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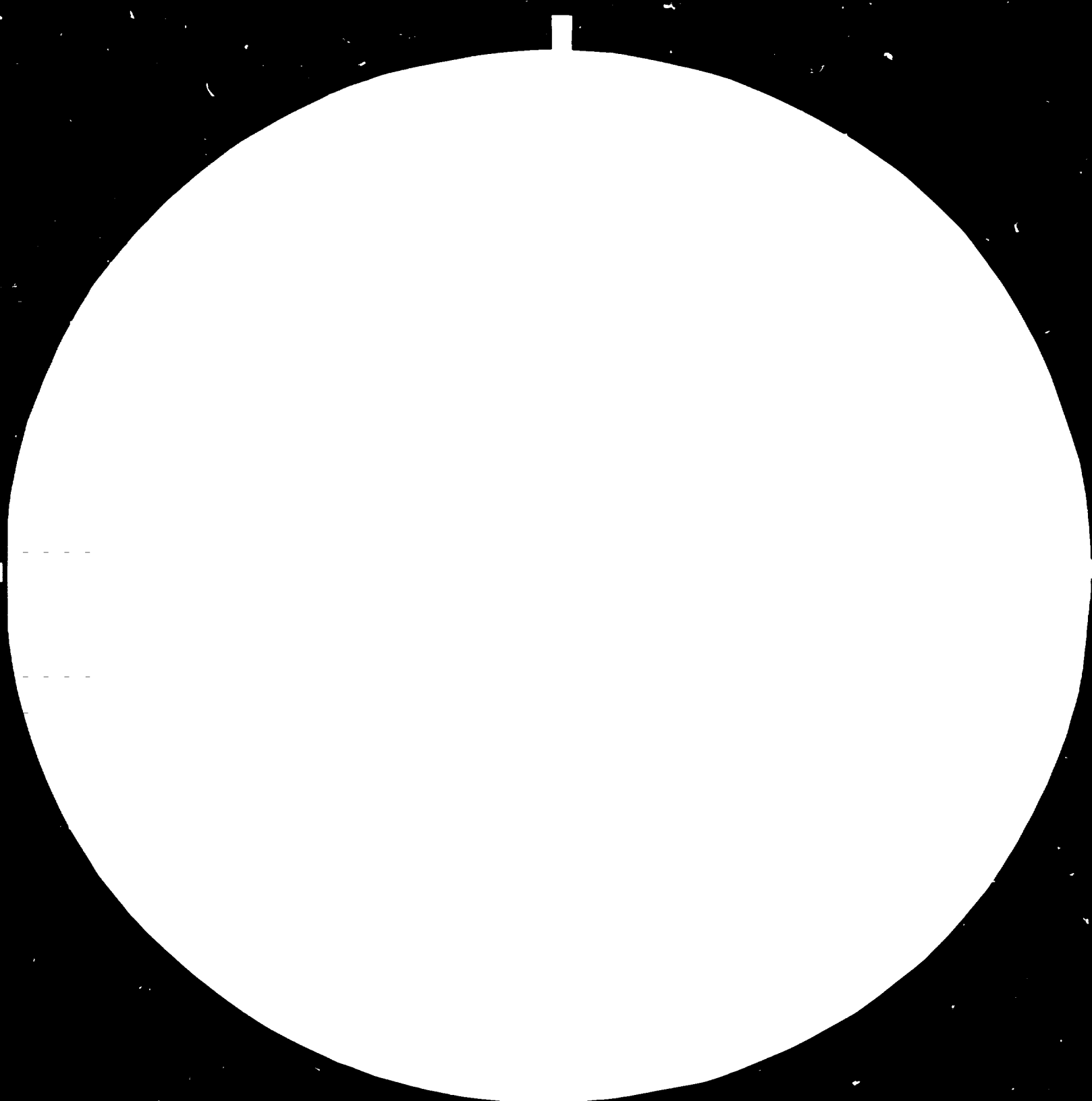

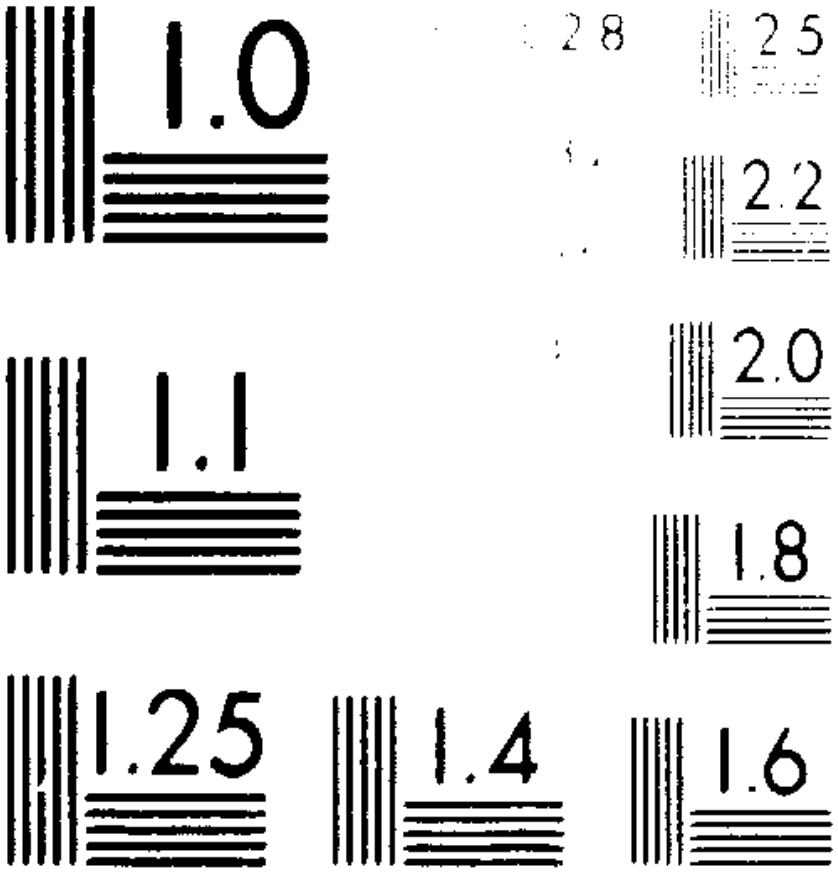
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# REVIEW OF LOCAL MANUFACTURING CAPABILITIES FOR SPARE-PARTS AND EQUIPMENT FOR THE OILS AND FATS INDUSTRY IN THE SYRIAN ARAB REPUBLIC

US/INT/78/073

TERMINAL REPORT

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

Based on the work of Mr. Varnakulasingam, expert in oilseed and vegetable oil processing industry

* This report has not been cleared with the United Nations Industrial Development Organization, which does not, therefore, necessarily share the views expressed.

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# I. SUMMARY

1.01 There are two public sector companies involved in vegetable oil production in Syria with an annual average production of 25,000 tons. These companies are also involved in soap and margarine production. The estimated annual turnover of these two companies is 250 million Syrian pounds. Presently, about 60-70 per cent of the spare parts required are locally made either in their respective company's workshops or made to order from local engineering workshops. The remaining 30 to 40 per cent are imported from abroad at prices 2-5 times higher than locally made, specially parts for machines which are already discarded by the foreign companies. The estimated annual imports of parts by these two public sector companies averages 3.5 million Syrian pounds, which is 1.4 per cent of the annual turnover.

1.02 Syrian Industrial Company and Homs Sugar Company have well planned preventive maintenance system for their plants and equipment, thereby wear and tear is reduced, accidental break-downs are minimized and facilitates timely fulfilment of repair preparation works. These companies have not faced any difficulties concerning spare parts. They usually maintain 1-1½ years stock of all vital spare parts, both locally made as well as imported from abroad.

1.03 It is possible for some of the public sector companies to manufacture at least 80 per cent of the spare parts required in their existing workshops. The major constraints are as follows:

i) lack of skilled labour, to replace the retiring skilled workers;

ii) needs additional investment on modern technological machines;

iii) lack of know-how on the right type of raw material to be used for fabricating a particular spare part;

iv) dependence on imports of the essential materials required for the production and the right materials are not available at the right time;

v) relatively high production costs, due to low output by the workers and under-utilization of production capacity;

vi) inadequate control of quality;

vii) lack of engineering drawings for some of the vital spare parts.

Syrian Industrial Corporation and Homs Sugar Co. have adequate list of spare parts and engineering drawings for some of the spare parts.

1.04 The vegetable oil industry in Syria is relatively small and the spare parts requirement is also small. Because of comparatively small volume of spare parts required by the individual companies, the feasibility of setting-up individual modern technological workshop is limited. 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 should be considered. The policy should, therefore, aim towards the establishment of an integrated central workshop. Since Homs Sugar Co. 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.

1.05 Other alternative would be to utilize the existing facilities available in the private workshops. Good number of competent private workshops are available to manufacture spare parts, but only constraint will be their inability to make engineering drawings. These drawings and other guidance may have to come from the mechanical engineers from the public sector companies. The assistance is needed only in the initial stages. As they gain experience, the quality of the fabricated spare parts will also improve.

1.06 The next important problem will be the training of people. The Vocational Training Centres in Damascus and Aleppo produce through 9 months course 400 turners, drillers, planners, welders and millers every year. But, continued on-the-job training will also be required for all types of skilled workers. For further training, gear makers, borers, tool makers, electroplaters, heaters (thermist), moulders and melters be sent to the equipment manufacturers'and suppliers' countries. For more efficient management of the Central Workshop, it is necessary to send few engineers and technicians to developed countries to widen their skills in workshop practice.

