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UNIDO STUDY

ON

Syria

# INDUSTRIAL DEVELOPMENT PROSPECTS IN THE SYRIAN ARAB REPUBLIC

## THE IRON AND STEEL SECTOR

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## CHAPTER 1

## SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS

### I - The Steel Industry in Syria

1 - The General Company of Iron and Steel products in Hama, "GECOSTEEL" is the first metallurgical enterprise in Syria. It started its operations in 1972 with a rolling mill for the production of steel reinforcement bars based on imported billets with a designed capacity of 110,000 tons per year in three daily shifts.

2 - In 1978 GECOSTEEL commissioned an electric steel melting shop which is composed of two electric arc furnaces 25 tons each and two continuous casting machines each with 4 strands for the production of billets 80 x 80 - 100 x 100 mm cross section and 3 - 6 meter long. The steel melting shop has a designed capacity of 120 000 tons per year on the bais of three shifts per day.

3 - GECOSTEEL commissioned also a tube mill in 1978 with two production lines for producing longtudinally welded pipes with diamerters varying between 3/8" - 3". The mill has an annual designed capacity of 20,000 tons equivalent to 9.8 million meters on the basis of one production shift per day.

It should however, be emphasized that the design capacity of both the rolling mill and the tube mill is based on certain product mix, and the effective capacity of each mill varies with variation in the product mix.

4 - Table 1.1 shows the annual prodution of the three production [illegible] and the capacity utilization since they were put into operation.

Table 1:1

| Year | ROLLING MILL | | ELECTRIC STEEL | | TUBE MILL | |
|---|---|---|---|---|---|---|
| | Prodn Tons | Cap. Util. % | Prodn Tons | Cap. Util. % | Prodn Meters | Cap. util % |
| 1972 | 60,000 | 80% | | | | |
| 1973 | 36,000 | 48% | | | | |
| 1974 | 50,654 | 67% | | | | |
| 1975 | 85,437 | 77% | | | | |
| 1976 | 97,984 | 89% | | | | |
| 1977 | 97,621 | 89% | | | | |
| 1978 | 108,603 | 99% | 37,946 | 32% | 4,544,192 | 30% |
| 1979 | 92,824 | 84% | 30,184 | 25% | 4,568,780 | 30% |
| 1980 | 79,968 | 73% | 29,334 | 24% | 5,620,170 | 37% |
| 1981 | 102,363 | 93% | 35,187 | 29% | 6,724,874 | 45% |
| 1982 | 66,741 | 61% | 46,536 | 39% | 97,480 | 0.6% |
| 1983 | 83,855 | 76% | 35,523 | 30% | 916,736 | 6% |
| 1984 | 84,033 | 76% | 32,262 | 27% | 5,976,415 | 40% |

5 - In the above mentioned table the design capacity for the three shops were taken as follows:

5.1 - The designed capacity for the electric steel melting shop is 120,000 tons/year on the basis of three shifts/day.

5.2 - The designed capacity for the rolling mills was taken as 75,000 tons/year for two operating shifts per day until 1974 and then raised to 110,000 tons/year for three operating shifts per day.

5.3 - The designed capacity according to the contracated product mix is 9.8 million meters per year and one shift per day. It was adjusted to 15 million meters per year and two shifts per day according to actual product mix.

6 - Capacity utilization of the rolling mill shop is satisfacatory, it could achieve better results if enough billets were supplied to the mill from the steel melting shop.

7 - The capacity utilization of the steel melting shop and the pipe mill is considerably below the designed capacity. Provisions are being made by the management to improve capacity utilization. For this purpose, a technical assistance agreement was signed with the Polish firm "Centrozap".

The agreement covers the steel melting shop and the pipe mill and it came into effect in January 1985. The early results seem to be satisfacatory. It is expected that the production of 1985 will approach to a great extent the designed capacity of both the steel plant and the pipe mill with a considerable saving in the production cost of the billets and the pipes.

## II - Iron and Steel Sector in the Syrian Economy

1 - The average annual growth rate of the agriculture and manufacturing sectors are the lowest among all other economic sectors in the period 1963 - 1981 ;

| | |
|---|---|
| Agriculture | 4.05 % |
| Mining and quarrying | 44.74 % |
| Manufacturing | 4.8 % |
| Utilities | 14.06 % |
| Construction | 11.64 % |
| Services | 8.31 % |

2 - The percentage share of the manufacaturing sector in the GDP decreased from 13.2% in 1960 to 8.1% in 1980.

