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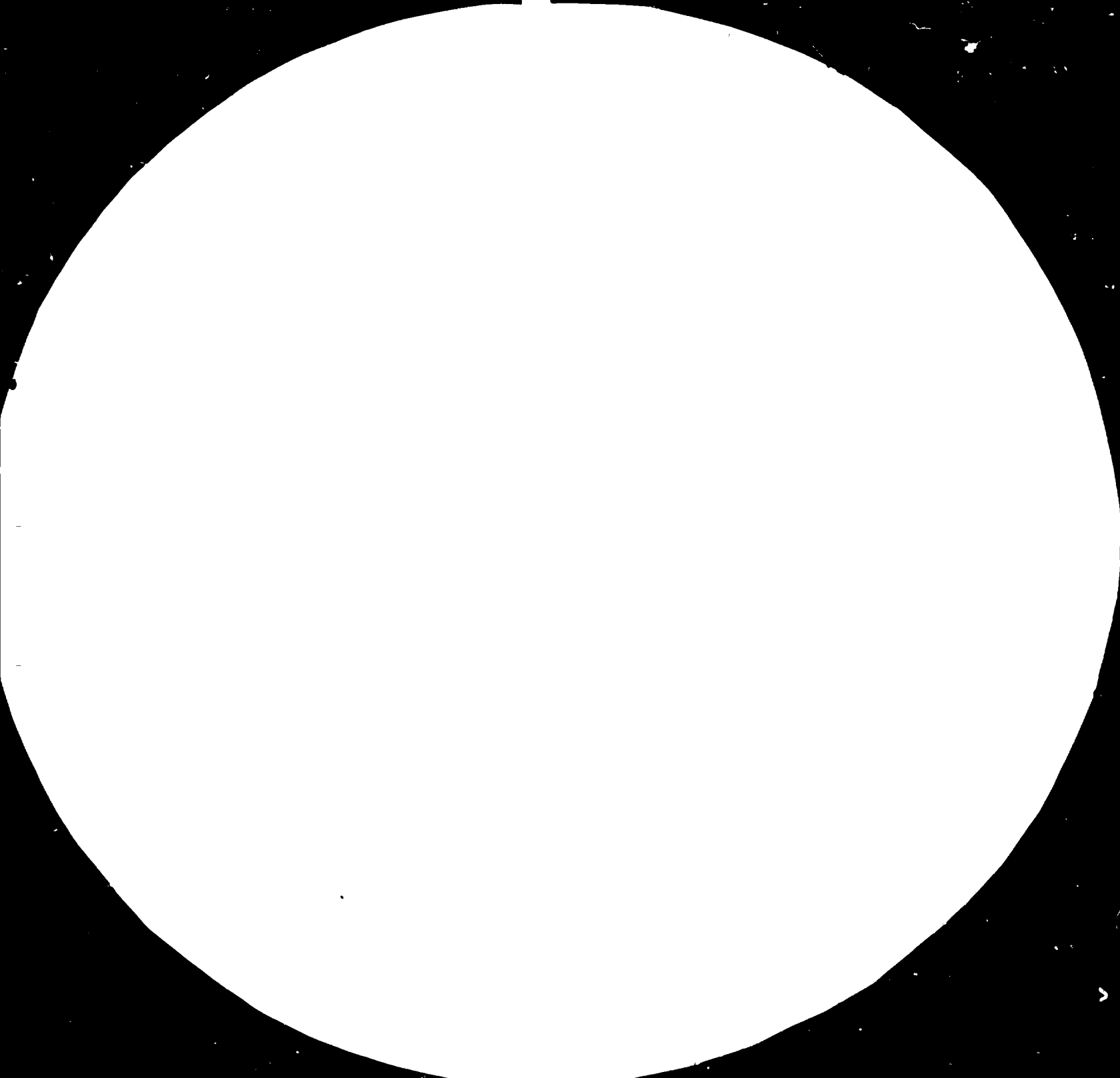
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(ANSI and ISO TEST CHART No. 2)

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Angola

ASSISTANCE TO THE PETROLEUM TRAINING CENTRE (PTC)

SUMBE (KWANZA SUL) ^{1/}

PEOPLE'S REPUBLIC OF ANGOLA

DP/RAF/83/022

REPORT

by

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UNIDO Consultant

20 January - 23 March 1985

^{1/} The views and opinions expressed in this report are those of the expert, and do not necessarily reflect the views of the United Nations Secretariat. This document has been reproduced without formal editing.

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INTRODUCTION

UNDP and the Norwegian Agency for International Development (NORAD), are financing a project for establishing a Petroleum Training Centre (PTC) for the Southern African Development Co-operation Conference (SADCC), through the special-purpose contribution to UNDP. The Centre is to be based on an existing Petroleum Training Centre in Sumbe.