CONCLUSIONS

1.07 The spare parts fabrication for the vegetable oil industry should not be isolated from other engineering industries. The patterns of development of engineering industries in developing countries are generally similar. 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. Th 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.

1.08 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. Syria has now reached this stage. The local fabrication of spare parts for motor vehicles, agricultural machines, food processing industries, vegetable oil industry construction equipments, etc. are increasing day-to-day.

1.09 The problems facing Syria are lack of adequate domestic capital, shortage of foreign exchange and insufficiencies of technical know-how, raw materials, trained technical and managerial personnel, and industrial research and development facilities. Obviously these problems could be solved by international co-operation. This could include financial equity participation, licensing agreements, technical assistance and consultant service.

1.10 In combination with other measures for promoting the growth of engineering industries, government policies should include incentives such as tax holidays, import restrictions on indigenous products, tariff protection, manufacturing subsidies and provision of industrial estates.

RECOMMENDATIONS

1.11 The Government of Syrian Arab Republic to consider converting the existing workshop facilities at Homs Sugar Co. to a Central Workshop to fabricate spare parts for the entire five public sector companies involved in vegetable oil production. This workshop in addition continue to service and fabricate spare parts for sugar, yeast and alcohol plants. The main objective of this integrated approach is to reduce production unit cost through economies of scale, which comes from large scale production.

1.12 It would be particularly valuable, if arrangements could be made to trainees from Syria (vegetable oil industry) to receive in-plant training in some of the modern engineering workshops in the developed countries from where the plants and equipment for the vegetable oil industry have been imported. On-the-job training will be required for

(a) 5 Engineers
(b) 12 Semi-skilled or skilled workers
in the following field of specialization foundry, pattern,

mechanical assembly, boiler welding, forging and heat treatment, corrosion prevention, tool room, grinding gear cutting, galvanic, small parts manufacture, and electrical workshop.

Government of Syria may make use of UNIDO FELLOWSHIP AND TRAINING IN INDUSTRY

It is recommended that the authorities should be very careful in selecting the personnel for training. Besides possessing the requisite qualifications, the persons selected should have aptitude for mechanical type of work and be able to withstand the hard and tough work in the engineering industry. A high standard of physical fitness is needed. They must also be willing workers possessing team spirit and patriotic feelings.

1.13 There is room for better co-ordination between the educational and the specific needs of industries in Syria. It is suggested, therefore, the Syrian Government, in co-operation with other United Nations Agencies, make further studies to evolve suitable arrangements for continuous liaison between their educational authorities and industries. In addition, it is suggested that engineer tradesmen and managerial staff be given periodic refresher courses or advanced training to enable them to keep pace with industrial progress.

1.14 The Government of Syria may wish to consider steps that will lead to the positively accelerated development of engineering industries. The first and obvious step is for Syria to determine, the types of industries to be set-up by public and private sector for which it has inherent advantages and which can be established with the most benefit to Syrian economy. For this purpose, Syria may take advantage of the direct advisory services rendered by UNIDO in organizing surveys and making consultants available.

## 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 dependant 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 undertake 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 those 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 Syria from 2-24 January 1982.

VEGETABLE OIL INDUSTRY IN SYRIA

2.08 Syria produces mainly olives, cottonseeds, sunflower groundnuts and sesame seeds, the more important being olives and cottonseeds. Total production of vegetable oil in 1980 was 104,033 tons (details are given in Annex 1; Tables 4 and 5), of which 83,385 tons was olive oil and the remaining 20,648 tons was mostly cottonseed oil. The olive oil industry is entirely a private sector, mostly on a smaller scale. The cottonseed oil industry is run by the public sector companies.

2.09 Presently, there are six public sector factories involved in vegetable oil production (mainly cottonseed, with small quantities of sunflower). Five of these factories are operated as part of General Organization for Food Industry and the last one operated as part of Sugar General Establishment. All these companies through their respective organisations responsible to the Ministry of Industry. The names of these companies are as follows:

i) The Syrian Industrial Co. for Vegetable Oils - Aleppo (consists of three factories).

ii) The Arab Industrial Co. for Vegetable Oil & Soap, Damascus

iii) Hama Vegetable Oil Co. Hama

iv) Homs Sugar Co. (Vegetable Oil Plant is part of the Homs Sugar Co.), Homs

The technology presently applied in (i) to (iii) companies for oil production is the mechanical expeller type. The plant in Homs (iv) uses both mechanical expelling and solvent extraction.

## III. VISIT TO VEGETABLE OIL PROCESSING PLANTS

3.01 To determine the spare parts requirements of the vegetable oil processing industry and required scope for repair of plants and equipment, five factories in Damascus, Homs and Aleppo have been visited. Due to technical reasons, the plant in Hama was not visited. The details are as follows:

### SYRIAN INDUSTRIAL CO., ALEPPO

3.02 The Syrian Industrial Co. is the biggest vegetable oil company in Syria and located in Aleppo with a total present production capacity of 150,000 tons of cottonseed per annum. This company accounts for 80 per cent of the vegetable oil production in Syria (without taking into account the olive oil production in the country) and belongs to the public sector. The company is also involved in vegetable oil refining, hardening, deodourization and soap making. A plant for the manufacture of margarines (10 tons/day) is almost nearing completion and expected to commence production by September 1982. The annual turnover of the company is approximately 200 million Syrian pounds.

3.03 The Company consists of three vegetable oil factories all of which are located in Aleppo. They are known as Nairab Oil Plant, Ain El Tal Factory and the Lyramoun Plant. The technology presently applied in these three factories for oil production is the mechanical expeller type. Alfa-Laval continuous refining units followed by hardening and deodorization units are used for the production of cooking oils, shortenings and oils for margarines production. Soap production starts from fatty acids directly imported from abroad.

NAIRAB OIL PLANT

3.04 The plant was established in 1945 as a private company. It was nationalized and operated by the Government since 1965. The plant consists of delinting, decortication, pressing and refining units. The installed capacity, present running capacity and plant origin are as follows:

| Processing Unit | Installed capacity/day | Installed capacity/annum */ | Origin of the Machines |
|---|---|---|---|
| 1. Delinting | 300 tons | 90,000 tons | U.S.A. |
| (i) linters | | 8,100 tons | |
| (ii) delinted seed | | | Carver |
| 2. Decortication | 273 tons | 81,900 tons | Cotton Gin Co. |
| (i) hulls | | 81,900 tons | |
| (ii) dehulled seed | | 22,500 tons | |
| | | 59,400 tons | |
| 3. Pressing | 198 tons | 59,400 tons | 11 expellers Rosedowns/England |
| (i) oil | | 13,050 tons | |
| (ii) coke | | 46,350 tons | 1 expeller Oleonic-Hercules/France |
| 4. Refining | 80 tons | 24,000 tons | Alfa-Laval/Sweden |

*/ Annual capacity worked out on the basis of 300 working days.

The capacity of hardening (Hydrogenation) and deodourizing unit is 30 tons/day each. The margarines plant when completed will produce 10 tons of margarine per day. The soap factory currently produces 3,000 tons of laundry and toilet soap with total fatty matter ranging from 80-82 per cent.

AIN EL TAL FACTORY

3.05 This plant was set-up in 1948 and consists of delinting, decortication and pressing units. Just after nationalization in 1965, the plant was reconditioned and the delinting and decorticating units were replaced

with new ones. The present running capacity of the plant is 150 tons of cottonseed per day or 45,000 tons per annum.

LAYRAMOUN PLANT

3.06 The plant was established in 1958. The processing units are similar to the earlier two factories, except that this plant has four Oleon Hercules (France) expellers. The present running capacity is 135 tons of cottonseed per day or 40,500 tons per year.

MAINTENANCE AND WORKSHOP FACILITIES/SPARE PARTS

3.07 The three factories of the Syrian Industrial Company have decentralized maintenance facilities and one central workshop located at the Nairab Oil Plant. Total of 30 skilled and semi-skilled workers run the workshop.

3.08 The problem of spare-parts availability is something the Syrian Industrial Company has been considering seriously. Annex 2, Table A give the list of vital parts that require frequent replacement. Some of which are locally made in their workshop, some purchased locally and others are imported from abroad. This information allows the Company to place order for spare parts at the appropriate time and not to wait until a component malfunctions before ordering. The top technical management team is well experienced (with experience 15 years and over) and they plan ahead, right spare parts are ordered in time and planned plant maintenance completed at the right time. Thereby, the factory shut down due to lack of spare parts is minimized.

3.09 In 1981, the cost for spare parts replacement totalled, approximately, 3.2 million Syrian pounds, of which approximately 3 million Syrian pounds worth of spare parts were imported from abroad. Remaining 200,000 Syrian pounds worth of spare parts were locally purchased (either from local private spare parts shops or made to order locally).

Production cost of spare parts made in the Company workshop is not available. But, the estimated annual cost of workshop work force (direct labour) is 500,000 Syrian pounds.

3.10 The Company also explored the possibilities of having some of the spare parts that cannot be manufactured in their own workshop to be made by local private workshops in Aleppo. Although, majority of the spare parts can be manufactured locally at a considerable savings to the Company, their life expectancy invariably much shorter than imported ones in some cases. Parts manufactured by two workshops in Aleppo, namely: Messrs. Tuhan and Hakkim, according to the Company management were found to be equally good as the imported parts. Mr. Tuhan's workshop have up-to-date metal processing and machine tools including automatic lathe, multiple spindle hobbing machines and gear cutters. This workshop charges high price for spare parts compared to other local workshops, because of his high investment, precision work and good quality raw materials used for the parts manufacture. The present policy of the Company (Commercial Department, which is responsible for all purchases), is to call in tenders locally for the manufacture and invariably they go for low price, rather than quality. It is true that lower unit cost compen for the shorter life expectancy but on the long run wear and tear machine will be high and needs frequent shut-down for maintenance.