3 - The highest average annual growth rate among all economic sectors was achieved by the mining and quarrying sector in the period 1963 - 1981, due to the discovery of oil.

4 - The share of the steel sector in the manufacaturing value added according to Table (3) of Annex (IV) is 0% in 1973 and 1980. Although there is an obvious mistake in these figures, neverthless the contribution of the iron and steel sector in MVA is very limited.

5 - The contribution of the developing countries to the world iron and steel sector was 5.4% in 1963 and increased to 10.3% in 1980.

6 - A strong and an economically sound iron and steel sector with diversified production programme of long and flat products would help in heating up the Syrian economy and intensifying the overall industrialization process due the strong interlinkage between the steel sector and the other economical and industrial sectors. Fig.1.1 shows the general pattern of interlinkage between the iron and steel sector and the other main economic sectors.

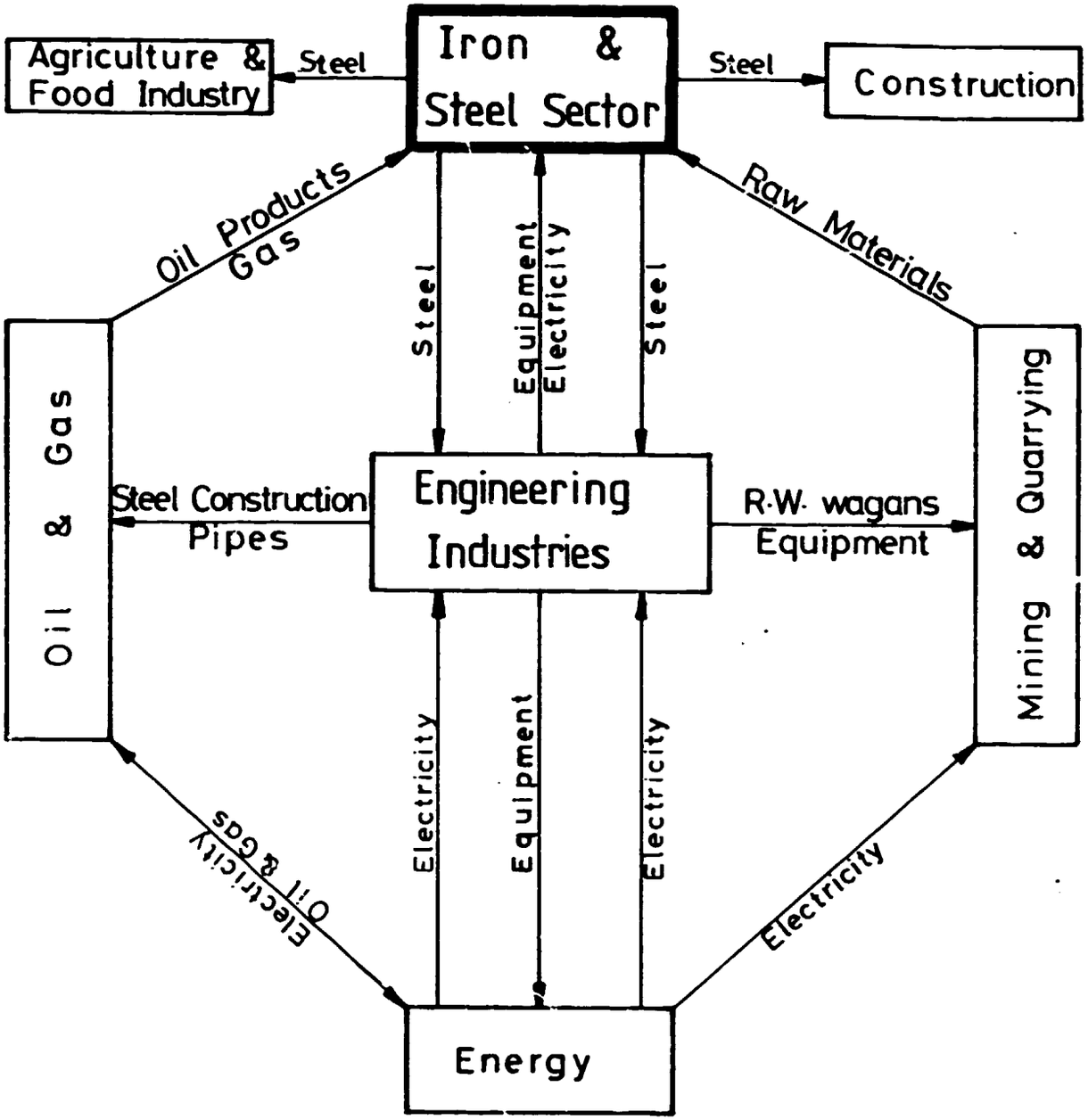



Fig. 1.1

Interlinkge of Iron & Seel Sector with other Sectors

7 - The pattern of consumption of iron and steel products depends generally on the level of economic development of the country.(1). Fig. 1.2 shows the pattern of steel consumption for country A with GNP/cap. of 734 (1975) $ compared with country B with GNP/cap. of 962 (1975) $.

GDP per capita in Syria at 1975 prices is 472 $ and 857 $ in 1970 and 1981 respectively.

## III - Future Demand, Availability and Gaps in the Syrian Iron and Steel Market

1 - The Syrian Iron and Steel market has been studied by various organizations. Due to shortage of time and the non-availability of all the studies, it was only possible for the expert to review the last two studies shown on Table 3.4 .

It is, therefore, difficult to say which one of them is the most reliable and which will prove itself in the future, since all of them depend on certain assumptions and forecasting is actually an intelligent guess. Some specialists say that forecasts have become "futile" or useless, and that other forecasting methods must be perfected (2).

Inspite of all this uncertainty, it seems that MECON study is elaborate enough and form a reliable basis for future planning of the steel industry in Syria.

3 - The market forecast presented by MECON is based on the following methods.

a - The end use estimate for the years 1985 and 1990.