The Petroleum Training Centre was created in Angola in the early 1970's. A part of that programme was financed by the Italian Government on a bilateral basis and UNDP supported the project by providing more than US\$ 2 million from its IPF resources during the period 1979 - 1983, through its technical assistance projects. The above programmes were implemented by a sub-contracted Italian company, COMERINT.

It was decided that COMERINT should also be the sub-contractor for developing the Petroleum Training Centre into a Regional Centre to train about 800 qualified workers, foremen, technicians and 140 training instructors for SADCC countries and the Petroleum Training Centre.

To monitor the project, UNIDO, the designated executing agency, decided to form a Project Technical Committee to include top-level oil refinery specialists, who would, during short-term meetings (up to ten days), review the development of the project and assist the UNIDO Secretariat in monitoring the project implementation.

The first meeting of the Project Technical Committee was convened in order to evaluate the proposals made by COMERINT for the services regarding the establishment of the Petroleum Training Centre. The above proposals were based on COMERINT's estimations of the Petroleum Training Centre's needs in accordance with the present Petroleum Training Centre's level and the project outputs planned.

The services of a consultant-observer are deemed necessary to provide the backstopping Branch of UNIDO and its Project Technical Committee with information on the PTC Training Programmes and their actual organization.

In accordance with the Job Description DP/RAF/83/022/11-55/32.1.H dated 15 June 1984, "Consultant in Oil-Refinery-Orientated Training Organization", the consultant will be assigned to work with UNIDO in the Chemical Industries Branch, and will specifically be expected to:

1. Assist UNIDO in reviewing and monitoring the training activities carried out by the sub-contractor at the PTC in order to ensure that these activities fully meet the requirements of SADCC member countries and the objectives of the project;
2. Visit the PTC during training sessions;
3. Evaluate the technical level of training, the correspondence of the equipment for the training purposes, and the organization of the PTC and its correspondence according to the training requirements;
4. Report to UNIDO, Chemical Industries Branch, Division of Industrial Operations, and to the Project Technical Committee;
5. Recommend to the Project Technical Committee, those areas requiring special attention in monitoring the contractor's performance.

The expert will also be required to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken.

However, the Second Meeting of the Project Technical Committee took place in Vienna from 21 to 25 January 1985, in which I participated and where the Terms of Reference were revised for the visit to Angola.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The PTC is equipped with the necessary machinery and instruments, part of which are in good working order.

The equipment, cars, spare parts, replacement materials and consumables which were listed by COMERINT for implementing the project, are still in the Luanda sea port.

This situation has resulted because all the above mentioned items were addressed to the Ministry of Energy and Petroleum, and not to the UNDP Office in Luanda. Thus certain problems with customs clearance, etc. have arisen.

There are also problems with the transportation of equipment from Luanda to Sumbe, due to lack of special tracks needed for the containers.

Upon comparing PTC's requirements of spare parts and replacement materials with the list of equipment shipped, it was discovered that some important spare parts which the PTC needs, such as evaporators for air-conditioners, complicated thermostats for refrigerators and some other items, were not included in the list of equipment shipped. This means that the list of equipment was made without taking into account the local situation and the PTC's needs.

No inventories of spare parts and replacement materials were found at the PTC. I was unable to find out who was responsible for the storage and consumption of replacement materials, spare parts, etc.

The PTC has some problems with the water and energy supply. At present the PTC is supplied with water and electricity solely through emergency generators which are insufficient for the full operation of the PTC.

There exists a rather old pipe-line for water supply. Its capacity is two times less than was foreseen according to the project construction in 1979.

The PTC has at present at its disposal only two Angolan teachers and one assistant, of whom only one has knowledge of the English language.

Software for all planned courses is available, but only in Portuguese.

The courses of External Refinery Operations which are running at the PETROFINA refinery in Luanda, could not meet the required standards for theoretical training courses.

The PTC needs the following, in order to facilitate operational activities of the Centre:

1. Major inventories of PTC property, including not only buildings and furniture but every single piece of machinery, equipment and also spare parts and their replacement materials and consumables;
2. Periodical inventories (about once a year). It is suggested that an Inventory Control Commission should be established and should consist of representatives of the parties concerned;
3. Angolan teaching staff have to be increased in order to meet the requirements of all courses planned for 1985. The PTC also needs some teachers with knowledge of the English language;

4. The list of equipment and replacement materials should be compiled jointly by national and Italian staff. Also the equipment and required materials should be addressed to the UNDP Office in Luanda and not to the Ministry of Energy and Petroleum;
5. To avoid unqualified training of students, it would be preferable not to have theoretical courses on certain subjects for students at various locations which do not have laboratories outside the PTC. The above highlights the reason for transferring the course on External Refinery Operations from Luanda to Sumbe.