3.11 The present system for ordering spare parts from abroad is on an yearly basis for usual spare parts. Spare parts that are urgently required due to unexpected break-down are airfreighted. Normally, it takes the Company between 8-14 months from the time an order is placed to the time the spare parts are actually received. This period is distributed as follows:

(a) <u>Quatation: 2 - 3 months</u>

Spare parts from overseas manufacturers of plants and equipment takes approximately 2 months to receive firm quatation. Other spare parts are usually open for tenders from overseas manufacturers. This takes about 3 months to finali

(b) Import Licence: 2 days - 1 month

Past Company's experiences are that import licences are issued in two days. In exceptional cases, it can be delayed upto two months.

(c) Letter of Credit: 3 - 4 months

The import documents are sent to the Commercial Bank for opening Letter of Credit. This needs the approval of both the Minister of Industry and Finance. The usual delay is 3-4 months.

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

After Letter of Credit has been opened, 3-6 months time is needed for the manufacture of spare parts, packing, transportation (sea or rail), customs inspection and clearance and final delivery to Aleppo factory site.

3.12 The technical management of the company claimed that they did not face difficulties or delays in importing spare parts during the last five years. Any spare parts that are urgently required are air-freighted, even without opening a Letter of Credit. The suppliers so far have been very co-operative to airfreight spare parts even without a Letter of Credit.

MAJOR CONSTRAINTS

3.13 Due to shortage of foreign exchange, any imports required by the Company, needs the approval of both Ministry of Industry and Finance. Usual delay of obtaining approval is 3-4 months.

3.14 The Company claims that the spare parts imported from abroad are exhorbitantly priced and out of proportion to the initial cost of the plants and equipment.

3.15 It is possible to manufacture at least 70 per cent of the spare parts needed locally in the Company's Central Workshop. The estimated investment needed to up-date existing Workshop is about 5 million Syrian pounds. Even if up-to-date machines are available main problem will be to attract skilled Lathemen/Mechanics/Technicians. The salary offered by the Public Sector Workshops are lower than that offered by the privately owned workshops. The present manpower available at Company is inadequate to handle the rather sophisticated level of technology involved in the manufacture of some the precision spare parts needed.

3.16 Majority of the present workshop workers were recruited recently, when some of the senior and most experienced workshop men retired or resigned to take up positions in the private sector or migrated to neighbouring Arab countries, where salaries and incentives paid are attractive. Some of the present workers lack proper training and others lack aptitude for mechanical work.

3.17 The management of Syrian Industrial Company feels that the prices quotated by some of the local private workshops for turning out spare parts are high compared to what the Company could manufacture in their workshop, if all facilities are provided. (Company also claims that the prices quoted by local workshops are 40 per cent cheaper than imported items). It is difficult to judge the validity of this answer as no cost comparison have been made so far.

NEW INVESTMENTS IN VEGETABLE OIL INDUSTRY

3.18 The Syrian Industrial Company propose to establish two solvent extraction plants with a processing capacity of 200 tons of prepressed cottonseed cake each. One plant will be set-up in Nairab Oil Plant and the other in Ain El Tal Factory. These two plants would enable the existing industry to produce additional 10,000 tons of cottonseed oil per annum from the same raw material.

3.19 The present average quantity of raw material supply is 200,000 tons of cottonseed, which means these two solvent extraction plants will run to 83 per cent of its capacity. The load on the existing mechanical presses, which is expected to do the pre-pressing (17% residual oil) for the solvent extraction plant will be reduced to 50 per cent of its present running capacity. This means the wear and tear (or the break-down) of the mechanical presses will be less and the spare parts requirement will also be reduced. The spare parts requirement for the solvent extraction is considerably less.

CONSTRUCTION OF THE SOLVENT EXTRACTION PLANT

3.20 Tender for the supply of Solvent Extraction plants will be called in within the next one month for supply of plants and equipment from plant manufacturers from U.S.A. England, Germany and Belgium. The installation of the plant will be done by the local engineers according to the plant layout given by the plant suppliers.

3.21 The local engineering industries are competent to handle construction of buildings for housing the solvent extraction plants as well as plant installation according to the plant-layout and specifications given by the plant and equipment manufacturers. In the past number of factories have been constructed and plant installed by local engineers and most of which were found to be in par with international standards.

CONCLUSIONS

3.22 There is no doubts that at least 30 per cent of the spare parts required by the Syrian Industrial Company could be locally manufactured. Economics of the Company turning out spare parts in their own workshop against made to order from the local private workshops have to be studied in details.

3.23 Syrian Industrial Company, which is part of the General Organization for Food Industries under the Ministry of Industries, specializes in vegetable fats and oils, margarines and soap production. It has an annual turn-over of approximately, 200 million Syrian pounds. In 1981, spare parts worth about 3 million Syrian pounds were imported from abroad, which represents 1.5 per cent of the total Corporation's turn-over. For 1982, imports of spare parts from abroad estimated at 2 million Syrian pounds worth. The question is whether it is worthwhile and profitable for the Company to venture into a secondary and new field. It would be better for the Company to diversify to manufacture other vegetable oil based food products and toilet preparations (such as hair cream, shampoo, face creams, shaving creams, toilet water, toothpaste, etc.) rather than invest on entirely new engineering field.

3.24 The national (local) workshops in Aleppo are mostly small workshops normally run by the owner and his family. Some of them are capable of producing good quality spare parts, equally good as the imported items needed by the Company at 60 per cent of the cost of parts imported from abroad. The Company, being a public sector, should encourage and groom these workshops to produce good quality spare parts. Such an action will not only conserve foreign exchange, but also contribute towards the furtherance of Syria's current national development objectives.

HOMS SUGAR COMPANY

3.25 The Homs Sugar Company was established in 1948 as a private Company and after nationalization in 1965, operated as a public sector company as part of Sugar General Establishment under the Ministry of Industry. This public sector company, in addition to producing sugar, involved in vegetable oil/soaps, yeasts and alcohol production.

3.26 The Sugar General Establishment has five sugar companies, currently producing about 118,000 tons of sugar per annum (1979 Statistics). The total investment in these five factories as of 1979 was 756.2 million Syrian pounds. The Homs Sugar Co. has an installed capacity of 1,000 tons of sugar beet per day and its present running capacity is 850 tons per day.

3.27 A total of 1,100 workers are employed by the Homs Sugar Co., of which 100 workers are utilized by the Vegetable Oil Plant. The Company has a central workshop with 25 skilled workmen.

3.28 The installed capacity of the vegetable oil plant is 95 tons/day or 28,500 tons/annum of cottonseed. The present running capacity is 80 tons/day. Due to short supply of cottonseed, the plant process sunflower and at times soya beans and other oil seeds which are locally available. The technology applied for oil production is mechanical pressing followed by solvent extraction. The prepressed extracted oil is refined, bleached, hardened and deodourized using the batch process. The soap-stock, which is a biproduct of refining is used for making laundry (low quality) soap.

3.29 The delinting and decortication machines were originally imported from Carver Cotton Gin Co., U.S.A. The prepress expellers consist of fou units, two Simon Rosedowns Mk.2, one Oleonic-Hercules/France and one Fried Krupp of West Germany. Presently, the prepressed cake which goes for solvent extraction contains 13-14% oil. The solvent extraction plant used is a rotary type imported from England with a capacity of 22-24 tons of prepressed cake per day, producing 3-4 tons of oil per day. The extracted meal contains 1-2 per cent oil. The solvent used is hexane. The oil refining (refining/bleaching, hardening and deodourizing) is done by batch process and all units including hydrogen-gas generating plant was imported from England.

MAINTENANCE AND WORKSHOP FACILITIES/SPARE PARTS

3.30 Since the Homs Sugar Co. is a bigger company as whole and have a well equipped workshop with well experienced and loyal maintenance and workshop staff. Some of them have passed their retirement age. One of the problems the Company is facing now is the training of people to take over from the experienced retiring staff. This is mainly due to past personnel recruitment, invariably people with no aptitude for mechanical type of jobs are recruited. Homs Sugar Co., being a public sector company, once a person is recruited and employed, it is difficult to discontinue his services, purely on the grounds of incompetence.

3.31 The vital parts that require frequent replacement for the vegetable oil plant is more or less same as that given in Annex 2, Table A for Syrian Industrial Company. The usual parts are saw cylinder parts for linters, gears, bearings, joints, rings, cylinder heads, housing, screws, etc. In 1981, spare parts worth 150,000 Syrian pounds were imported from abroad, mostly parts for the oil presses. The parts locally turned out in their workshop for the same year was estimated at 150,000 Syrian pounds. The parts such as ball bearings and saw cylinder parts, which the company workshop could not make, they had carried over stocks from the previous year 1980.

3.32 According to the top Technical Management of the Company, 65-70 per cent of spare parts required are locally turned out in their central workshop. The remaining parts are imported from abroad and the usual delay for importing range from 8-14 months (same as that for Syrian Industrial Company). The company usually maintain a stock of spare parts imported from abroad to last for 1½ years. It was claimed by the Company that they did not have any problems or shut down of plants due to lack of spare parts. They have experienced technical staff, who are capable of estimating the number of vital parts needed and they always maintain sufficient stocks to last for at least 1½ years.

