top priority. In order to carry out this assistance program, the services of a casting consultant should be sought for a period of 6 months.

7. <u>Manufacture and repair of equipment:</u> Since an expansion plan of the manufacturing and repair center in EMIN in Luanda currently exists (project UF/ANG/78/209), the experience gained from the development of this project should be applied to the maintenance and repair centers in Huambo (FADARIO MUTEKA) and Benguela (COMANDANTE JIKA). The aid

of a consultant is anticipated for a 6 month period.

8. Manufacture of Farming tools and implements: Strengthening of the prodution capacity in LUPRAL (Benguela).

9. Other activities: Solution of specific problems in the units of FATA and INCUTAL (Luanda), IAF (Huambo) and MATEC (Benguela) through rendering the facilities suitable.

The solution of the problems in this sector and the development of project plans of action require the establishment of an Engineering Department which would report directly to the Ministry of Industry. This department would be responsible for developing local engineering and consulting skills as well as co-ordinating and assisting in the remodeling of the various firms in the sector.

E. PROJECT OUPUTS

Putting this project into action should obtain the following results:

1. Creation of an Engineering Department in charge of assisting in management, development and planning within the sector and co-ordination in the establishment of definite expansion plans in the various firms.

2. Obtain the outside technological assistance necessary to rehabilitate and obtain maximum output from the existing facilities.

3. Detailed inventory of all metal-mechanics factories divided into subsectors, dealing with the following aspects in each case.

3.1. Analysis of the present condition of machinery, taking special notice of those which because of being technologically out of date should be discarded and of those which are not being used and can be utilized in the same or other factories.

3.2. Inventory of spare parts necessary for normal manufacture or to put into operation any equipment currently out of order.

3.3. Establish a maintenance plan.

3.4. Analyze the ways and means of quality control and set the standards to be used.

3.5. Establish the technical level of labor and the necessary management staff.

4. Assistance in staff training for labor and management.

F. PROJECT ACTIVITIES

1. Groundwork

1.1. Approval of the Project Document.

1.2. Appointment of the National Project Co-ordinator and Nationals.

1.3. Preparation of the terms of reference for hiring of a team of experts from the outside to take part in the project activities.

1.4. Hiring of the team of experts.

1.5. Preparation, by the team of experts, of a preliminary report examining the need of a foreign consulting staff and Angolan counterparts.

1.6. Preparation of the terms of reference for the hiring of the foreign consulting staff.

1.7. Hiring of consultants.

2. <u>Specific Project Activities</u>

2.1. Market analysis

2.2.1. Analyze the demand for metal-mechanics products on the national market and the projected demand for them in the future compared to present demand.

2.1.2. Analysis of available importation figures.

2.1.3. Study the results obtained in order to determine the range and volume of manufacture in the sector.

2.2. Analysis of the industries.

2.2.1. Work methods

2.2.2. Type of technology used.

2.2.3. State of repair and use of existing equipment.

2.2.4. Analysis of raw material being used.

2.2.5. Ways and means of quality control.

2.2.6. Means of maintaining and repairing equipment.

2.2.7. Stock of raw materials and spare parts.

2.2.8. Degree of staff training.

2.2.9. Economic and administrative capacity.

2.2.10. Productivity levels.

2.2.11. Degree of utilization of machinery.

2.3. Establishment of expansion plans for the firms

2.3.1. Metal furniture

A team of two consultants who specialize in industrial analysis and planning as well as the development of metal-mechanics projects, will carry out a study of the regrouping of different productive units and will decide what modifications, substitutions or expansions are necessary within the units and more specifically within the equipment itself.

2.3.2. Aluminum household wares

The Department's consulting team should work out a plan which assures the continuation of raw material supplies.

2.3.3. Metal containers (cans and drums) and bottle caps

The Department's consulting team should analyze the modernization plans of the manufacturing lines, stating the characteristics of equipment needed, number of staff needed to assemble and put the equipment into operation and training of the staff who will handle the machines.

2.3.4. Bicycles and Motorcycles

A team of two consultants who specialize in industrial analysis and planning as well as development of projects connected with the assembly division, will make a study of the rehabilitation possibilities of these firms and determine the type of equipment necessary in order to adapt production volume to Angola's demand.

2.3.5. Screws

The Department's consulting team should analyze what supplementary machinery is needed in order to manufacture products there are shortages of, as well as define the characteristics of the machinery and technical staff needed to assemble it, put it into operation and train the staff who will handle it.

2.3.6. Foundry

A consultant who specializes in casting works will include plans for the starting up of facilities in METALVI under project DP/ANG/81/005.

2.3.7. Equipment repair

A consultant who specializes in maintenance workshops will apply the results obtained from the project UF/ANG/78/209 to other firms in the subsector.

2.3.8. Farming tools and implements

The Department's consulting team will take part in co-ordinating and planning the existing project within this subsector.

2.3.9. Other

2.3.9.1. Pipe manufacture

The Department's consulting team will analyze what needs to be remodeled and expanded on the manufacturing lines and will decide upon the technical characteristics best suited to these lines, as well as the technical staff needed to assemble and put equipment into operation and the staff to be trained to operate it.

2.3.9.2. Water pump manufacture

One consultant who specializes in the design and assembly of water pumps, will study this firm's problems and prepare specific design, assembly and testing plans for the pumps.

2.3.9.3. Other subsectors

The Department's consulting team should create a plan to assure the continuation of raw material supply.

2.4. Carrying out the expansion plans

2.4.1. Specification of budgets, financial investment sources and payment calendars.

2.4.2. Specification of the number of staff needed and the degree of qualification required of them.

2.4.3. Raw material management.

2.4.4. Terms of reference in the hiring of foreign consultants who will study rehabilitation possibilities in the sector.

- metal furniture, bicycles, foundry and repair equipment.

2.4.5. Preparation of characteristics and technical and economic specifications for the contracting of equipment, machinery, spare parts and raw materials needed in each subsector.

2.4.6. Preparation of terms of reference for the hiring of technicians who will assist in putting equipment into operation and in training the staff who will operate the new machines.

2.4.7. Assistance to the Government for the contracting of the above-mentioned items.

2.4.8. Working out and developing the plans

G. INPUTS

1. Inputs by the Government

1.1. Assignment of the National staff

a) 1 National Project Co-ordinator
b) 1 Mechanical engineer
c) 1 Economist
d) 9 Mechanical Engineers assigned to the various subsectors.
e) 2 Draftsmen
f) 4 Administrators
g) 1 secretary

1.2. Supplies, equipment and supplementary materials

Will be supplied by the Government in accordance with international regulations.

A prior estimate of the price of needed equipment is approximately -- 2,862,500 U.S. dollars and does not include the equipment needed to rehabilitate the metal furniture, bicycle, foundry maintenance workshop and agricultural tools subsectors. These investments which are not included in the above-mentioned figure, will be decided upon once the rehabilitation plan has been completely carried out.

1.3. Other

The Government will provide the necessary accomodations, living allowances and transport for the foreign staff, as well as office space and any materials needed to help in the development of project work.

2. Inputs by UNDP

2.1. Assignment of International Staff

11.01: Co-ordinator/Team leader

Must be a mechanical engineer with experience in technical analysis of metal-mechanics firms.

He will make up the team's work plans, co-ordinate activities and supervise the work done by the consulting teams.

11.02: Economist

Must have experience in economic, market and financing studies.

His duty will be to plan, develop and co-ordinate the economic, financial and market aspects of the project.

11.03: Consulting team

A consulting team made up of:

- 1 Economist who is an expert in market studies.
- 1 Engineer who is an expert in mechanical technology.
- 1 Planning engineer.
- 1 Engineer who is an expert in industrial maintenance.

The duties of the consulting team will be to study the activities that fall under their specialties within the industries in the sector.

20. Subcontracts

a) Rehabilitation studies

A total of 6 consultants is anticipated; 4 of them assigned to the study of problems in the metal furniture, and bicycle sectors and the other 2 assigned to adapt the existing foundry and equipment maintenance workshop projects.

b) Assistance in assembling and putting equipment into operation, and in training staff

A total of 7 technical specialists is anticipated for each new piece of equipment acquired.

An organizational chart of foreign staff is included in appendix 1 of this document. On this chart, the activities that can not be decided upon until a detailed study of them has been made, are represented by a broken line.

H. PREPARATION OF WORK PLAN

A detailed Work Plan for the implementation of the project will be prepared by the Project Co-ordinator, in consultation with the National Project Co-ordinator. This will be done at the start of the project and brought forward periodically. The agreed-upon Work Plan will be attached to the Project Document as Annex I and will be considered as part of thast document.

In appendix No. 2 of this Project Document a diagram is given which shows time estimates of the development of activities previously mentioned which cover the entire duration of the 5 years project until the rehabilitation was finished.

I. PREPARATION OF THE FRAMEWORK FOR EFFECTIVE PARTICIPATION OF NATIONAL AND INTERNATIONAL STAFF IN THE PROJECT

The activities necessary to produce the indicated outputs and achieve the project's immedite objetive will be carried out jointly by the national and international staff assigned to it. They respective roles of the national and international staff will be determined by their leaders, by mutual discussion and agreement, at the beginning of the project and set out in a framework for Effective Participation of National and International Staff in the Project. The Framework, which will be attached to the Project Document as an annex, will be reviewed from time to time. The respective roles of the national and international staff shall be in accordance with the established concept and specific purposes of technical co-operation.

J. DEVELOPMENT SUPPORT COMMUNICATION

The Government will let the results of the project be known through the National Administration of Heavy Industry, and will take any necessary steps in order to put the specific modernization programs into operation.

K. INSTITUTIONAL FRAMEWORK

It will be up to the National Direction of Heavy Industry to carry out this project; this is the governmental organization in charge of supervising any activity within the sector in question.

L. FUTURE UNDP ASSISTANCE

No future assistance is anticipated at the moment.

PART III

SCHEDULES OF MONITORING, EVALUATION AND REPORTS

A. TRIPARTITE MONITORING REVIEWS; TECHNICAL REVIEWS

The project will be subject to periodic review in accordance with the policies and procedures established by UNDP for monitoring project and programme implementation.

B. EVALUATION

The project will be subject to evaluation, in accordance with the policies and procedures established for this purpose by UNDP. The organization, terms of reference and timing of the evaluation will be decided by consultation between the Government UNDP and the Executing Agency concerned.

C. PROGRESS AND TERMINAL REPORTS

Progress reports will be made by the Project Co-ordinator will submit a rough draft of the final project report as stipulated by the rules and procedures followed by the UNDP.

PART IV BUDGETS

PROJECT BUDGET INCLUDING UN

Country: Angola

Project Title: Assistance for the establishment of an Engineering Depa

	TOTAL		1 st year		
	m/m	US $	m/m	US $	m/m
10. Project staff					
11. Experts					
11.01 Team leader	60	414,000	12	82,800	12
11.02 Economist	60	384,000	12	76,800	12
11.03 Consulting team	24	153,600	–	–	12
11.99 Subtotal	144	951,600	24	159,600	36
20. Subcontracts					
20.1. Rehabilitation studies	28	179,200	–	–	–
20.2. Assistance by technical specialist	43	249,400	–	–	–
20.99 Subtotal	71	428,600	–	–	–
TOTAL	215	1,380,200	24	159,600	36

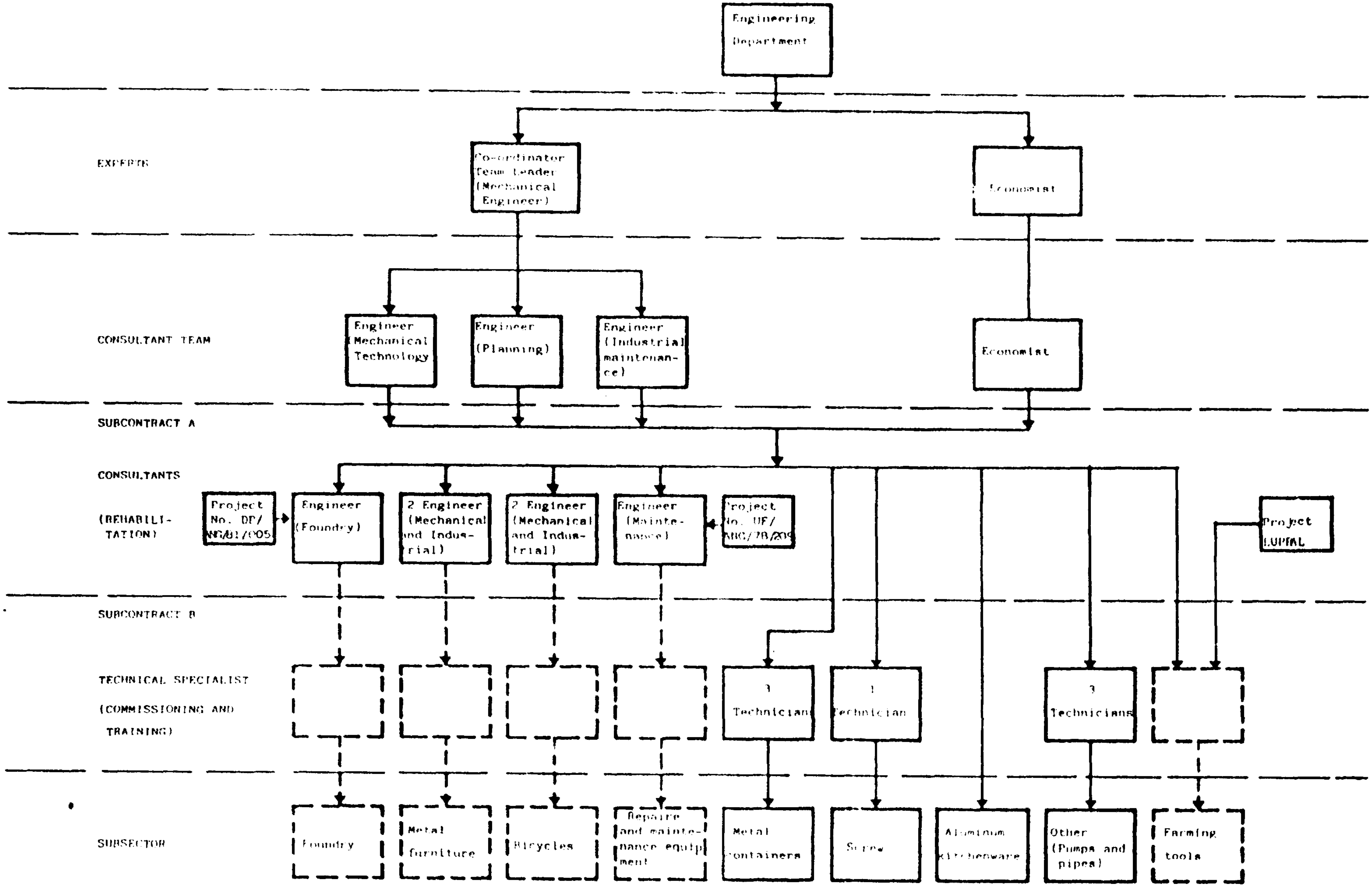
P CONTRIBUTION

tment.

'nd year	3rd year		4th year		5 thyear	
US $	m/m	US $	m/m	US $	m/m	US $
82,800	12	82,800	12	82,800	12	82,800
76,800	12	76,800	12	76,800	12	76,800
76,800	12	76,800	-	-	-	-
236,400	36	236,400	24	159,600	24	159.600
-	28	179,200	-	-	-	-
-	-	-	14	81,200	29	168.200
-	28	179,200	14	81,200	29	168,200
236,400	64	415,600	38	240,800	53	327,800

APPENDIX 1

ORGANIZATIONAL CHART OF FOREIGN STAFF



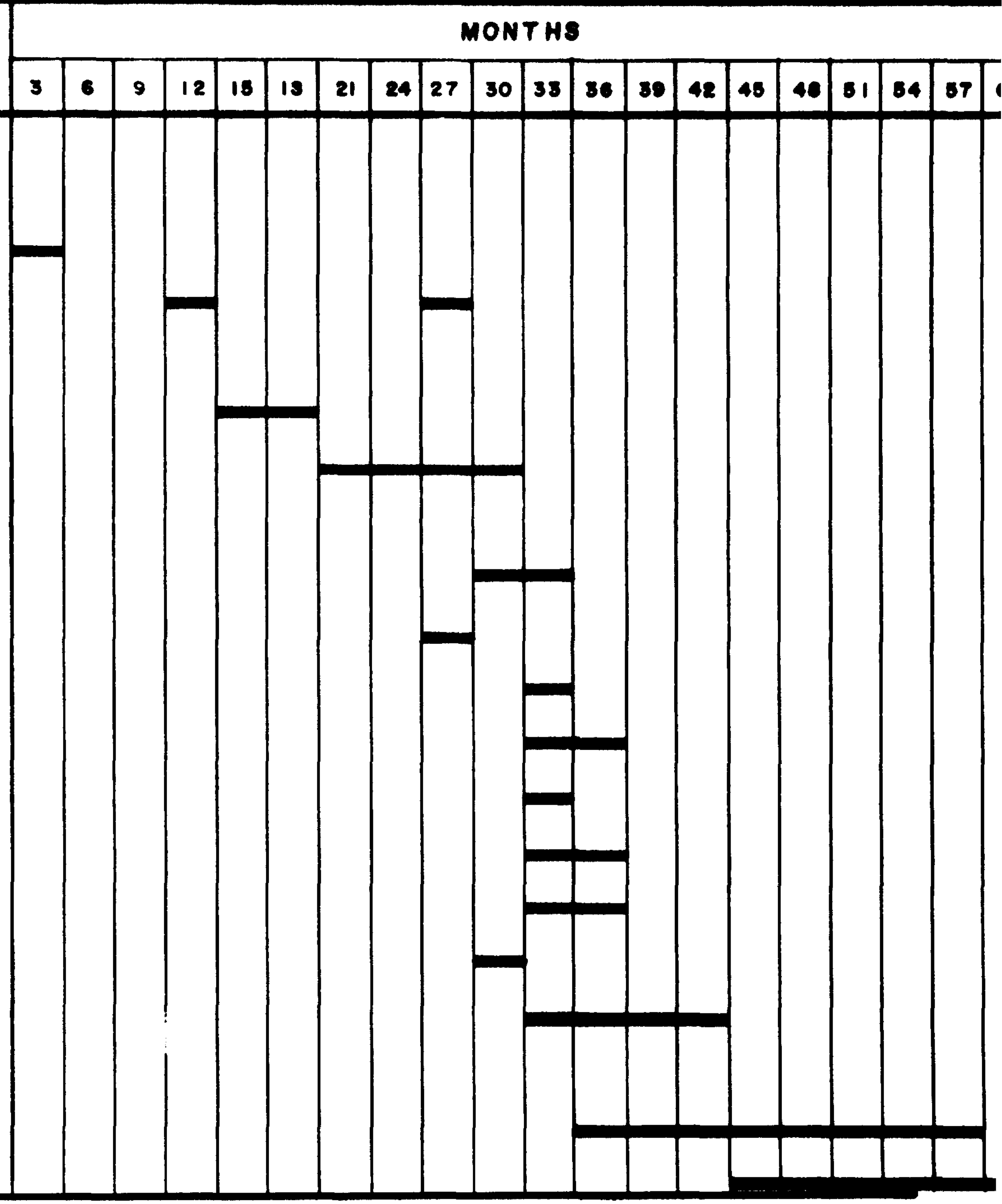
APPENDIX 2

WORKING TIME AND SCHEDULE OF ACTIVITIES

ACTIVITIES

1. Grounwork
- .1 Hiring of the team of experts
- .2 Hiring of consultants

2. Specific Project Activities
- 2.1 Market analysis
- 2.2 Analysis of the industries
- 2.3 Establishment of expansion plan for the firms
  - 2.3.1 Metal furniture
  - 2.3.2 Aluminum householdware
  - 2.3.3 Metal cans , drums and caps
  - 2.3.4 Bicycles
  - 2.3.5 Screws
  - 2.3.6 Foundry
  - 2.3.7 Equipment repair
  - 2.3.8 Farming tool
  - 2.3.9 Other
- .4 Carrying out the expansion plans
  - 2.4.1 Equipment
  - .4.2 Hiring of technicians



6.2. ESTABLISHMENT OF A DIES AND SPECIAL TOOLS CENTER

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

Project of the Government of People's

Republic of Angola

PROJECT DOCUMENT

Title:	Establishment of a Dies and Special Tools Center.
Number:	Duration: 56 months.
Primary function:	Direct support.
Secondary function:	Desing and production
Sector: (Govt.Class)	Industry
UNDP (Class+Code):	Industry (35)
Sub-sector:	Metal Working Industry
PNUD (Class+Code)	Industrial Services and Institutions (3530)
Government Implementing Agency:	Ministry of Industry (National Direction of Heavy Industry)
Executing Agency:	(UNIDO)
Estimated starting date:	

Government inputs: UNDP inputs: US $ 1,806,600

Government Cost-Sharing:

Signed:

______________________________ Date: ______________
on behalf of the Government

______________________________ Date: ______________
on behalf of the Executing Agency

______________________________ Date: ______________
on behalt the United Nations Development Programme (UNDP)

PART I

LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article I, paragraph 1, of the Assistance Agreement between the Government of the People's Republic of Angola and the United Nations Development Programme, signed by the parties on18 th February 1977.