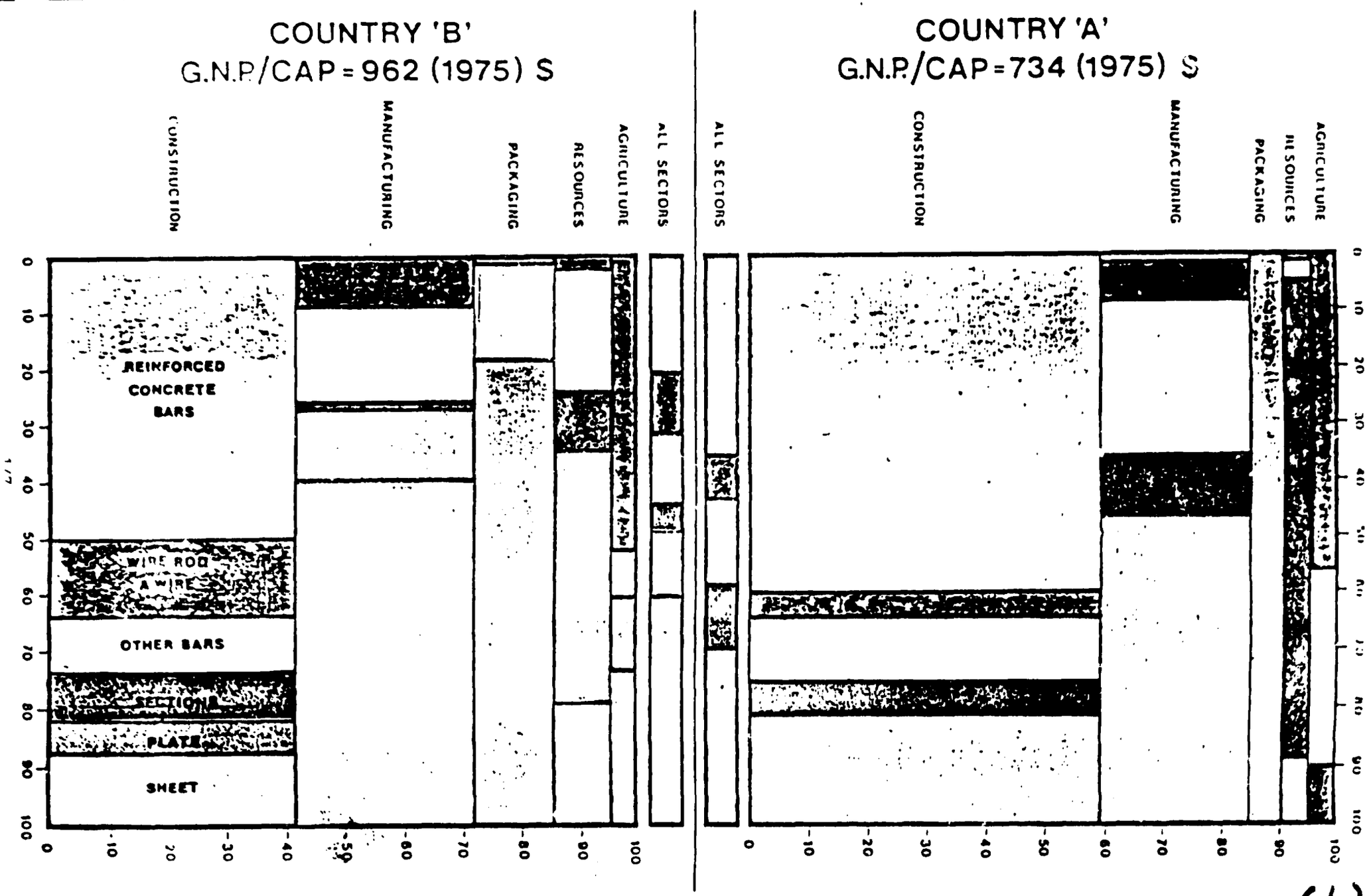



Figure 4 SECTORAL ANALYSIS OF STEEL CONSUMPTION BY PRODUCT (1)

b - Macro economic methods based on corelation of steel consumption with economic indicators were used to forecast steel demand in 2000 and 2010.

4 - Accordingly, MECON estimastes of steel demand for the different terminal years are as follows:

| Year | Total demand of finished Rolled Steel t/year |
|---|---|
| 1985 | 1,342,000 |
| 1990 | 2,042,000 |
| 2000 | 3,675,000 |
| 2010 | 5,170,000 |

5 - MECON considers thast the availability of rolled steel product from the existing local supplier GECOSTEEL will remain unchanged during the period 1985 - 2010 and equal to 126 000 tons of which 108 000 tons round bars and 18,000 of black and glavanized pipes.

6 - The gaps for the terminal years will therefore be as follows:

| Year | Gap in t/year |
|---|---|
| 1985 | 1,216,000 |
| 1990 | 1,916,000 |
| 2000 | 2.7 - 2.8 million tons |
| 2010 | 4.2 - 4.3 million tons |

## IV The New Iron and Steel Project

1 - The results of the markets study, future demand, availability and gaps prepared by MECON have shown that the bulk of the deficit of finished rolled product in Syria by the year 1990 will be in the category of non-flat products (1.16 m[illegible].

MECON therefore recommended that the proposed iron and steel plant should go for the production of non-flat produts for which two fairly economic capacity rolling mills would cover the bulk of the gap of 1.16 million tons by 1990. The two rolling mills proposed will have the following capacities

| | | | |
|---|---|---|---|
| Mill 1 | - | Round bars 6- 12 mm | 400,000 t/y |