FUTURE INVESTMENT PLANS

3.33 There is no future plans for expansion of the vegetable oil plant. Presently, there is a committee appointed by the Ministry of Industry to study the possibility of improving the efficiency of the existing plant without increasing the capacity.

3.34 Presently, 50 per cent of the raw material supply cottonseed comes from the Homs surrounding area. The remaining 50 per cent (approx. 40 tons/day) come from Aleppo, when the proposed two solvent extraction plants are completed in Aleppo with a total capacity of 400 tons of prepressed cottonseed per day, mostly likely the Homs plant may not obtain the 50 per cent of the raw material they are presently getting from the Aleppo area. The Homs plant may have to rely on other oil-seeds supply such as sunflower, soya beans, sesame and peanut. The present import of soya meal for animal feed averages about 25,000 tons per year or equivalent to 31,250 tons of soya beans. It would be economical for Syria to import soya beans and solvent extract at Homs, which will provide both oil and meal.

CONCLUSIONS

3.35 The vegetable oil processing operation of the Homs Sugar Co. is relative small compared to the overall activities of the Company. Nevertheless, the Company has made every efforts to manufacture most of vital parts needed for the vegetable oil plant locally. Presently, 65-70 per cent of the spare parts required are locally made in their workshop. This share may increase as the workshop personnel gain experience.

3.36 The problems facing both the Homs Sugar Co. and the Syrian Industrial Company are the lack of trained technical personnel at the floor level and insufficiences of technical know-how, raw materials and industrial research and development facilities. Obviously these problems could

be solved by international co-operation. This could include licensing agreements, technical assistance and consultant service.

3.37 In addition to the above assistance, another aid to rapid development of local spare parts industry would be the establishment of a large central workshop that could result in low unit production costs. The vegetable oil industry in Syria is so small to set up an economically viable up-to-date central workshop. Therefore, attempts should be made to integrate the existing workshops (Public Sector) producing spare parts for the vegetable oil industry either with the existing sugar industries or food industries.

ARAB INDUSTRIAL COMPANY FOR VEGETABLE OIL AND SOAPS, DAMASCUS

3.38 The Arab Industrial Company is the only vegetable oil mill operating in Damascus. It was established in 1953 as a national private sector company and was nationalized in 1963. Since then it was run as a public sector company as part of General Organization for Food Industries under the Ministry of Industry.

3.39 The Company has both mechanical oil pressing as well as soap production units. The mechanical oil pressing unit is set-up for cottonseed processing and consists of delinting, decorticating and pressing units. The installed capacity of the plant is 80 tons of cottonseed per day or 24,000 tons per annum. There are two presses, one Simon Rosedowns - Type E.4 (England) with capacity of 50 tons/day and the other Cleonic-Hercules (France) with capacity of 30 tons/day. Due to shortage of raw materials (cottonseed), the presses are presently working around 68 tons/day.

3.40 The oil pressing section employs 50 people of which 42 are skilled/ semi-skilled/unskilled production workers and maintenance workers (14 on each shift),3 Production Supervisors, one Engineering Supervisor, one boiler operator and three Working Directors. The three Working Directors are also responsible for management of the soap factories.

3.41 The soap unit employs a total of 250 workers and produces on an average 3,500 tons of soap per annum, of which 150 tons/year is marketed as toilet soap with a total fatty matter (TFM) of 74 per cent. The remaining approximately 3,350 tons is marketed as all purpose soap (for laundry, toilet and other purpose soap) with TFM 70 per cent.

3.42 Both oil presses and soap plants run 300 days per year without proper schedule for maintenance. The turn-over of technical staff is high, mainly due to the low wages paid by the company compared to the private sector. Presently, due to lack of proper planning, maintenance is done only when the plant break-down. Whenever there is a break-down, the plant is shut-down sometimes for weeks either due to lack of spare parts or due to lack of trained mechanics to handle the repairs.

MAJOR CONSTRAINTS

3.43 LACK OF SPARE PARTS: Lack of spare parts for the plant, which has caused frequent shut-downs of the plants are due to bad planning. The critical parts, which are frequently needed (based on past experience) such as gear wheels, ball bearings, gaskets (metal and plastic joints), V-belts, electric motors, washers, miscellaneous metal products such as nuts and bolts, welded pipes, cast iron pipes, impellers and other precision instruments are not available in stocks at the right time. Other spare items, which are needed rarely or occasionally, ample stocks are available. Some of the spare parts could be easily manufactured in the company workshop. Items which are beyond the manufacturing capacity of the company can be purchased in the local Damascus market or made to order from established local workshops. There are parts which are solely to be purchased from abroad. All these needs proper planning and can only be done by experienced management staff and maintenance engineers.

3.44 LACK OF TRAINED MAN-POWER: The maintenance section as well as the workshop of the factory lack trained mechanics, lathemen and maintenance engineers. Due to low wages paid by the public sector company, experienced hands prefer to join the private sector, where wages are attractive.

3.45 LACK OF TECHNICAL KNOW-HOW ON RAW MATERIALS USED FOR PRODUCTION OF HIGH QUALITY SPARE PARTS: The quality of the spare parts made in privatly owned workshops in some cases are good as the imported items. In cases, where inferior quality parts are made, it is either due to invailability of good quality raw material or lack of know-how on the right type of raw material to be used.

FUTURE PLANS

3.46 There is no definite plans for future expansion of this plant or new investment. Since most of the cottonseed for crushing comes from the ginneries outside Damascus and the fact that cottonseed is a low oil content seed, the question of the economics of transporting cottonseed from ginneries to Damascus should be studied.

CONCLUSIONS

3.47 In view of the difficulties faced by the management of the Arab Industrial Company in recruitment and training of technical personnel, it is profitable for the Company to utilize the services of local workshops for turning out some of the spare parts needed. The repair and maintenance of the plants and equipments that cannot be successfully carried out by the company engineering staff could also be sub-contracted to local engineering companies.

## 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 output. 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, replacements and recovery of main worn-out parts, assembly adjustment and load test.

(c) Capital Repairs: 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.

PLANS FOR REPAIR AND MAINTENANCE

4.06 Plans include 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 months before shut-down of plants and equipment for repair during a planned inspection. The master sheet is finalized during the dismantling of plants and equipment 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.

WORKSHOP FOR MANUFACTURE OF SPARE PARTS

4.07 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, chargehand, turners, shaperman, drillers, welders, millers, fitters, blacksmith, hammerman, helpers and unskilled labour.

4.09 Lastly the list of vital spare parts needed and their drawings should be made available to the workshop.

PRESENT SYSTEM OF SPARE PARTS PROCUREMENT FOR THE VEGETABLE OIL INDUSTRY

4.10 Based on the visits made to two public sector companies involved in vegetable oil processing in Syria, their machines which need spare parts can be categorized into two:

i) Out-dated Machines/Equipment: These are machineries already discarded by the foreign manufacturers or manufacturers who have already stopped manufacturing. Spare parts order for these machines and equipment are usually accepted as special order and hence making them are more costly. Sometimes 5 times higher that locally made.

ii) Current Machines/Equipment: Manufacturers of these machines equipment charge two times higher than made locally.

4.11 It is estimated that approximately 3.5 million Syrian pounds worth of spare parts are imported from abroad annually by the public sector companies (Syrian Industrial Company, Homs Sugar Co., and Arab Industrial Co.,) for their vegetable oil industry. The remaining spare parts required are either made locally in their individual workshops or made to order from local workshops. Because of the small volume of spare parts involved, it is not economical for these three public sector companies to set-up individual modern workshops. In order to have low unit production costs, these three companies to consider establishment of a Central Workshop or consider integrating with the existing workshops, either with the existing sugar industry or food industry workshops.

4.12 Other alternative would be to rely on the local private workshops for fabrication and supply of spare parts.

## V. LOCAL ENGINEERING INDUSTRIES

5.01 The major engineering industries in Syria belongs to the public sector and managed by the General Organization for Engineering Industries of the Ministry of Industry. The total investment as of 1979 in the engineering industrial public sector was 986.7 million Syrian pounds. Types of products manufactured by public sector engineering industries range from electrical engines, electrical transformers, refrigerators, pressure cookers, steel industry for producing round iron bars, metal pipes and wires; cables, television sets, telephone sets, gas cookers and ovens, water meters and electrical meters. The private sector in the organized scale is involved in the manufacture of refrigerators, washing machines and gas cookers. Statistics of production in 1970 and 1976-1980 is given in Annex 1, Tables E and F.

5.02 Other than the above engineering industries, there are small private engineering industries which produce durable consumer goods such as metal manufacture, mechanical and electrical appliances, utensils, building and hardware and accessories. In some places particularly in Aleppo manufacture of small engines, complete units of simple agricultural machinery, electrical goods and food processing machineries have also been made to order to meet part of the domestic demand. In some cases, these products are exclusively for export market.

5.03 In Damascus, Aleppo and Homs, many small workshops (mostly family owned) have been set-up in the past for repair of machineries used in industry, construction and agriculture. The trend now is to expand these workshops and diversify production for greater utilization of existing facilities. Majority of these workshops are now involved in the manufacture of spare parts, farm implements and tools, the assembly of tractors for farm mechanization, the manufacture of

irrigation pumps in small foundries and workshops and small-scale manufacture of household utensils, building hardware and common electrical appliances.

5.04 A number of small private workshops involved in spare parts manufacture as well as other engineering items were visited in Aleppo and Damascus. Some features of the progress made and plans for developing them are described below on an individual basis.