The Government Implementing Agency shall, for the purposes of the Standard Basic Agreement, refer to the Government Co-operating Agency described in that Agreement.

PART II

THE PROJECT

A. DEVELOPMENT OBJETIVE

1. Contribute to the development of industry in general and to the metal-mechanics sector in particular by improving work methods through more efficient use of the existing equipment.
2. Achieve the maximum output of facilities or machinery which are currently either broken down or running poorly because of the lack of special tools needed.
3. To decrease the country's dependence on foreign technology and commitment of foreign exchange.
4. Be able to handle the supply of certain special spare parts which because of the difficulty involved in mechanizing them, the special characteristics of the steel and the heat treatments they require, can not be manufactured in the existing workshops at the present time.

B. INMEDIATE OBJETIVE

1. Study the country's present die and special tools needs in order to determine the range and quality of these items that can be manufactured within the country.

2. Establish a die and special tools design and manufacture Center which will be able to meet the industry's demands and advise, as a specialized unit, how to find the most efficient way to use the machinery or equipment which utilize these items.

3. Prepare a staff training program which is necessary in order to make the Center work.

C. SPECIAL CONSIDERATIONS

Since 1973 there has been a decline in industrial productivity, particularly in the metal-mechanics sector. The production figures have fallen to the point where in 1981 they are approximately 40% the corresponding figures of 1973.

One of the causes nost frequently found in the decline of productivity has been having to do without machinery and equipment which can not be used either because no special tools are available or because of a lack of spare parts.

An industrial sub-sector made up of workshops exists whose duty it is to repair and maintain equipment, but the equipment and the technological level do not permit the workshops to handle production as specialized as that of dies and special tools.

D. BACKGROUND AND JUSTIFICATION

Upon request of the People's Republic of Angola, in 1982 UNIDO analyzed the present production capacity of the metal-mechanics industry in Angola and projected a plan to strengthen the industrial sector. The project number was DP/ANG/80/007 and carried out by TECNIBERIA.

This study, which was made from a sample of 30 firms belonging to the metal-mechanics sector, showed an almost complete lack of dies and special tools. These vital items have to be imported from abroad, with the result that valuable time is lost and foreign exchange is unnecessarily spent.

The above-mentioned reasons justify the establishment of a National Die Center that can handle the country's needs.

E. OUTPUTS

Putting this project into operation should obtain the following results:

1. Establishement of a Center whose responsibilities within the industrial sector will be:

1.1. To design and manufacture the dies and special tools the industry needs, supply the necessary spare parts for these items and carry out their repair.

1.2. Manufacture of special parts for equipment or machines which can not be manufactured in repair and maintenance workshops because of their special material or mechanization characteristics.

1.3. Design new special tools which can reduce the number of steps in the process and/or improve the quality of finished products.

1.4. Research systems , materials and heat treatments in order to increase production output and decrease the cost of special tools.

1.5. Keep technology as concerns the stamping in of dies and countersinking processes up to date through periodical contact with countries which are advanced in this industrial area.

1.6. Counselling the industry about which die or special tools is the most suitable to its operation or its cost for a specific machine or process.

2. Obtain complete rehabilitation of all machinery currently out of order either because of the lack of special tools or special spare parts.

F. ACTIVITIES

1. Groundwork

1.1. Approval of the Project Document.

1.2. Appointment of the Project's National Co-ordinator.

1.3. Preparation of terms of reference for the hiring of the outside team of experts who will conceive and develop the project.

1.4. Hiring of the team of experts.

2. <u>Speccific activities of the Project</u>

2.1. A study of what the necessities are.

2.1.1. Make an analysis of the firms in the industrial sector in general and the metal-mechanics sector more specifically in order to determine the extent and volume of yearly manufacturing that the Center should handle.

2.1.2. Aid in the development of the die and special tool in order to anticipate any possible future expansion of the Center, in accordance with the current technological level of the firms in the various sub-sectors and the Government's modernization plans.

2.1.3. Analysis of importation figures for these items if these figures are available.

2.1.4. Study the information obtained and determine which dies, special tools or spare parts should be manufactured in the country now and in future expansion plans.

2.2. Working out the Project

2.2.1. Choose the most appropriate location for the construction of the Center.

2.2.2. Decide on the size and set up of the Center as regards workshop space, offices, warehouses and auxliary branch-offices.

2.2.3. Decide on which machinery and auxiliary equipment is best suited to the operations which are to be handled.

2.2.4. Prepare the basic layout of the necessary buildings and the set up of machinery, equipment and facilities.

2.2.5. Specify the number of specialized and unspecialized staff needed.

2.2.6. Preparation of the following costs: Completion of civil construction and facilities, adquisition of machinery and auxiliary equipment, raw material and staff.

2.2.7. Preparation of the programs and calendars of the time by which the various phases of the project must be finished.

2.3. Preparation fo the terms of reference

2.3.1. Terms of reference for the purchase of machinery and auxiliar equipment with a two year supply of spare parts.

2.3.2. Terms of reference for the contracting of necessary civil construction: preparation of buildings and machines foundation design and construction.

2.3.3. Terms of reference for facility contracting such as electrical facilities, water facilities and compressed air facilities.

2.3.4. Terms of reference for the adquisition of enough raw materials to last for about two years of production.

2.4. Staff selection and training

2.4.1. Selection of staff trained to use machine tools from a, local training center.

2.4.2. Work out training programs and select the firms or national centers where professional training can be improved.

Choose foreign centers where specialized training can be completed.

2.4.3. Direct supervision of staff training in two stages; in national and foreign centers.

2.5. Assistance to the Government

2.5.1. Assistance to the Government in machine and raw material orders.

2.5.2. Assistance to the Government for the continuation of delivery and receipt dates for materials.

2.5.3. Assistance to the Government in the contracting of facilities and civil construction.

2.6. <u>Completion of the project and preparation of date to begin production</u>

2.6.1. Supervision in carrying out civil construction and construction of facilities.

2.6.2. Supervision to insure that the program is being carried out and that completion dates are met.

2.6.3. Design of dies and special tools and preparation of construction drawings in order to start manufacture as soon as the facilities have been put into operation.

2.6.4. Hiring of unskilled staff.

2.6.5. Machine mounting

2.7. <u>Commissioning and start-up</u>

2.7.1. Working out and carrying out the program to put facilities into operation.

G. <u>INPUTS</u>

1. <u>Inputs by the Government</u>

1.1. <u>Assignment of national staff</u>

- National Project Co-ordinator
- Technical Director (Mechanical Engineer)
- Technical Office Manager (Mechanical Engineer)
- Workshop Manager (Mechanical Engineer)
- Tools Designer (Associate degree level Engineer)
- Quality Control Specialist
- Administrative Office Manager
- 2 Draftsmen
- 2 Administrative Assistance
- 6 Machine Tool Operators
- 5 Fitters
- 1 Electrician/mechanic
- 5 Unskilled Operators
- 1 Typist

1.2. Training

The Government will finance the national staff training programs within the country.

1.3. Buildings, Equipment and Facilities

The Government will supply the buildings, equipment and facilities.

The provisional estimation for this is around US $ 535,000 equivalente in local currency.

1.4. Other

The Government will provide the necessary accomodations, living allowances and transport for the foreign team of experts.

2. Inputs by UNDP

2.1. Appointment of international staff

11.01: Technical Director, Team Leader.

Must be a mechanical engineer with practical technological and economic experience in die manufacture, project organization and development of the workshops in this area of activity.

He will be responsible for organizing and co-ordinating all the project activities and the other experts'duties.

He will develop staff training programs and will give guidance on broadening training programs abroad.

11.02: Technical Office Manger. Must be a mechanical engineer with practical technical and economic experience in die and special tools design as well as the organization of the technical office.

Together with the Tools Designer, he will work out a study of yearly demand and the types of special tools and dies the country needs.

He will take part in stablishing the dimensions of the Center.

He will take part in the selection and training of staff from the technical office.

11.03: Workshop Manager. Must be a mechanical engineer with technical experience in die and special tools manufacture as well as in work organization and division within the workshop.

He will participate in establishing the dimensions of the Center.

He will take part in the selection and training of workshop and warehouse staff.

Together with the Technical Director, he will work out training programs and schedules for the workshop staff.

11.04: Tools Designer. Must be an associate degree level engineer with experience in the design and development of dies.

He will take part along with the Technical Office Manager in the analysis of the country's needs.

He will also participate in the training of draftsmen at the same he is preparing the manufacturing program's designs.

11.05: Quality Control Specialist. He must also be an expert in quality testing and control.

He will participate in establishing dimensions of the center.

He will take part in planning staff training.

Once the project has been completed and put into action, this team of experts will take over the Center's operation and training the staff assigned by the Government for a two year period.

2.2. Training

A stury tour will be organized for the Angolan counterparts during which suitable workshops will be visited where similar facilities are in operation to exchange experience.

Fellowships financing of a three month program abroad for the six machine tool specialists in order to complete the specialization courses received in the country.

H. PREPARATION OF WORK PLAN

A detailed Work Plan for the implementation of the project will be prepared by the Technical Director, in consultation with the National Project Co-ordinator. This will be done at the start of the project and brought forward periodically. The agreed upon Work Plan will be attached to the Project Document as Annex I and will be considered as part of that document.

In appendix of this Project Document, a diagram is given which shows time estimates of the development of activities previously mentioned.

I. PREPARATION OF THE FRAME WORK FOR EFFECTIVE PARTICIPATION OF NATIONAL AND INTERNATIONAL STAFF IN THE PROJECT

The activities necessary to produce the indicated outputs and achieve the project's immediate objetive will be carried out jointly by the national and international staff assigned to it. The respective roles of the national and international staff will be determined by their leaders, by mutual discussion and agreement, at the beginning of the project, and set out in a Framework for Effective Participation of National and International Staff in the Project. The Framework, which will be attached to the Project Document as an annex, will be reviewed from time to time. The respective roles of the national and international staff shall be in accordance with the established concept and specific purposes of technical co-operation.

J. DEVELOPMENT SUPPORT COMMUNICATION

The Government will let the project assistance results be known through the National Administration of Heavy Industry.

K. INSTITUTIONAL FRAMEWORK

The project plans will be carried out by the National Administration of Heavy Industry which is the Governmental organization in charge of supervising any activity within the metal-mechanics sector which concerns the Center.

L. FUTURE UNDP ASSISTANCE

No further assistance from the UNDP is anticipated.

PART III

SCHEDULES OF MONITORING, EVALUATION AND REPORTS

A. TRIPARTITE MONITORING REVIEWS, TECHNICAL REVIEWS

The project will be subject to periodic review in accordance with the policies and procedures established by UNDP for monitoring project and programme implementation.

B. EVALUATION

The project will be subject to evaluation, in accordance with the policies and procedures established for this purpose by UNDP. The organization, terms of reference and timing of the evaluation will be decided by consultation between the Government, UNDP and the Executing Agency concerned.

C. PROGRESS AND TERMINAL REPORTS

Regulations for progress reports will be established by the Technical Director in accordance with the National Project Co-ordinator after each of the activities has been completed.

Upon completion of the Project, the Technical Director will submit a rough draft of the final project report as stipulated by the rules and procedures followed by the UNDP.

PART IV BUDGETS

PROJECT BUDGET INCL

ountry: Angola

roject Title: Assistance in the establishment of a Die and Specia

	TOTAL		1st year	
	m/m	US $	m/m	US $
10.Project staff				
11.Experts				
11.01.Technical Director	56	386,400	12	82,800
11.02.Technical Office Manager	56	358,400	12	76,800
11.03.Workshop Manager	56	358,400	12	76,800
11.04.Designer	56	324,800	12	69,600
11.05.Quality Control Specialist	56	324,800	12	69,600
11.99.Sub total	280	1,752,800	60	375,600
30.Training				
31.00.Fellowship	18	28,[illegible]		
32.00.Study Trips		2[illegible]		[illegible]
39.00.Total training costs		5[illegible]		25,[illegible]
TOTAL		1,806,[illegible]		400,[illegible]

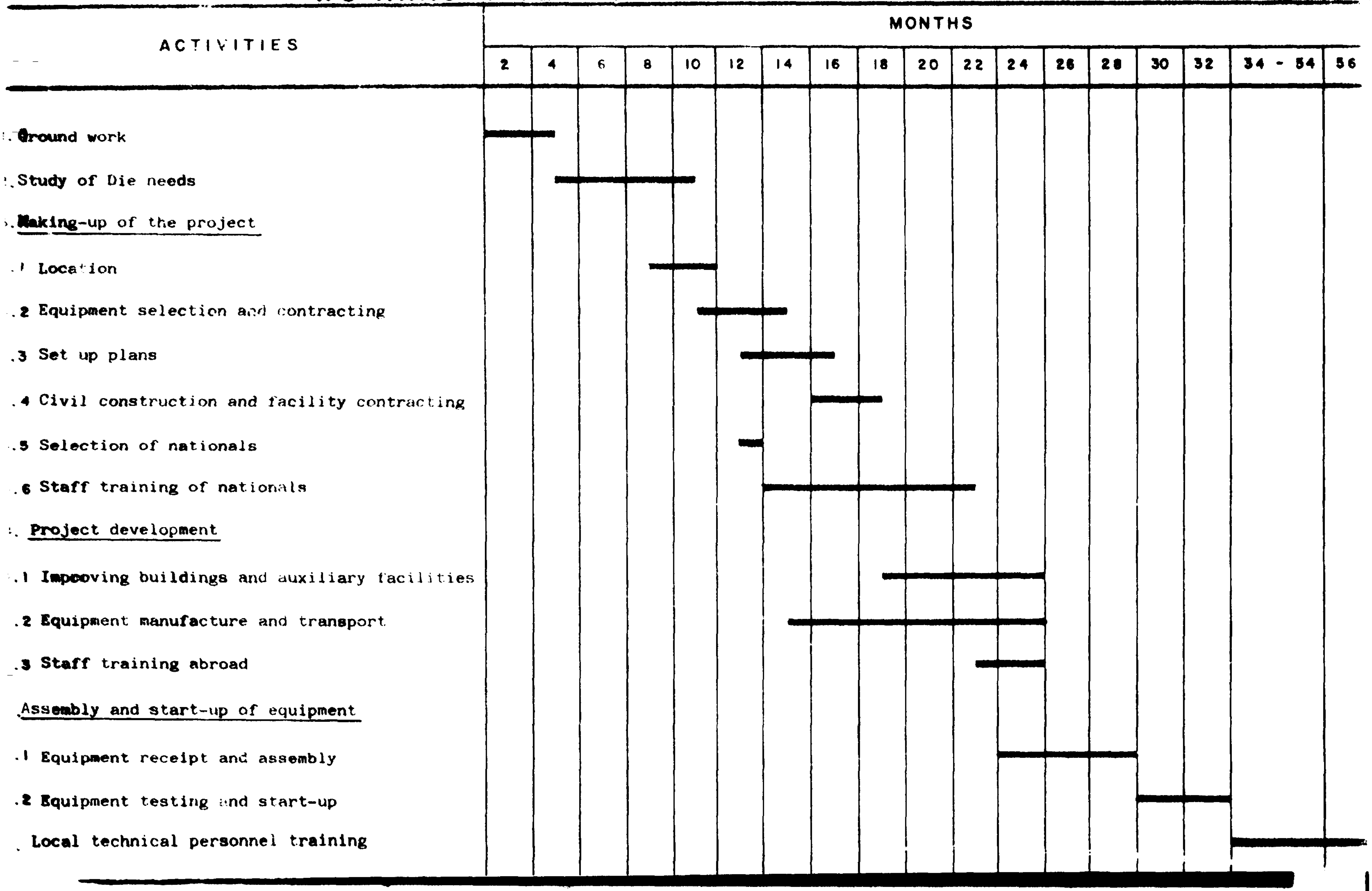
ING [illegible] CONTRIBUTION

Tools Center.

2nd year		3rd year		4th year		5th year	
m/m	US $	m/m	US $	m/m	US $	m/m	US $
12	82,800	12	82,800	12	82,800	8	55,200
12	76,800	12	76,800	12	76,800	8	51,200
12	76,800	12	76,800	12	76,800	8	51,200
12	69,600	12	69,600	12	69,600	8	46,400
12	69,600	12	69,600	12	69,600	8	46,400
60	375,600	60	375,600	60	375,600	40	250,400
12	28,800						
	28,800						
	404,400		375,600		375,600		250,400

APPENDIX

WORKING TIME AND SCHEDULE OF ACTIVITIES



UNITED NATIONS

UNITFD NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

11448
(2 of 3)

ASSESSMENT OF THE PRESENT CAPACITY OF THE METALWORKING INDUSTRY IN ANGOLA AND PROJECTION TO EXPAND THIS INDUSTRIAL SECTOR

FINAL REPORT

VOL II: ANNEXES 1 AND 2

TECNIBERIA

MADRID - SPAIN

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

ASSESSMENT OF THE PRESENT CAPACITY OF THE METALWORKING INDUSTRY IN ANGOLA AND PROJECTION TO EXPAND THIS INDUSTRIAL SECTOR

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UNIDO PROJECT NO. DP/ANG/80/007

CONTRACT NO. T 81/35/IS

TECNIBERIA

April 1982

SUMMARY

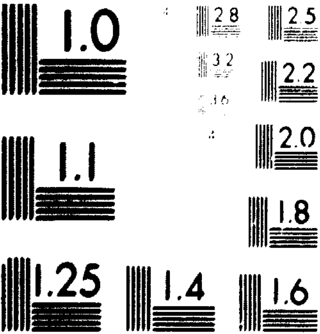
ANNEX. 1 DATA OF THE FIRMS VISITED IN THE PEOPLE'S REPUBLIC OF ANGOLA

Pag.