ASSISTANCE TO THE PETROLEUM TRAINING CENTRE (SADCC)

I. TERMS OF REFERENCE OF THE MISSION

In accordance with the Terms of Reference described in the job description and the proposed Terms of Reference mentioned above (see "Introduction"), and taking into account the existing local situation, the following agenda was adopted:

1. A visit to the Petroleum Training Centre in Sumbe (Kwanza Sul) in order to investigate the state of operational readiness of the PTC, and estimate when the PTC would be fully operational.

1.01 In which condition the Petroleum Training Centre is, and what does it look like.

1.02 Chemical, instrumentation, electrical and language laboratories, workshop and practical fire exercise area.

1.03 Staffing structure of the Centre.

2. Logistical structure of the Centre

2.01 Water supply

2.02 Electricity supply

2.03 Fuel supply

2.04 Food supply

2.05 Communication system

2.06 Maintenance

2.07 Other services

3. Discussions with representatives of COMERINT and the national authorities of the PTC about their suggestions to accelerate readiness of the PTC for starting courses in May 1985 for the following:

3.01 Selection of students

3.02 What courses are they planning to start in May 1985?

3.03 Teaching staff required

3.04 Improvement of water supply

3.05 Improvement of electricity supply

3.06 Problems of food supply

3.07 Increasing the efficiency of joint work of Italian and Angolan personnel.

4. A visit to the Luanda Refinery.
5. A visit to the course of External Refinery Operations in Luanda.

II. FINDINGS OF THE MISSION

During the mission, it was possible to collect the following facts covering questions concerning the Terms of Reference:

1. Condition of the Petroleum Training Centre

1.01 The Petroleum Training Centre is situated about 300 km south of Luanda in the Kwanza Sul province. It is about 14 km to the north - north-east from Sumbe at the cross roads which lead from Sumbe to Luanda and to Gabela.

The total Centre compound is around 100,000 m², 7,023 m² of which are occupied by 25 different buildings which may be divided into some parts as follows:

Buildings for training

They include 5 buildings- Auditorium for 200 seats, 7 laboratories: chemistry, instrumentation, electricity and language, each of them for 15 students. (2 buildings include 12 rooms for theoretical courses, each of them for 15 students) and 1 building is designed as a workshop for mechanics, auto-mechanics and welders for 15 students each.

The rest of the buildings are designed for the following purposes:

The compound capacity has 200 students living in and gives all kinds of facilities:

- 13 classrooms (total space - 892 m²)
- 10 laboratories (total space - 1,593 m²)
- dormitories for 240 students
- dormitories for professors
- dormitories for general staff members
- canteen and kitchen
- laundry service
- storage and depository
- voltage transforming station from 30KV to 380/220 v power 1,260KVA
- emergency electric generators of 250 KVA
- Rio Keve pumping station and water treatment section - pipeline length 14 km, flow rate 10³/hour

- bar and recreation facilities
- cinema and theatre
- administration building for 20 employees
- library
- sports area (basket- and football ground, and guest house)
- houses for instructors with families
- infirmary
- fire-fighting practical exercise area
- heliport
- green zone
- horticultural ground
- external lighting KW 20.00

All buildings are in good condition. They are prefabricated and manufactured in Italy. There is equipment and teaching software (at present only in Portuguese, published in 1979) which gives the possibility to train students for the following specific fields of activity:

- refining technicians
- external refinery operators
- hydrocarbon production plant operators
- chemistry laboratory operators
- electricians
- instrumentation technicians
- rotating machine operators
- vehicle mechanics
- fitting mechanics
- pipe welders
- fire prevention and safety operators
- hydrocarbon production plant supervisors
- reservoirs and terminal operators

1.02 The condition of laboratories and the workshop

All laboratories and the workshop are equipped with up-to-date machinery and instruments according to the manuals and text books.

Machinery and equipment are in working order. Example: In order to put into operation one of the complicated training aids called a Simulator, it took the experts only five working days. It is located in the laboratory of Instrumentation.

Two things should be taken into consideration: Firstly the Simulator was not in operation for two years, and secondly, the laboratory had electricity and water supply for only three days out of the five working days.

It should also be mentioned that no inventories have been made except for one in the workshop. As I managed to find out practically, the list of spare parts and consumables was made without taking into consideration the existing spare parts and consumables, and the real need for them.

Examples: CuSO_4 Copper Sulphate 500 gr was booked in the list of spare parts (page 13). However, there are 5 kg of CuSO_4 available in the Chemistry Laboratory. Similar situations exist with graduated glass pipettes and so on.