ALEPPO

i) Thahan's Workshop: The workshop is located at Arcob in Aleppo. This workshop is owned by Mr. Thahan and his family. Two of his sons are equalified mechanical engineers. His workshop is well equipped with metal processing and machine tools including automatic lathe, multiple spindle hobbing machines and gear cutters. This workshop specializes on making all types of gear wheels, horizontal, helical and worm type for sale in local market in Syria as well as made to order on request from local industry. Syrian Industrial Company is one of the workshop's clients. The workshop claimed that they have in the past made and supplied one and two stroke compressors to the local industry and fabricated and supplied complete ice-making plant for the local industry in Aleppo.

Some of the problems faced by this workshop are as follows:

(a) lack of trained labour. The workshop is the past trained workers, but moment they are trained, they seek employment with higher wages elsewhere. Therefore, the workshop prefer to use family labour;

(b) lack of continuity of the supply of some raw materials, particularly semi-finished steel products;

(c) due to shortage of foreign exchange, some of the precision spare parts needed for the workshop machines are difficult to import;

(d) due to high investment in workshop machines and better quality control: prices quoted are high compared to other small workshops with inadequate quality control. The market usually look for cheaper parts than quality parts.

ii) Bedros Mekorory's Workshop: A few units to manufacture machine tools such as lathe, shaper, drilling machine and power presses are available in this workshop. The workshop is owned by Mr. Bedros Mekorory and his family. He makes anything to order. At the time of the visit, he was making a motor truck weigh scale - a straight level design, 50 ton capacity, 50' x 10' platform size with all the necessary structural steel. Ticket printer caliberated in kilograms and metric tons. The price quoted for making this scale was 150,000 Syrian pounds; where as an imported one will cost around 250,000 Syrian pounds. According to the workshop it takes 6 months to make one weigh scale at an estimated labour cost of 25,000 Syrian pounds and raw material cost of 75,000 Syrian pounds.

The problems faced by this workshop is similar to that of the first one.

iii) Amir Khanyan's Workshop: This workshop in addition to having units to manufacture machine tools have a small foundry shop to meet the requirements in castings. This workshop specializes in making water pumps and concrete mixers. They are also involved in repairs and maintenance to water pumps and concrete mixers.

DAMASCUS

i) Aladin Arnaute's Workshop: Location of the workshop is Gin Street, Damascus. It is a small workshop established in 1945 by the present owner Mr. Aladin Arnaute, who is a graduate from the Technical School. Presently, 5 skilled workers are employed in this workshop. Their daily wages range from 20-30 Syrian pounds. This workshop accepts any type of orders ranging from spare parts making, small engines and repairs to plants and equipment. There are no facilities available for making models. Models are usually made in Aleppo.

ii) Bedder Deen Savah's Workshop: Also located in Gin Street, Damascus. The owner possesses 20 years experience and his workshop was established 6 years ago. Total of 4 skilled workers are employed at present, two of which are from the family and two hired hands. The skilled latheman is paid 40 Syrian pounds per day. This workshop is also involved in spare parts manufacture. Mr. Savah has no intention of expanding his workshop, because of government policy. Any workshop which employs more than one skilled workers are considered a factory and the employer is expected to pay his insurance and retirement benefits.

iii) Ahmed Dahan's Workshop: The workshop is located at Gin Street, Damascus and the owner has 30 years experience in workshop practice. The workshop was established 22 years ago and specializes in making gear wheels: horizontal, helical and worm type from iron, cast iron and bronze. Total of 6 skilled workers are employed, of which two are family workers. The workshop is fully equipped to make all types of gear wheels.

iv) There are number of other workshops visited, but unable to interviews the owners due to lack of time.

CONCLUSIONS

5.05 Based on the study, it is clear that small private engineering workshops/industries have been in existence in Syria for a long time. Initially these workshops started as repair workshops for machinery used in industry, construction and agriculture. Most of the workshops have not expanded, but diversified production for greater utilization of existing facilities. The future expansion of the existing small engineering units to medium or large scale workshops to manufacture spare parts, farm implements and tools, the assembly of tractors for farm mechanization, irrigation pumps in small foundries and workshops and manufacture of household utensils, building hardware and common appliances, depends on the incentives given by the government.

PROBLEMS OF SMALL PRIVATE ENGINEERING WORKSHOPS

5.06 Some of the problems of the small private workshops are:

i) Under-utilization of production capacity in some small modern technological workshops. Some units are only operating at about 50 per cent of installed capacity.

ii) High cost of production of locally made products, because of small market and seasonal demand. In addition, high cost of raw materials (imported).

iii) Dependence on imports of semi-finished raw materials. Foreign exchange difficulties have been encountered in the import of these materials.

iv) Inadequate quality control in the production process.

v) Lack of technical know-how (technology).

vi) Lack of incentives given by the government to expand or diversify their present activities.

vii) Lack of skilled, reliable and devoted workers.

## VI. VISIT TO INTERMEDIATE INSTITUTE FOR ENGINEERING AND METALLIC INDUSTRIES

6.01 There are now 60 Intermediate Institutes for Engineering and Metallic Industries in Syria. Presently, 20,000 students are enrolled. The minimum qualification required for the students to be admitted is Secondary School Certificate (12 years) and the duration of the course is two years.

6.02 The students are usually paid a salary of 465 Syrian pounds per month plus special allowance ranging from 20 to 45 per cent depending on their performance during the first year. The funds for running this institute comes from the special fund allocation from the Ministry of Industry. There are two separate courses conducted, one for Electricity and Electronics and the other for Metallic and Mechanical. The scholar plan is given in Annex 4. It seems the course is more theoretical oriented.

## VII. VISIT TO VOCATIONAL TRAINING CENTRE

7.01 There are two Vocational Training Centres in Syria, one in Damascus and the other in Aleppo. Total of 500 technicians/skilled workers graduate every year through 9 months course. The centre in Damascus has a well equipped workshop with experienced instructors. The course provides both theory and practical training in modern workshop practice. Practical course includes use of lathe machines, cutting, turning, grinding, polishing, making tools, nuts and bolts, welding, tinkering and foundry work.

7.02 Some of the management staff of public sector companies are satisfied with the quality of technicians produced from the Vocational Training Centres. But, these technicians require continued on-the-job training followed by theoretical refresher courses to have a better understanding

of the technology. It would also be very useful to send few selected technicians occasionally to developed countries to widen their skills in workshop practice. These types of training is recommended for all types of skilled workers.

## VIII. LOCAL ENGINEERING COMPANIES

8.01 There are a number of both private and public sector companies involved in all types of construction work including housing, factory building and plant installations. Majority of them are using local engineers and technicians for all types of construction work. Some of the local private companies also act as agents for foreign plants and equipment manufacturers. In such cases, the plan for construction of the factory, plant layout, specifications, etc. are given by the manufacturers. The local company act as their agents or subcontractors.

8.02 There are three major public sector companies involved in all types of construction work. They are:

i) The Establishment for Executing Military Constructions.

ii) The Establishment for Military Housing.

iii) Quasion Company.

Usually, construction works are open for tenders and the lowest bidder, who confirms to the specifications is accepted.

ANNEX 1

TABLE A

PRODUCTION OF VEGETABLE OIL AND VEGETABLE OIL PRODUCTS: (1970,1976-1980)

(In tons)

| Type of Product | 1980 | 1979 | 1978 | 1977 | 1976 | 1970 |
|---|---|---|---|---|---|---|
| 1. Olive Oil | 83,385 | 40,428 | 69,573 | 38,056 | 55,898 | 15,500 |
| 2. Vegetable Oil | 20,648 | 26,122 | 24,010 | 24,040 | 24,727 | 25,100 |
| 3. Margarine | 7,274 | 5,753 | 5,448 | 6,196 | 6,008 | 6,500 |
| 4. Soaps | 37,400 | 36,900 | 35,800 | 34,600 | 31,200 | 21,200 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

TABLE B

PRODUCTION OF VEGETABLE AND VEGETABLE OIL PRODUCTS BY PUBLIC AND PRIVATE SECTOR: (1970, 1976 - 1980)

(In tons)

| Type of Product | 1980 | 1979 | 1978 | 1977 | 1976 | 1970 |
|---|---|---|---|---|---|---|
| 1. Olive Oil | | | | | | |
| Public | NIL | NIL | NIL | NIL | NIL | NIL |
| Private | 83,385 | 40,428 | 69,573 | 38,056 | 55,898 | 15,500 |
| 2. Vegetable Oil | | | | | | |
| Public | 20,648 | 26,122 | 24,010 | 24,040 | 24,727 | 24,731 |
| Private | NIL | NIL | NIL | NIL | NIL | NIL |
| 3. Margarine | | | | | | |
| Public | 6,586 | 5,220 | 4,674 | 5,053 | 4,425 | 4,030 |
| Private | 688 | 533 | 774 | 1,143 | 1,583 | 2,470 |
| 4. Soaps | | | | | | |
| Public | 6,186 | 6,927 | 7,254 | 7,413 | 6,029 | 2,754 |
| Private | 31,214 | 29,973 | 28,546 | 27,187 | 25,171 | 18,496 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

TABLE C

PRODUCTION OF VEGETABLE OIL SEEDS IN SYRIA (1646, 1963, 1970, 1977 - 1980)

(In tons)

| C r o p | 1980 | 1979 | 1978 | 1977 | 1970 | 1963 | 1946 |
|---|---|---|---|---|---|---|---|
| Cotton | 323,000 | 344,000 | 377,000 | 395,000 | 383,000 | 410,000 | 14,000 |
| Peanut | 19,000 | 18,000 | 15,000 | 20,000 | 16,000 | 2,000 | 5,000 |
| Sesame | 25,000 | 14,000 | 19,000 | 18,000 | 3,000 | 5,000 | 3,000 |
| Sunflower | 13,000 | 11,000 | 10,000 | 7,000 | 2,000 | 0 | 0 |