SUMMARY OF THE FIRMS VISITED IN LUANDA

SUMMARY OF THE FIRMS VISITED IN HUAMBO

Pag.



MICROCOPY RESOLUTION TEST CHART

ANNEX. 1 DATA OF THE FIRMS VISITED IN THE PEOPLE'S REPUBLIC OF ANGOLA

SUMMARY OF THE FIRMS VISITED IN LUANDA

In order visited	Name of the firm	Business activity	Type of product manufactured, according to Techniberia's classification
1	FATA	Welded pipes	9
2	METANG	Corrugated sheet	9
3	ALFAG	Harrows	8
4	API	Corrugated cardboard	9
5	EPMEL	Metal furniture, metal-work, scales and platform scales, maintenance	1,7,9
6	CAPSUL	Bottle caps	3
7	ENMEL	Metal furniture, spring mattresses, aluminum kitchenware	1,2
8	SOMETAL	Foundry, heavy iron works	3,6
9	METANGOL	Tin-plate cans	3
10	FABIMOR	Bicycles and motorcycles	4
11	COMETA II	Metal cisterns, tanks	3
12	EMB.VAN LEER	Metal drums	3
13	INCUTAL	Steel flatware	9
14	METALVI	Foundry, aluminum kitchenware, stoves (cooking)	2,6,9
15	TRABASSOS JORGE	Vehicles for the handicapped	9

1. GENERAL INFORMATION

1.1. Name of the firm: FATA

1.2. Location: Viana (Luanda)

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr.Antonio Ferreira Vieira Lopes, Director.

2. BUSINESS ACTIVITIES, PRODUCTS, AND PRODUCTION

2.1. Business activity: Manufacture of pipes and welded bars

2.2. Range of products manufactured: Diameters from 3/8" to 4", maximum lengths 6 m.

2.3. Production capacity: 10,000 tons per year, working 1 shift (8 hours a day, 5 days a week).

2.4. Actual production: In 1.981, production is forecast at 50% of production capacity, (taking into account a 2 month shutdown) equivalent to a production of 500 tons per month.

3. RESOURCES

3.1. Facilities and equipment

- Sheet-metal cutting line
- Resistance-welding machine for pipe manufacture
- High-frequency induction welding machine f[illegible] pipe manufacture

- Maintenance workshop (electrical, mechanical, automotive, maintenance and repair work and metal work).

3.2. Employees: Total staff: 237. Technicians: 1 engineer and 2 middlegrade qualified employees (holders of academic degrees).

3.3. Raw material: Coiled steel sheet, imported from Japan

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems: The main problems stem from the outdated resistance-welding machine, since replacement of parts is increasingly difficult.

4.2. Plans: The plan of action for 1.983 includes the installation of a Walter Korn (brand) pipe-galvanizing line; its components (6 tanks for rust removal and washing, and galvanization vat, pre-drying oven and drying oven) are stored at FATA.

1. GENERAL INFORMATION

1.1. Name of the firm: METANG

1.2. Location: Viana (Luanda)

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr. Antonio Ferreira Vieiria Lopes, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: Manufacture of galvanized corrugated sheet

2.2. Range of products manufactured: only one size

2.3. Production capacity: 12,000 tons per year, working 3 shifts (Shut down 16 hours per week).

2.4. Actual production: At the present time, 5,000 tons are produced per year, equivalent to 41,7% of production capacity.

3. RESOURCES

3.1. Facilities and equipment: Equipment for continuous rust-removal, drying, and immersion galvanizing. Non mechanized equipment for corrugating the sheet.

3.2. Employees: 95

3.3. Raw materials: Cut sheet, imported from Japan

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems: The imported sheet suffers great delays at the port of Luanda until it can be unloaded, which leads to rust formation and shrinkage of 6 to 7%.

4.2. Future plans: Non-existent.

1. GENERAL INFORMATION

1.1. Name of the firm: ALFAG

1.2. Location: Viana (Luanda)

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr. Aurelio Pinto, Acting Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture and assembly of farm equipment

2.2. Products: Electrowelded harrows

2.3. Production capacity: 700 harrows per year

2.4. Actual production: Manufacturing is at a standstill for lack of raw materials; operations are expected to begin again in 1.982.

3. RESOURCES

3.1. Facilities and equipment:

3 lathes
1 milling machin
1 drill press
oxygen-cutting and electrical welding equipment
sheet-bending machine
painting equipment

3.2. Employees: 79

3.3. Raw materials: Parts imported from Portugal

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems: An important parts order did not arrive when needed, delaying production for several months.

4.2. Future plans: Two prototypes have been built for manufacturing the basic harrow frame from welded sheet, with only certain parts being imported.

1. GENERAL INFORMATION

1.1. Name of the firm: API DE ANGOLA

1.2. Location: Luanda

1.3. Legal status: composite (mixed).

1.4. Name and position of the person interviewed: Mr. Morgado, Associate Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture of corrugated cardboard

2.2. Range of products manufactured: cardboard boxes, assorted sizes

2.3. Production capacity: 400 tons per month (planned production 200 tons per month).

2.4. Actual production: 100 tons per month, in other words, 25% of production capacity and 50% of planned production.

3. RESOURCES

3.1. Facilities and equipment:

Main Langston equipment system for manufacturing cardboard from paper
Corrugating machine
Cutting and packaging equipment
Steam boilers
Mechanical workshop

3.2. Employees: A total of 174

3.3. Raw materials: Paper (domestic)

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems: There was a fire at the factory in 1.978, and repairs took 32 months; operations began again in March, 1.981. The chief problems which exist at the present time are:

- Lack of an industrial mechanic to repair productive equipment
- Problems in acquiring replacement parts for the principal machinery
- Shortage of steam supply
- Problems with the water supply
- Lack of a drive transformer for the corrugating machine

4.2. Future plans: The only project planned is the construction of a 200 m^3 water-storage tank.

1. GENERAL INFORMATION

1.1. Name of the firm: EPMEL (Empresa Provincial Metalo-mecánica Ligeira)

1.2. Location: Luanda

1.3. Legal status: Government-owned. Belongs to the Luanda Provincial Delegation of the Ministry of Industry.

1.4. Name and position of the people interviewed: Mr. Carlos Buteilha, Director Mr. Antonio Lima, Head of the Manufacturing department.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: EPMEL is made up of 8 productive units, devoted to the following activities:

UNIT	BUSINESS ACTIVITY
SERRALHARIA ARTISTICA	Metal work (railings, doors, etc.)
SERRALHARIA ANGOLANA	Metal furniture (school desks and tables).
ROFIL	Scales and platform scales
EQUIPAMENTOS TECNICOS	Industrial maintenance
FAGOL	Office file cabinets (will soon shut down)
IRA	Tricycles for children
IRMÃOS RIBEIRO	Wood carpentry
LINHA DE MONTAGEM	Assembly of metal furniture

2.2. Range of products manufactured: The S. ANGOLANA and IRMÃOS RIBEIRO units make parts for metal furniture; these parts are assembled at LINHA DE MONTAGEM. The rest of the units make finished products which are sold abroad.

2.3. Production capacity: The production capacity of the 6 units that manufacture finished products, expressed in terms of the invoicing (Kz per month) according to planned production, is as follows: (Statistics from January to August, 1.981).

LINHA DE MONTAGEM	7,500,000 Kz per month
IRA	4,600,000 Kz per month
EQUIPAMENTOS TECNICOS	1,500,000 Kz per month
SERRALHARIA ARTISTICA	1,500,000 Kz per month
ROFIL	1,500,000 Kz per month
FAGOL	1,100,000 Kz per month
TOTAL	17,700,000 Kz per month

2.4. Actual production: Average actual invoicing for the same period (Jan-Aug 1.981) is as follows:

LINHA DE MONTAGEM	2,775,000 Kz per month
IRA	641,250 Kz per month
EQUIPAMENTOS TECNICOS	198,750 Kz per month
SERRALHARIA ARTISTICA	474,000 Kz per month
ROFIL	615,125 Kz per month
FAGOL	596,175 Kz per month
TOTAL	5,300,300 Kz per month

If the actual invoicing figures are divided by the planned invoicing figures (both expressed in Kz per month), the following percentages are obtained:

	% Actual/planned production
LINHA DE MONTAGEM	37.0%
IRA	13.9%
EQUIPAMENTOS TECNICOS	13.3%
SERRALHARIA ARTISTICA	31.6%
ROFIL	41.0%
FAGOL	54.2%
TOTAL	29.9%

3. RESOURCES

3.1. Facilities and equipment: As a whole, EPMEL has 98 machines and other equipment (lathes, presses, benders, shears, etc).

3.2. Employees: The total staff numbers 368 employees, with the following breakdown:

Central structure:	44
EQUIPAMENTOS TECNICOS	59
FAGOL	31
ROFIL	38
IRA	48
S.ANGOLANA	35
S.ARTISTICA	52
IRMAOS RIBEIROS	37
LINHA DE MONTAGEM	24
TOTAL	368

3.3. Raw materials: The principal raw materials are: pipes (from FATA) and plywood (both domestic). Imported: Reading bolsters for scales, bars/ rolled steel sections, and sheet.

4. MANUFACTURING COSTS

Only personnel costs are available, which amount to 3,199,100 Kz per month, in other words, on an average:

$$\frac{3,199,100}{368} = 8,693.2 \text{ Kz/person/month}$$

5. INVOICING

See point 2.4.

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: The main problems are:

- Inadequate technology
- Lack of qualified staff at certain units
- Shortages in the raw material supply, especially pipes and plywood.
- Absenteeism

6.2. Future plans: The inmediate plan is to close the FAGOL unit; this building will be used for the assembly of RENAULT automobiles. Another plan is to group all the metal-furniture assembling units into one single unit. The activities of the EQUIPAMENTOS TECNICOS unit will probably be expanded as well.

1. GENERAL INFORMATION

1.1. Name of the firm: CAPSUL

1.2. Location: Luanda

1.3. Legal status: Composite (mixed). Subsidiary of Produtos Corticeiros Portugueses (Lisbon, Portugal).

1.4. Name and position of the person interviewed: Mr. Tomas García, Associate Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: Manufacture of bottle caps for wine, beer, and soft drink bottles.

2.2. Range of products manufactured: 26 and 29 mm. diameter bottle caps.

2.3. Production capacity: 300,000,000 caps per year, working one shift. Annual planned production: 180 million caps per year, working one shift.

2.4. Actual production: In 1980, 186 million caps were manufactured, equivalent to 62% of production capacity.

3. RESOURCES

3.1. Facilities and equipment:

1 shear

3 presses

7 assembling machines (for the cork liners)

Maintenance workshop

3.2. Employees: A total of 51

3.3. Raw materials: Tin-plate sheet varnished at METANGOL. Cork from Portugal.

4. MANUFACTURING COSTS

Statistics from 1980:

Maintenance and upkeep costs	2,570,000 Kz
General costs for each section	453,000 Kz
General administrative costs	3,368,000 Kz
Salaries, raw materials, and manufacturing costs	38,5[illegible]4,000 Kz
Other (advertising, telephone, etc).	[illegible],000 Kz
TOTAL	[illegible],118,000 Kz

5. INVOICING

1980: 41,624,000 Kz

6. PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: The equipment dates from 1963, and has not been replaced.

Initially, there were 14 assembling machines (to join the cork liner to the cap), of which only seven are left. Because of this, production is much greater from the presses than from the assembling machines.

6.2. Future plans: Projected replacement of the assembling machines currently in use, in order to be able to use thermomolded PVC sheets instead of cork.

1. GENERAL INFORMATION

1.1. Name of the firm: ENMEL (Empresa Nacional Metalo-mecânica Ligeira).

1.2. Location: Luanda

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Pascual Joao dos Santos, General Director of Fama Comercial (the firm that commercializes the products manufactured at the different units of ENMEL).

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: ENMEL has 12 productive units, devoted to the following activities:

UNIT	BUSINESS ACTIVITY
EDAL	Metal furniture
SADIL	"
FAMA INDUSTRIAL	"
ANFIBAR	"
M.VALENTE	"
ROULOTES	"
MAQUINAG	"
STAMEL	Aluminum kitchenware
SIAL	"
FANCOL	Spring mattresses
PADINHA	Metal furniture
GUIDAMEX	"

2.2. Products: Among the different kinds of metal furniture, the following are outstanding: beds, tables, chairs, metal wardrobes, metal filing cabinets, etc. Among the aluminum items manufactured, the following are noteworthy: plates, small ladles, coffee pots, saucepans, etc.

2.3. Production capacity: The following table shows the production capacity, expresses in units manufactured, and based on planned production from January to September, 1981.

- Spring mattresses	2,997 units
- Metal furniture	108,322 units
- Aluminum kitchenware	115,794 units

2.4. Actual production: For the same time period, actual production (expressed in units) and actual production expressed as a percentage of planned production, are as follows:

- Spring mattresses	2,464 units (82.2%)
- Metal furniture	55,814 units (51.5[illegible]
- Aluminum kitchenware	117,352 units (101%)

3. RESOURCES

3.1. Facilities and equipment: The units devoted to the manufacture of aluminum kitchenware have lathes for manual shape. SIAL also has a melting furnace for aluminum for casting handles. The units devoted to the manufacture of metal furniture have equipment for cutting and shaping sheet, pipes and rolled steel sections, and carpentry, upholstery, and finishing departments.

3.2. Employees: The total staff as of September 30, 1981, numbers 1,139 people with the following breakdown:

EDAL	308 people
SADIL	166 "
FAMA INDUSTRIAL	188 "
ANFIBAR	92 "
M.VALENTE	56 "
ROULOTES	40 "
MAQUINAG	69 "
STAMEL	44 "
SIAL	41 "
FANCOL	34 "
PADINHA	53 "
GUIDAMEX	13 "
FAMA COMERCIAL	33 "
TOTAL	1.139 people

3.3. Raw materials: The principal raw materials used are the following: STAMEL and SIAL: Imported aluminum sheet, thicknesses from 0.5 to 1.6 mm.

The rest of the units: Steel sheet, thicknesses from 0.8 to 1.6 mm, wire and rolled steel sections, all imported. Pipe from FATA (domestic). Wood and synthetic leather (domestic) and imported fabrics.

4. MANUFACTURING COSTS

Since ENMEL was created in 1976, there has been no accounting system for the costs. Only the salary costs are available, which from January to September, 1981, were 82.74 million Kz, in other words, an average of 8,071 Kz per person per month.

5. INVOICING

For all the units as a whole, from Jan, 1981 to Sept. 30, 1981:
169,391,000 Kz.

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: A problem shared by all of the units is the lack of technical assistance for equipment repair, as well as delays, at times considerable, in receiving the imported raw materials. Also, there are problems with absenteeism in certain units.

The are also problems with the supply of domestic raw materials: foam rubber, plywood, wood, and synthetic leather.

6.2. Future plans: Non- existent.

1. GENERAL INFORMATION

1.1. Name of the firm: SOMETAL

1.2. Location: Luanda

1.3. Legal status: Private

1.4. Name and position of the person contacted: Mr. Ferreira, Technical Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities. Iron foundry and heavy boiler making.

2.2. Range of products manufactured: Casting of diverse items, on order. Iron works/Boilermaking: Manufacture of tanks for storing liquids, maximum capacity 20,000 liters.

2.3. Production capacity: Foundry: 50 tons per month
Iron works: 8-10 tanks per month

3. RESOURCES

3.1. Facilities and equipment: Foundry: 2 cupolas, 1,500 kg/h each. Iron works: 3 sheet benders, cutting and bending presses, welding outfits, mechanical workshop with 10 lathes, 2 filers, 5 drills and 1 milling machine.

3.2. Employees: A total of 91

3.3. Raw materials:

Foundry: Imported coke and pig. Domestic scrap iron.
Iron works: Imported steel sheet

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems: Lack of qualified staff, antiquated workshop equipment and supply of imported raw materials.

4.2. Future plans: Non-existent

1. GENERAL INFORMATION

1.1. Name of the firm: METANGOL

1.2. Location: Luanda

1.3. Legal status: government-owned

1.4. Name and position of the person interviewed: Mr. Carlos Jorge Amaral, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: manufacture of lithographed metal cans

2.2. Products: 5-liter cylindrical cans for ink, 5-liter rectangular cans for oil, 5-liter cylindrical cans with screw-on cap for glue, 1/4 to 1 liter cylindrical cans, 1-quart cylindrical cans.

2.3. Production capacity: 1,950,000 units per year.Planned production:1.650.000 units/ye

2.4. Actual production: in 1980, 775,355 units were manufactured, representing 39.8% of the production capacity (working 1 shift).

3. RESOURCES

3.1. Facilities and equipment: photolithography laboratory, 3 lithograph lineas with a drying kiln, 5 production lines with presses, cutting shears, gluing machine (for bottoms), workshop equipment. All this machinery was installed in 1963.

3.2. Employees: A total of 220.

3.3. Raw materials: tinplate, imported from Japan, thicknesses from 0.20 to 0.28 mm (the tinplate currently in stock is equivalent to the amount normally used in 2 years).

Tin for soldering/welding.

4. MANUFACTURING COSTS

Due to the fact that the buying price of tin plate is higher than the selling price of the container, annual losses occur. The losses for the last 5 years are as follows:

1976: 6 million Kz
1977: 18 million Kz
1978: 8 million Kz
1979: 11 million Kz
1980: 17 million Kz

5. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

5.1. Problems: The main problem is a shortage of the tin needed to weld the lengthwise seam of the cans; the amount of tin used is 2,000 kg. per year.

5.2. Future plans: To eliminate the problem of the tin supply, they are planning to install semi-automatic welding machines, using copper wire and direct-current.

1. GENERAL INFORMATION

1.1. Name of the firm: FABIMOR

1.2. Location: Luanda

1.3. Legal status: Composite (mixed)

1.4. Name and position of the person interviewed: Mr. Teodoro Carlos, Director

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture of bicycles, assembly of SUZUKI motorcycles.

2.2. Production capacity, working 1 shift:

Bicycles: 22,000 units per year (Planned production: 2000 per year)
Motorcycles: 2,600 units per year

2.3. Actual production: (Current figures)

Bicycles: 300 per month = 3600 per year (16,4% of production capacity and 60.0% of planned production).

Motorcycles:150 per month = 1800 per year (69.2% of production capacity)

3. RESOURCES

3.1. Facilities and equipment: There are a total of 235 machines and other equipment in various states of repair, as follows:

In good condition	207
Broken-down but reparable	25
Broken-down, irreparable	3
Total	235

3.2. Employees: A total of 217

3.3. Raw materials: the principal raw materials are:

Bicycles: Calibrated pipe, strip steel, and imported accessories.

