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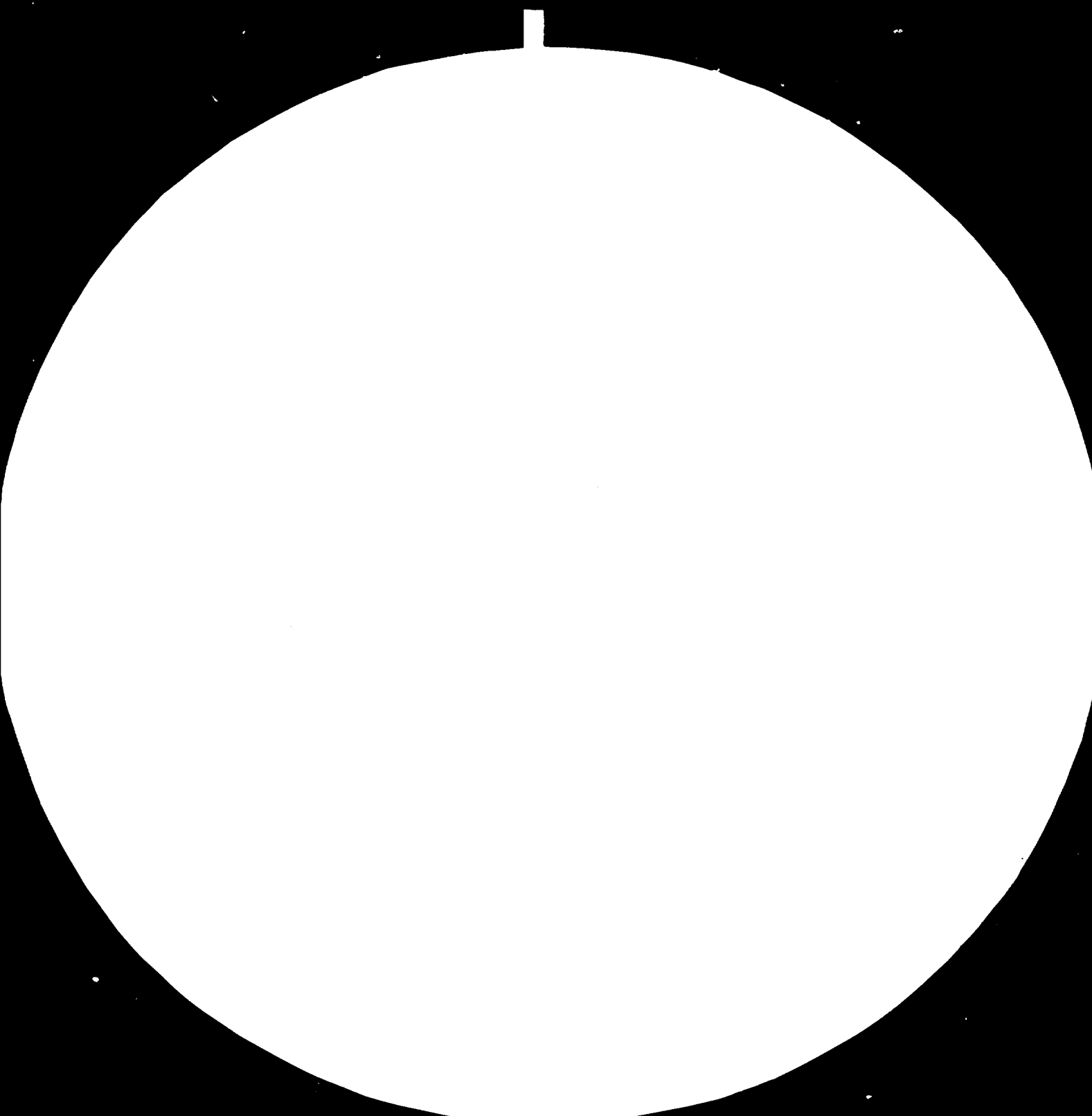
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Egypt.
REVIEW OF LOCAL MANUFACTURING CAPABILITIES FOR SPARE-PARTS
AND EQUIPMENT FOR THE OILS AND FATS INDUSTRY)
IN THE ARAB REPUBLIC OF EGYPT

US/INT/78/073

TERMINAL REPORT*

Prepared for the Government of the Arab Republic of Egypt
by the United Nations Industrial Development Organization

Based on the work of M. Varnakulasingam, Expert in Oilseed
and Vegetable Oil Processing Industry

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I. SUMMARY

1.01 There are seven public sector companies in Egypt involved in vegetable oil production. The total amount of vegetable oils produced locally is about 100,000 tons per year. In 1980, 286,000 tons (in oil equivalent) of oilseeds and oils were imported from abroad. These companies are also involved in the production of cooking oils, shortening (Ghee), soaps and detergents.

1.02 The technology applied for oil production, oil refining, (includes refining, bleaching, hardening and deodourization), soap making, margarine production and detergents have been recently up-graded to most modern continuous plants and equipment. In some factories, particularly, for oil production, combination of both old processes for pre-pressing followed by modern solvent extraction process is used. The modern plants and equipment that are widely used in Egypt are imported from the following overseas manufacturers/suppliers.

(i) Oil Extraction (solvent process)

- (a) Extraction De Smet S.A. of Belgium
- (b) Lurgi Apparate - Technik GmbH of West Germany
- (c) Speichim of France

(ii) Oil Refining (refining, hardening and deodourization)

- (a) Alfa-Laval of Sweden
- (b) Construzioni Meccaniche Bernardini, S.P.A. of Italy
- (c) Davy Bamag of West Germany
- (d) EMI Corporation of U.S.A.
- (e) Gianazza F.L.L.i. S.P.A. of Italy

(iii) Margarine Production

(a) Johnson and Co. of England

(iv) Soap Production

(a) Alfa-Laval of Sweden

(b) Meccaniche - Moderne of Italy

(c) Mazzoni S.P.A. of Italy

(d) Weber und Seelander of West Germany

(v) Detergents

(a) Ballestra Group of Italy

(b) Meccaniche Moderne of Italy

(vi) Boilers

(a) Baumgarte of West Germany

(b) Babkoc of West Germany

1.03 In factories where combination of both old and modern technology are used, 60 - 70 per cent of the spare parts required are imported from abroad. Factories, where modern technology is used, 85 - 90 per cent of the spare parts are imported. The high percentage of imports is understandable considering the high technology required for making spare parts for modern plants locally. Majority of the modern plants and equipment are closed units and the engineering drawings and the specifications for the spare parts are not available to the local workshops. The manufacturers and suppliers in most cases are internationally reputed and have been dedicated to continually improving equipment and processes to meet the challenges of the vegetable oil industry with service, dependability and imaginative engineering. Millions of dollars have been spent on continued research and development. It is most unlikely these manufacturers will transfer the technology overnight.