Source: Statistical Abstract 1981. No. 429
Central Bureau of Statistics, Damascus

TABLE D

PRODUCTION OF OLIVES
(1946, 1963, 1970, 1977 - 1980)

(In tons)

| | For Oil Production | Fresh consumption | Total Production |
|---|---|---|---|
| 1946 | - | - | 45,000 |
| 1963 | 60,288 | 16,618 | 76,906 |
| 1970 | 61,963 | 23,439 | 85,402 |
| 1977 | 151,167 | 24,190 | 175,357 |
| 1978 | 268,447 | 36,230 | 304,677 |
| 1979 | 162,348 | 33,602 | 195,950 |
| 1980 | 326,356 | 65,659 | 392,015 |

Source: Statistical Abstract 1981. No. 429
Central Bureau of Statistics, Damascus

TABLE E

PRODUCTION OF ENGINEERING GOODS

(1970, 1976 - 1980)

(In tons)

| Products | Unit | 1980 | 1979 | 1978 | 1977 | 1976 | 1970 |
|---|---|---|---|---|---|---|---|
| 1. Electrical Engines | Piece | 71,619 | 59,353 | 65,000 | 52,972 | 42,549 | - |
| 2. Electrical Transformers | Piece | 969,187 | 334,302 | 600,000 | 11,299 | 19,470 | - |
| 3. Iron Bars round | Ton | 79,968 | 92,824 | 108,603 | 97,621 | 97,984 | - |
| 4. Cables | Ton | 9,115 | 4,029 | 4,310 | 2,888 | 3,079 | 412 |
| 5. Metal pipes | 1,000 metres | 5,620 | 4,069 | 4,544 | - | - | - |
| 6. Washing Machines | Piece | 26,203 | 25,173 | 22,319 | 23,912 | 22,562 | 5,937 |
| 7. Pressure Cookers | Piece | 75,622 | 63,720 | 57,197 | 33,485 | 43,174 | - |
| 8. Refrigerators | Piece | 138,503 | 98,110 | 74,157 | 72,298 | 60,704 | 16,895 |
| 9. T.V. Sets | Piece | 72,058 | 70,975 | 50,701 | 55,358 | 57,967 | 7,590 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

TABLE F

PRODUCTION OF ENGINEERING GOODS BY PUBLIC AND PRIVATE SECTOR: (1970, 1976-1980)

(In tons)

| Products | | Unit | 1980 | 1979 | 1978 | 1977 | 1976 | 1970 |
|---|---|---|---|---|---|---|---|---|
| 1. Electrical Engines | (Public | Piece | 71,619 | 59,353 | 65,000 | 52,972 | 42,549 | - |
| | (Private | | NIL | NIL | NIL | NIL | NIL | - |
| 2. Electrical Transformers | (Public | Piece | 969,187 | 334,302 | 600,000 | 11,299 | 19,470 | - |
| | (Private | | NIL | NIL | NIL | NIL | NIL | - |
| 3. Iron bars round | (Public | Ton | 79,968 | 92,834 | 108,603 | 97,621 | 97,984 | - |
| | (Private | | NIL | NIL | NIL | NIL | NIL | - |
| 4. Cables | (Public | Ton | 9,115 | 4,029 | 4,310 | 2,888 | 3,079 | 412 |
| | (Private | | NIL | NIL | NIL | NIL | NIL | NIL |
| 5. Metal Pipes | (Public | 1,000 | 5,620 | 4,069 | 4,544 | - | - | - |
| | (Private | Metres | NIL | NIL | NIL | - | - | - |
| 6. [illegible]hing | (Public | Piece | NIL | NIL | NIL | NIL | NIL | NIL |
| [illegible]nes | (Private | | 26,203 | 25,173 | 22,319 | 23,912 | 22,562 | 15,937 |
| 7. Pressure Cookers | (Public | Piece | 75,622 | 63,720 | 57,197 | 33,485 | 43,174 | 21,000 |
| | (Private | | NIL | NIL | NIL | NIL | NIL | NIL |
| 8. Refrigerators | (Public | Piece | 126,755 | 86,717 | 70,520 | 69,129 | 58,306 | 14,769 |
| | (Private | | 11,749 | 11,393 | 3,637 | 3,169 | 2,398 | 2,126 |
| 9. T.V. Sets | (Public | Piece | 72,058 | 70,975 | 50,701 | 55,356 | 57,967 | 7,590 |
| | (Private | | NIL | NIL | NIL | NIL | NIL | NIL |
| 10. Water Meters | (Public | Piece | 110,000 | 92,310 | 78,630 | 62,880 | 72,000 | 42,760 |
| | (Private | | NIL | NIL | NIL | NIL | NIL | NIL |
| 11. Electrical Meters | (Public | Piece | 153,490 | 133,250 | 148,949 | 98,160 | 101,000 | 21,437 |
| | (Private | | NIL | NIL | NIL | NIL | NIL | NIL |
| 12. Telephone Sets | (Public | Piece | 49,990 | - | 2,750 | - | 37,053 | 8,093 |
| | (Private | | NIL | - | NIL | - | NIL | NIL |
| 13. Gas Cookers and Oven | (Public | Piece | 24,866 | 18,810 | 17,425 | 11,163 | 13,403 | - |
| | (Private | | | 34,403 | 30,723 | 29,278 | 29,408 | 12,603 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

ANNEX 2

## LIST OF VITAL SPARE PARTS FREQUENTLY NEEDED AND THE ESTIMATED NUMBER OF UNITS REQUIRED PER YEAR

| Components and Part Number | Number of Units required per year | Remarks |
|---|---|---|
| **1. Linter Draft Shield Parts** | | |
| i) Draft shield adj.arm (L.3685) | 20 | Locally made in the Company Workshop |
| ii) Draft shield adj.level (lower) (L.1121) | 10 | |
| iii) Draft shield adj.level connecting link (L.1122) | 15 | |
| iv) Draft shield handwheel | 5 | |
| **2. Linter Brush Parts** | | |
| i) Brush lag bristle stock (Gray hair) (L.575 B) | 100 | Locally made in Private workshops |
| **3. Linter Duplex Cylinder Parts** | | |
| i) Cylinder tube (L.1643) | 2 to 3 | Imported |
| ii) Cylinder saw (L.1693A) | 2,000 | Imported |
| iii) Cylinder Trunnion R.H. (L.2610D) | 1 unit every 10 years | Imported |
| **4. Duplex Cylinder Box Parts** | | |
| i) Cylinder box bearing (L.1330) | 100 | Imported |
| ii) Cylinder box housing (L.2831) | 15 | Locally made |
| **5. Gratefall Parts** | | |
| i) Gratefall butt (L.415) | 50 | Locally made |
| ii) Gratefall butt hinge pin (L.415B) | 25 | |
| iii) Gratefall head R.H. (L.3686A) | 2 to 3 | Imported |

| Components and Part Number | Number of Units required per year | Remarks |
|---|---|---|
| 6. Parts for 176-Saw | | |
| i) Gratefall grate unit Med. (L.3943) | 100 | Imported |
| ii) Gratefall grate R.H. (L.3944) | 25 | |
| iii) Gratefall grate L.H. (L.3945) | 25 | |
| iv) Gratefall butt hinge link (L.3485A) | 30 | Locally made |
| v) Gratefall butt hinge link adj. bracket (L.3488A) | 15 | |
| 7. Linter Float Parts | | |
| i) Float spider (L.1446E) | 26 | Locally made |
| 8. Float Box Parts | | |
| i) Float box (L.1373H) | 15 | Locally made |
| ii) Float bearing (L.1330C) | 50 | Imported |
| 9. Underneath Gratefall Lift Parts | | |
| i) Gratefall lift level roll (L.3184) | 25 | Locally made |
| ii) Gratefall lift hand lever elbow (L.1125) | 25 | |
| iii) Gratefall lift shaft box (L.738) | 10 | |
| 10. Seed Board Parts | | |
| i) Eccentric (L.3199) | 25 | Locally made |
| ii) Eccentric latch lock (L.3209) | 50 | |
| iii) Eccentric adj. latch (L.3233A) | 50 | |
| iv) Eccentric adj. latch hinge pin (L.3235) | 50 | |

| Components and Part Number | Number of Units required per year | Remarks |
|---|---|---|
| 11. Feeder Drive Parts | | |
| i) Eccentric (LF.110) | 30 | Locally made |
| ii) Eccentric Hange (LF.111) | 30 | |
| iii) Eccentric Strap connecting rod eye (LF.113) | 30 | |
| iv) Shield frame (LF.79) | 30 | |
| v) Shield (LF.V.82) | 30 | |
| vi) Rocker Arm (LF.89C) | 30 | |
| vii) Rocker arm bawl (LF.93) | 100 | |
| viii) Rocker arm bawl pin (LF.103) | 100 | |
| ix) Ratchet (FF.96B) | 100 | |

ANNEX 3 (A)