Motorcycles: All parts are imported from Japan (SUZUKI), and are assembled and painted at FABIMOR.

4. MANUFACTURING COSTS

Statistics from 1980:

Salaries:	18,196,262.50 Kz
Raw materials:	39,033,303.00 Kz
Financial expenses:	2,952,340.00 Kz
Administrative expenses:	938,176.00 Kz
Amortizations:	2,365,000.00 Kz
Other costs:	30,638,222.13 Kz
Total	94,123,303.63 Kz

5. INVOICING

1980: 95,470,370.50 Kz

6. PROBLEMS

There are 3 different problem areas at FABIMOR:

a) Lack of qualified staff.

b) Antiquated technology in the manufacture of bicycles

c) Raw materials are often very slow to arrive because of delays in unloading (up to 6 months) at the Port of Luanda.

1. GENERAL INFORMATION

1.1. Name of the firm: COMETA II

1.2. Location: Luanda

1.3. Legal status: Government-owned

1.4. Name and position of the people interviewed: Mr. Delfin Henriques da Silva, Associate to the General Director; Mr. Manuel Ninita, Production Foreman

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business Activities: Manufacture of cisterns and storage tanks for petroleum products.

2.2. Products: Capacities ranging from 5 to 60 m^3

2.3. Production capacity: Planned production: Cisterns and tanks, total capacity of 34,000 m^3, per year.
Anticipated production: Idem. 23,800 m^3 per year

2.4. Actual production: The factory began operations in May, 1981, although the granulated metal section (recovery of metal filings) and painting cabins have not yet been installed. Anticipated production per week (working 6 days a week, 1 shift) is as follows:

- Two 25 m^3 cisterns
- Four 15 m^3 cisterns

In 1982, 17,000 m^3 of production capacity is anticipated, together with the cisterns already assembled and stored.

3. RESOURCES

3.1. Facilities and equipment: Not counting the equipment in point 2.4., the plant has 2 assembly lines, equipped with sheet-cutters, bending machines, continuous-welding machines (with copper wire), hydraulic equipment for testing pressure and water-tightness, and a mechanical workshop.

3.2. Employees: 150, working 1 shift, and co-operating technicians(2.8millions Kz/month)

3.3. Raw materials: Imported steel sheet, thicknesses of 5 and 6 mm. Cistern bottoms, also imported.

4. INVOICING

Anticipated selling prices vary between 56,000 Kz for the 5 m^3 cisterns, and 267,000 Kz for the 60 m^3 ones.

5. CURRENTLY-EXISTING PROBLEMS

At the present time, production is at a standstill because of a lack of welders. Another problem is that the plant does not have any special welding equipment to use for inside the cisterns.

1. GENERAL INFORMATION

1.1. Name of the firm: EMBALAGENS VAN LEER

1.2. Location: Luanda

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr.Martinho Moraes, Head of Production.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: Manufacture of metal drums from steel sheet.

2.2. Range of products manufactured: Steel drums of 25,50, and 200 liter capacity.

2.3. Production capacity: planned production in 1980:
- large drums (200 l.): 105,600 units per year
- small drums (25 and 50 l.): 264,000 units per year

2.4. Actual production: Production in 1980:
- large drums: 66,419 units (62.9% of planned production)
- small drums: 58,663 units (22.2% of planned production)

3. RESOURCES

3.1. Facilities and equipment: There are 2 production lines, one for large drums and the other for small drums, made up of a machine to form cylinders with the sheet, an automatic induction welding machine for the lengthwise seam, and a painting division. The sheet for the lids is already cut, and there are hammering presses to from the edges.

3.2. Employees: 80, working 1 shift

3.3. Raw materials: imported steel sheet.

4. MANUFACTURING COSTS

Salaries (1980) 7,209,758 kz

Raw materials. 720 Kz per drum (Average price)

5. INVOICING

In 1980: 79,678,539 kz

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS

6.1. Problems: The machinery dates form 1969, and frequently breaks down. In 1981, the production line for large drums was shut down for two weeks because of a breakdown in the flanging machine, and the production line for small drums was shut down for six months because of a breakdown in the induction-welding machine.

6.2. Future plans: At the present time, the firm is negotiating with the government to decide the future of this factory.

1. GENERAL INFORMATION

1.1. Name of the firm: INCUTAL (Inoxidaveis e Cutelarias de Angola)

1.2. Location: Viana (Luanda)

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr. Ferreira, Owner/Director

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture of stainless-steel flatware, as well as platters, ashtrays, etc.

2.2. Production capacity: Partially-finished items, 20,000 per day, equivalent to 5.3 million items per year. Planned production, 3 million finished items per year.

2.3. Actual production: In 1980, 1.3 million items were manufactured, equivalent to 43.3% of planned production, and 24.5% of production capacity.

3. RESOURCES

3.1. Facilities and equipment: The items are made from stainless-steel sheet, and several different machines (installed in 1969) are used for cutting, stamping in dies, sharpening (for knives), and manual polishing. There is also a carpentry department, for manufacturing handles, and a mechanical workshop with 1 operator.

3.2. Employees: a total of 60 (working 1 shift)

3.3. Raw materials: Imported stainless-steel sheet

4. MANUFACTURING COSTS

Only the cost of salaries is available: 350,000 Kz per month

5. INVOICING

In 1980: 50 million Kz

6. PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: Absenteeism, which on certain days is as much as 50% of the total staff, affects the production line greatly. Another problem is the great need for dies for stamping, since one is needed for each different king of item manufactured, and at the present time all importing of these dies has been suspended. Finally, the time needed for unloading at the Port of Luanda is very long (for example, an order of sheet arrived by ship in March, 1981, and by September still had not been unloaded)

6.2. Future plans: In order to increase production, in 1979 INCUTAL made a study on the possibilities of collaborating with the Portuguese firm CHROMOLIT; this project has not been authorized by the Government of the People's Republic of Angola.
The expansion plan anticipated a production of 11 million items in the third year of operations, with an investment of 30 million Kz for equipment, imports of partially-finished items valued at 36 million Kz per year, and technical assistance valued at 2.7 million Kz per year.

1. GENERAL INFORMATION

1.1. Name of the firm: METALVI (Metalúrgica de Viana, S.A. R.L.)

1.2. Location: Viana (Luanda)

1.3. Legal status: Private

1.4. Name and position of the people interviewed. Mr. Jose Manuel, Production Manager; Mr. Viana, Administrative Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: The firm was planned in 1972 as a foundry for pipe fittings (by malleable casting); the equipment was installed in 1974, but has never been put into operation.

At the present time, the firm manufactures plates and small ladles from aluminum, oil lamps, portable oil and gas stoves (for cooking), and hand carts for warehouses and cleaning, in the metal-mechanics division.

2.2. Production capacity: The production capacity of the foundry, once the lacking equipment is installed, is estimated at 1,500 tons of goods per year. The metal-mechanics division had the following planned production for the period of January 1 to September 30,1981:

- Aluminum Kitchenware: 300 tons.
- The rest of planned production: 452,750 units

2.3. Actual production: For the same period (Jan. to Sept., 1981), manufacturing has been as follows:

- Aluminum kitchenware: 78 tons (26.0% of planned production)
- Rest of production: 26.328 units (5.8% of planned production)

In addition, 40,622 units of products not included in the production plan were manufactured, for the purpose of using surplus raw materials from 1979.

3. RESOURCES

3.1. Facilities and equipment:

a) Foundry: 2 Brown Boveri induction furnaces (800 Kw), with commutable transformer; complete facilities for recovery and treatment of sand used for casting. 4 core blowing machines. Molding carrousel. 2 shotblasting machines.

b) Metal-mechanics

2 filers
2 mechanical lathes
11 presses (10 to 150 tons)
7 grinders
1 gate shear
2 circular saws
11 welding outfits and 4 spot-welding outfits
4 drills
4 manual chipping hammers
1 shear
1 scrap packager, 40 x 20 x 20 mm
11 repoussé lathes
3 compressers (200 liters/min.)

3.2. Employees: A total of 120, working 1 shift

3.3. Raw materials: Basically, imported steel and aluminum sheet

4. MANUFACTURING COSTS

A record of the manufacturing costs is not kept; however, it is estimated that the cost of manufacturing the goods is roughly 75% of their selling price.

5. INVOICING

In 1980: 126,850,000 Kz

Jan-Sept. 30, 1981: 54,300,000 Kz

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: The main problem of the Metal-mechanics department stems from delays in receiving the raw materials. The first shipment of raw materials required for the 1981 plan arrived at the plant in July.

6.2. Future plans: The most important project is to put the foundry into operation. To this end, the firm has proposed several different plans to the Government, the last of which was presented to the National Director of Heavy Industry on July 17, 1981.

1. GENERAL INFORMATION

1.1. Name of the firm: TRABASSOS AND JORGE

1.2. Location: Luanda

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr. Anibal Alfonso Jorge, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture and assembly of vehicles for the handicapped.

2.2. Range of products manufactured: Tricycles (with and without engine) wheelchairs, 2- and 4-wheeled carts (for use in warehouses).

2.3. Production capacity: Planned production for the period covering Jan. 1-Sept. 30, 1981 was as follows:

- Tricycles for the handicapped (non-motorized): 6000
- Motorized tricycles: 1000
- Wheelchairs: 400

2.4. Actual production: For the same perid in 1981, actual production was as follows:

- Tricycles for the handicapped (non-motorized): 700 (17.5% of planned production)
- Motorized tricycles: 200 (20.0% of planned production)
- Wheelchairs: 400 (100% of planned production)

Unplanned production:

- 2 wheeled carts: 120
- 4 wheeled carts: 130

3. RESOURCES

3.1. Facilities and equipment: There is pipe-cutting and bending equipment, as well as fitting benches and painting cabin. Electroplating.

3.2. Employees: 12, working shift

3.3. Raw materials: All parts for the motorized tricycles are imported from Portugal. For the manufacture of non-motorized tricycles and wheelchairs, domestic raw materials are used (pipe, plywood, and synthetic leather); small parts (chains, brakes, etc.) are imported.

4. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS

4.1. Problems: A previosly-existing factory was demolished, and now the firm only handles assembly work. Raw materials suffer long delays at the port. There is a great deal of absenteeism.

4.2. Future plans: New facilities to increase production capacity are planned for 1983, possibly at a new site.

SUMMARY OF THE FIRMS VISITED IN HUAMBO

In order visited	Name of the firm	Business activity	Type of product manufactured, according to Techniberia's classification
1	UNIDADE METALICA	Metal furniture, scales, platform scales	1,7
2	ULISSES	Bicycles and motorcycles	4
3	JOBA	Aluminum and iron casting	2,6
4	FADARIO MUTEKA	Manufacture and repair of machinery, staff-training center	6,7
5	CODUME	Screws, etc .	5
6	SOALUMINIO	Aluminum kitchenware	2
7	IAF	Builder's hardware	9
8	FUNDIÇÃO MARCAO	Animal-drawn plows	6,8

1. GENERAL INFORMATION

1.1. Name of the firm: UNIDADE METALICA (Empresa Provincial de Metalo-Mecânicas)

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Simón Marcelino, Director.

2. BUSINESS ACTIVITIES, PRODUCTS, AND PRODUCTION

2.1. Business activities: The Unidad Metálica of Huambo is a group of 7 productive units, devoted to the following activities:

UNIT	ACTIVITY
OASIS	Metal forniture
BALANÇAS SIMAO VAZ	Scales and platform scales
INDUSTRIAL METALURGICA	Metal furniture
METALURGICA DO PLANAO	Metal furniture
BERNARDO LOPES MARQUES	Metal furniture
SERRALHARIA ANGOLANA	Painting of metal furniture
SERRALHARIA JOTAL	Metal furniture

2.2. Products: Among the different types of metal furniture, the following are the most important: military bunks, school desks, office furniture, wardrobes, and chairs.

2.3. Production capacity: According to statistics for the second half of 1980 and the first half of 1981, the production capacity in terms of projected production, as well as the actual production taken as a percentage of the projected total production figure, are as folows:

	Planned prod.		Actual prod.		% Actual/Planned	
	2nd half 1980	1st half 1981	2nd half 1980	1st half 1981	2nd half 1980	1st half 1981
Bunks	1,998	1,999	1,795	1,756	89	88
Desks	1,595	1,249	-	-	-	-
Office furniture	300	-	479	-	159	-
Scales	75	-	14	-	18	-
Various (especially chairs)	2,994	3,522	486	2,325	16	66
TOTAL	6,962	6,770	2,774	5,728	40	85
unplanned production				1,647		

3. RESOURCES

3.1. Facilities and equipment: The equipment in use for the manufacture of metal furniture is made up of sheel-metal shears, sheet-bending presses, hacksaws for pipe-cutting, machines for pipe-bending, electric welding equipment and paint sprayers.

For the manufacture of scales and platform scales, there is a mechanical workshop equipped with:

3 lathes
1 milling machine
1 hydraulic press
1 saw file
4 vertical drills

2 electric sanders

1 disk saw

1 grinder/polisher

3.2. Employees: The total staff, as of September 30, 1981, numbered 153, with the following breakdown:

Management	19
Oasis	35
B.Simao Vaz	32
Ind. Metalúrgica	17
Met. do Planao	23
Bernardo López	8
S. Angolana	6
S. Jotal	13
Total	153

3.3. Raw materials: For the manufacture of metal furniture: imported steel sheet, 0.5 to 1.5 mm. thick; pipes, basically from Ø ½" to 3/4" (domestic, from FATA); domestic plywood and artificial leather.

For the manufacture of scales, a local iron foundry is used.

4. MANUFACTURING COSTS

Of all the units taken as a whole:

	2nd half 1980	1st half 1981
Salaries	7,669,782.00 Kz	5,947,997.000 Kz
Raw materials	5,082,898.02 Kz	7,564,468.20 Kz
Other costs	2,623,304.76 Kz	3,283,498.10 Kz
Total costs	15,375,984,78 Kz	16,795,963.30 Kz

5. INVOICING

Of all the units taken as a whole:

2nd half 1980:	14,082,719.50 Kz
1st half 1981:	17,113,436.50 Kz

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS

6.1. Problems

The main problem is the insufficient supply of raw materials, which are transported by truck from Luanda and Benguela, folowed in second place by a lack of qualified staff.

There is a shortage of specialized staff for the manufacture of scales.

There are 22 welding outfits currently broken down, for lack of welding pliers and files.

There is a shortage of paint thinner.

6.2. Future plans: The closing of the Bernardo Lopez unit is planned; staff from Bernardo Lopes will be integrated into the other units.

1. GENERAL INFORMATION

1.1. Name of the firm: ULISSES

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mrs. Ana Maria P. Fidaldo, Directress.

2. BUSINESS ACTIVITIES, PRODUCTS, AND PRODUCTION

2.1. Business activities: Assembly of YAMAHA motorcycles, through a technical-assistance contract signed in January, 1979.
Manufacture and assembly of bicycles.

2.2. Production capacity:
Bicycles: 960 per month (11,500 per year)
Motorcycles: 1,140 per month (13,700 per year) (Planned production: 8,000 per year)

2.3. Actual production: The manufacture of bicycles has been suspended for a year, because of a shortage of parts, and because of the fact that some of the necessary equipment is broken down or damaged beyond repair.
In 1980, with a planned production of 8,000 motorcycles, 7,000 were actually manufactured. This is 51% of the production capacity of 13,700, and 88% of the planned production. In 1981, with the same figure for planned production, 4,000 motorcycles had been manufactured by the end of September.

3. RESOURCES

3.1. Facilities and equipment
a) Motorcycles: Using imported parts, the production line is made up of:

- Spot-welding line
- Assembly line
- Painting and chrome-plating line

b) Bicycles: The assembly equipment dates from 1967, and in many cases is shut down, damaged beyond repair.

3.2. Employees: There are a total of 347 employees, with the following breakdown:

Managers	2
Foremen/superintendents	20
Administrative and other positions	96
Laborers, operators	229
	347

3.3. Raw materials: The principal raw materials are:

Bicycles: Calibrated pipe, iron bands, and imported accessories.

Motorcycles: All parts are imported from Japan (YAMAHA), and are assembled and painted at ULISSES.

At the present time, ULISSES itseld takes the necessary steps for importing the parts, maintaining a minimum 4-month stock. There are 3 different warehouses at the plant, and records are kept (by means of an NCR machine) of the movement of each part or accessory.

4. MANUFACTURING COSTS

Statistics from 1980, in millions of Kwanzas:

Salaries	26
General expenses	6
Raw materials and other production costs	228
Total	260

5. INVOICING

1980: 267,000,000.00 Kz

6. PROBLEMS AND FUTURE PLANS

6.1. Problems

a) Bicycles: In addition to the already-mentioned problems of antiquated and broken-down manufacturing equipment, there is a stock control problem, due to the fact that the NCR machine currently in use is mechanical, and requires much time and effort.

b) Motorcycles: The chief problem is that of the supply of raw materials, which are received by sea via the port of Lobito.
Up until May, 1981, the raw materials were transported from Lobito to Huambo by railroad. From that date on, the railroad ceased operations, and the goods must now be transported by truck.
Currently 17% of productive working hours are lost due to different causes, including absenteeism.

6.2. Future plans

a) Bicycles: There is a Japanese-designed project (currently suspended) based on the renovation and replacement of equipment, which projected the manufacture of 3000 bicycles per month, as well as accessories and 3000 bicycle frames per month to send to FABIMOR (Luanda).

b) Motorcycles: At the present time, the motorcycle frames are imported pre-shaped, and welded at the factory. A sheet metal press section is being installed, so that by end of 1982, only the engines and small pieces will be imported.

1. GENERAL INFORMATION

1.1. Name of the firm: JOBA

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Jose Augusto Federico dos Santos, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Aluminum and iron foundry

2.2. Range of products manufactured: Aluminum pots; plows and bottoms of pots in cast-iron .

2.3. Production capacity: estimated at:
Aluminum: 60 tons per year (planned production in 1981: 36 tons)
Cast iron: 72 tons per year (planned production in 1981: 30 tons)

2.4. Actual production: production forecast for 1981
Aluminum: 27.6 tons (46% of production capacity and 77% of planned production).
Cast iron: 12 tons (17% of production capacity and 40% of planned production.

3. RESOURCES

3.1. Facilities and equipment:
1 cupola, 1500 kg/hour (in use for melting once a week)
3 fuel-oil furnaces, 50 kg. capacity, for melting aluminum (5-6 tappings per day), sand casting with plate.
Trimming division

3.2. Employees: A total of 56

3.3. Raw materials: Domestic aluminum and iron scrap.

4. MANUFACTURING COSTS

1980 statistics:

Salaries:	2,978,000 Kz
Raw materials and other costs:	1,668,000 Kz
Total	4,646,000 Kz

5. INVOICING

In 1980: 10,112,000 Kz

Forecast for 1981: 6,460,000 Kz

6. CURENTLY-EXISTING PROBLEMS

There is a shortage of aluminum scrap, and for this reason they are currently using pig (40%) and aluminum sheet and scrap (60%). There is also a shortage of scrap iron.

For the melting furnaces for aluminum, there are problems with the supply of fuel-oil (at 2 Kz per Kg), which means that gas oil (4 Kz. per Kg) must be used.