- 1.04 In the case spare parts for out-dated plants and equipment (these are machines already discarded by the foreign manufacturers), majority of them are locally fabricated. Spare parts that cannot be locally fabricated for quality reasons are usually accepted by the foreign manufacturers as special order and hence making them are more costly. Sometimes the price is five times higher than that of locally made.
- 1.05 The local engineering workshops both in the public and private sector are capable of fabricating spare parts locally. The workshop in Tanta, which belongs to the public sector - Tanta Oil and Soap Co. have the necessary facilities for fabricating spare parts. The major constraints faced by this company are as follows:
- (i) lack of specifications and designs for some of high precision spare parts;
 - (ii) lack of technological know-how on heat treatment;
 - (iii) inadequate quality control;
 - (iv) relatively high production cost, due to low output by the workers and under-utilization of production capacity;
 - (v) high turn over of skilled workers, due to low wages paid by the public sector companies, compared to the private sector.
- 1.06 In the field of fabrication of plants and equipment for the vegetable oil industry, Egypt has made impressive progress. Two major workshops namely: Nasr Boiler and Pressure Vessel Co. and Egyptian Company for Metallic Construction (Metalco) have been collaborating with foreign companies of international reputation, Lurgi of West Germany, De Smet of Belgium, Baumgarte of West Germany, and Babkoc of West Germany for local fabrication of some of their plants and equipment. In some

cases, particularly, boilers, are fabricated under licencing agreements and in others, 20 per cent of the plants and equipment for the vegetable oil industry are locally fabricated under the supervision of the parent company. The percentage of local fabrication is expected to increase as these companies gain experience. The major problems faced by these two companies are as follows:

- (i) lack of modern technology and shortage of skilled technicians, design engineers and welding engineers;
- (ii) high production cost due to under-utilization of production capacity;
- (iii) inadequate quality control in the production process.

1.07 To attract foreign capital and technology, the Government has promulgated Law No. 43 of 1974, which provides an incentive package for foreign investments and issues guarantees against nationalization, except under the due process of law. In 1976, Siemens' Ltd. of West Germany together with the West German Government collaborated (joint venture) with the Egyptian Government to produce locally electrical items of Siemens brand. The technology as well as training of local technicians and engineers were provided by the Siemens' Ltd. of West Germany.

1.08 Past experience has demonstrated the importance of the role that international technical co-operation can play in prompting engineering industries' growth. While shortage of capital has been singled out as one of the most important factors hindering industrialization, attention has been focussed in recent years on certain other factors such as lack of trained manpower. International technical assistance thus has played and will continue to play an important role in alleviating these basic shortages in Egypt.

CONCLUSIONS

- 1.09 The spare parts fabrication for the vegetable oil industry should not be isolated from other engineering industries. The relative importance of the engineering industries in Egypt may be assessed by the percentage share in the total manufacturing output, by their contribution to employment and by added value in the process of manufacture.

- 1.10 The patterns of development of engineering industries in Egypt is generally similar to that of the other developing countries. Minimal facilities for manufacture of agricultural implements and hardware items gradually gave way to the establishment of more sophisticated workshops for maintenance of imported machinery and equipment. Then followed a long period of development of skills in the use of imported tools and semi-processed materials, until a stage was reached at which components and complete units could be manufactured for agricultural, food processing, transport and construction purposes.

- 1.11 The next step was to set-up facilities for processing imported steel ingots into bars, sections, sheets and wire and ultimately for producing steel and other metals from indigenous raw materials. Egypt is one of the few developing countries, who have realized that their economic and industrial development can be improved by modern techniques. In the vegetable oil processing and further processing of vegetable oil sector, majority of the out-dated plants have been replaced with modern technological plants. In other words, Egypt has now reached a stage where the local workshops are beginning to develop their skills in repair/maintenance and fabrication for spare parts for sophisticated plants and equipment.

- 1.12 Egypt have in the past made use of offers from developed countries for exchanges of study and observation teams in engineering industries. The scope of such exchanges could usefully be extended to engineers and technicians involved in fabrication of spare parts, plants and equipment for the vegetable oil industry. It would be particularly valuable if arrangements could be made for trainees from the state-owned workshops such as Nasr Boiler and Pressure Vessel Co., Egyptian Company for Metalic Constructions (METALCO) and Tanta Oil and Soap Co. (Workshop), Tanta to receive in-plant training in some of the modern technological workshops of the vegetable oil plants and equipment manufacturers in the developed countries, such as De Smet of Belgium, Lurgi of Germany, Alfa Laval of Sweden, Meccaniche-Moderne and Mazzoni of Italy and Baumgarte and Babkoc of West Germany. This would provide them with all-round experience in some of the practical problems encountered in the establishment and operation of modern technological workshops.
- 1.13 In addition, it is suggested that engineers, technicians and managerial staff be given periodic refresher courses or advanced training to enable them to keep space with technological progress. The government may also consider establishing a technological information centre as part of the existing Metallurgical Research and Development Centre (established under special fund - UNDP/UNIDO project) for the purpose of collecting and distributing data and information on techniques, processes, materials, standardization and quality control.

RECOMMENDATIONS

1.14 The Government of Arab Republic of Egypt to consider sending a panel of four to six expert engineers, carefully selected from the existing public sector workshops (Nasr Boiler and Processor Vessels Co., METALCO, Tanta Oil and Soap Co.) private sector workshops and a representative from the Department of Local Fabrication, General Organisation for Industrialization, Ministry of Industry and Mineral Wealth to visit vegetable oil plants and equipment manufacturers in Germany, Belgium, Italy, France, England and U.S.A. to discuss the ways and means of further strengthening the existing co-operation between Egypt and the above mentioned developing countries in the field of local fabrication of plants, equipment and spare parts for the vegetable oil industry. The panel may consider the following problems for discussions.

- (a) training of local personnel in modern workshop technology
e.g. welding, materials testing, designs, foundry work, etc.
- (b) financial equity participation
- (c) licensing agreements
- (d) technical assistance
- (e) consultant services
- (f) a re-examination of international trade and investment policies.

For this purpose, Egypt may take advantage of the services rendered by UNIDO in developing co-operation programmes between developed and developing countries.

1.15 The Government of Arab Republic of Egypt to consider converting the existing workshop facilities at Tanta Oil and Soap Co. to a Central Workshop to fabricate spare-parts for the entire seven public sector companies involved in the

vegetable oil production. The main objective of this integrated approach is to reduce production cost through economies of scale, which comes from large scale production.

1.16 The Government of Arab Republic of Egypt request UNIDO to arrange for technical co-operation programme with Governments of Federal Republic of Germany, Italy, Belgium, France, England and United States of America for training of at least ten technical personnel from Egypt in the following fields:

- (i) modern welding technology;
- (ii) plant design;
- (iii) materials testing.

II. INTRODUCTION

PROJECT BACKGROUND

- 2.01 In course of further development of oils and fats industry in developing countries, UNIDO has noted that a considerable number of existing factories experience technical problems due to lack of spare parts. Replacement of worn out pieces of equipment in most cases dependent on imported spare parts from overseas manufacturers in the developed countries. Shortage of foreign exchange hardly permits relevant imports from developed countries and the local engineering industry lacks the manufacturing know-how and the required technical facilities.
- 2.02 When setting up new factories, similar difficulties are being experienced by industrialists in some developing countries. Machineries and equipment, which could easily be manufactured by the local engineering industry have to be imported, if the required know-how cannot be made available from suitable sources.
- 2.03 The efficient operation and further technical development and economic improvement of the oils and fats industry in developing countries also depends on the ability and capability of the local engineering industry to service it, maintain its technical standards and further expand it by new supplies of locally fabricated quality plants and equipment.
- 2.04 These problems were discussed in details among the representatives of developing and developed countries at the First UNIDO Consultation Meeting on the Oils and Fats Industry which resulted in a conclusion that co-operation programmes should be established between developed and developing countries in order to bring about the manufacture of essential factory components, spare parts, machinery and equipment in the developing countries.