| Mill 2 | - | Round bars and medium sections | 500,000 t/y |
| | | of which : | |
| | | Round bars 14 - 50 mm | 310,000 t/y |
| | | Medium Sections | 190,000 t/y |

2 - The financial indices of the project whether for the mines and the concentration plant Table 5/2 or for the integrated iron and steel works Table 5/3 cannot justify the construction of an iron and steel complex in Syria with such enormous investment. It will be very risky, under the assumptions given in Table 5/1 to take any decision for starting up the construction of the project.

## V - Alternative Development Strategy for the Iron and Steel Sector in Syria

1 - Steel industry requirs large inputs which can be summarized as follows:

1.1 - Capital

1.2 - A market size compatible to optimum sizes of the production and finishing facilities of a steel plant.

1.3 - Manpower

1.4 - Energy

1.5 - Raw Materials

1.6 - Water

1.7 - Equipment, structural, technology and know-how

1.8 - Infrastructure development

2 - The availability of all above listed factors in any developing country is very rare, and the establishment of a successful steel industry is possible in the presence of some of those factors and not necessarily all of them.

3 - In Syria a reasonable number of those factors are available and sufficient to form an accepted base for the establishment of a successful steel industry such as the market, energy in the form of oil and gas, raw materials such as iron ores, limestone, dolomite, water, manpower Some of the infrastructure projects needed for the industry exists but they may need to be further developed together with other new infrastructure projects.