There are no pattern makers to make mold-plates.

1. GENERAL INFORMATION

1.1. Name of the firm: FADARIO MUTEKA (formerly Maquinas Pinheiro)

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr.Jose Ricardo J.S. Freitas Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities

a) Manufacture and repair of wood-working machines

b) Training center (for lathe-operators, milling machine operators, industrial mechanics and industrial electricity)

c) Mechanical and electrical maintenance for the industry.

2.2. Range of products manufactured

a) Manufacture of the following wood-working machines:

- large fore planes, tables width: 410,510 and 630 mm.
- lathes for pieces up to 500 mm Ø
- 3 plate presses, available dimensions 2,500x1,300 mm.
- band saws, flywheels of 800 to 1,000 mm Ø
- charriots, automatic and with rack
- manual packagers

b) Maintenance (Unidad de Apoio Empresarial)

- repair of boilers and mills, electrical repairs, equipment maintenance, engine winding.

2.3. Production capacity

a) wood-working machines: planned production: 129 machines per year.

b) mechanical workshop and technical assistance to companies: 170,000 hours per year.

2.4. Actual production

a) wood-working machines: 80 machines per year, equivalent to 62% of planned production.

b) mechanical workshop and technical assistance to companies: 45,000 hours per year, equivalent to 26% of production capacity.

3. RESOURCES

3.1. Facilities and equipment

a) Workshop equipment:

14 lathes
3 milling machines
2 grinders/rectifiers
5 drills
3 power files
2 grinders
5 presses
2 emery stones
1 wood saw
1 large fore plane

b) Foundry

2 cupolas, one 2,160 kg/h, the other 760 kg/h
1 induction furnace, 800 kg. crucible capacity, 300 kw and 600 v, (at the present time in COMANDANTE JIKA-Benguela)
Sand mixer
2 molding machines

3.2. Employees

Manufacturing unit for wood-working machines	70
Staff training center	7
Technical assistance to companies area	56
Total	133

3.3. Raw materials

Foundry: scrap iron and sand (domestic); imported bentonite, ferroalloys, and coke.

Machine manufacture: Imported accessories.

4. MANUFACTURING COSTS

Statistics from the first half of 1981:

Directly paid salaries:	5,344,088.50 Kz
Raw materials	2,962,990.23 Kz
Maintenance	1,378,813.21 Kz
General expenses	3,338,433.64 Kz
Total	13,024,325.58 Kz

5. INVOICING

First half of 1981: 11,952,761.34 Kz

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS

6.1. Problems: The principal problems are those concerning the supply of raw materials and accessories, the lack of specialized personnel (for this reason, the staff training center was created), and above all, a lack of orders, especially in the technical assistance to companies area.

The staff training center, which up until now has had 2 graduating classes (the first of 70 and the second, 24) has a current enrollment of 39, with the following breakdown:

Lathe operators - 14 students
Milling-machine operators - 3 students
Industrial electricity - 13 students
Industrial mechanics - 9 students

These skills are taught during two trimesters, with a total of 426 hours of theory and 598 hours of practical training.

There is not a great deal of co-ordination between the planning and continuing stages of the courses, since the entrance exams for students are based on the psycotechnical tests of the Italian firm Comerit, the courses are planned with the aid of Cubans, and the teaching material is Brazilian and Italian.

6.2. Future plans

There is a 39 x 39 m building, which, according to the plans of the firm, will be used for housing the workshop for machine repair and electrical repairs. The present facilities will be used only for the manufacture of new machinery.

At the staff-training center, they are planning to set up a modular training program.

1. GENERAL INFORMATION

1.1. Name of the firm: CODUME

1.2. Location: Caala (Huambo)

1.3. Legal status: government-owned

1.4. Name and position of the person interviewed: Mr. Mario Lopes, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture of screws, nuts, rivets, and washers. First and foremost is the manufacture of self-tapping wood screws.

2.2. Production capacity: 1970 tons per year (planned production: 509 tons per year).

2.3. Actual production: The factory began operating in May, 1981, and by September had an average production of 22 tons per month, equivalent to 13% of production capacity and 52% of planned production.

3. RESOURCES

Equipment installed in 1973 and 1979

a) Screw manufacture
   - 2 wiredrawing outfits
   - 5 automatic presses
   - 1 annealing furnace
   - 1 heat treatment furnace with tanks for quenching in water and oil
   - 1 outfit for zinc-phosphate coating
   - lathes, cutting machines, threading machines

b) washers
   - 3 cam presses

c) nuts

3 lathes (1 parallel and 2 automatic)

1 cam press

3 nut-tapping machines

d) Mechanical workshop

3.2. Employees: 51 operators and 3 technicians (Italian)

3.3. Raw materials: Imported rods for wiredrawing, of 5.5,8, and 13 mm.

4. MANUFACTURING COSTS

Amounts per month (July to September, 1981)

Salaries:	187,867 Kz per month
Raw materials:	258,000 Kz per month
Other expenses:	151,000 Kz per month
	596,867 Kz per month

5. INVOICING

4,050,800 Kz per month (average selling price 175 Kz per kg).

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS

6.1. Problems

a) supply of raw materials: a 4-month delay is forecasted for the supply of rounds in 1982.

b) nuts: There is not enough machinery for nut-making, with only 10% of the needed amount being produced.

c) Market: In connection with the aforementioned problems, there are also problems in finding markets for the items produced.

d) There is a shortage of dies.

e) Shortage of electrical energy

6.2. Future plans

They are planning to acquire nut-making machinery.

1. GENERAL INFORMATION

1.1. Name of the firm: SOALUMINIO

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Enrique Jamba Lima, Director.

2. BUSINESS ACTIVITIES, PRODUCTS, AND PRODUCTION

2.1. Business activities: Manufacture of aluminum kitchenware from sheet, with a manual lathe.

2.2. Range of products manufactured: pots and pans, plates, etc. (each item weighing from 90 to 1500 g.)

2.3. Production capacity: 78 tons per year (6 tons per month). Planned production: 50 tons per year (4.17 tons per month).

2.4. Actual production: From January to September, 1981, 34.9 tons of products have been manufactured, an average of 3.89 tons per month, equivalent to 65% of the production capacity, and 93% of the planned production.

3. RESOURCES

3.1. Facilities and equipment: There are 2 manual machines for cutting sheet metal and 8 manual spinning lathes.

3.2. Employees: a total of 60

3.3. Raw materials: imported aluminum sheet, 0.4 to 1.9 mm. thick, and aluminum handles cast at JOBA (Huambo)

4. COSTS

Manufacturing costs are not accounted for.

5. INVOICING

From January to September, 1981, invoices have totaled 8,276,457 Kz, equivalent to an average of 919,606 Kz per month.

6. PROBLEMS AND FUTURE PLANS

6.1. Problems: The equipments in use is manual and antiquated. There are problems with the supply of aluminum sheet and cast handles.

6.2. Future plans: In order to solve the handle supply problem, they are going to install their own foundry, with a fuel-oil melting furnace.

1. GENERAL INFORMATION

1.1. Name of the firm: IAF (Industria Angolana de Ferralhlas)

1.2. Location: Huambo

1.3. Legal status: Mixed

1.4. Name and position of the person interviewed: Mr. Antonio Neves Gerardo, government representative in the firm.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: Building hardware for civil construction works.

2.2. Type of products manufactured: hinges, locks, bocks, bolts, towel racks of varying lengths.

2.3. Production capacity:

Manually: 36 locks per day (7,920 per month)

With an injection machine: 4,000 per day (88,000 per month)

2.4. Actual production:

Expressed as a percentage of planned monthly production

Units per month

Product	Planned	Actual	%actual/planned
Model 101 locks	2,300	184	8
C/8/2 locks	1,920	-	-
C/3/2 locks	1,920	-	-
C/4 locks	3,840	-	-
3" hinges	12,000	4,229	35
2" hinges	10,000	-	-
62 cm towel racks	3,833	-	-
42 cm towel racks	3,833	-	-
30 cm towel racks	3,833	-	-

3. RESOURCES

3.1. Facilities and equipment

ITALPRESS injection-molding machine (Italian), currently shut down because of lack of injector and molds.

Chrome-plating line, currently shut down because of a lack of technicians to put it in to operation.

Mechanical workshop equipment

- Lathe
- Milling machine for making duplicates
- Cutting saw
- Drill
- Shear
- 3 hydraulic presses
- 10 manual presses

3.2. Employes: a total of 63

3.3. Raw materials:Steel sheet, keys, and thief tubes, all imported.

4. MANUFACTURING COSTS

Only the amount paid for salaries is available: 420,000 Kz per month

5. INVOICING

Normal invoicing varies between 1,500,000 and 1,900,000 Kz per month. At the present time (September 1981) the figure is 442,265 Kz per month.

6. CURRENTLY-EXISTING PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: The currently-existing problems are due to the fact that the injection-molding machine is broken down, which means that locks must be manufactured by hand; these locks cannont be chrome-plated because the chrome-plating line is not in operation.

6.2. Future plans: One plan for the inmediate future is to put the chrome-plating line into operation; this will be done by the Italian technicians who ar› currently working at CODUME. To put the injection-molding machine into operation, tne firm has requesŀed an import license from the Ministry of Industry on several occasions for thŀ pieces that are needed.

1. GENERAL INFORMATION

1.1. Name of the firm: FUNDIÇÃO MARCAO

1.2. Location: Huambo

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Jonatao David Director.

2. BUSINESS ACTIVITIES, PRODUCTS, AND PRODUCTION

2.1. Business activities: Manufacture of animal-drawn plows

2.2. Range of products manufactured: Plows and plowshares

2.3. Planned production : Plows: 4,800 per year
Plowshares: 30,000 per year

2.4. Actual production:
Statistics from 1980:
Plows: 1,889 (39% of the planned production).
Plowshares: 31,150 (104% of the planned production)

3. RESOURCES

3.1. Facilities and equipments:
500 kg/h cupola
Induction furnace, 100 kg. crucible capacity; has not been in use for several years.
Mold division
Mechanical workshop with 3 lathes
Assembly and painting division

3.2. Employees: a total of 109

3.3. Raw materials: I and T bars,ferroalloys, pig iron, fluospar coke, and imported bearings.

4. PROBLEMS AND FUTURE PLANS OF THE FIRM

4.1. Problems

a) Lack of qualified staff

b) Antiquated facilities

c) Supply of raw materials, in particular the I and T bars; at the present time substituted by ingots and pig.

4.2. Future plans: A plan to move the factory has been set up by Bulgarian technicians; to this end, a building was constructed, but no new machinery has been acquired. At the present time, the move has been suspended.

SUMMARY OF THE FIRMS VISITED IN BENGUELA

In order visited	Name of the firm	Business activity	Type of product manufactured, according to Techniberia's classifications
1	COMANDANTE JIKA	Industrial maintenance, manufacture of plowshares and stoves (cooking)	6,7,9
2	MATEC	Water pumps, corn mills	6,7,9
3	SOREFAME DE ANGOLA	Ship-manufacture and repair, mechanical workshop	7,9
4	LUMEL	Metal furniture, car exhaust pipes and mufflers, feeding troughs for chickens	1,9
5	INDUMEC	Metal furniture	1
6	METANGOL	Manufacture of metal cans	3
7	LUPRAL	Screws, nails, farming implements, tools, chains, asbestos cement, casting	5,6,9

1. GENERAL INFORMATION

1.1. Name of the firm: COMANDANTE JIKA (previously ALFREDO GUERRA)

1.2. Location: Benguela

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Diamantino Mureira Lima, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Technical assistance for the industry, manufacture and repair of equipment for the sugar industry, manufacture of plowshares, manufacture of coal-burning stoves (cookers).

2.2. Production capacity: The manufacture of plowsbares and stoves (cookers) is part of the workload of the industrial repair and maintenance area. The planned production is 24,000 plowshares per year; no plan exists for stove (cooker) production.

2.3. Actual production: For plows, the actual production is around 50% of production capacity. Cast iron, bronze steel, and aluminum are also manufactured.

3. RESOURCES

3.1. Facilities and equipment:

a) Tool machinery

8 lathes (2 broken down)

1 roller/flattener

2 filers

2 milling machines

3 rectifiers/grinders

b) Metal working:

4 drills

8 welding machines (3 broken down)

3 chipping hammers (1 broken down)

1 cutting machine

2 saws

1 calender

1 hydraulic press

c) Wood working:

1 mechanical saw

1 roller/flattener

1 lathe

d) Foundry

2 melting furnaces for bronze and aluminum

1 cupola (broken down), 1,8 t/h

1 induction furnace (broken down), 600 kg. crucible capacity

3.2. Employees: a total of 161, 13 of whom are foreign technicians (8 Cubans and 5 Portugueses)

3.3. Raw Materials: Steel scrap, cast iron and non-ferrous metals (domestic).

4. MANUFACTURING COSTS

Forecast for 1981:

Salaries:	17,000,000 Kz	(In 1980, 13,000,000 Kz)
Other costs:	5,200,000 Kz	
	22,200,000 Kz	

5. INVOICING

Forecast for 1981: 24,000,000 Kz. In 1980, 17,000,000 Kz

6. PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: There is no technical division. There is a cashflow problem, as well as a high absentee rate, estimated at 10%. The induction furnace was punctured in mid-1981, and the one in FADARIO MUTEKA (Huambo) is being used as a substitute.

6.2. Future plans: The firm has presented an improvement plan to the National Heavy Industry Administration; this plan includes the mechanization of the foundry and the creation of an apprentice school, and is pending approval.

1. GENERAL INFORMATION

1.1. Name of the firm: MATEC

1.2. Location: Benguela

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Manuel Fernando Codinho, Foreman of the unit.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: Manufacture and assembly of water pumps. Manufacture (on special order) of corn mills and other equipment. Chrome-plating line.

2.2. Products: The firm manufactures 3 different kinds of pumping engines, propelled by a gasoline engine.

2.3. Production capacity: Pump manufacture began in January, 1981, with a planned production of 7 pumps per month (84 per year).

2.4. Actual production: As of September 30, 1981, 40 pumps had been manufactured (and average of 4.5 per month), equivalent to 63% of planned production

3. RESOURCES

3.1. Facilities and equipment

2 cupolas (one, 2 t/h and the other, 1 t/h)

10 mechanical lathes (3 broken down)

1 hydraulic press (broken down)

4 welding machines

1 filer (broken down)

2 mechanical saws (1 broken down)

1 air compressor (broken down)

2 chipping hammers (broken down)

1 chrome-plating line

1 crucible for smelting bronze

3.2. Employes: A total of 81(3 of whom are co-operating foreign technicians) (Cuban).

3.3. Raw materials: Nickel-chromes steel for hardering and tempering, cementation steel, phosphor bronze, pig iron and aluminum, all imported.

4. MANUFACTURING COSTS

Statistics from Jan. 1, 1981 to Sept. 30, 1981:

Salaries:	4,458,848 Kz	(495,428 Kz per month)
Raw materials:	1,916,545 Kz	(212,949 Kz per month)
Other costs:	38,687 Kz	(4,299 Kz per month)
	6,414,080 Kz	(712,676 Kz per month)

5. INVOICING

January-September, 1981: 6,979,987 Kz. Average invoicing: 774,554 Kz per month. In 1980, 580,916 Kz per month

6. PROBLEMS AND FUTURE PLANS

6.1. Problems: There is a need for the following qualified staff:

- designer and work organizer
- foundryman
- boilermaker
- chief fitter/Machinist

There is also a need for metrology equipment and tools (drill bits, milling tools, grindstones, etc).

A testing bench is also needed for the pumps.

6.2. Future plans: If the firm had the qualified staff listed in point 6.1., an average of 10 pumps per month could be manufactured, more than double the present production.

1. GENERAL INFORMATION

1.1. Name of the firm: SOREFAME DE ANGOLA (Sociedad Reunida de Fabricaçoes metálicas)

1.2. Location: Lobito (Benguela)

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Julio Cesar Ferreira Adambres, Acting Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Activities

a) Ship building and repair (at the present time, practically at a standstill).

b) Mechanical workshop:

- Fuel tanks, underground or above-ground
- Assistance to the sugar industry (repair of boilers, condensers, etc).

c) Staff training school

- Training of 20 intermediate management-level staff per year, for welding and boiler-making.
- Work hygiene and safety courses.

2.2. Production: At the present time, the firm is going through a re-structuring and expansion program, in order to completely separate the metal-mechanics and ship-building/repairing areas. There are 3 different re-structuring plans, submitted by the Soviet Union, France, and Portugal, and based on different solutions for equipment and staff needs.

As the outcome of this international bidding will soon be known, it is pointless to make a more in-depth study of the current situation of this firm at the present time.

1. GENERAL INFORMATION

1.1. Name of the firm. LUMEL (Luso Metálica de Lobito)

1.2. Location: Lobito (Benguela)

1.3. Legal status: Goveronment-owned

1.4. Name and position of the person interviewed: Vitorino Manuel Alves Carbahlo, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: manufacture of metal furniture (school desks) exhaust pipes and car mufflers, feeding troughs for chickens.

2.2. Production capacity: The principal activity is the manufacture of school desks, with a capacity of 6,100 units per month (planned production 4,000 per month). The production capacity of pipes and car mufflers is 500 units per month. For feeding troughs, the capacity is 20,000 units per month.

2.3. Actual production:

Average statistics from January to September, 1981:

- school desks: 5,500 per month (90% of production capacity)
- pipes and car mufflers: 400 per month (80% of production capacity)
- feeding troughs for chickens: 17,000 per month (85% of production capacity)

3. RESOURCES

3.1. Facilities and equipment

3 cutting and bending presses for sheet metal

4 sheet metal benders

3 multiple-spindle boring machines

14 welding machines (3 broken down)

Painting department

3.2. Employees: A total of 76 (including a Cuban technician)

3.3. Raw materials: imported steel sheet. domestic steel pipes (supplied by FATA), and wood, in general domestic as well.

4. MANUFACTURING COSTS

Average monthly statistics from January to September, 1981

- Salaries	500,000 Kz per month
- Raw materials and other costs	1,030,000 Kz per month
	1,530,000 Kz per month

5. INVOICING

Average statistics from the same period: 4,125,000 Kz per month.

6. PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems

The main problem is a shortage of the steel pipes supplied by FATA; this has halted school desk production until March, 1982.

6.2. Future plans

The firm is planning the construction of a new plant, to be devoted to the manufacture of exhaust pipes and mufflers for trucks.

1. GENERAL INFORMATION

1.1. Name of the firm: INDUMEC

1.2. Location: Lobito (Benguela)

1.3. Legal status: Government-owned

1.4. Name and position of the person interviewed: Mr. Marcian Carlo Tito, Administrative Manager.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: At the present time, the manufacture of metal furniture (military bunks).

2.2. Production capacity: Planned manufacture: 250 units per month.

2.3. Actual production: Manufacturing began in April, 1981, with an average production of 150 units per month, equivalent to 60% of planned production.

3. RESOURCES

3.1. Equipment: 8 welding outfits, painting department.

3.2. Employees: a total of 50

3.3. Raw materials: Domestic steel pipes (supplied by FATA), imported steel sheet.

4. MANUFACTURING COSTS

Only the amount paid for salaries is available: 350,000 Kz per month.