2.05 In order to determine and outline the specific action required to be taken by all concerned in relevant developing countries, UNIDO is expected to under take an evaluation survey. Hence this study.

TERMS OF REFERENCE

2.06 The expert is specifically expected to:

- (i) visit several vegetable oil factories, review their technical capacities and determine the type of machinery, equipment, spare parts, piping, fittings, instruments etc. which have to be made available.
- (ii) Review new investments in the vegetable oil industries sector presently under execution or planned and determine these types of equipment, installation etc. which would be profitable to manufacture locally.
- (iii) Visit a number of local engineering workshops, review their organization, the existing manufacturing facilities and the available expertise and manufacturing know-how.
- (iv) Review the capability of the local engineering industry to develop new designs, study the available facilities and expertise in the preparation of construction plans, workshop and other drawings and comment on the engineering industry's capability to appropriately utilise relevant know-how received from partners abroad.
- (v) Review the local engineering industry's capability to carry out factory construction work from the civil engineering point of view and also their capability to carry out the installation of equipment and machinery, piping, wiring and other relevant technical and electrical installation work.

(vi) Draw conclusions from the studies and surveys as mentioned above and determine type of foreign assistance required and in what special fields in the order of priority with a view to enabling the local engineering industry to manufacture that equipment, machinery, spare parts and other installations required by the vegetable oil industry and to suitably maintain and service it.

2.07 The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the government on further action which might be taken. The expert conducted the study in Egypt from 24 January to 21 February 1982.

VEGETABLE OIL INDUSTRY IN EGYPT

2.08 Egypt produces mainly cottonseeds, soya beans and linseed, the more important being cottonseeds. The total amount of edible oils produced locally is about 100,000 tons per year. It is estimated that the production will increase to 125,000 tons in 1985, after improving the techniques of oil extraction and increasing the production of various locally cultivated oil seeds.

2.09 The consumption of edible oils in the Arab Republic of Egypt was 386,000 tons in 1980, and this is expected to increase to 900,000 tons by 1985. The increased demand will continue to be met by increased importation of oil seeds and oils, mainly soya beans, cottonseed and sunflower. The table below shows the local demand and supply projections for edible oils.

Year	Local supply (in tons)	Local consumption (in tons)	Demand/supply Gap	
			Quantity (in tons)	Value in millions US\$
1980	100,000	386,000	286,000	200
1984/85	125,000	900,000	775,000	542
1989/90	150,000	1,350,000	1,200,000	840
1994/95	150,000	1,800,000	1,650,000	1,155
1999/2000	150,000	2,250,000	2,100,000	1,470

Source: Industrial Investment Opportunities in Egypt
Ministry of Industry and Mineral Wealth, July 1981

2.10 In order to process increased quantity of imported oilseeds, urgent studies have been conducted by a National Committee of the Ministry of Industry. The committee recommended the following projects:

Project	Total Investment (in millions L.E)			Production of full capacity in tons	
	Total	Local	Foreign	Type of product	Quantity
1. Oil Extraction (sunflower) seeds 300,000 tons	50	15	35	Edible oils and Hydrogenated	120
2. Two similar units (1.2) million tons of seed	180	60	120	Animal feed	480,000
3. Two units (soya beans) 900,000 tons beans	188	56	132	Poultry feed	140,000
4. One unit (sunflower) 600,000 tons seeds	90	30	60	Vegetable protein	240,000
5. Nine hydrogenation units each of 20,000 tons capacity	18	5.4	12.6	Hydrogenated oils	180,000

Source: Industrial Investment Opportunities in Egypt, Ministry of Industry and Mineral Wealth, July 1981.

- 2.11 The total production of laundry and toilet soaps in 1980 was 250,000 tons. The demand in 1980 was 268,000 tons. It is expected that by 1984/85, the production will increase to 310,000 tons and the estimated demand will be 540,000 tons. In order to bridge the gap between demand and supply, the Government under National Plan for the year 2,000 has planned to establish seven units to produce laundry soap, the capacity of each unit will be 15,000 tons annually. In the case of toilet soap, nine new units have been planned, the capacity of each unit would be approximately 9,000 tons per years.
- 2.12 The funds for implementation of these projects will come through loans, grants or joint ventures.
- 2.13 Presently, there are seven public sector companies involved in vegetable oil and soap production in Egypt. The names and location of these companies are as follows:
- (i) Misr Oil and Soap Co., Cairo
 - (ii) El Nile Oil and Soap Co., Cairo
 - (iii) Cairo Soap and Oil Co., Cairo
 - (iv) Tanta Oil and Soap Co., Tanta
 - (v) The Egyptian Salt and Soda Co., Alexandria
 - (vi) Alexandria Oil and Soap Co., Alexandria
 - (vii) Extracted Oils Co., Alexandria

The technology applied for oil production is the solvent extraction process. In most cases, the old presses have been replaced with solvent extraction recently. In some plants, combination of pre-pressing followed by solvent extraction is applied.

III. VISIT TO VEGETABLE OIL PROCESSING INDUSTRY

3.01 To determine the spare parts requirements of the vegetable oil processing industry and required scope for repair of plants and equipment, seven industries in Cairo, Tanta and Alexandria have been visited. The details of the existing public sector industries are as follows:

EL NILE OIL AND SOAP CO., CAIRO

3.02 This is a public sector, company. Before nationalization in 1963, this company was run as a private sector under the name Universal Co. (a subsidiary of Unilever Ltd., England). The company consist of four plants, involved in oil extraction by solvent process, hydrogenation of oils for shortenings and margarines, soap production, synthetic detergents manufacture and cattle feed production. The installed capacity of the various production lines and their plant origin are as follows.

Processing unit	Installed capacity per annum (tons)	Plant and equipment origin	Remarks
1. Solvent Extraction	60,000 (cottonseed)	De Smet Belgium and Spain	Technology of oil extraction up-graded from mechanical pressing to solvent extraction in recent years
2. Hydrogenation-deodorization	12,000	Gianazza F.LLi, S.P.A., Legnano, Italy	Continuous operation
3. Soaps	23,000 (15,000 tons laundry soap plus 8,000 tons toilet soap)	Mazzoni S.P.A., Italy. Meccaniche Mederne, Italy. Lurgi, West Germany	Continuous operation
4. Synthetic detergents	10,000	Ballestra Group of Italy, Milano	Plant capacity expected to increase to 20,000 tons per year by middle of 1982.
5. Cattle Feed	12,000	Presses from Jakober and Cie, Austria and all other plants and equipment locally fabricated.	