4 - It is a well known fact all over the world that steel industry alone cannot give a reasonable return on investment unless further processing is made on a part of its rolled products.

5 - In order to improve the economy of the industry and to reduce the foreign currency component in the production cost of the finished product it is necessary to identify some reasonable investment opportunities in the field of up and down stream industries which are related to the steel industry and to study their implementation parallel with the establishment of the steel industry.

6 - With the available inputs, it is possible to have a successful steel industry in Syria if it is developed within a global strategy incorporating the development of the existing facilities GECOSTEEL, the existing up and down stream industries together with new projects in those fields.

7 - The bulk production of the newly proposed iron and steel plant will be in the form of non-flat products and mainly round bars. Most of such product goes to the construction sector and very little goes to the manufacturing sector, it is therefore necessary to aim at a diversified product mix in the new steel capacities in the form of flat and non-flat rolled products.

8 - The strategy should also include a study for the development of the capital goods. This sector, besides, being a down stream industry, it plays a very important role in the overal industrialization and development in the country. Capital goods industry has alreay started in Syria, some of the capital goods manufacturing facilities are now producing tractors, pumps, industrial weighing machines, textile machinery, steel structure fabrications, electric motors, other facilities are being in the planning stage such as a cement plant equipment project and machine tool project.

It is interesting to note that developing economies have been characterized by two major structural changes in their pattern of production, first, a reversal in the relative shares in output of agriculture and industry and industry related activities (services such as transport and communications, banking, insurance, marketing and trade, etc.); and secondly an equally profound change in the relative shares within industry of consumer goods and capital goods or producer goods (including intermedite produts).(3)

Capital goods industries have played an important part in the industrialization of advanced capitalist and socialist economies(4). Since this sector constitutes as complex grouping, comprising millions of proudcts(5) then it will be necessary to develop this industry according to a plan taking into consideration the needs and priorities of the country in order to achieve an efficient expansion of capital goods production.

9 - There are also various up stream industries linked with the steel sector, such as the refractory industry. The Iron and steel industry and the cement industry are big consumers of refractory products. It is therefore, suggested to study the feasibility of establishing a refractory industry in Syria.

## Basic Policies and Objectives of the Development Strategy of the Iron and Steel Sector.

10 - The following is a summary of the key policies and main objectives of an alternative developing strategy for the iron and steel industry.

### II - The Market and Product Mix

11.1 - To consider the results of the market study of MECON sufficient for the future planning of the steel industry.

11.2 - To orient the industry mainly towards the local market.

11.3 - The product mix to be diversified, within economic limits, to include both long and flat products.

### 12 - Planning

12.1 - To agree on a long term plan for the development of the steel industry until the year 2010.

12.2 - The construction of iron and steel complex and its relevant infrastructure projects needs long time for planning, negotiation of tenders, arrangement of finance, construction, equipment manufacture and erection, commissioning, achieving of designed capacity. This will need about 10 years, so it is recommended for designing new capacities to consider the supply gap in 1995.

12.3 - The new capcities should be capable of being expanded to double their initial capacities.

12.4 - The possibility of future expansion in GECOSTEEL operations should be examined and a feasibility study should be made for this purpose.

12.5 - Planning of new capacities should take into consideration the expansion of GECOSTEEL if it proved to be feasible.

13 - **Technologies**

13.1 - To accept technologies which are economically and technically sounds and have been tested for long periods of operation under various conditions, taking into consideration of the following:

1 - Should allow for maximum use of local resources
2 - Should alllow for minimum foreign currency for operation.
3 - To examine and negotiate the new technology for the production of flat products with their respective suppliers. It is claimed that these technologies are cheaper and suitable for relatively limited flat products market.

14 - **Raw Materials**

14.1 - To examine the concentration of ore by using magnetizing roasting and low intensity magnetic seperation instead of high intensity magnetic seperation. This will give concentrate with higher Fe content and reduce considerably the amount of imported ore required. Natural gas can be used as reducing agent.

14.2 - To import coke instead of coking coal and postpone the construction of the coking plant to a later stage. The water requirement of the coking plant can be used for more urgent needs e.g. the concentration plant.

15 - **Energy**

15.1 - To consider the replacement of oil by natural gas. Oil could be exported much easier than the gas.