5. INVOICING

From April to September, 1981: 4,900,000 Kz (890,910 Kz per month)

6. PROBLEMS AND FUTURE PLANS

6.1. Problems

This is a firm that had been closed since 1973. Previously the principal products manufactured were bus bodies, cement mixers, hydraulic lifting jacks, along with services such as engine repairs, and technical assistance to palm oil factories. Due to the long shutdown, the previously-employed staff left to take up other jobs, their re-incorporation being practically impossible.

6.2. Future plans

The future of this firm depends on the decision to be made by the National Heavy Industry Administration of the Ministry of Industry.

1. GENERAL INFORMATION

1.1. Name of the firm: METANGOL

1.2. Location: Benguela

1.3. Legal status: government-owned

1.4. Name and position of the person interviewed: Mr. Mario Lourenço, Head of production.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activity: Manufacture of cans

2.2. Range of products manufactured, production capacity, and actual production: statistics from January to September, 1981:

Type of can	Planned production 10^3 ud.	Actual production 10^3 ud.	% actual/ planned
1/4 tall	3,906	2,059	52.7
1/2 margarine	490	270	55.1
1 lb. pineapple	60	-	-
1 kg. margarine	560	113	20.2
2 lb. pineapple	560	683	122.0
10kg.margarine	28	27	96.4
5 kg. tomato	56	8	14.3
5 kg. ink	280	92	32.[illegible]
TOTAL	5,940	3,252	54.7

3. RESOURCES

3.1. FaCilities and equipment:

1 printing machine (sheets)

10 stamping presses

5 cutting lines

5 staplers

7 flanging machines

7 machines to put on bottoms

7 rolling machines

6 multiple-welding machines

14 guillotines

mechanical workshop with 2 grinders, 2 lathes, 1 saw, and 1 milling machine

3.2. Employees: A total of 279

3.3. Raw materials: Tinplate, imported from Japan, with the following dimensions:

0.20 x 754 x 700 mm.

0.20 x 694 x 694 mm.

0.23 x 734 x 504 mm.

0.25 x 885 x 704 mm.

4. MANUFACTURING COSTS

Only the cost of the salaries is available: 1,900,000 Kz per month.

5. INVOICING

From January to September, 1981: 18,272,060 Kz

6. PROBLEMS

The principle problem is one of lack of accessories for the automatic machines, bought second-hand and installed in 1965. Among the accessories that are lacking, the most outstanding ones are dies for the presses, chain conveyors, accessories for the stapling machines, and cutting blades for the guillotines.

1. GENERAL INFORMATION

1.1. Name of the firm: LUPRAL

1.2. Location: Benguela

1.3. Legal status: Private

1.4. Name and position of the person interviewed: Mr. Fernando Antonio Ferreira Magno, Director.

2. BUSINESS ACTIVITIES, PRODUCTS AND PRODUCTION

2.1. Business activities: The plant is divided into two large areas, one manufacturing asbestos cement products (deck plates, piping, conduit systems, etc) and the other metal-mechanics items (screws and nails, farming implements, tools, chains and casting). The asbestos cement division was not visited since it does not come within the scope of this report.

2.2. Range of products manufactured:

a) Screws
Whitworth thread: Ø 1/8" to Ø ½"
Metric thread: M3 to M14

b) Farming implements: two different types of animal-drawn plows, and wheelbarrows.

c) Tools: Shovels, European hoes, traditional hoes.

d) Chains: Butt-welded, Ø 3 mm to Ø 20 mm.

e) Casting: Items weighing up to 4,500 kg.

2.3. Production capacity:

a) Screws : 10,000,000 pieces per year (833,000 per month) planned production: 8,400,000 pieces per year (700,000 per month)

b) Nails. Planned production: 1,500 tons per year (125 tons per month)

c) Farming implements: Planned production 6,000 units per year (150 per month)

d) Tools: Production capacity:
European hoes: 300,000 units per year (25,000 per month)
Traditional hoes: 190,000 units per year (15,800 per month)
Planned production (both kinds) 24,000 units per month

e) Chains: 96 tons per year (8 tons per month)

f) Casting: 300 tons per year (25 tons per month)

2.4. Actual production:

a) Screws : The machinery was installed in 1974, but lay idle until May, 1981. At the present time, 200,000 units are manufactured per month, equivalent to 24% of production capacity and 29% of planned production.

b) Nails: Statistics from January to September, 1981: Average production, 110 tons per month, equivalent to 88% of planned production.

c) Farming implements: Monthly production of 300 units, equivalent to 60% of planned production.

d) Tools: European hoes : Production began in October, 1981; up until Oct. 21, 7,000 hoes had been manufactured, equivalent to 28% of the monthly production capacity.
Traditional hoes. From January to September, average production was 16,000 units per month (101% of planned production)

e) Chains: Average production of 5 tons per month, equivalent to 63% of production capacity.

f) Casting: Average production of 18.2 tons per month, equivalent to 73% of planned production.

3. RESOURCES

3.1. Facilities and equipment:

a) screws and nails:
- wiredrawing
- 3 cold presses
- 2 threading machines
- 1 thread-roller
- 9 nail-making machines
- cleaning and nickel-plating equipment

b) Farming implements and tools:
2 soaking furnaces (for bars)
1 forging mill
3 stamping presses

c) chains:
3 butt-welding machines

d) Casting:

2 cupolas, 2.5 t/h each

Facilities for crushing and preparing sand

e) Electrical and mechanical maintenance workshop

3.2. Employees:

a) Workers:

Screws, etc (1 shift)	22
Nails (2 shifts)	26
Farming implements and tools (2 shifts)	97
Chains (1 shift)	6
Foundry (1 shift)	78
Maintenance workshop (1 shift)	45
Total	274

b) Qualified staff (with academic degrees) and technicians:

1 engineer (full university degree)

3 qualified staff (associate university degrees)

7 professionals (trade school degrees)

11 Total

3.3. Raw materials:

a) Screws, nails: Imported rods for wiredrawing

b) Farming implements and tools: Imported tool steel

c) Chains: Imported steel rod

d) Casting: Sand and scrap (domestic). Imported ferroalloys, binders, and coke.

4. MANUFACTURING COSTS

- Salaries: 2.417,000 Kz per month

- Raw materials: Information available only for nail and screw manufacture.

screw:	19,50 Kz per Kg.
nuts:	23,00 Kz per kg.
nails:	15,00 Kz per kg.

5. INVOICING

Average monthly statistics for 1981:

- Screws:	860,700 Kz per month
- Nails:	3,137,222 Kz per month
- Chains:	230,000 Kz per month
- Tools and implements:	5,100,000 Kz per month
- Casting	1,570,200 Kz per month
	10,898,122 Kz per month Total

6. PROBLEMS AND FUTURE PLANS OF THE FIRM

6.1. Problems: Among the general problems of the firm are antiquated equipment and difficulties in importing raw materials.

Specific problems:

a) Screws and nails: Wiredrawing plants cannot be manufactured because there is no annealing furnace. The threading machines are very old. For nails, a packing machine is needed.

b) Implements and tools: Although there are 2 production lines, one of the stamping presses is shared by both, which makes it impossible for both lines to be in operation at the same time.

c) Foundry: Both cupolas are very old, and maximum production capacity is limited by the crane, which has a lift capacity of 4.5 tons. There is no mold-maker.

6.2. Future plans: The immediate plans of the firm are focussed on the screw and nail-making areas (substitution of machinery by stamping) and tool-manufacturing area (acquisition of a 150-ton press in order to permit the simultaneous operation of both production lines). Nevertheless, these improvements are contingent on the solution of the problems connected with the supply of raw materials.

ANNEX. 2 TABLES

TABLE 3.1.

BUSINESS ACTIVITIES OF THE DIFFERENT FIRMS AND UNITS VISITED

GROUP	LUANDA		HUAMBO		BENGUELA		TOTAL	
	No. of units	No. of firms	No. of units	No. of firms	No. of units	No. of firms	No. of units	No. of firms
1.Metal furnitures	14	2	6	1	2	2	22	5
2.Aluminum kitcheware	2	2	2	2	-	-	4	4
3.Metal cans, drums and caps	5	5	-	-	1	1	6	6
4.Bicycles and motorcycles	1	1	1	1	-	-	2	2
5.Screws and nails	-	-	1	1	1	1	2	2
6.Foundry	2	2	3	3	3	3	8	8
7.Manufacture and repair of machinery	3	2	4	2	3	3	10	7
8.Farming tools and implements	1	1	1	1	2	2	4	4
9.Other busines activities	8	5	1	1	3	3	12	9
TOTAL	36	20	19	12	15	15	70	47

TABLE 3.2.

LUANDA

PERCENTAGE OF PRODUCTION CAPACITY AND PLANNED PRODUCTION

Factory	Product	Unity	Period analyzed	Capacity	Planned production	Actual production	% of capacity	% of planned production
FATA	Welded pipe	t/year	1981	10.000	9.000	5.000	50	56
METANG	Corrugated sheet	"	"	12.000	8.000	5.000	42	63
ALFAG	Harrows	unities/year	"	700	480	-	-	-
API	Corrugated card board	t/month	"	400	200	100	25	50
LINHA DE MONTAGEM (1)	Metal furnitures	Kz/month	1.1.81-31.8.81		7.500.000	2.775.000		37
IRA (1)	Tricycles	"	" "		4.600.000	641.250		14
EQUIP.TECNICOS	Maintenance	"	" "		1.500.000	198.750		13
SER.ARTISTICA (1)	Grilles, doors	"	" "		1.500.000	474.000		32
ROFIL (1)	Scales	"	" "		1.500.000	615.125		41
FAGOL (1)	Metal furnitures	"	" "		1.100.000	596.175		54
CAPSUL	Bottle capsfor wine,beer,etc	unities/year	1980	300.000.000	180.000.000	186.000.000	62	103
EMMEL	Mattresses	unities/period	1.1.81-30.9.81		2.997	2.464		82
EMMEL	Metal furnitures	" "	" "		108.322	55.814		52
EMMEL	Aluminum kitchenwares	" "	" "		115.794	117.352		101
METANGOL	Metal cans	unities/year	1980	1.950.000	1.650.000	775.355	40	47
FABIMOR	Bicycles	" "	"	22.000	6.000	3.600	16	60
FABIMOR	Motorcycles	" "	"	2.600	2.000	1.800	69	90
COMETA II	Cisterns	m^3/year	Forecast for 1981	34.000	23.800	17.000	50	71
EMB.VAN LEER	Drums	unities/year	1980	435.000	369.600	125.082	29	34
INCUTAL	Cutlery	" "	"	5.300.000	3.000.000	1.300.000	25	43
METALVI	Aluminum kitchenwares	t/period	1.1.81-30.9.81		300	78		26
METALVI	Cookers and other	unities/period	" "		452.750	66.950		15
TRAB & JORGE	Vehicles without engine	" "	" "		6.400	1.100		17
TRAB & JORGE	Vehicles with engine	" "	" "		1.000	200		20

(1) EPMEL Group

TABLE 3.3.

HUANBO

PERCENTAGE OF PRODUCTION CAPACITY AND PLANNED PRODUCTION

Factory	Product	Unity	Period analyzed	Capacity	Planned production	Actual production	% of capacity	% of planned production
UNIDADE METALICA	Metal furnitures	unities/period	1.1.81-30.6.81		6.770	5.728		85
ULISSES	Bicycles	unities/year	1980	11.500	-	-	-	-
ULISSES	Motorcycles	" "	"	13.700	8.000	7.000	51	88
JOBA	Iron Foundry	t/year	forecart for 1981	72	30	12	17	40
JOBA	Aluminum foundry	"	" "	60	36	27,6	46	77
FADARIO NUTEKA	Machinery	unities/year	1980		129	80		62
FADARIO NUTEKA	Maintenance	h/year	"		170.000	45.000		26
CODUME	Screws	t/month	1.5.81-30.9.81	165	42,4	22	13	52
SOALUMINIO	Aluminum kitchenwares	"	1.1.81-30.9.81	6	4,17	3,89	65	93
IAF	Lockes and hinges	unities/month	" "	92.000	43.479	4.403	5	10
FUNDIÇÃO MARCAO	Plows	unities/year	1980		4.800	1.889		39
FUNDIÇÃO MARCAO	Plowshares	" "	"		30.000	31.150		104

TABLE 3.4.

BENGUELA-LOBITO

PERCENTAGE OF PRODUCTION CAPACITY AND PLANNED PRODUCTION

Factory	Product	Unity	Period analyzed	Capacity	Planned production	Actual production	% of capacity	% of planned production
COMANDANTE JIKA	Plowshares	unities/year	1.980		24.000	12.000		50
MATEC	Water pumps	unities/period	1.1.81-30.9.81	75	63	40	53	63
LUMEL	School desks	unities/month	" "	6.100	4.000	5.500	90	138
LUMEL	Exhaust pipes	" "	" "	500	-	400	80	-
LUMEL	Fiding troughs forchikens	" "	" "	20.000	-	17.000	85	-
INDUMEC	Metal furnitures	" "	1.4.81-30.9.81		250	150		60
METANGOL	Metal cans	unities/period	1.1.81-30.9.81		5.940.000	3.252.000		55
LUPRAL	Screws	unities/month	" "	833.000	700.000	200.000	24	29
LUPRAL	Nails	t/month	" "		125	110		88
LUPRAL	Farming tools	unities/month	" "		500	300		60
LUPRAL	Hoes	" "	" "	40.800	24.000	21.000	51	88
LUPRAL	Chains	t/month	" "	8		5	63	
LUPRAL	Foundry	"	" "	25		18,2	73	

TABLE 3.5.

FIRMS WITH INFORMATION ABOUT COSTS AND INVOICING

Province	Factory	Salaries	Raw materials and other costs	Invoicing
Luanda	EPMEL	X		X
	CAPSUL	X	X	X
	ENMEL	X		X
	FABIMOR	X	X	X
	COMETA II	X		X
	EMB. VAN LEER	X		X
	INCUTAL	X		X
	METALVI			X
Total Luanda	8	7	2	8
Huambo	UNIDADE METALICA	X	X	X
	ULISSES	X	X	X
	JOBA	X	X	X
	F.MUTEKA	X	X	X
	CODUME	X	X	X
	SOALUMINIO			X
	IAF	X		X
Total Huambo	7	6	5	7
Benguela	C.JIKA	X	X	X
	MATEC	X	X	X
	INDUMEC	X		X
	METANGOL	X		X
	LUMEL	X		X
	LUPRAL	X	X	X
Total Benguela	6	6	3	6
TOTAL	21	19	10	21

TABLE 3.6.

MANUFACTURING COST OF 9 FIRMS

Firm	Product	Monthly production	Employee cost	Raw materials	Other cost	Total costs	Cost per unit of product	% of employee costs
CAPSUL	Bottle caps	15.000.000 ud	482.000		3.277.833 (1)	3.759.833	0,25 Kz/ud	13
FABIMOR	Bicycles and motorcycles	450 ud	1.516.355	3.252.775	3.074.479	7.843.609	17.430 Kz/ud	19
UNIDADE METALICA	Metal furnitures	1.230 ud	991.333	1.260.745	547.250	2.799.328	2.276 Kz/ud	35
ULISSES	Motorcycles	1.167 ud	2.166.667		19.500.000 (1)	21.666.667	18.566 Kz/ud	10
JOBA	Fe and Al foundry	3,3 t	248.167		139.000 (1)	387.167	117,3 Kz/Kg	64
F.MUTEKA	Machinery and maint.		890.681	493.832	768.208	2.152.721		41
CODUME	Screws	22 t	187.867	258.000	151.000	596.867	27,1 Kz/Kg	31
C.JIKA	Maintenance		1.416.700		433.300 (1)	1.850.000		77
MATEC	Water pumps	5 ud	495.428	212.949	4.299	712.676	142.535 Kz/ud	70
LUMEL	Metal furniture	5.500 ud	500.000		1.030.000 (1)	1.530.000	- (2)	33

(1) Raw materials included

(2) It is not posible to obtein the cost per unit of product because they making also another products (pipes and car mufflers, etc).

TABLE 3.7.

EMPLOYEE COSTS AND MONTHLY INVOICING (LUANDA)

	EMPLOYEE			INVOICING				
Unit	No. total of workers	Total salaries Kz/month	Mean salaries Kz/person/month	Period analyzed	Invoicing for the period	Monthly invoicing (Kz/month)	Invoicing per person Kz/person/month	% of salaries on total invoicing
S.ARTISTICA	[illegible]	354.[illegible]	[illegible].806	1.1.1981-[illegible].8.1981	3.792.000	474.000	9.115	75
EQ.TECNICOS	[illegible]	[illegible]01.000	8.49[illegible]	" "	1.590.000	198.750	3.369	252
IRA	45	420.000	6.667	" "	5.130.000	641.250	13.359	50
ROFIL	38	374.000	9.842	" "	4.921.000	615.125	16.188	61
FAGOL	31	237.000	7.645	" "	4.769.400	596.175	19.231	40
L.MONTAGEN	54 (1)	606.000	11,222		22.200.000	2.775.000	51.389	22
TOTAL EPMEL	282	2.392.000	8.482	" "	42.402.400	5.300.300	18.795	45
EDAL	308	2.541.769	8.252	1.1.1981-30.9.1981				
FAMA	188	1.573.337	8.369	" "				
ANFIBAR	92	741,148	8.056	" "				
SIAL	41	281.661	6.870	" "				
M.VALENTE	56	422.271	7.541	" "				
MAQUINAG	69	601.694	8.720	" "				
SADIL	166	1.364.662	8.221	" "				
RESTO ENMEL	219	1.666.863	7.611					
TOTAL ENMEL	1.139	9.193.405	8.071		169.391.000	18.821.222	16.524	49
CAPSUL	51	482.000	9.451	1.980	41.624.000	3.468.666	68.013	14
CONETA II	150	2.800.000	18.667	1.5.1981-30.9.1981	48.000.000	9.600.000	64.000	29
METANGOL	220	1.518.000 *	6.900	1.980	9.150.000 *	762.500	3.466	
FABINOP	21[illegible]	1.516.355	6.989	1.980	95.470.400	7.955.867	36.663	19
EMB.VAN LEER	80	600.813	7.510	1.980	79.678.500	6.639.875	82.998	9
INCUTAL	[illegible]	350.000	5.833	1.980	50.000.000	4.166.667	69.444	8
METALVI	[illegible]	504.000 *	6.700	1.1.1981-30.9.1981	54.300.000	6.033.333	50.278	13
TOTAL LUANDA	2.319	19.656.573	8.476			62.748.430	27.059	31

* Estimate

(1) Also included S. ANGOLANA and IRMÃOS RIBEIRO

TABLE 3.8.