As for the fire fighting practical exercise area, there used to be a very nice Simulator, but now it is out of order. Half of the equipment is disassembled and I was told half of it is being repaired. Most of the equipment has not been working for two years.

1.03 Staffing structure of the PTC

The Petroleum Training Centre staff consists of 71 persons, headed by the Director, Mr. Asiss, an Angolan national.

The PTC staff may be divided into four groups:

- administrative staff
- teaching staff
- maintenance staff
- general staff

Special attention should be given to the Angolan teaching staff.

It consists of only two teachers and one assistant.

- SIMAO PEDRO MASSVENE HEMBO

Teacher of Electricity

12 years in a school specialized in electricity

- NIGUEL MWELED

Teacher of Instrumentation

12 years in a school specialized in instrumentation

- ANDRE MONTEIRO

Assistant of Mechanics

10 years in school

Graduated from the PTC in 1981

Only one of them, namely Mr. Hembo, teacher of Electricity, has a command of the English language.

2. Logistical problems

2.01 Water supply

According to the PTC design, the planned water should be pumped from the small Keve river, which is about 15 km from the PTC in the direction of Gabela. There is a water pumping station there. Its capacity is about 12 m³ per hour. According to the design, the water pumping station must work round the clock with centralized supply of electricity. The station has three pumps, two of them are designed to work continuously, keeping the PTC water supply at around 250 - 260 m³/day.

At present, the water pumping station is being supplied with electricity from an emergency generator, and in order to keep the generator in good working condition, the water pumping station works only 8-10 hours per day (from 8 a.m. to 5 p.m.) during working days, producing about 50 - 60 m³ a day. This is more than four times less than originally projected. Its profile output equals now only about 5 m³ per hour instead of 12 m³ per hour as originally designed. It was noted that the pipe-line connecting the pumping station to the PTC is too old.

2.02 Electricity supply

The PTC's electricity requirement is approximately 830 KWA. The original design had foreseen the centralized supply of electricity at about 20 KW.

There are two generators for emergency situations, one for the PTC (250 KWA capacity) and the other (100 KWA capacity) for the water pumping station. Since 10 September 1984, the PTC has not had a centralized supply of electricity. At present, 250 KWA is sufficient for almost complete operation of the PTC, with one reservation. There must be a strict control of electricity distribution during day and night. However, in the event of a generator breakdown for two days or more, all people staying at the PTC should be evacuated to Sumbe or other locations because without electricity, the PTC cannot supply water.

Therefore, in order to have a reliable electricity supply, a new generator with a capacity of not less than 500 KWA at the PTC, and 100 KWA at the water pumping station, would have to be installed until a centralized electricity supply is recovered.

2.03 Fuel supply

Now the PTC has almost no problem with fuel supply. But in the case of installing two new generators, fuel supply problems may appear because the PTC gas-oil consumption will increase to 900 litres per day. At present, it is only 150 - 200 litres per day. The capacity of the gas-oil reserve tanks is now 6 m³. Taking into consideration the local situation, this means problems of fuel transportation may appear. This problem should be considered along with the problem of electricity supply.

2.04 Food supply

This is a very delicate subject. But it may also become a big problem, taking into consideration the local situation and the increased special service personnel.

2.05 Communication system

Internal communication is provided by the telephone station with a capacity of 50 individual numbers.

The PTC has no external telephone communication system. At present, the PTC can only contact Sumbe and Luanda through a radio which belongs to COMERINT. Therefore, it is of extreme importance for the PTC to obtain their own radio station.

2.06 Maintenance system

This is one of the very important subjects. The problem is that all the equipment was installed in 1979, i.e. almost six years ago. This problem has two sides:

- availability of a maintenance specialist
- availability of spare parts and replacement materials

The PTC has at its disposal, only the following specialists in maintenance:

Mechanics

- Alberto Lopes Silvestre
- Augusto Fernandes
- Miguel Chimbundo Depa

Electricians

- Emanuel Lucau
- Antonio Ferreira

Building Maintenance

- Raimundo Jose Manuel
- Manuel Antonio Armando
- Domingos Mario
- Artur Antonio
- Artur Sabino - Pedreiro IMP

Civil Infrastructure Maintenance

- Pedro Fernando
- Jaime Julio
- Sabalo Joao Cambambe
- Jose Adelino

Only one of the above mentioned groups may replace Italian specialists, but not all of them. Others are assistants and workers, of not a very high level. It takes about two years to fully train specialists to replace the Italian maintenance specialists completely.

Spare parts and replacement materials

This is another problem. The authorities of the PTC do not pay enough attention to the importance of regular inventory control. This is why out of the twenty cars presently at the PTC, only six are in working condition. The PTC needs many more cars at its disposal.