15.2 - Blast furnace technology should allow for maximum injection of natural gas to reduce the coke consumption to a minimum.

15.3 - Blast Furnace stoves should give maximum possible hot blast temperaature.

16 - **Up and Down Stream Industries**

16.1 - To identify a number of investment opportunities in the field of up and down stream industries related to the steel sector and to carry out feasibility studies for the most viable industries. Those studies may include new industries or expansion in existing one.

17 - **Capital Goods Industry**

17.1 - Capital goods industry plays an important part in industrialization, it has already started in Syria.

17.2 - To consider the expansion of the capital goods sector according to a plan taking into consideration the needs and priorities of the country.

18 - **Design Organization**

18.1 - Engineering and industrial design are indespensible for creating, promoting and maintaining industry in any country. Without viable designs, industry will not flourish in a developed country and will never become established in a developing one. Design is the link between science and technology; it seeks to transform knowledge and ideas into economic goods (6).

Machine shops, foundries, forging shops, heat treatment shops represents the muscles needs for the manufacture of capital goods, or to modify and modernize plant equipments, design organizations are the brains needed to prepare the designs for the manufacture of the equipment. The absence of design centres in developing countries is the main reason behind the very low contribution of those countries in the production of capital goods.

The successful establishment or expansion of iron and steel industries in developing countries has been facilitated by central, long-term planning and by government encouragement and support of local ventures in design, engineering and equipment manufacture (7)

18.2 - To consider establishment of design organization for equipment manufacture and to start with similar and important sectors such as cement industry and steel industry.

19 - **Research and Development**

19.1 - Research and development, and design organization are two sides for one coin, the idea usually originates in R & D organization and is industrialized in design organization and then finally transformed into economic goods by various manufacturing facilities.

19.2 - To consider the establishment of R&D institute for metallurgical industries.

20 - **Plant Site**

20.1 - To consider the the construction of the plant in Tartous instead of Homs.

21 - **Government Support and Subsidies**

21.1 - To consider a loan equity ratio of 1 : 1 instead of 3 : 1

21.2 - To reduce the interest rate on the local loans to a minimum.

21.3 - To consider subsidised prices for energy, water and transportation tariffs.

21.4 - The investment on infrastructure projects to be born by the government.

21.5 - To consider nominal land cost.

21.6 - To protect the industry by imposing custom duties on similar imported products.

21.7 - Selling price of the iron and steel products ex-work should not be less than that of the imported similar produts in the local market.

21.8 - To establish new training centres, or expand existing ones for the various skills and professions needed for the metallurgical sector and the up and down stream industry.

## Proposed Plan of Action

22 - In order to implement the strategy proposed, the following plan of action is suggested.

22.1 - To form a high level committee from the competent authorities and ministries, it will be directly responsible to the cabinet of ministers.

22.2 - The main task of this committee will be as follows:

a - To collect and discuss all the documents, studies and reports concerning the development of the steel industry in Syria.

b - To agree on a strategy for the development of the steel industry until the year 2010.

c - To prepare the terms of reference for all the studies to be made for the implementation of the strategy. The studies are expected to include the following:

1 - Master plan with alternative scenarios for the development of iron and steel sector until the year 2010.
2 - Feasibility study for new iron and steel project.
3 - Feasibility study for the expansion of GECOSTEEL.
4 - Feasibility studies for selected up and down stream industries. A separate study for each project e.g. refractories, capital goods etc.

5 - A study for the establishment of design organisation.

6 - A study for the establishment of a R & D Center for the metallurgical industries.

7 - A study for the excpansion of vocational training Centers.

d - To invite highly reputed consulting firms to submit their offers for the preparation of the studies.

e - To choose the successful consultant

f - To study the reports which will be prepared by the consultant.

g - Decision making.

It is expected that the above mentioned steps will need about 9 - 12 months.

23 - If the results of the studies are positive and relevant investment decisions are taken then it will be necessary to form a new organization, which may be called:

**"The General Organization for Metallurgical Industries"**

This new organization will be responsible for the construction of the new projects and their further operation.

The organization will also supervise the construction of the infrastructure projects, the up and down stream projects which may be handed later to their respective authorities and organizations after being completed and ready for operation.

## VI - The General Company of Iron and Steel Products, Fact findings and Recommendations

24 - Chapter 4 have dealt with this subject and a number of recommendations have been proposed covering the following areas:

24.1 - Management and supervision.