EMPLOYEE COST AND MONTHLY INVOICING (HUAMBO)

Unit	EMPLOYEE			INVOICING				
	No. total workers	Total salaries Kz/month	Mean salaries Kz/person/month	Period analyzed	Invoicing for the period	Monthly invoicing (Kz/month)	Invoicing per person Kz/person/month	% of salaries on total invoicing
OASIS	35			1.1.1981-30.6.1981				
B.SIMAO VAZ	32			" "				
IND.METALURGICA	17			" "				
MET.DO PLANAO	23			" "				
S.JOTAL	13			" "				
RESTO UNIDADE				" "				
METALICA	33			" "				
TOTAL UN.METALIC	153	991.333	6.479		17.113.436	2.852.239	18.642	35
ULISSES	347	2.166.667	6.244	1.980	267.000.000	22.250.000	64.121	10
JOBA	56	248.167	4.432	1.980	10.112.000	842.667	15.047	29
F.MUTEKA (1)	70	890.681	12.724	1.1.1981-30.6.1981	11.952.761	1.992.127	28.459	45
CODUME	51	300.000	5.882	1.7.1981-30.9.1981	12.152.400	4.050.800	79.427	7
SOALUMINIO	60	270.000	4.500	1.1.1981-30.9.1981	8.276.457	919.606	15.326	29
IAF	63	420.000	6.667	Sept.1.981	442.265	442.265	7.020	95
TOTAL HUAMBO	800	5.286.848	6.609			33.349.704	41.687	16

(1) Manufacturing unit for wood working machines

TABLE 3.9.

EMPLOYEE COSTS AND MONTHLY INVOICING (BENGUELA)

Unit	EMPLOYEE			INVOICING				
	No. total of workers	Total salaries Kz/month	Mean salaries Kz/person/month	Period analyzed	Invoicing for the period	Monthly invoicing (Kz/month)	Invoicing per person Kz/person/month	% of salaries on total invoicing
C.JIKA	148	1.083.333	7.319	1.980	17.000.000	1.416.667	9.572	76
MATEC	[illegible]	378.805	6.313	1.980	6.970.989	580.916	9.682	65
LUMEL	76	500.000	6.578	1.1.1981-31.8.1981	33.000.000	4.125.000	54.276	12
INDUMEC	50	350.000	7.000	1.4.1981-15.10.1981	4.900.000	890.910	17.818	39
METANGOL	279	1.900.000	6.810	1.1.1981-31.8.1981	18.272.060	2.284.007	8.186	83
LUPRAL(screws and nuts)	[illegible]	152.000	8.000	1.1.1981-30.9.1981	8.607.000	860.700	39.122	20
LUPRAL (nails)	26	221.000	8.500	1.1.1981-30.9.1981	28.235.000	3.137.222	120.662	7
LUPRAL (chains)	6	51.000	8.500	1.1.1981-20.10.1981	2.300.000	230.000	38.333	22
LUPRAL (farming)	97	824.500	8.500	1.1.1981-20.10.1981	51.000.000	5.100.000	52.577	16
LUPRAL (foundry and repair)	123	1.169.000	9.505	1.1.1981-20.10.1981	15.702.000	1.570.200	12.766	74
TOTAL LUPRAL	274	2.417.500	8.823			10.898.122	39.774	22
TOTAL BENQUELA LOBITO.	887	6.629.638	7.474			20.195.622	22.768	33

TABLE 3.10

STATISTICS BY ACTIVITIES

LUANDA

Group	EMPLOYEE			ACTUAL INVOICING		PLANNED INVOICING		
	No. of workers	Total salaries Kz/month	Mean salary Kz/person/month	Monthly Kz/month	Per person Kz/person/month	Monthly Kz/month	Per person Kz/person/month	% actual planned invoicing
1.Metal furnitures	1.134	9.442.826	8.327	19.413.818	17.120	46.225.281	40.763	42
2.Aluminum kitckenware	210	1.397.579	6.655	5.493.912	26.157	17.300.951	82.835	32
3.Cans,drums and cisterns	501 (1)	5.400.813	10.780	20.471.041	40.860	45.242.616	90.305	45
4.Bicycles and motorcycles	217	1.516.355	6.988	7.955.867	36.663	8.839.852	40.737	90
5.Screws and nails	-	-	-	-	-	-	-	-
6.Foundy	-	-	-	-	-	-	-	-
7.Manufacture and repair	[illegible]	875.000	9.021	813.875	8.390	3.000.000	30.928	27
8.Various	160	1.024.000	6.400	8.599.917	53.749	15.715.385	98.221	55
TOTAL LUANDA	2.319	19.656.573	8.476	62.748.430	27.059	136.324.086	58.786	46

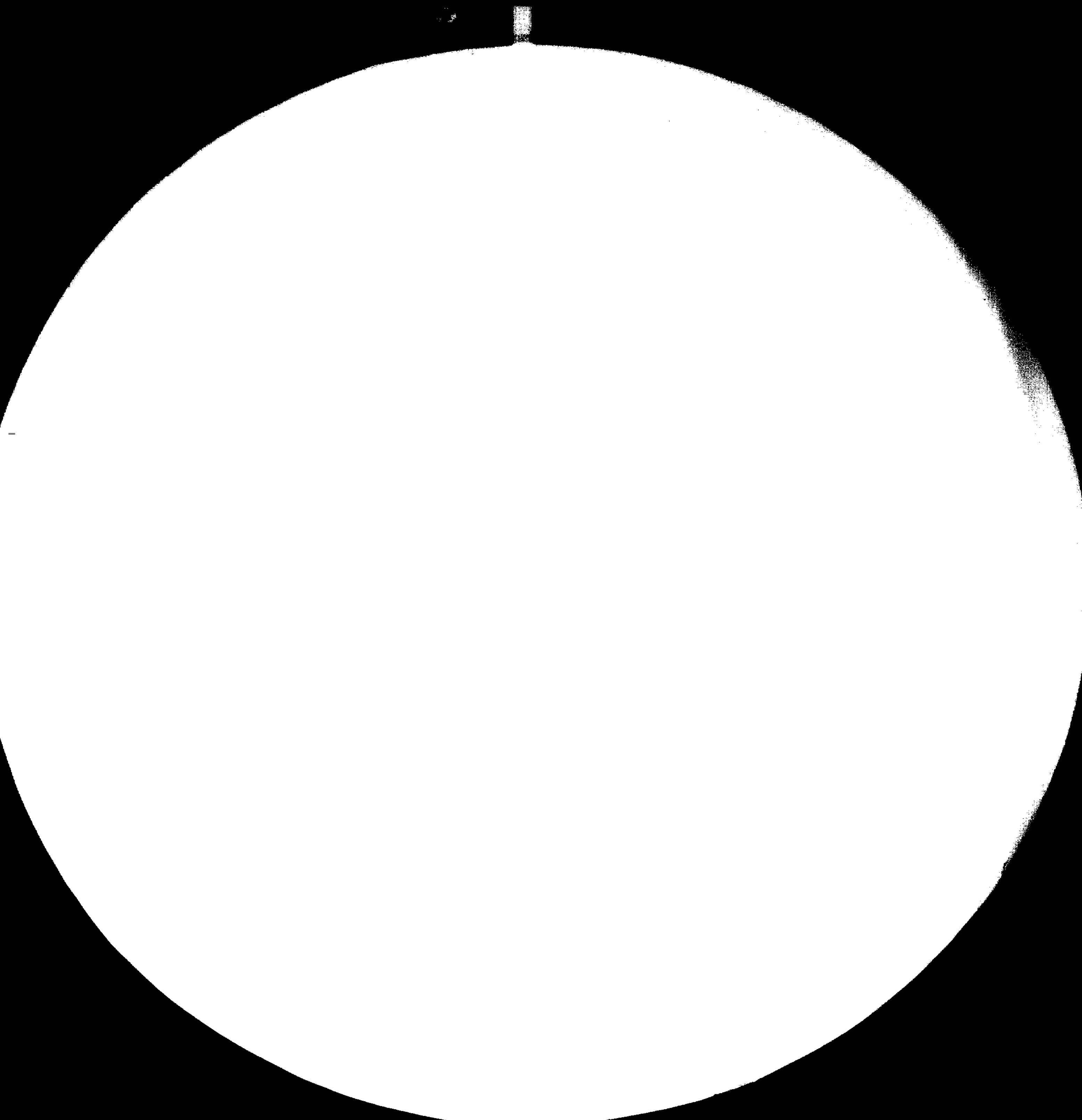
(1) SOMETAL is not included.

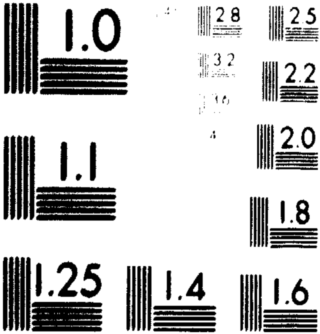
TABLE 3.11.

STATISTICS BY ACTIVITIES

HUAMBO

Group	EMPLOYEEE			ACTUAL INVOICING		PLANNED INVOICING		
	No. of workers	Total salaries Kz/month	Mean salary Kz/person/month	Monthly Kz/month	Per person Kz/person/month	Monthly Kz/month	Per person Kz/person/month	% actual planned invoicing
1.Metal furnitures	[illegible]	991.333	6.479	[illegible]	18.642	3.391.667	22.168	84
2.Aluminum kitchenware	60	270.000	4.500	919.606	15.327	1.313.723	21.895	70
3.Cans, drums and cisterns						-	-	-
4.Bicycles and motrocicles	[illegible]	2.166.667	6.244	[illegible]	64.121	25.429.000	70.990	87
5.Screws and nails	[illegible]	300.000	5.882	[illegible]	79.427	7.733.345	151.634	52
6.Foundry	[illegible]	248.167	4.432	842.667	15.047	1.101.116	19.663	77
7.Manufacture and repair	70	890.681	12.724	1.992.127	28.459	3.237.206	46.246	62
8.Various	[illegible]	420.000	6.667	442.265	7.020	7.680.000	121.905	6
TOTAL HUAMBO	[illegible]	5.286.848	6.609	33.349.704	41.687	49.886.057	62.358	67





MICROCOPY RESOLUTION TEST CHART

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TABLE 3.12.

SATATISTICS BY ACTIVITIES

BENGUELA-LOBITO

	EMPLOYEE			ACTUAL INVOICING		PLANNED INVOICING		
Group	No. of workers	Total salaries Kz/month	Mean salary Kz/person/month	Monthly Kz/month	Per person Kz/person/month	Monthly Kz/month	Per person Kz/person/month	% actual planned invoicing
1.Metal furnitures	126	850.000	6.746	5.015.910	39.809	7.754.550	61.544	65
2.Aluminum kitchenware	-	-	-		-	-	-	-
3.Cans, drums and cisterns	279	1.900.000	6,810	2.284.007	8.186	4.263.073	15.280	54
4.Bicycles and motrocycles		-	-		-	-	-	-
5.Screws and nails	48	373.000	7,771	3.997.922	83.290	5.285.712	110.119	76
6.Foundry	123	1.169.000	9.504	1.570.200	12.766	2.156.868	17.536	73
7.Manufacture and repair	311	2.337.638	7.516	7.327.583	23.561	12.319.496	39.614	59
8.Various	-	-	-		-	-	-	-
TOTAL BENGUELA-LOBITO	887	6.629.638	7.474	20.195.622	22.768	31.779.699	35.828	64

TABLE 3.13.

EMPLOYEE COSTS AND MONTHLY INVOICING
(IN THE THREE PROVINCES)

	EMPLOYEE			ACTUAL INVOICING		PLANNED INVOICING		
	No. of workers	Total salaries Kz/month	Mean salary Kz/month	Monthly Kz/month	Per person Kz/person/month	Monthly Kz/month	Per person Kz/person/month	% actual planned invoicing
LUANDA	2.319	19.656.573	8.476	62.748.430	27.059	136.324.086	58.786	46
HUAMBO	800	5.286.848	6.609	33.349.704	41.687	49.886.057	62.358	67
BENGUELA	887	6.629.638	7.474	20.195.622	22.768	31.779.699	35.828	64
TOTAL	4.006	31.573.059	7.881	116.293.756	29.030	217.389.842	54.416	53
By activities								
1.Metal furnitures	1.413	11.284.159	7.986	27.281.967	19.308	57.371.498	40.602	48
2.Aluminum kitchenwares	270	1.667.579	6.176	6.413.518	23.754	18.614.674	68.943	34
3.Metal containes	780	7.300.813	9.360	22.755.048	29.173	49.505.689	63.469	46
4.Bicycles and motorcycles	564	3.683.022	6.530	30.205.867	53.557	34.268.852	60.760	88
5.Screws and nails	99	673.000	6.798	8.048.722	81.300	13.019.057	131.506	62
6.Foundry	179	1.417.167	7.917	2.412.867	13.480	3.257.984	18.201	74
7.Manufacture and repair	478	4.103.319	8.584	10.133.585	21.200	18.556.702	38.822	55
8.Various	223	1.444.000	6.475	9.042.182	40.548	23.395.386	104.912	39
TOTAL	4.006	31.573.059	7.881	116.293.756	29.030	217.989.842	54.416	53

TABLE 3.14.

EMPLOYEE AND INVOICING DISTRIBUTION PERCENTAGES

	EMPLOYEE		ACTUAL INVOICING		PLANNED INVOICING	
	% of total of workers	% of total of salaries	% of total invoicing	Invoicing indexes per person (1)	% of total invoicing	Invoicing indexes per person (2)
1.Metal furnitures	35,3	35,6	23,5	66,5	26,3	74,6
2.Aluminum kitchenwares	6,7	5,3	5,5	81,8	8,6	126,7
3.Metal containes	19,5	23,1	19,6	100,5	22,5	116,6
4.Bicycles and motorcycles	14,1	11,7	26,0	184,5	15,8	111,7
5.Screws and nails	2,5	2,1	6,9	280,1	6,0	241,7
6.Foundry	4,5	4,5	2,1	46,4	1,6	33,4
7.Manufacture and repair	11,9	13,0	9,7	73,0	8,5	71,3
8.Various	5,5	4,7	7,7	139,7	10,7	192,8
TOTAL	100	100	100	(1)	100	(2)

(1) Considering 100 as the average invoicing (29,030 Kz/person/month)

(2) " " " " " " (54,416 Kz/persob/month)

TABLE 3.15

DIFFICULTIES AND PROBLEMS ENCOUNTERED IN THE DIFFERENT FACTORIES VISITED IN: THE LUANDA AREA

FACTORIES / ACTIVITY / PROBLEMS	FATA welded pipes	METANG corrugated sheet	ALFAG harrows	API corrugated cardboard	S.ARTIS-TICA metalwork	S.ANGOLA NA metal furniture	EQUIP. TECN. maintenance	IRA tricycles	ROFIL scales	CAPSUL bottle caps	EDAL metal furniture	SOMETAL foundry cisterns	FAMA metal furniture	TOTAL
1. Lack of qualified staff	x		x	x			x	x	x	x	x	x	x	10
2. Lack of imported raw materials		x	x		x		x	x			x	x	x	8
3. Use of inadequate technology	x		x	x					x	x	x	x		7
4. Antiquated machinery	x			x	x			x		x	x	x		7
5. Need for new machinery				x			x							2
6. Lack of tools	x						x		x					3
7. Existence of damaged equipment				x		x		x		x		x		5
8. Lack of auxiliary products						x		x			x		x	4
9. Damaged welding equipment			x		x	x					x	x		5
10. Absenteeism					x		x	x	x					4
11. Important equipment not in use	x													1
12. Lack of dies						x	x	x			x		x	5
13. Lack of local supplies						x			x					2
14. Lack of pattermakers and pattern plates for casting											x			1
15. Inadequate building facilities					x						x		x	3
16. Interruptions in the electrical power supply					x	x	x	x						4
17. Shortage of funds											x			1
18. Lack of means for warehouse control														-
19. Lack of orders														-
20. Shortages in the water supply	x	x		x										3

TABLE 3.15 (CONTINUATION)

DIFFICULTIES AND PROBLEMS ENCOUNTERED IN THE DIFFERENT FACTORIES VISITED IN: THE LUANDA AREA

PROBLEMS \ FACTORIES / ACTIVITY	METANGOL metal cans	FABIMOR bicycles motorcycles	ANFIBAR metal furniture	SIAL aluminum wares	CONETAI cisterns	M.VALENTE metal furniture	EMB.VAN LEER steel drums	MAQUINAG metal furniture	SADIL metal furniture	INDUTAL aluminum wares	METALVI foundry	METALVI aluminum wares	TRABASSOS vehicles for invalids	TOTAL
1. Lack of qualified staff	x	x				x	x	x	x	x				7
2. Lack of imported raw materials		x		x			x			x		x		5
3. Use of inadequate technology	x	x				x				x				4
4. Antiquated machinery		x		x		x	x			x				5
5. Need for new machinery						x	x						x	3
6. Lack of tools			x			x		x	x					4
7. Existence of damaged equipment	x	x					x	x	x					5
8. Lack of auxiliary products	x		x					x	x				x	5
9. Damaged welding equipment			x			x		x						3
10. Absenteeism		x					x		x			x		4
11. Important equipment not in use											x			1
12. Lack of dies			x			x		x	x					4
13. Lack of local supplies			x			x		x	x				x	5
14. Lack of pattermakers and pattern plates for casting				x							x			2
15. Inadequate building facilities						x			x					2
16. Interruptions in the electrical power supply														-
17. Shortage of funds														-
18. Lack of means for warehouse control		x												1
19. Lack of orders														-
20. Shortages in the water supply														-

TABLE 3.16

DIFFICULTIES AND PROBLEMS ENCOUNTERED IN THE DIFFERENT FACTORIES VISITED IN: THE HUAMBO AREA

PROBLEMS / ACTIVITY / FACTORIES	OASIS metal furniture	B.S.VAZ scales	IND.MET. metal furniture	MET.DO PLANAO metal furniture	S. JOTAL metal furniture	ULISSES bicycles motocycles	JOBA foundry	F.NUTEXA wood-working machinery	C.FORMACAO training center	CODUME screw-manufacture	EDALUMINIO aluminum wares	IAF locks and hinges	F. MARCAO foundry	TOTAL
1. Lack of qualified staff	x	x	x	x	x	x	x	x	x	x		x	x	12
2. Lack of imported raw materials	x	x	x	x	x	x	x	x		x	x	x	x	12
3. Use of inadequate technology	x	x	x	x	x	x		x		x		x	x	10
4. Antiquated machinery						x				x	x	x	x	5
5. Need for new machinery	x	x	x	x	x	x		x	x	x			x	10
6. Lack of tools	x		x	x		x		x						5
7. Existence of damaged equipment	x					x		x						3
8. Lack of auxiliary products	x		x	x	x		x	x					x	7
9. Damaged welding equipment	x		x	x	x									4
10. Absenteeism	x	x	x	x	x									5
11. Important equipment not in use								x				x		2
12. Lack of dies	x		x	x	x			x		x		x		7
13. Lack of local supplies	x	x					x				x			4
14. Lack of pattermakers and pattern plates for casting							x	x			x		x	4
15. Inadequate building facilities				x	x		x				x		x	5
16. Interruptions in the electrical power supply							x							1
17. Shortage of funds										x				1
18. Lack of means for warehouse control						x								1
19. Lack of orders								x		x				2
20. Shortages in the water supply														-

TABLE 3.17

DIFFICULTIES AND PROBLEMS ENCOUNTERED IN THE DIFFERENT FACTORIES VISITED IN: THE BENGUELA-LOBITO AREA

FACTORIES / ACTIVITY / PROBLEMS	C.JIKA foundry	MATEC wate- pumps	SOREFAME const. and repair of ships	LUMEL metal furniture exhaust	INDUMEC metal furniture	METANOL metal cans	LUPRAL screws	LUPRAL nails	LUPRAL chains	LUPRAL farming tools	LUPRAL foundry	LUPRAL tools		TOTAL
1. Lack of qualified staff	x	x	x	x	x		x		x		x			8
2. Lack of imported raw materials		x	x	x	x		x				x			6
3. Use of inadequate technology					x	x				x	x			4
4. Antiquated machinery					x	x	x	x			x			5
5. Need for new machinery							x	x		x	x	x		5
6. Lack of tools	x	x		x	x	x	x							6
7. Existence of damaged equipment	x					x								2
8. Lack of auxiliary products	x		x											2
9. Damaged welding equipment	x		x											2
10. Absenteeism						x								1
11. Important equipment not in use	x					x								2
12. Lack of dies						x	x							2
13. Lack of local supplies				x										1
14. Lack of pattermakers and pattern plates for casting	x										x			2
15. Inadequate building facilities		x												1
16. Interruptions in the electrical power supply														-
17. Shortage of funds	x													1
18. Lack of means for warehouse control							x	x	x	x	x	x		6
19. Lack of orders			x											1
20. Shortages in the water supply														-

TABLE 4.1.