Example 1: The PTC cannot use it - because they have no battery. As mentioned earlier, the list of spare parts was made without taking into consideration local conditions.

Example 2: Air conditioners break down every day. The reason is the corrosive environment. Evaporators often break down completely. But no evaporators for air conditioners were included in the list of replacement materials shipped by COMERINT. (Annex II of the Progress Report of the present contract - and also Annex II of this report)

3. The status of preparation of the PTC for the 1985 training session

3.01 Selection of students

There are no nominations of students for attending the courses scheduled to start in May 1985.

According to the Director of the National Institute of Petroleum, Mr. Nunes e Sa, he sent two telegrams on 19 February 1985. The first one to the companies oriented in petroleum activities located in Angola, e.g. SONANGOL, SONANGOL/DISTRIBUTION, ESPA, CABGOS, ELF, FINA, AGIP, TEXACO - with a request to inform the PTC which kind of courses they are interested in and the number of candidates for each course.

The second telegram was sent to all SADCC countries with the same request. Mr. Nunes e Sa also informed that he had provisional data from petroleum oriented companies and data which they expect from SADCC countries. The figures are about 240 candidates for various courses, but they expect exact figures from petroleum companies and from SADCC countries.

3.02 Courses planned to take place, starting May 1985

Mr. Romagnoli, the team leader of the COMERINT project, supported the plan for 1985 as presented in the Progress Report.

Mr. Nunes e Sa agreed with him and expressed his intention to personally participate in the selection of students from SADCC countries.

3.03 Teaching staff required

As previously mentioned, the PTC has at its disposal only two Angolan teachers and one assistant. According to the COMERINT Plan of Services for the year 1985, the PTC will have six courses:

- External Refinery Operators
- Production Operators
- Instrumentation technicians
- Automatic mechanics
- Electricians
- Petroleum storage, transportation and distribution

(In addition to the above six courses, two courses are being held at present, which are not however, included in the 1985 Plan of Services.) These are:

- Course for External Refinery Operators (Luanda)
- Course on Deductive Methods of Construction (Luanda and Sumbe)

All these courses require a minimum of 12 - 15 teachers excluding the Italian staff which should play a co-ordinating role. Mr. Nunes e Sa suggested to strengthen the Italian staff by the assistance of the team leader on pedagogical issues, because he feels that this part should be covered more than in the past. Therefore, additional Angolan teaching staff are urgently required.

3.04 Water supply

I was informed by Mr. Nunes e Sa, that the Angolan Government would like to entrust COMERINT with the construction of the water pumping station and the laying of an additional water pipeline. However, negotiations have not yet been completed.

3.05 Energy supply

As I was informed by Mr. Nunes e Sa, the Angolan Government has made some attempts to settle the problem of electrical supply. The Government is considering two alternatives:

One of them is to keep the PTC supplied with electricity through a centralized source from other cities, e.g. from Port Amboim, which is about 15 km from the PTC. Another option is to install three additional generators. Two of them with a capacity of 500 kw, and one of 150 kva capacity, in order to meet the PTC's own requirements. One generator of 100 kva capacity for the water pumping station already exists.

But these options mentioned above are still in the stage of consideration.

3.06 Food supply

Mr. Nunes e Sa informed us that in the case of lack of food, the problem could be settled by importing foodstuff.

3.07 Increasing the efficiency of joint work of the Italian and Angolan personnel

I proposed to include in the joint plan for 1985, training of Angolan specialists for maintenance, who could start making an inventory. At present, Mr. Francisco Di Fine, Engineer for Building and Civil Engineering work, and Mr. Piero Agosta, Electrical Technician, work together with Angolan specialists without any particular plans. Therefore, it is difficult to determine when the Angolan specialists may possibly replace the Italian specialists. This suggestion was supported by all parties concerned.

4. A visit to the Luanda Refinery

The Refinery in Luanda is called PETRANGOL A REFINARIA DA PETRANGOL DE LUANDA, and was established in 1958 with a capacity of 100,000 tons of crude oil per year. At present, the refinery comprises nine installations. The refinery produces a number of oil products such as liquid petroleum gas,

premium gasoline, regular petrol, kerosene jet oil, diesel oil, fuel oil, asphalt and cut-back RC-2.

The age of many installations is between 12 - 22 years, which speaks for itself. About 10 per cent of the products are exported. Meanwhile, the losses amount to approximately 5 per cent. The level of automation could be estimated as medium. (the computers are not used)

The structure of the refinery technological staff is as follows:

- second class operator
- first class operator
- principal operator (control room)
- chief of shift
- chief of unit
- chief of division

The refinery lacks technological personnel at an estimate of about 10 - 20%; the lack of maintenance personnel is also very high. The technological staff may be divided into two groups, Angolan specialists, and expatriates who are mainly Portuguese. All the top level specialists are expatriates. The graduates from the Petroleum Training Centre work as first and second class operators.