- 3.03 The total investment in the expansion programme for the production of synthetic detergents at Nile Oil and Soap Co. is LE. 5.239 millions, of which L.E. 2.932 millions is foreign component. When the project is completed, it is expected that at least L.E. 2.685 millions worth of detergents will be exported.

SPARE PARTS PROCUREMENT, MAINTENANCE AND WORKSHOP FACILITIES

- 3.04 Presently, approximately 70 per cent of the spare parts required for their plants and equipment are imported from abroad. The remaining 30 per cent are locally obtained either from local spare part shops or made to order from private workshops in Cairo. The company workshops are used purely for plant maintenance purpose only.
- 3.05 Since latest technologies are used for oil extraction, hardening, refining, deodourization, soap making and animal feed manufacture; the majority of plants and equipments are of recent origin. These plants are constructed by the manufacturers as a result of many years of research, development and experience, hence the manufacturers may not transfer the technology for manufacturing spare parts locally. All the newly built plants are delivered complete large scale plants beginning with the projections and ending with the handing over of the turn-key plant.
- 3.06 Every year, approximately 1.5 million Egyptian pounds is required for purchase of spare parts, of which approximately 1 million Egyptian pounds worth of spare parts are imported from abroad. Remaining 500,000 Egyptian pounds worth of spare parts are locally purchased, either from local private spare part shops or made to order locally.

MISR OIL AND SOAP CO., CAIRO

- 3.07 The Misr Oil and Soap Co., Cairo has six plants involved in oil extraction by solvent process from cottonseed and rice bran, manufacture of cooking oil and shortening (Ghee), soaps, glycerine, cattle feed and detergents. Except for glycerine, all other products manufactured by this company is for local consumption. Approximately, 300 - 400 tons of crude glycerine (83 to 85 per cent) are exported per annum.
- 3.08 The oil extraction section consists of two solvent extraction plants, each with a capacity of 200 tons of cottonseed per day. One unit was imported from De Smet, Belgium as a turn-key project four years ago. The other unit presently under construction is also from De Smet and is expected to be completed and made operational by end 1982.
- 3.09 The workshops in these factories are small and used only for plant maintenance. According to the Head of the Engineering Department, the company has no problems in spare parts importation or procuring them locally. The private workshops are competent to make any type of spare parts, provided the engineering drawings of the spare parts are given to them. Even some of the company's maintenance work are entrusted to the private sector as they are more efficient and experienced.

CAIRO OIL AND SOAP CO., CAIRO

- 3.10 The Cairo Oil and Soap Co. has six plants involved in oil extraction, oil refining, soap making, glycerine production and animal feed. A total of about 2,000 workers are employed by these six plants.
- 3.11 Five years ago, the technology for producing vegetable oil was up-graded from mechanical pressing to solvent extraction. The present capacity of the solvent extraction plant is 200 tons of cottonseed per day. The company has planned for another solvent extraction unit of 200 tons of cottonseed/day

and it is expected that the plant will be in operation by mid 1983. The existing plant was imported from Stange Europe S.A. of France. The new plant is expected to come from De Smet of Belgium. The refining plants continuous, hardening and deodourization were imported from Construzioni Meccaniche Bernardini S.P.A. of Italy.

- 3.12 According to the chief of the Production Department, approximately, 50 per cent of the spare parts required are imported from abroad, the remaining 50 per cent locally purchased or made to order from local private workshops. Estimated amount spent on spare parts last year was 500,000 Egyptian pounds. The companies' workshops are used purely for plant maintenance purpose and not for making spare parts.

TANTA OIL AND SOAP CO., TANTA

- 3.13 Tanta Oil and Soap Co, consist of five factories involved in vegetable oil production, (cottonseed and rice bran oil), soap production, cooking oil, shortening (Ghee), animal feed, and glycerine (both crude and refined).
- 3.14 Three years ago, a solvent extraction plant (imported from De Smet of Belgium) was added to the mechanical processing units. Presently, the pre-pressed oilseeds are solvent extracted. The present capacity of combined mechanical pressing/solvent extraction is 200 tons of cottonseed per day. The solvent extraction plant for rice bran was imported from Lurgi of West Germany.
- 3.15 Oil refining, hardening and deodourization are mostly done by batch process and recently one continuous refining unit was installed in one of the factories. The capacity of the soap production units is 115 - 120 tons/day (100 tons laundry soap plus 15 - 20 tons toilet soap/day). Plants for toilet

soap manufacture was imported from G. Mazzoni, S.P.A. of Italy and Meccaniche Moderne of Italy. The laundry soap plants were imported from Weber and Seelander of Germany. The animal feed plants and equipment were locally fabricated, except the presses. The glycerine plants (both for crude 82 - 85 per cent and 99.5 per cent glycerine) were locally fabricated.

PROCUREMENT OF SPARE PARTS AND WORKSHOP FACILITIES

- 3.16 The company has a central workshop in Tanta with a total of 300 employees. The workshop is well equipped with modern technological workshop, including a Foundry and Design Department. Presently, 70 per cent of the spare parts required are made in their workshop and the remaining 30 per cent imported from abroad at an average cost of 70,000 Egyptian pounds per year.
- 3.17 The workshop have provisions for working castings, fabrication of various vessels for refineries, production of heat treated gears, bolts, screws, nuts, for electroplating, chrome plating, nickel/copper plating and steeling. In addition company has a training programme for workers both electrical and mechanical type of work. This includes turners, shaperman, drillers, welders, mullers, fitters, blacksmith, hammerman, helpers and other skilled workers. Every year 100 workers are given training and they are paid L.E. 10 per month. According to the company management, the turn-over of trained workers are high due to the low wages paid by the public sector companies. The experienced workers prefer to join the private sector, where wages are attractive.

3.18 It is claimed that the spare parts fabricated in the company's workshop is 15 per cent cheaper than the imported items and 50 per cent cheaper than purchasing locally (i.e. spare parts fabricated and sold by private workshops).

MAJOR CONSTRAINTS

3.19 MATERIALS USED FOR SPARE PARTS

Due to lack of technical know-how on the type of materials to be used for spare parts fabrication, the life expectancy of the spare parts made in the company's workshop is invariably much shorter than imported items in some cases. The information on the material to be used is also not available to the workshop engineers.

3.20 HEAT TREATMENT TECHNOLOGY

Technology for heat treatment of various spare parts are also not available to the workshop engineers.

3.21 SPECIFICATIONS

Spare parts specifications and drawings of some of the precision components are also not available. The suppliers or manufacturers of plants and equipment from overseas are reluctant to pass this information to the workshop engineers.

3.22 THE EGYPTIAN SALT AND SODA CO., ALEXANDRIA

This company has three factories in Alexandria, one in El Kafer El Rayat, one in Mohrram Bey and the other in Gambory. The factory in El Kafer El Rayat is involved in cottonseed oil, soaps and cattle feed production. The cottonseed oil produced using a hydraulic presses for pre-processing (90 years old), followed by solvent extraction using plant from De Smet of Belgium (30 years old). Laundry soap plant was imported

30 years ago from Chambers and Fargins, Hull, England with a capacity of 3 tons per hour. The toilet soap plant was erected 3 years ago and the plant was imported from Meccaniche Moderne of Italy.