IMPORT OF MAIN COMMODITIES 1978 - 1980

"Quantity in ton Value in S.P.000"

| Commodities | 1980 | | 1979 | | 1978 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Bars and rods of iron or steel | 504698 | 805128 | 430730 | 541189 | 172119 | 155181 |
| Angles, shapes and sections, of iron or steel | 86046 | 142394 | 43723 | 66583 | 58775 | 58798 |
| Universal plates and sheets of iron or steel | 99722 | 187891 | 105892 | 173154 | 119344 | 147375 |
| Rolls of iron or steel | 6269 | 8606 | 19764 | 24118 | 9087 | 10938 |
| Iron or steel wire | 34468 | 66276 | 28042 | 42673 | 16052 | 23934 |
| Tubes, pipes of iron or steel | 48843 | 130502 | 34926 | 104077 | 98917 | 201586 |
| Copper and copper alloys, worked | 6111 | 61191 | 5918 | 49702 | 5700 | 38269 |
| Aluminium and Aluminium alloys, worked | 13303 | 135250 | 10367 | 91181 | 10519 | 81152 |
| Finished structures | 14812 | 74910 | 18722 | 107141 | 25534 | 133995 |
| Wire, cables of Aluminium | 1505 | 7677 | 8481 | 47820 | 8902 | 40496 |
| Nut, bolts of iron or steel | 4022 | 24654 | 6433 | 26771 | 4300 | 21228 |
| Locks and padlocks and parts thereof, of basic metal | 5103 | 64722 | 4316 | 50023 | 3012 | 32846 |
| Sewing Machines No. | 163059 | 29372 | 81208 | 20790 | 102146 | 27132 |
| Metal cutting machinetools | 2378 | 37814 | 2748 | 41004 | 3509 | 48802 |

Annex 3 (A) - Contd.

| Commodities | 1980 | | 1979 | | 1978 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Taps, cocks, valves and similar appliances | 2436 | 42639 | 2000 | 37445 | 2458 | 45492 |
| Transmission shafts and cranks, pulleys | 1589 | 45398 | 1414 | 31929 | 1144 | 31161 |
| Television No. | 10353 | 107508 | 1635 | 31502 | 1021 | 1789 |
| Other radio-broadcast receivers | 703 | 35444 | 638 | 31819 | 387 | 20816 |
| Electrical apparatus for making and breaking in electrical circuits | 2362 | 87202 | 4461 | 137388 | 3939 | 112231 |
| Insulated electric wire, cable and the like | 6033 | 72478 | 8024 | 68505 | 11623 | 90087 |
| Electro-mechanical domestic appliances | 3034 | 54982 | 2820 | 57137 | 1482 | 34437 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

ANNEX 3 (B)

## IMPORTS OF MAIN COMMODITIES 1978 - 1980

"Quantity in ton. Value in S.P. 000"

| Commodities | 1980 | | 1979 | | 1978 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Milk and cream, preserved | 10330 | 65870 | 10388 | 53546 | 7667 | 50586 |
| Ghee and butter | 27457 | 209467 | 23318 | 156554 | 21563 | 137736 |
| Flour of wheat or/of meslin | 224897 | 209072 | 202679 | 162180 | 78228 | 55942 |
| Oranges | 93589 | 77547 | 87664 | 66497 | 62613 | 49078 |
| Bananes | 39353 | 36985 | 64976 | 61621 | 67050 | 61505 |
| Apples | 25007 | 36092 | 21501 | 27010 | 18626 | 20409 |
| Raw Sugar | 31990 | 32464 | 92603 | 82422 | 93056 | 76842 |
| Refined sugar | 160035 | 215346 | 117821 | 111641 | 170416 | 166457 |
| Cigarettes | 748 | 35894 | 1061 | 47523 | 8821 | 33346 |
| Pitprops, poes and other wood in the rough | 26056 | 35407 | 30579 | 37152 | 30637 | 33382 |
| Wood, and railway sleepers of wood simply worked | 1592079 | 320616 | 150079 | 210908 | 135102 | 183289 |
| Gas oils | 282210 | 278376 | 1400342 | 770743 | 333473 | 161218 |
| Lubricating Oils | 39189 | 98488 | 28141 | 66169 | 44055 | 53483 |
| Petroleum gases | 49819 | 90012 | 92648 | 71376 | 25 | 267 |
| Fatty acids, acid oils from refining | 15552 | 48482 | 13645 | 37133 | 11509 | 30009 |
| Synthetic organic dyestuffs | 1164 | 29792 | 1106 | 26644 | 991 | 25703 |
| Antibiotics | 83 | 17543 | 37 | 20753 | 43 | 7789 |
| Medicaments | 5926 | 418500 | 6379 | 364835 | 5121 | 273030 |
| Products of condensation | 9793 | 57704 | 10048 | 47943 | 8554 | 38184 |
| Polyethylene | 14992 | 70720 | 16049 | 59162 | 15068 | 35822 |
| Polypropylene | 7023 | 28070 | 6985 | 22874 | 4966 | 11494 |
| Killers rat poisons and similar products | 3292 | 50576 | 2532 | 32504 | 2909 | 28821 |

Annex 3 (B) - Cont.

| Commodities | 1980 | | 1979 | | 1978 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Other chemical products and preparations n.e.s. | 6584 | 28864 | 16466 | 48439 | 6320 | 19817 |
| Printing and writing paper | 20028 | 65820 | 20763 | 45194 | 14727 | 30123 |
| Paper and paperboard impregnated, coated | 12375 | 36902 | 13328 | 27104 | 12812 | 23847 |
| Textile yarn | 23110 | 300464 | 25543 | 278101 | 23469 | 224890 |
| Bags and sacks of textile materials | 8307 | 29032 | 20746 | 52575 | 13358 | 31791 |
| Cement | 1285838 | 331934 | 1517480 | 310509 | 584370 | 112320 |
| Alloy steel and high carbon steel | 14830 | 44196 | 14304 | 30318 | 9363 | 17901 |
| Blooms, billets, slabs and sheet bars | 91714 | 115680 | 159836 | 141092 | 75359 | 56476 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

ANNEX 3 (C)

EXPORT OF MAIN COMMODITIES 1978 - 1980

"Quantity in ton. Value in S.P. 000"

| Commodities | 1980 | | 1979 | | 1978 | |
|---|---|---|---|---|---|---|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| Sheep "000" heads | 2 | 828 | 21 | 8274 | 21 | 6531 |
| Croats "000" heads | 197 | 18548 | 248 | 29094 | 150 | 18044 |
| Lentils, dried | 53856 | 104508 | 122987 | 139738 | 107292 | 121077 |
| Vegetable dried | 1094 | 6298 | 2250 | 11750 | 980 | 5661 |
| Kumardin & Malben | 2980 | 17387 | 5568 | 21760 | 4630 | 16328 |
| Sugar confectionery | 2255 | 9389 | 2581 | 10358 | 2381 | 9926 |
| Tobacco unmanufactured | 3427 | 53535 | 2114 | 29094 | 1883 | 24257 |
| Hides and skins raw | 1160 | 11796 | 2372 | 37658 | 2212 | 34594 |
| Raw cotton not combed or carded | 93583 | 664505 | 113298 | 758009 | 126742 | 647357 |
| Cotton linters | 14755 | 15573 | 19333 | 14868 | 17050 | 9799 |
| Sheep's and lamb's wool greasy or fleece washed | 5517 | 45303 | 5822 | 41159 | 6319 | 34440 |
| Sheep's or lambs' wool not carded or combed, washed | 428 | 2302 | 972 | 4372 | 1310 | 6059 |
| Natural calcium phosphates | 744034 | 89117 | 1253380 | 126299 | 919304 | 89570. |
| Spirittype, jat fuel | 549589 | 659151 | 139876 | 104887 | 64064 | 25547 |
| Residual fuel oils n.e.s. | 908359 | 605797 | 231175 | 101645 | 113472 | 31393 |
| Woven cotton fabrics printed | 1625 | 35728 | 1557 | 33003 | 947 | 16878 |
| Woven fabrics of artificial fibres printed or decorated | 1509 | 73629 | 1013 | 39271 | 648 | 19641 |
| Bed linen, table linen and other furnishing articles of textile materials | 853 | 23768 | 994 | 23402 | 681 | 10874 |
| Television No. | 637 | 1658 | 21061 | 10868 | 351 | 898 |
| Outer garments and clothing accesscries | 613 | 19734 | 843 | 26616 | 888 | 23114 |
| Under garments of cotton | 562 | 22855 | 536 | 17049 | 590 | 15696 |

Source: Statistical Abstract: 1981. No. 429
Central Bureau of Statistics, Damascus

ANNEX 4 (A)

Intermediate Institute for Engineering
and Metallic Industries

## Metallic and Mechanical Section

## First Year

## Scholar Plan

| Subject | Number of Periods Per Week | Maximum Grade | Minimum Grade | Duration of Exam. by hours |
|---|---|---|---|---|
| **A. General Culture** | | | | |
| 1. National and Socialist Culture | 2 | 100 | 40 | 2 |
| 2. Foreign Language | | | | |
| a) General ) b) Specialized ) | 3 | 100 | 40 | 3 |
| 3. Industrial Security | 1 | 100 | 40 | 2 |
| 4. Oriented Statistics | 2 | 100 | 40 | 2 |
| **B. Scientific Culture** | | | | |
| 1. Mathematics | 2 | 100 | 40 | 3 |
| 2. Foundation of Electricity and Electronics | 2 | 100 | 40 | 2 |
| 3. Oriented Industrial Physics | 2 | 100 | 40 | 2 |
| 4. Oriented Industrial Chemistry | 2 | 100 | 40 | 2 |
| **C. Subject of Specialization** | | | | |
| 1. Industrial Drawing | 3 | 200 | 100 | 4 |
| 2. Material Technology | 3 | 200 | 100 | 3 |
| 3. & Strength of mat. | 2 | 200 | 100 | 3 |
| 4. Measurement | 2 | 100 | 50 | 2 |
| 5. Machines Theory | 2 | 200 | 100 | 3 |