5. A visit to the Course of External Refinery Operations

At present, fourteen Angolan students are taking part in the Course of External Refinery Operations. The course began in November 1984. At the beginning, sixty students were examined by representatives of the refinery training unit. Only fourteen candidates were selected.

The major qualifications and experience required from the applicants are as follows:

- school certificate (8-12 grades)
- permanent residence in Luanda
- knowledge of the Portuguese language
- completed military service

.....

All students took part in a test. (test paper enclosed as Annex III)
Only fourteen students passed the test, but none of them could answer all
the questions. A maximum of sixteen questions out of nineteen were
answered correctly.

The teaching staff of the course is given below:

- Ricchi Giancarlo, Italian - Co-ordinator,
he lectures on chemistry and characteristics
of crude oil and oil products.

A graduate of the Italian Institute of Chemistry
Faculty and has worked in developing countries as
a teacher for about ten years.

- Five Angolan instructors who graduated from the PTC.
They also participated in a six-month course on
Deductive Methodology in Italy.

All the Angolan teachers work now at the Luanda Refinery and not at
the PTC.

III. CONCLUSIONS

At present, the PTC is not yet ready to receive students for training due to the following reasons:

1. The equipment, machinery, cars, replacement materials, spare parts and consumables shipped to Luanda last December, are still in Port Luanda and have not passed through customs by 16 March 1985. This equipment is however, urgently needed by the PTC. Therefore, it is of extreme urgency and importance that UNDP, COMERINT and representatives of the Angolan Government, accelerate their endeavours in obtaining customs clearance for the above items so that they can be transported to the PTC in Sumbe.
2. The existing conditions of water and energy supply do not meet the requirements for normal operation of the PTC. The problem of achieving a reliable energy/water supply should be solved as soon as possible.
3. The national PTC staff needs about 4-6 additional specialists for maintenance of the PTC in general, and for mechanical, pumping and electrical maintenance in particular.

The PTC needs urgently additional teaching staff (about 12-15 teachers) of which at least six of them have knowledge of the English language. This problem should be settled as soon as possible.

4. The sub-contractor's staff foreseen for the suggested Work Plan of 1985 is sufficient. But it should be strengthened by dividing the responsibility into two parts:

- general maintenance of the PTC
- pedagogical matters

Therefore, it was suggested to have two Italian specialists leading the contractor's team. One in general management and the other responsible for pedagogical matters in addition to acting as deputy.

5. The problem of selection of students is up to now unclear. In fact, no nominations of candidates for training have been received. There are different approaches to this problem:

The sub-contractor considers this issue as its own responsibility, whilst the PTC management believes that the problem should be handled by them in a different way.

A decision on this issue should be reached by UNIDO and representatives of SADCC countries as soon as possible.

6. No inventory has ever been carried out, which has complicated the compilation of a meaningful list of equipment actually required by the PTC.

It is obvious that the PTC's requirements of equipment, machinery, cars, instruments, tools, replacement materials, spare parts and consumables, have not been properly handled.

Inventories must be carried out on a regular basis by representatives of the three parties concerned, namely UNDP, COMERINT and the Petroleum Training Centre.

ACKNOWLEDGEMENTS

I would like to express my appreciation to all colleagues and official persons for their assistance and kindness in helping me during my mission.

Petroleum Training Centre Authorities

Mr. J. Nunes e Sa	Director, National Institute of Petroleum
Mr. Asiss	Director, Petroleum Training Centre

UNDP Office in Luanda

Mr. G. Merrem	Resident Representative
Mr. J.-P. Gernay	Deputy Resident Representative
Mr. A. Milovanov	Senior Industrial Development Field Adviser
Mr. E. Bengtsson	Junior Professional Officer

Representatives of COMERINT

Mr. C. Romagnoli
Mr. Madonia
Mr. F. di Fine
Mr. P. Agosta

Members of the Project Technical Committee

Mr. L. Brezula	Consultant
Mr. H. Huber	Consultant
Mr. J.F. Mohr	Consultant
Mr. T. Russell	Consultant

UNIDO

Mr. S. Sazonov	Project Backstopping Officer Industrial Development Officer Chemical Industries Branch Division of Industrial Operations
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PRICE BREAKDOWN OF THE MATERIALS