- 3.23 The plant in Mohrram Bey is involved mainly in refining of oils for salad oil, shortening, canning and candle light making. The refining plant has a capacity of 200 tons per day (batch process) and the plant was originally imported from Pennwalt Ltd., England. The plant in addition to refining cottonseed oil, refines soyabean oil and sunflower oil. New plants for continuous refining, hardening and de-odourization is now under erection. The plants are from Costruzioni Meccaniche Bernardini of Italy. The hydrogen production cells are imported from Davy Bmag GmbH of Federal Republic of Germany.
- 3.24 The plant in Gambory has similar make plants as in El Kafer El Rayat, but with production capacity almost one-third. The total number of workers employed in these three factories is 6,000, of which about 500 skilled and unskilled workers are employed by the workshops for making spare parts and maintenance. Annually, about 2 million Egyptian pounds worth of spare parts are purchased, of which 90 per cent are imported from abroad.
- 3.25 ALEXANDRIA OIL AND SOAP CO., CAIRO
This company consist of seven factories in Alexandria. Presently, they are involved in vegetable oil extraction for salad oils and shortening, soaps, glycerine (both crude 82 - 85 per cent and pure glycerine), cheese and margarines. This is the only public sector company presently involved in margarine manufacture for pastry and bakery. The table margarine production is expected to commence by end 1982.

3.26 The capacity and origin of various plants and equipment are as follows:

Processing	Capacity	Plant and equipment origin	Remarks
1. <u>Oil production</u> Hydraulic presses are used for pre-pressing followed by solvent extraction.	200 tons/day for cottonseed 50-60 tons per day for rice bran.	2 solvent extraction plants for cottonseed, imported from Speichim of France. Plant for rice bran imported from Lurgi of Germany	The present running capacity of all three plants is 200 tons per day.
2. <u>Oil refining</u>			
(a) <u>continuous refining</u>	4 units of capacity (i) 40 t/day (ii) 150 t/day (iii) 300 t/day (iv) 40tons/day	Alfa Laval of Sweden Alfa Laval of Sweden Construzioni Meccaniche Bernardini S.P.A., Italy	Cottonseed, soyabean and sunflower oils are refined (sunflower oil is imported).
(b) <u>hydrogenation units (continuous)</u>	80 t/days to be increased to 150 t/day	Davy Bamag of Germany and EMI Corporation of USA	It is claimed that the plant when completed will be the biggest in the Middle East.
(c) <u>deodorization (continuous)</u>	approx. 500 tons/day. 3 units under construction two for Ghee production (shortening) one for salad oil.	Construzioni Meccaniche Bernardini S.P.A., Italy	--
(d) <u>Soaps</u>			
(i) <u>laundry soap</u>	150 t/day	Saponification unit from Alfa Laval and other units from Meccaniche Moderne, Italy.	--
(ii) <u>toilet soap</u>	30 tons/day	Meccaniche Moderne of Italy and Weber and Seelander of Germany.	--
(e) <u>Margarines</u>	20 tons/day	Johnson and Co. Ltd., U.K.	Presently manufacturing pastry and bakery margarine. Table margarine manufacture will commence by end 1982.
(f) <u>Detergents</u>	15,000 t/year	Meccaniche Moderne, Italy.	
(g) <u>Caustic soda</u>	45 t/day	Machineries imported from U.S.A.	Plant was established in 1948.

3.26 Every year 2 - 3 million Egyptian pounds worth of spare parts are purchased of which approximately, 50 per cent is imported from abroad. All the seven factories have individual workshops which are used both for turning out spare parts as well as for plant maintenance. The biggest workshop is located in Alexandria

3.27 EXTRACTED OILS CO., ALEXANDRIA

Extracted Oils Co. consist of seven factories and involved in vegetable oil production, soaps, salad oils, shortening (Ghee) and cattle feed. Approximately, 150 skilled and unskilled workers are involved in the seven factories' workshops, purely for maintenance work. No spare parts are fabricated in any one of these factories.

3.28 There are two solvent extraction units, one imported from De Smet at Belgium with a capacity of 300 tons of cottonseed per day. The other from Lurgi of West Germany, with a capacity of 60 tons per day. The soap plants were imported from G. Mazzoni S.P.A. and Meccaniche Moderne of Italy.

3.29 FUTURE INVESTMENT PLANS IN VEGETABLE OIL INDUSTRY

In order to meet the rising domestic demand for vegetable oil, Egypt had to import oilseeds and oils. In 1980, the total amount of edible oils produced locally was about 100,000 tons and the consumption was 386,000 tons. The deficit of 286,000 tons was met by imports at a cost of 200 million US dollars. It is projected that the shortage will continue to rise, due to acute shortage of locally produced oilseeds. By 1984/85, the estimated deficit will be 775,000 tons and will reach 1,200,000 tons by 1989/90. In order to meet the deficit, the government has decided to increase the existing capacities of the vegetable oil plants to produce oil from imported oil seeds. The future investment plans are given in item 2.10.

CONCLUSIONS

- 3.30 The vegetable oil industry (which includes oil extraction for edible, soaps and margarines) in Egypt is relatively large. The technology of oil extraction, soap making and margarine production in all seven public sector companies visited have been recently up-graded. In some companies, the old mechanical presses are used for pre-pressing followed by solvent extraction.
- 3.31 In factories, where modern solvent extraction units are used, almost 85 - 90 per cent of the spare parts required are imported from abroad. This situation will also continue in the future, due to lack of technical know-how for local fabrication. The know-how is limited in the following fields.
- (i) lack of engineering drawings for the spare-parts;
 - (ii) technology of heat treatment;
 - (iii) materials specification.
- 3.32 Majority of the modern plants and equipment for the vegetable oil industry are closed units, developed by overseas manufacturers/suppliers through many years of research. It is most unlikely that the overseas manufacturers and suppliers will transfer the technology overnight. From the past pattern of development of engineering industries, Egyptian engineers and technicians are developing their own skills through international co-operation. This includes licensing agreements, technical assistance and consultant service.

3.33 Even if the technology is made available to Egypt, there are many other constraints to overcome. There are as follows:

- (i) lack of skilled workers (workshop), to replace the retiring skilled workers or those resigned to take up positions in the private sector or migrated to neighbouring Arab countries, where salaries and incentives paid are attractive. In this respect continued on the job training is required for new recruits;
- (ii) Needs additional investment on modern technological machines for fabricating spare parts. Need for a techno-economic feasibility study;
- (iii) dependence on imports of the essential raw materials;
- (iv) relatively high production costs. To reduce production unit cost to a competitive level through economies of scale, which comes from large-scale production, setting-up a large Central Workshop to be considered. The policy should, therefore, aim towards the establishment of an integrated Central Workshop. Since Tanta Oil and Soap Co. in Tanta have a large workshop and have considerable experience in fabrication of spare parts for the vegetable oil industry, consideration should be given for converting this to a Central Integrated Workshop.