INVESTMENTS (U.S.$)

ITEM	Equipment	International staff		TOTAL
		m/m	Total	
1.Engineering Department				
1.1.Team Leader		60	414,000	414,000
1.2.Economist		60	384,000	384,000
1.3.Consultant team		24	153,600	153,600
2.Metal forniture				
2.1.Re-grouping study		8	51,200	51,200
2.2.Equipment	(1)			
3.Metal cans and bottle caps				
3.1.METANGOL. Luanda	93,000	3	17,400(2)	110,400
3.2.METANGOL. Benguela	665,000	6	34,800(2)	699,800
3.3.CAPSUL. Luanda	120,000	3	17,400(2)	137,400
4.Bicycles				
4.1.Re-habilitation study		8	51,200	51,200
4.2.Equipment	(1)			
5.Screws and nails				
5.1.CODUME. Huambo	665,000	3	17,400(2)	682,400
5.2.LUPRAL. Benguela	29,500	2	11,600(2)	41,100
6.Foundry				
6.1.Current project co-ordination		6	38,400	38,400
7.Repair equipments				
7.1.Current project applications		6	38,400	38,400
8.Other activities				
8.1.FATA. Luanda	1,270,000	24	139,200(2)	1,409,200
8.2.MATEC. Benguela	20,000	2	11,600(2)	31,600
TOTAL	2,862,500	215	1,380,200	4,242,700

(1) To determinate when the study was finished

(2) Technical foreign expert to assistance commissioning, start-up and training of local staff.

TABLE 5.1.

ESTIMATED ANNUAL NEEDS FOR DIES IN NUMBER OF PIECES AND WEIGHT

PRODUCTION RANGE	SIZE			TOTAL
	SMALL	MEDIUM	LARGE	
Cutoff and punching dies	150	50	10	210
Bending and winding dies	15	25	5	45
Stamping dies	60	65	5	130
Drawing dies	70	15	5	90
Total number of pieces	295	[illegible]	25	475
Total weight in kilos	8.850	20.155	5.750	34.755

TABLE 5.2.

ESTIMATED ANNUAL NEEDS FOR CUTTING, BENDING AND SPECIALIZED TOOLS IN NUMBER OF PIECES AND WEIGHT

PRODUCTION RANGE	NUMBER OF AND WEIGHT
Cutting tools for shears for steel sheet, and other sheet metals	155
Curving tools for steel and metal sheet benders	110
Specialized tools	300
Total number of pieces	565
Total weight in kilos	21.000

TABLE 5.3.

STEEL QUALITY AND HEAT TREATMENT

TYPE OF PIECE	STEEL TO BE USED	HEAT TREATMENT
Base plates	St 33 Steel or casting	
Anchor plates	St 42 Steel	
Constraint rods	St 42 Steel	
Intermediate plates	St 42-2 Steel	
Guide columns	C 15 Steel	Casehardened
Punch holder plates	St 52-3 Steel	
Punches		
-Cutting	210 Cr 46 Steel	Hardening and drawing
-Cutting (heavy duty)	74 WV74 Steel	" "
-Countersinking	210 Cr 46 Steel	" "
Cutting Bushings	80 WCr 3 Steel	" "
Dies		
-Cutoff	210 Cr 46 Steel	" "
-For wedging and stamping	55 WCr V7 Steel	" "
Ejectors	210 Cr 46 Steel	" "
Specialized tools	St 42, 74 WV74, 79 WCo 7919 and 76 WCo 7240 Steel	

Note: DIN denomination

TABLE 5.4.

YEARLY COST OF RAW MATERIAL

TYPE OF MATERIAL	Average price Kz/Kilo	Annual Consumption in kilos	Total price Kz/year
Base plates	32	8.000	256.000
Anchor plates and dollies	34	6.000	204.000
Intermediate plates	35	5.000	175.000
Guide columns	40	2.500	100.000
Punch base plates	38	4.500	171.000
Punches, rings, blades, etc.	70	5.500	385.000
Die plates	70	8.000	560.000
Ejectors, intermediate rings, etc.	65	4.000	260.000
Specialized elements	50	12.500	625.000
Total	Average 48,86	56.000	2.736.000

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

11448
(3 of 3)

ASSESSMENT OF THE PRESENT CAPACITY OF THE METALWORKING INDUSTRY IN ANGOLA AND PROJECTION TO EXPAND THIS INDUSTRIAL SECTOR

FINAL REPORT

VOL III: DRAWINGS

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

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UNIDO PROJECT NO. DP/ANG/80/007
CONTRACT NO. T 81/35/IS

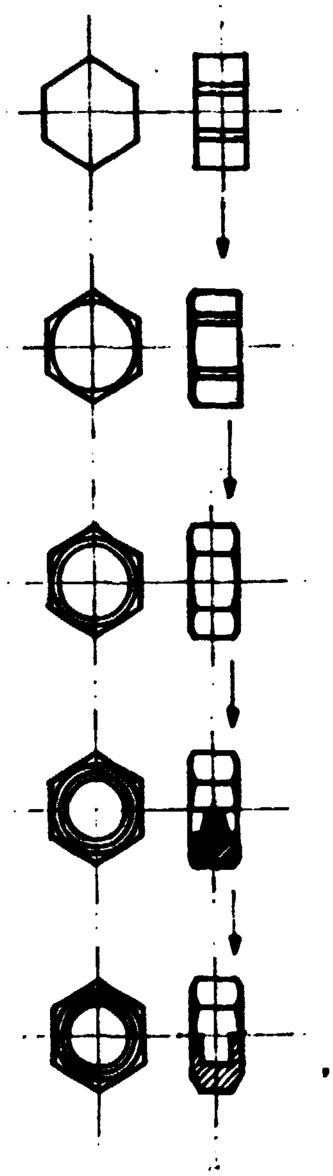
TECNIBERIA
April 1982

SUMMARY

SOME FIGURES
OF THIS DOCUMENT
ARE TOO LARGE
FOR MICROFICHING
AND WILL NOT
BE PHOTOGRAPHED.

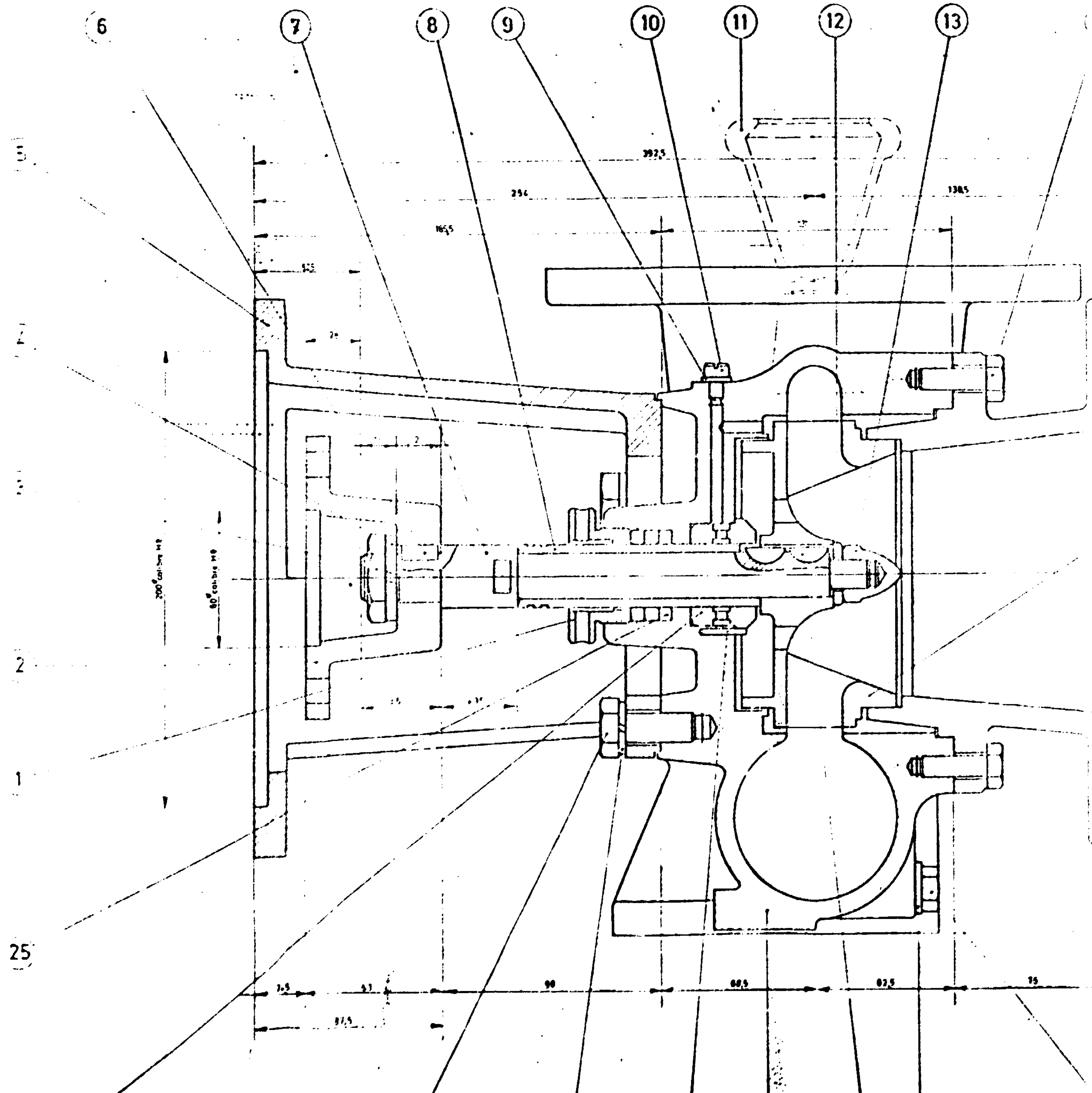
MANUFACTURING PROCESS OF HEXAGONAL NUTS IN A RAPID STAMPING MACHINE.

CHART 4.2

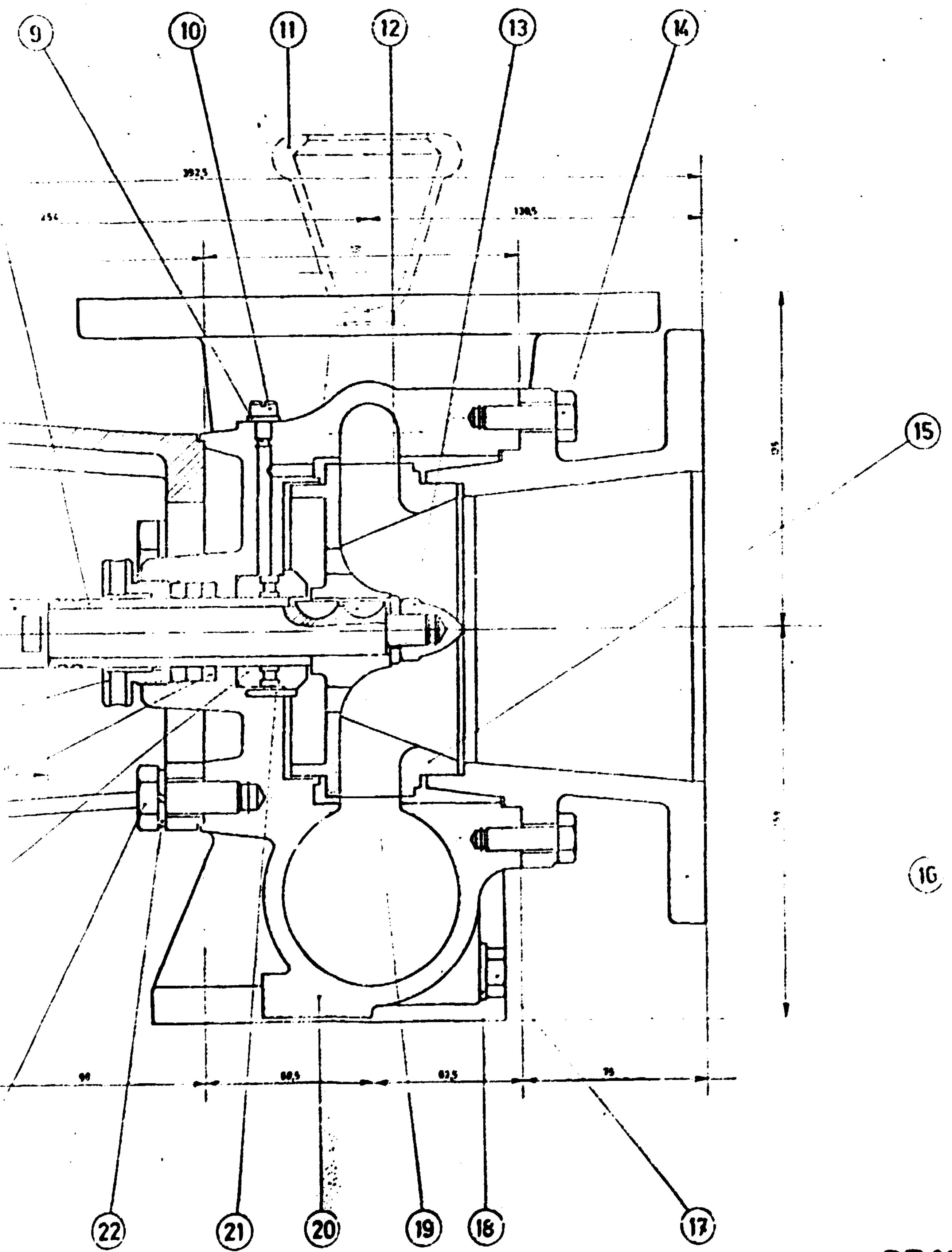


1. CUTTING OF THE METAL PIECE FOR THE NUT.
2. FORMATION OF ONE SIDE.
3. FORMATION OF THE OTHER SIDE.
4. DEFINITIVE SHAPING OF THE NUT.
5. PUNCHING THE HOLE.

JOINT PLAN AND NOMENCLATURE FOR WATER PU

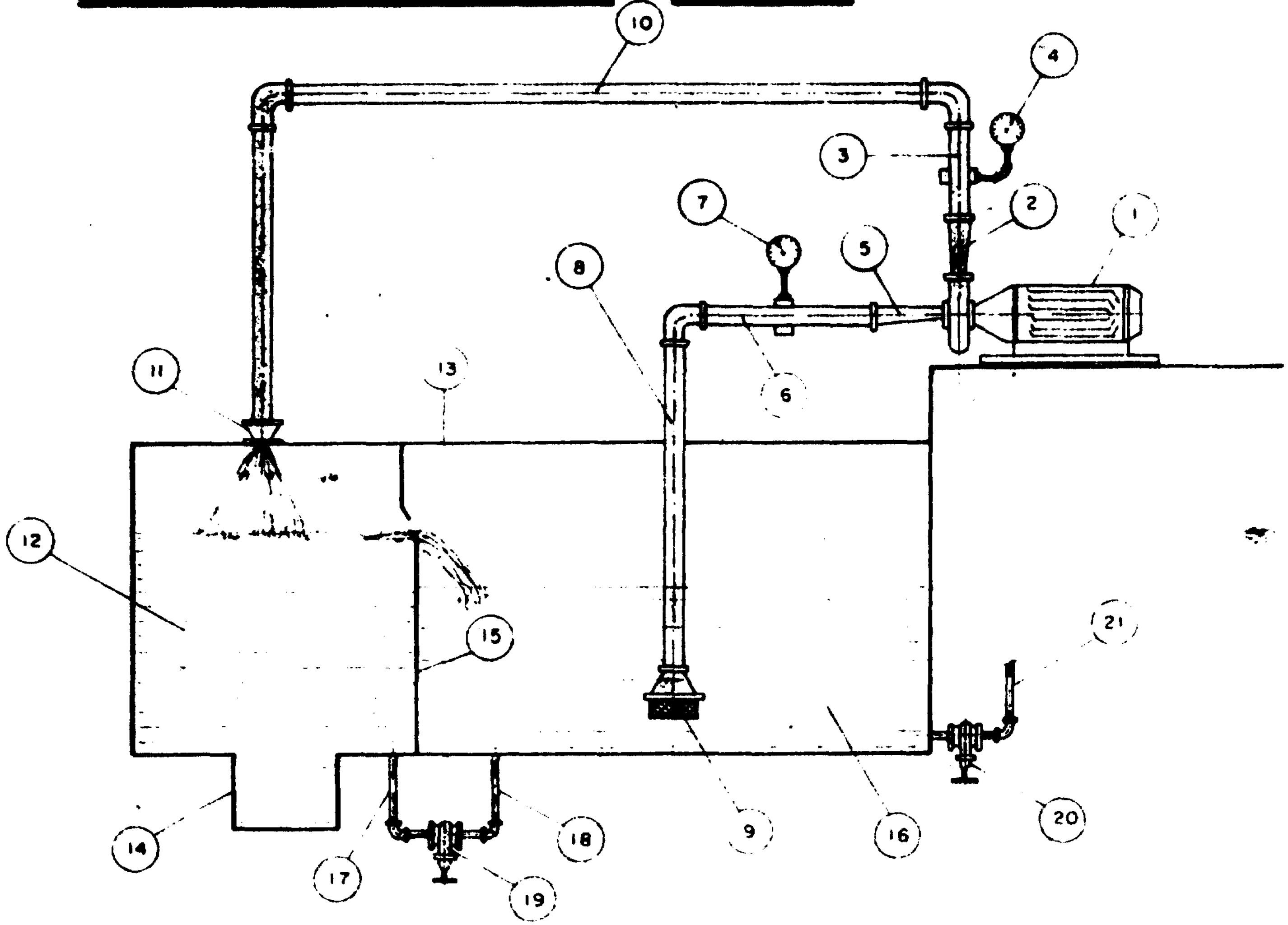


NOMENCLATURE FOR WATER PUMP MOUNTING



DRAWING 4.4

WATER PUMP TESTING BENCH



DRAWING 4.5