	PRICE BREAKDOWN OF THE MATERIALS										
UNIDO - PROJECT - OP RA/83/022	<div style="display: flex; justify-content: space-around; font-size: small;"> COST OF THE MATERIALS IN ITALIAN LINES (THOUSANDS) ENGINEERING AND COORDINATION PROCUREMENT AND PURCHASING SERVICES PACKING CONTAINERS TRANSPORT - INSURANCE FREIGHT GENERAL EXPENSES CONCRETE PROFIT TOTAL IN ITALIAN LINES (THOUSANDS) </div>									SUPPLY PRICE CIF/LUANDA IN US Dollars	
REGIONAL PROJECT FOR THE SADC											
MEMBERS STATES											
ASSISTANCE TO PIC											
CHANGE RATE AT 0.3.84											
1 \$ - L11. 1.582											
EXTERIOR FIXTURES Ref. 4.4 page 74											
RAIN DOWN	7.000										
WINDOW	36.000										
FALSE CEILING	16.932										
TOTAL	66.932	2.474	3.888	2.474	15.198	2.474	8.836	102.276			64.650
INTERIOR FIXTURES Ref. 4.4 page 74	22.250	1.050	1.500	1.050	6.564	1.050	4.000	37.464			23.682
TRENSES Ref. 4.5 page 74	24.600	1.230	1.720	1.230	4.031	1.230	3.690	37.731			23.850
FLOORING Ref. 4.6 page 74											
- VINYL	4.760	178	280	178	1.097	178	637	7.308			4.620
- RED GRES	5.850	300	410	300	1.780	300	1.055	9.995			6.318
FINISHING Ref. 4.7 page 74	6.900	400	500	400	2.240	400	1.250	12.090			7.643
MOSAZONETTA MACHINE Ref. 4 page 73	13.201	660	923	660	3.960	660	2.375	22.439			14.184

LIST OF EQUIPMENT

ANNEX II

PRICE BREAKDOWN OF THE MATERIALS

UNIDO - PROJECT - CP RNF/03/022																	
REGIONAL PROJECT FOR THE SADC																	
MEMBERS STATES																	
ASSISTANCE TO CTC																	
CHANGE RATE AT 0.3.04																	
1 \$ - L11, 1.582																	
		COST OF THE MATERIALS IN ITALIAN LIRAS (THOUSANDS)	ENGINEERING AND COORDINATION	PROCUREMENT AND COORDINATION	PACKING CONTAINERS	TRANSPORT - INSURANCE FREIGHT	GENERAL EXPENSES	GROSS PROFIT	TOTAL IN ITALIAN LIRAS (THOUSANDS)					SUPPLY PRICE CIF/LUANDA IN US Dollars			
PHOTOCOPIER	8.500																
SORTER	2.500																
AUTOMATIC FEEDER	1.500																
Ref. 1.3 page 22	TOTAL	12.500	625	875	625	3.750	625	2.250	21.250								13.432
TUMBLER TINES Ref. 1.4 page 20	5.493	259	370	259	1.608	259	942	9.190									5.809
STATIONERY SHEETS A4 FORMAT 80 GR IN PACKAGES OF 500 SHEETS	14.000	686	1.078	686	4.214	686	2.450	23.800									15.300
Ref. 2.1 page 00																	
INK FOR PHOTOCOPIER IN BARS	14.600	795	1.086	795	4.448	795	2.329	25.248									15.960
Ref. 2.1 page 00																	
FIAT DUCATO PANAMA VAN - N° 2	26.150																
FIAT TYPE A.60.10 VAN - N°11	51.500																
FIAT CAMPAGNOLA DIESEL N° 1	24.980																
Ref. 3.1 page 71	TOTAL	102.630	1.000		30.789	5.131	18.650	158.700									100.000

QUESTIONÁRIO

(Test Paper for Trainees)

1. Calcular o valor da seguinte multiplicação:

$$8,4 \times 41,5 =$$

- A) 348,6
- B) 34,86
- C) 224,3
- D) 3,486

2. Calcular o valor da seguinte divisão:

$$135,196 : 7,3 =$$

- A) 18,52
- B) 18,16
- C) 18,59
- D) 18,14

3. Por em coluna e calcular o valor da seguinte soma:

$$15,713 + 8,412 + 7,916 =$$

- A) 30,021
- B) 34,011
- C) 32,041
- D) 28,031

4. - Pôr em coluna e calcular o valor da seguinte subtração:

$$17,4985 - 8,7286 =$$

A) 9,7416

B) 8,1682

C) 9,7184

D) 8,7699

5. - 17 m. são iguais a :

A) 1700 mm

B) 170 cm

C) 1700 cm

D) 1,7 cm

6. - 15 mm são iguais a :

A) 0,15 m

B) 0,015 m

C) 0,15 cm

D) 150 cm

7. - 17 m^2 são iguais a :