IV. SOME IMPORTANT ASPECTS OF REPAIR AND MAINTENANCE

- 4.01 The preventive maintenance system for industrial plants and equipment exists in all developed countries. Plants and equipment is the techno-economic potential and vital part of a company's or industrial concerns' main function. In this connection, engineers, technicians and workers play a vital role in the equipment proper operation and its longer life.
- 4.02 Proper operation of plants and equipment results in lower maintenance cost and bigger out-put. During operation machines loose their working capacity, because of wear and tear of some parts, resulting in poor precision, smaller capacity or productivity. The recovery of these important qualities is effected through repairs, replacement of worn out parts and adjustment of mechanisms.
- 4.03 The preventive maintenance system consists of preventive inspection and planned repairs. It can be minor repairs, medium repairs or capital repairs.
- (a) Minor repairs: This is a kind of planned repair maintaining the normal operation of a unit (up to the next planned repair) by replacement or restoration of worn-out parts and adjustment of mechanisms;
 - (b) Medium repairs: It is also a kind of planned repair responsible for part dismantling of the unit, overhaul of some mechanisms, replacement and recovery of main worn-out parts, assembly, adjustment and load test.
 - (c) Capital repair: Here the work involves full dismantling of a unit, replacement of worn-out parts and mechanisms, repair of base and other parts and mechanisms, assembly, adjustment and load test of units.

The last type is the emergency repair, which is caused by accidental break-down of equipment or not envisaged by the annual repair plan. With the efficient preventive maintenance system, this repair should take place very rarely.

4.04 The time and sequence of above repairs are determined depending on type of machine, its design size and operation duty. The preventive maintenance of equipment reduces its wear and tear, prevents accidental break-downs and facilitates timely fulfilment of repair maintenance works.

4.05 In between the above repairs, the plants and equipments need attendance. This attendance covers observations of plants and equipment operating conditions given by the manufacturers, especially for control gear, protective guards and oiling devices and also duly removal of minor defects and adjustment of mechanisms. This repair/attendance is carried out by workers responsible for the units and by shift duty personnel such as fitters, electricians, oilers, etc. during interruptions in a unit operation without disturbance of production process.

4.06 PLANS FOR REPAIR AND MAINTENANCE

Plans includes compilation of typical flow charts of assembly and dismantling of aggregates, fabrication or procurement of most complex parts and drawing up a defects sheet. The latter is a master sheet which must be made up in capital repair and also in medium repair with over a year period. This sheet is drawn up by a repair foreman. The preliminary defects sheet is made up 2 - 3 month before shut-down of plants and equipment for repair during a planned inspection. The master sheet is finalized during the dismantling of plants and equip-

ment for capital and medium repairs. The preparation work include timely procurement or fabrication of spare parts to replace the worn-out ones, supply of tools and devices, materials and purchased items. The stock of parts in the store should be adequate to do all kinds of plants and equipment repair and maintenance.

4.07 WORKSHOP FOR MANUFACTURE OF SPARE-PARTS

The workshop for fabrication of spare-parts should be equipped with series of modern technological machineries to make wide nomenclature of parts in small batches. The workshop should have provisions for working castings, some of which could be made from other local workshops for fabrication of various vessels for refineries, production of heat treated gears, bolts, screw, nuts, for electro-plating, chrome plating, nickel, copper plating and steeling. In addition, the workshop should have provision for fabrication of small parts for various apparatus and repair of electrical motors and electrical devices.

In order to cater the above needs, the workshop should have the following sections:

- (i) Foundry:
- (ii) Pattern:
- (iii) Mechanical Assembly;
- (iv) Boiler welding;
- (v) Forging and heat treatment:
- (vi) Corrosion prevention:
- (vii) Tool room
- (viii) Grinding
- (ix) Gear cutting
- (x) Galvanic
- (xi) Small parts fabrication
- (xii) Electrical repair workshop

- 4.08 Above all there should be at least 30 skilled foremen and workers available ranging from workshop foreman, charge-hand, turners, shaperman, drillers, welders, millers, felters, blacksmith, hammer man, helpers and unskilled labour.
- 4.09 Lastly the list of vital spare parts needed and their drawings to be made available to the workshop.

4.10 PRESENT SYSTEM OF SPARE PARTS PROCUREMENT FOR THE VEGETABLE OIL INDUSTRY

Based on the visits made to seven public sector companies involved in vegetable oil production and vegetable oil based industries in Egypt, their plants and equipment, which need spare parts can be categorized into two.

(i) Out-dated machines/equipment

These are machineries/equipment already discarded by the foreign manufacturers or suppliers who have already stopped manufacturing. About 99 per cent of the spare parts required for these machines/equipment are locally made either at the company workshops or made to order from local private workshops. The remaining 10 per cent are imported from abroad. These spare parts imports are usually accepted as special order by overseas suppliers and making them are more costly, due to small volume.

(ii) Modern technological plants/equipment

These are manufacturers, who have been dedicated to continually improving equipment and processes to meet the challenges of the vegetable oil industry with service, dependability and imaginative engineering. Large amounts of money are spent every year on continued research and development for further improvement. Majority of the modern processing plants are closed units and hence the technology of making spare parts are not readily available to every one. Therefore, the spare parts have to be imported from plants and equipment suppliers.

4.11 The present system for ordering spare parts from abroad is on a yearly basis for usual spare parts. Spare parts that are urgently required due to unexpected breakdowns are either borrowed from other public sector companies or purchased locally from private spare parts importers or airlifted from overseas. Usually, it takes between 6 to 16 months from the time an order is placed to the time spare parts are actually received. In some instances, where spare parts are available in stock with the overseas manufacturers and suppliers and there is no delay in allocating foreign exchange by the government, the time taken to receive the spare parts may be short as 3 - 5 months. The usual delay may be distributed as follows:

(i) Quotation: 1 - 3 months

Spare parts for modern plants and equipment from overseas takes approximately 1 to 2 months to receive firm quotation. Other spare parts for out-dated plants are usually open for tenders from overseas manufacturers. This takes about 3 months to finalize.

(ii) Clearance by department for local manufacture: 2 weeks to 1 month

Any spare parts to be imported should be cleared by the Department for Local Manufacture to ensure that no spare parts or equipment/plants that could be locally fabricated are imported. The maximum delay under exceptional circumstances would be one month.

(iii) Letter of credit: 1 - 6 months

Foreign exchange is allocated on a priority basis. If foreign exchange is readily available, the delay may be maximum one month. There are instances where the delay is up to six months.

(iv) Manufacture of parts, packing and final delivery
to factory site: 3 - 6 months

After Letter of Credit has been opened, 3 - 6 months time is required for the manufacture of spare parts, packing, transportation by sea, customs inspection and clearance, and final delivery to the factory site. In some cases, Government prefer to transport via Egyptian vessels, where the awaiting time for shipment is longer. The delay can be six months or even more.

- 4.12 In almost all companies visited, it was claimed that they have well planned preventive maintenance system, thereby wear and tear is reduced. Majority of these companies have not faced any difficulties in procuring spare parts in the past or plants were shut down due to lack of spare parts. In most places, stocks of spare parts to last for one to one and a half years are maintained.