Annex 4 (A) - Contd.

| Subject | Number of Periods Per Week | Maximum Grade | Minimum Grade | Duration of Exam.by hours |
|---|---|---|---|---|
| D. Practical and Applied Subjects | | | | |
| (Workshops) | 12 | 300 | 180 | 24 |
| Total | 40 | 2000 | 950 | 57 |

ANNEX 4 (B)

Ministry of Industry
Intermediate Institute for Engineering
and Metallic Industries

## Metallic and Mechanical Section

## Second Year

## Scholar Plan

| Subject | Number of Pericds Per Week | Maximum Grade | Minimum Grade | Duration of Exam.by Hours |
|---|---|---|---|---|
| A. General Culture | | | | |
| 1. National and Socialist Culture | 2 | 100 | 40 | 2 |
| 2. Industrial Organization and Business Administration | . | 100 | 40 | 2 |
| 3. Foreign Language | | | | |
| a) General ) b) Specialized ) | 3 | 100 | 40 | 3 |
| B. Scientific Culture | | | | |
| 1. Strength of Materials | 2 | 100 | 40 | 3 |
| 2. Thermodynamic and Hydraulic Principles | 2 | 100 | 40 | 2 |
| C. Subject of Specialization | | | | |
| 1. Special Technology | 4 | 200 | 100 | 4 |
| 2. Machines Elements | 4 | 200 | 100 | 4 |
| D. Practical and Applied Subjects | | | | |
| 1. Practical Workshops | 14 | 300 | 180 | 12 |
| 2. Practical Design | 5 | 200 | 180 | 6 |
| Total | 40 | 1600 | 800 | 41 |

ANNEX 4 (C)

Ministry of Industry
Intermediate Institute for Engineering
and Metallic Industries

## Electricity and Electronics Section

## First Year

## Scholar Plan

| Subject | Number of Periods Per Week | Maximum Grade | Minimum Grade | Duration of Exam.by hours |
|---|---|---|---|---|
| A. General Culture | | | | |
| 1. National and socialist culture | 2 | 100 | 40 | 2 |
| 2. Foreign Language | | | | |
| a) General | 2 | 100 | 40 | 3 |
| b) Specialized | 1 | | | |
| 3. Industrial Security | 1 | 100 | 40 | 2 |
| 4. Oriented Statistics | 2 | 100 | 40 | 2 |
| B. Scientific Culture | | | | |
| 1. Mathematics | 4 | 100 | 40 | 3 |
| 2. Mechanics | 2 | 100 | 40 | 2 |
| 3. Oriented Industrial Physics | 2 | 100 | 40 | 2 |
| 4. Oriented Industrial Chemistry | 2 | 100 | 40 | 2 |
| C. Subject of Specialization | | | | |
| 1. Industrial drawing | 2 | 100 | 50 | 3 |
| 2. Foundations of Electrical Engineering | 4 | 200 | 100 | 3 |
| 3. Electronics | 4 | 200 | 100 | 4 |
| 4. Electrical Machines | 2 | 100 | 50 | 3 |
| D. Practical and Applied Subjects | | | | |
| (Laboratory) | 10 | 300 | 180 | 4 |

ANNEX 4 (D)

Ministry of Industry
Intermediate Institute for Engineering
and Metallic Industries

## Electricity and Electronics Section

## Second Year

## Scholar Plan

| Subject | Number of Periods per Week | Maximum Grade | Minimum Grade | Duration of Exam. by hours |
|---|---|---|---|---|
| A. General Culture | | | | |
| 1. National and Socialist Culture | 2 | 100 | 40 | 2 |
| 2. Industrial Organization & Business Administrat. | 2 | 100 | 40 | 2 |
| 3. Foreign Language | | | | |
| a) General | 1 | 30 | 12 | 3 |
| b) Specialized | 2 | 70 | 28 | |
| B. Scientific Education | | | | |
| 1. Technology of Electric & Electronic Substances | 2 | 100 | 40 | 2 |
| 2. Principles of Electronic Computers | 3 | 100 | 40 | 3 |
| 3. Telecommunications | 2 | 100 | 40 | 2 |
| C. Subjects of Specialization | | | | |
| 1. Semiconductors and Applications | 3 | 200 | 100 | 3 |
| 2. Electric and Electronic Measuring Instruments and Methods of Measurements | 2 | 200 | 100 | 3 |
| 3. Principles of Black/White and Color Television | 2 | 100 | 50 | 2 |
| 4. Wire Communications | 2 | 100 | 50 | 2 |
| 5. Electric Machines for Alternating Currents | 2 | 100 | 50 | 2 |
| D. Practical and Applied Subjects | | | | |
| 1. Electricity | 6 | 300 | 180 | 6 |
| 2. Electronics | 6 | 300 | 180 | 6 |

ANNEX 5

## LIST OF PERSONS INTERVIEWED

### I. DAMASCUS

#### (A) UNDP Damascus

1. Mr. Ahmed Salim
   Senior Industrial Development Field Adviser
   UNDP, Damascus

2. Mr. Albertus Van Burik
   Junior Programme Officer (UNIDO)
   UNDP, Damascus

3. Dr. Yahaya Kassab
   Programme Officer
   UNDP, Damascus

#### (B) Meeting with General Organization for Food Industries Ministry of Industry

1. Mr. Kassam Mayala
   Director-General
   General Organization for Food Industries
   Ministry of Industry
   Damascus

2. Mr. Antoine Louis*
   Technical Director
   General Organization for Food Industries
   Ministry of Industry
   Damascus

3. Mr. Ahmed Salim
   SIDFA/UNDP
   Damascus

4. Dr. Yehya Kassab
   Programme Officer
   UNDP, Damascus

5. Mr. Albertus Van Burik
   Junior Programme Officer
   UNDP, Damascus

ANNEX 5 (Cont'd.2)

(C) Meeting with the Arab Oil Co. for Vegetable Oil, Damascus and Visit to Factory

1. Dr. Abed-Al-Magid Dakak
   General-Director (Engineering)
   Arab Oil Co.
   Damascus

2. Mr. Zakaria Harmach
   Director for Personnel and Administration
   Arab Oil Co.
   Damascus

3. Mr. Antoine Louis
   Technical Director
   General Organization for Food Industries
   Ministry of Industry
   Damascus

(D) General Organization for Food Industries
Technical Division, Damascus

1. Mr. Hayssam Midani
   Chief, Industry Development Section
   General Organization for Food Industries
   Damascus

2. Dr. Zouher Monanor
   Food Technologist
   General Organization for Food Industries
   Damascus

3. Dr. Abdul M. Alastmani
   Food Technologist
   General Organization for Food Industries
   Damascus

(E) Technical Institute/Vocational Centre

1. Mr. Zerandji Abdul Latif
   Director
   Intermediate Institute for Engineering & Metallic Industries
   Damascus

2. Mr. Ibrahim Abutak
   Deputy-Officer-in-Charge
   Vocational Training Centre
   Damascus

ANNEX 5 (Contd. 3)

(F) Engineering Workshops (Private)

1. Mr. Aladin Arnaute
   Gin Street, Damascus
2. Mr. Bedder Deen Savah
   Gin Street, Damascus
3. Mr. Jandart Hadat
   Gin Street, Damascus
4. Mr. Ahmed Dahan
   Gin Street, Damascus

(G) Private Engineering Company

1. Mr. Ibraheem Yahya Shihabi
   Administrative Director
   Arabian Technology & Engineering Office
   Rokneddine Matrak Shakko Bldg., No.2
   Damascus

II. ALEPPO

(A) Syrian Industrial Co.

1. Mr. Mustafa Boulad
   General-Director
   Syrian Industrial Co.
   Aleppo
2. Dr. Adnan Chiek El-Kaar
   Technical Director
   Syrian Industrial Co.
   Aleppo
3. Mr. M. Saleh Muhandes
   Chief, Production Department
   Syrian Industrial Co.
   Aleppo
4. Mr. Khaled Kayyali
   Commercial Director
   Syrian Industrial Co.
   Aleppo
5. Mr. Musattar Khalili
   Chief, Engineering Research & Development Department
   Nairab Oil Plant, Syrian Industrial Co.
   Aleppo
6. Mr. Hamam Hazzowriy
   Mechanical Engineer, Engineering Research & Development Dept.
   Nairab Oil Co., Syrian Industrial Co.
   Aleppo

ANNEX 5 (Contd. 4)

7. Mr. Yousuf Dankla
Maintenance Engineer
Nairab Oil Plant, Syrian Industrial Co.
Aleppo

(B) Engineering Workshops (Private)

1. Mr. Thahan
Arcob, Aleppo

2. Mr. Bedros Mekordry
Arcob, Aleppo

3. Mr. Amir Khaniyan
Arcob, Aleppo

III. HOMS

(A) Homs Sugar Co.

1. Mr. Tares Sharabi
Technical Director
Homs Sugar Co.,
Homs

2. Mr. Abdul Maged Rahmani
Manager, Vegetable Oil Plant
Homs Sugar Co.
Homs

3. Mr. Abdel Aziz El Hag
Head, Plant Maintenance
Homs Sugar Co.,
Homs

IV. Final Meeting with General Organization for Food Industries, Damascus

1. Mr. Kassam Mayala
Director-General
General Organization for Food Industries
Ministry of Industry
Damascus

2. Mr. Antoine Louis
Technical Director
General Organization for Food Industries
Ministry of Industry
Damascus

3. Mr. Maysaam Midani
Chief, Industry Development Section
General Organization for Food Industries
Ministry of Industry
Damascus