A) 170 mm^2

B) 1.700 cm^2

C) 170.000 cm^2

D) 170 cm^2

8. A superfície de um retângulo, cujos lados meçam 2m e 6m é de :

- A) 8 m²
- B) 6 m²
- C) 12 m²
- D) 16 m²

9. O volume de um paralelepípedo cujos lados tenham respectivamente 5 m, 7 m e 2 m é de :

- A) 70 m³
- B) 12 m³
- C) 9 m³
- D) 16 m³

10. Calcular o volume V de um reservatório esférico que tenha um diametro de 6 m :

- A) V = 296,12 m³
- B) V = 904,78 m³
- C) V = 523,10 m³
- D) V = 113,1 m³

11. Um cilindro com um volume útil de 9.000m³ é cheio, até um terço, com um certo produto.
Qual é o volume V que fica vazio?

- A) V = 2.000 m³
- B) V = 4.500 m³
- C) V = 6.000 m³
- D) V = 8.000 m³

12. Deve-se injectar 2 litros de um certo aditivo por cada 100 toneladas de um produto. Qual é a quantidade de aditivo que se deve injectar para 2.000 toneladas de produto?

- A) 100 litros
- B) 20 litros
- C) 40 litros
- D) 4.000 litros

13. Com qual das seguintes unidades de medida se mede o volume?

- A) Kg.
- B) m
- C) m³
- D) m²

14. A pressão é:

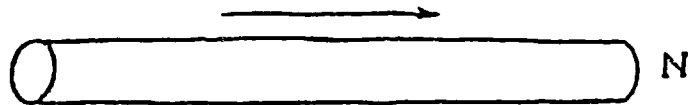
- A) uma força sobre uma superfície
- B) uma força num volume
- C) a velocidade de um fluido
- D) a quantidade de caudal num tubo

15. Num recipiente que contém água e óleo, o óleo flutua sobre a camada de água.

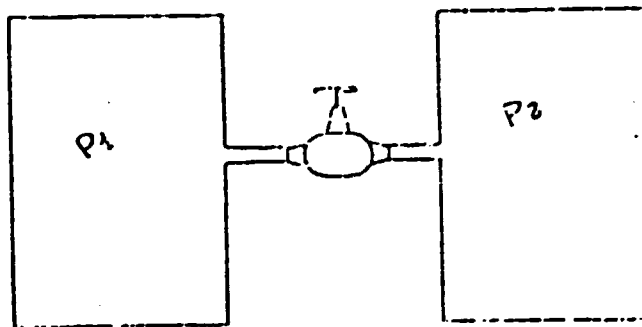
Porquê?

- A) Porque a densidade do óleo é superior à da água
- B) Porque a densidade da água é superior à do óleo
- C) Porque tanto o óleo como a água têm a mesma densidade e o recipiente foi agitado.
- D) Porque tanto o óleo como a água têm a mesma densidade e em primeiro lugar deitou-se a água.

16. Se um líquido percorre o tubo abaixo desenhado, com um comprimento de 100 m, a pressão à saída será de (ponto H)

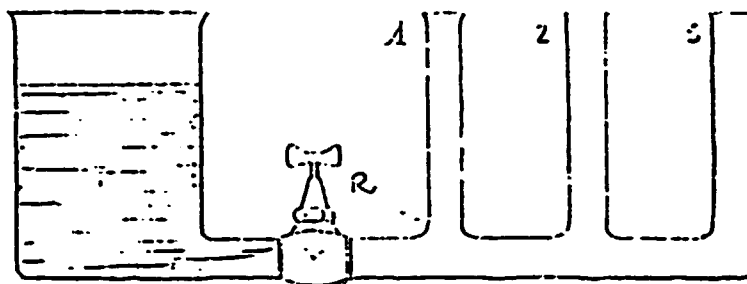


- A) superior à pressão de entrada
B) igual à pressão de entrada
C) inferior à pressão de entrada
17. Os dois recipientes 1 e 2 contêm gás.
Se a pressão P_1 é superior à pressão P_2 , que se passa quando se abrir a torneira?



- A) o gás passa do recipiente 2 ao recipiente 1
B) o gás passa do recipiente 1 ao recipiente 2
C) o gás não sai de nenhum dos recipientes.

18. Se se abrir a torneira R colocada no fundo do reservatório, a água que vai para os tubos 1, 2, 3 atingirá:



- A) O nível mais alto no tubo 1
B) O nível mais alto no tubo 2
C) O nível mais alto no tubo 3
D) O mesmo nível em todos os tubos.
19. Para se passar do estado de vapor ao estado líquido:
- A) Deve-se fornecer calor
B) Deve-se subtrair calor
C) Deve-se reduzir a pressão
D) Deve-se aumentar a temperatura