V. LOCAL ENGINEERING INDUSTRIES

- 5.01 The major engineering industries in Egypt belongs to the public sector and managed by the General Organization for Industrialization of the Ministry of Industry. The industries in Egypt consist of three main sectors namely: public sector, private sector and joint venture sector. While the private sector industry consists of smaller units and produces markedly less than public sector industry, it plays an important role in industrial employment. Small firms are mostly involved in fabrication of minor machine parts, as repair shops, and wide range of consumer goods. The public sector is involved in manufactured engineering products such as vehicles, refrigerators, television sets, metallurgical and building materials.

Some of the products manufactured by the public sector companies range from all types of steel structures for construction industry, tanks, plants and equipment for chemical, food textile and other light industries. Screw conveyors, silos, platforms, overhead cranes, barrel plugs, utensils from enamelled steel sheets, spare parts for automotives, ship building and repairs, production of disc brake pads and brake linings, screw and nuts, tin cans all types of electrical items (Siemens brand), lamp bulbs, coloured televisions, etc. Under joint venture scheme plans have been made to manufacture all popular types of centrifugal pumps, cold coiled helical springs (automatic parts), exhaust systems (automotive parts) and shock absorbers (automotive parts).

5.02 The integrated iron and steel plant at Helwan is involved in production of steel ingots into bars, sections, sheets and wire and also other iron and steel raw materials for the engineering industries. Plans have already been made for making steel reinforcing bars and rods, speciality steel plant for the production of bars, sections, high carbon, spring, low alloy, and free cutting steels and steel wires for pre-stressed concrete and other uses; tin plated steel, seamless pipes, high pressure steel valves, washing machines and refrigerators, shaving razors, medium size motor-cycles, manufacture of bus bodies, production of heavy equipment for cement, sugar and other engineering industries, agricultural tractors, passenger cars (Fiat), assembly of trailers, passenger coaches, production of lead and batteries and other capital equipments. All these projects are planned as joint venture projects for domestic and export markets.

- 5.03 In Cairo, Alexandria and Tanta, small workshops have been established for production of spare parts and repair of machineries used in industry, construction and agriculture. According to some of the public sector companies in Cairo and Alexandria, the services rendered by the small workshops are very satisfactory. These public sector companies prefer to utilize the services of the private workshops, rather than expanding their own workshops for manufacturing spare parts and maintenance.
- 5.04 The large engineering workshops in Egypt is run by the Government. By world standards, they are small. However, well established and diversified. In recent years, with the experience gained in the last 10 to 15 years, the industrial emphasis shifted from subsistence industries producing food, clothing and other consumer goods to engineering industries manufacturing industrial and farm machinery, electrical goods, construction and transport equipment and miscellaneous metal products. The present emphasis in Egypt is to develop engineering industries in collaboration with foreign companies. Some features of the progress made and plans for developing them are described below, based on visits made to few public and private sector workshops.
- 5.03 NASR BOILER AND PRESSURE VESSEL CO., CAIRO
This is a public sector workshop specializes in making all types of boilers and pressure vessels. Total of 1,000 skilled and unskilled workers are employed in this company. They are involved in the manufacture of boilers, heat exchangers, pressure vessels, super-heaters, autoclaves, economizers, deodourizers, neutralizers, hardening vessels etc. for the local industry on request. The materials used for the construction are partly obtained locally and partly imported from abroad. Usually, the design and materials specifications are given by the party requesting the order or by the foreign company.

- 5.04 The Nasr Boiler and Pressure Vessel is manufacturing under licence boilers for two well known boiler manufacturers from Germany, namely: (i) Baumgarte of West Germany. (ii) Babkoc of West Germany. The design and materials specifications are given by the German companies. In the past, this company has made some pressure vessels for Lurgi-Apparate-Technik GmbH of West Germany and Extraction De Smet S.A. of Belgium.
- 5.05 The Government propose to establish two new solvent extraction plants. Tenders were invited from Lurgi and De Smet. Both these companies have agreed to fabricate 20 per cent of the plants and equipment locally at the Nasr Boiler and Pressure Vessel Co. Final decision has not been made yet.
- 5.06 The workshop has all the necessary modern technological equipment including x-ray welding and ultrasonic x-ray plate quality control. The major draw-back of the company is the high turn-over of trained technicians and the lack of competent design engineers. The workshop lack modern technology in welding; which is very important, particularly for a workshop involved in fabrication of boilers and pressure vessels.
- 5.07 EGYPTIAN CO. FOR METALLIC CONSTRUCTION (METALCO)
The Metalco is a public sector company involved in construction work. They are also involved in the fabrication of all types of steel structures, tower/overhead cranes, bridges, tanks, screw conveyors, silos, bunkers, platforms, bucket elevators and plants and equipment for overseas companies according to their designs and specifications.

5.08 At the time of the visit, the workshop was making some plants and equipment for a Phosphoric Acid project to be set up in Egypt, according to designs and specifications given by Lurgi of England. In the past they have fabricated some plants and equipment for cement industry, according to designs and specifications given by an American Company, fuel tanks for Egyptian army and railway and cranes for a German company. Also, some plants and equipment for the vegetable oil industry according to designs and specifications given by Lurgi of Germany and De Smet of Belgium.

5.09 Because of high turn-over of trained technicians, particularly, welders, the company run a training course for welders. In the past ten workshop engineers were sent for advanced training in Germany. A total of 1,000 skilled and unskilled workers, 20 workshop engineers and 25 design engineers are employed by this company.

5.10 EGYPTIAN ELECTRICAL MANUFACTURING CO. (EGEMAC)

The EGEMAC is a public sector joint venture company with the Government of West Germany and Siemens Co. of West Germany as partners. The share participation are as follows:

Egyptian Governemnt	49 per cent
W. German Government	20 per cent
Siemens Co. of W. Germany	31 per cent

The company was formed in 1976/77 and run as a commercial oriented private sector company. (unlike other public sector companies subsidised by the Government).

5.11 The company is involved in the manufacture of medium and low voltage transformers, switch gears, insulators and steel structure (towers). Medium and low voltage wire, cables, transformers, insulators, switch gears and condensers, meters, switches and so on. The technology for the manufacture comes from Siemens of W. Germany.

5.12 OTHER PUBLIC SECTOR WORKSHOPS

There are two other public sector workshops involved in plants and equipment manufacture such as the Sugar Co. Workshop, Helwan and Ferro-metalco were not visited.

5.13 PROBLEMS OF THE ENGINEERING INDUSTRIES

The problems of the engineering industries in Egypt are generally similar to those of the other developing countries. The installed capacity of some of the public sector and private workshops has exceeded domestic market. Because of under-utilization, particularly in the public sector, production costs are high. The surplus capacity can only be absorbed by export demand.

5.14 There are other limiting factors and problems facing the engineering industries as a whole:

- (i) high production cost and inadequate quality control in the production process.
- (ii) lack of continuity of the supply of some materials, particularly semi-finished steel products; and shortage of foreign exchange for the purchase of those materials.
- (iii) inadequate financial resources in the small-scale manufacturing sector.
- (iv) lack of modern technology and shortage of skilled technicians and design engineers, particularly in the public sector.

5.15 CONCLUSIONS

The growth rate of engineering industries for local fabrication of plants, equipment and spare parts in Egypt is relatively higher than in other developing countries. The government has given top priority for local manufacture and has set-up a separate department called "Department of Local Manufacture", which is part of the General Organization for

Industrialization, under the Ministry of Industry. The factors that inhibit further development of the local manufacturing sector are as follows:

- (i) limitations in local market
- (ii) technology: such as materials specifications, designs, heat treatment, welding etc.

Past experience has also demonstrated the importance of the role that international technical co-operation can play in prompting further growth in engineering industries. While shortage of capital has been singled out as one of the most important factors hindering further development, attention has been focussed in recent years on certain other factors such as lack of trained man-power. International technical assistance thus has played and will continue to play an important role in alleviating these basic shortages.

5.16 The private engineering workshops/industries have been in existence in Egypt for a long time. Initially, these workshops started as repair workshops for machineries used in industry, construction and agriculture. Most of the workshops have not only expanded, but also diversified production. This is because of the incentives given by the government. With the recent adoption of the open door/liberalization policy, the Government has recognized the role that private investment, both domestic and foreign, can play, side by side with the public sector; in, inter alia, the industrial development of Egypt. There is now a widespread confidence among entrepreneurs that their investments will be treated under due process of law and protected from discretionary governmental actions.

5.17 To attract external capital and technology, the Government has promulgated law No. 43 of 1974, which provides an incentive package for foreign investments and issues guarantees against nationalization, except under the due process of law. There are number of other incentive laws and legislations issued by the Government to promote the growth and development of the private sector. These are some of the positive steps taken by the government for rapid industrial development.

ANNEX I

List of Persons Interviewed

I. Cairo

A. UNDP, Cairo

1. Mr. T. Sabry, Programme Officer/Industrial Development
Field Advisor
UNDIO/UNDP
2. Programme Assistant, UNIDO/UNDP.

B. General Organization for Industrialization, Ministry of Industry

1. Mr. Galal Bakir Hussein, General Director
Food Department, General Organization for Industrialization, Cairo
2. Mr. Amed Bayoumy Hassan, Senior Engineer
Food Department, General Organization for Industrialization, Cairo
3. Mr. Ahmed Esmatt Atta, Director General
Information and Documentation
General Organization for Industrialization, Cairo
4. Miss Ferial Ibraheim Hanna, Senior Statistical Officer
Information and Documentation, General Organization for
Industrialization, Cairo
5. Dr. Khalil Abouel Ela, Director General
Metallurgical Projects Department, General Organization for
Industrialization, Cairo
6. Mr. Abdel Gawad Gad Omer, Senior Officer
Metallurgical Projects Department, General Organization for
Industrialization, Cairo
7. Mr. Malek M. El Ashker, Director, Department of Local Manufacture
General Organization for Industrialization, Cairo
8. Ms. Azza Omer, Chemical Engineer, Department of Local Manufacture
General Organization for Industrialization, Cairo
9. Ms. Aida Aziz, Chemical Engineer, Department of Local Manufacture
General Organization for Industrialization, Cairo
10. Ms. Tafeda Galib, Mechanical Engineer, Depratment of Local
Manufacture, General Organization for Industrialization, Cairo
11. Mr. Abdel Ahmed, Mechanical Engineer, Depratment of Local
Manufacture, General Organization for Industrialization, Cairo
12. Mr. Mofied Ayyad, Girgis, Senior Mechanical Engineer
Department of Local Manufacture, General Organization for
Industrialization, Cairo

13. Mr. Kamal Naguib Aziz, Senior Mechanical Engineer
Department of Local Manufacture, General Organization for
Industrialization, Cairo
14. Mr. Sahed Abdul Cader, Senior Engineer, Metallurgical Project
Department, General Organization for Industrialization, Cairo
15. Mr. L. Yousif, Senior Engineer, Metallurgical Projects Depart-
ment, General Organization for Industrialization, Cairo

C. Public Sector Vegetable Oil Industry in Cairo

1. Mr. Fathy El Santawi, Chief, Production Department, Cairo Soap
and Oil Co., Cairo
2. Mr. Ezzeldin Abdel Gawad, Head, Engineering Department, Misr Oil
and Soap Co., Cairo
3. Mr. Fathi Shousha, Project/Maintenance Manager, El Nile Oil and
Soap Co., Cairo
4. Mr. Adel Mubarak, Maintenance Engineer, El Nile Oil and Soap Co.,
Cairo
5. Mr. Kamel Abdul Hameed, Purchasing Manager, El Nile Oil and Soap Co.,
Cairo

D. Public Sector Vegetable Oil Industry in Tanta

1. Mr. Mohamed El-Sharkawi, General Manager (Factories), Tanta Oil
and Soap Co., Tanta
2. Mr. Somir El-Sharnooby, General Research Manager, Tanta Oil and
Soap Co., Tanta
3. Mr. Awad Zaki El-Ghoul, General Engineer (Tanta Factories),
Tanta Oil and Soap Co., Tanta
4. Mr. Ahmed El Sayed Moghaub, Chief, Workshop Engineer
5. Mr. Ahmed Hasan Hauram, Workshop Engineer
6. Mr. Mohamed Naohat, Workshop Engineer

E. Public Sector Vegetable Oil Industry in Alexandria

1. Mr. Rabia Abou El Ezz, Chief of Projects, Egyptian Salt and Soda Co.,
Mohrrem Bey, Alexandria
2. Mr. Ibrahim Mohamed Zudan, Maintenance Director, Egyptian Salt and
Soda Co., Mohrrem Bey, Alexandria
3. Mr. Mohamed Hazam Osman, Chairman, Alexandria Oil and Soap Co.
Karmouz, Alexandria
4. Mr. Kalam Kodsy, Production Director, Alexandria Oil and Soap Co.,
Karmouz, Alexandria

5. Mr. Edward Aris, Maintenance Director, Alexandria Oil and Soap Co, Karmouz, Alexandria
6. Mr. Gamal Morsi El Karak, Chairman. Extracted Oil Co., Mohrram Bey, Alexandria
7. Mr. Ahmed El Salawi, Commercial Manager, Extracted Oil Co., Mohrram Bey, Alexandria
8. Miss Madiha Eweda, Electrical Engineer, Extracted Oil Co., Mohrram Bey, Alexandria

F. Public Sector Workshops in Cairo

1. Mr. Hussein Fathy Bayoomy, Chairman
Nasr Boiler and Pressure Vessel Manufacturing Co, Cairo
2. Mr. Badr Elden A. Elshaaraway, General Commercial Manager
Nasr Boiler and Pressure Vessel Manufacturing Co., Cairo
3. Mr. Emil Takawi, Factory Manager, Nasr Boiler and Pressure Vessel
Manufacturing Co., Cairo
4. Mr. Ahmed Taufeek El Katub, General Director (Administration)
Sugar Co., Cairo
5. Mr. Hasam Hetal, Technical Manager, Metalco, Cairo
6. Mr. Hamdounh Aziz, Production Manager, Metalco, Cairo
7. Mr. Mostafa Sabry, Chairman, Egymac (Joint-venture Siemens Ltd. and
Egyptian Government), Cairo