24.2 - Increasing the productivity of the shops, reducing the production cost and improving the quality.

24.3 - Maximum attention to be given to the steel melting shop being the key bottleneck for GECOSTEEL operations.

24.4 - Scrap policy should aim at maximum utilization of local scrap.

24.5 - Maximization of GECOSTEEL revenues through the production of high tensile steel bars St 52 instead of the normal bars St 37, and to increase the production of galvanized pipes.

24.6 - The selling price of the products not to be less than the similar imported product.

24.7 - Future development possibilities for GECOSTEEL to be investigated and a feasibility study to be prepared.

## VII - The New Iron and Steel Project, Comments and Recommendations.

25 - Chapter 5 have dealt with this subject and a number of recommendation have been proposed covering the following areas:

25.1 - Financial indices of the project and financial assumptions

25.2 - Plant site

25.3 - Energy and use of natural gas instead of liquid fuels.

25.4 - Iron Ore mines

25.5 - Concentration Technology

25.6 - Coke Oven Plant and importation of coke instead of coal

25.7 - Blast furnace numbers and technology

25.8 - Steel melting and technology selected

25.9 - Continuous casting technology

25.10 - Scrap handling and preparation

25.11 - Rolling Mill technology and wire production

25.12 - Product mix

25.13 - Sales Price

CHAPTER 2

# IRON AND STEEL SECTOR IN THE SYRIAN ECONOMY

## Basic Economic Indicators

1 - For rapid development of all economic activities Syria has adopted a number of successive economical and social five year development plans since 1971, and for the following periods:

| | | |
|---|---|---|
| 1971 | - | 1975 |
| 1976 | - | 1980 |
| 1981 | - | 1985 |

The Syrian authorities are working on the preparation of fourth Five Year Economical and Social Plan 1986 - 1990, which is expected to be ratified before the end of 1985.

2 - The progress and development in the Syrian economy can be generally understood from the progress made in the basic economic indicators shown in the tables of Appendix IV for National Statistics.

Table (1) compares the economic performance of Syria with western Asia and developing countries. Table (2) gives the comparative growth rates by economic sector at 1975 prices. Table (3) shows the distribution of the Syrian GDP by sector of origin at 1975 prices. Taable (4) gives the gross output and value added in manufacturing at current prices.

## The Position of the Iron and Steel Sector in the Syrian Economy.

3 - The following observation and comments on the various statistics given in the previously mentioned tables will help in identifying the position of the Iron and Steel Sector in the Syrian economy.

3.1 - The gorwth rate of the agriculture and manufacturing sectors are the lowest among all economic sectors as shown in Table (2). The growth rate for the various economic sectors of the Syrian economy in the period 1963 - 1981 are as follows:

| | |
|---|---|
| Agriculture | 4.05% |
| Mining and quarrying | 44.74% |
| Manufacturing | 4.80% |
| Utilities | 14.06% |
| Construction | 11.64% |
| Services | 8.31% |

3.2 - The share of the manufacturing sector in GDP was 13.2% in 1960 and 8.1% in 1980.

3.3 - The food and textile industries are dominating the manufacturing value added as follows:

| | 1973 | 1980 |
|---|---|---|
| Food Products | 26.1 | 24.5 |
| Textile | 44.1 | 32.0 |

3.4 - The share of the steel sector in the manufacturing value added in 1973 and 1980 are 0% according to Table (3).

It is obvicus that there is a mistake in Table (3) since the steel industry started in Syria in 1972.

**Share of Developing Countries in World Manufacturing Value added and World Iron and Steel Sector**

4 - The Lima Declaration and Plan of Action on Industrial Development and co-operation adopted at UNIDO Conference in 1975 reascerted that industry was a dynamic instrument essential to the rapid economic and social growth of developing countries and called for a 25% share for the developing countries in total world industrial production by 2000 AD.

With the present rate of industrial development in the developing countries, it is expected that their share in world manufaturing value added will not exceed 15% by 2000.

Table 2.1 shows that the share of developing coutries in world manufacturing value added incresed from 10.0% in 1975 to 11.0% in 1982 which is far below the expectations of Lima declaration.

Taole 2.2 shows that the share of developing countries in the world iron and steel sector has increased from 6.7% in 1973 to 10.3 % in 1980 which means that the iron and steel sector in developing countries is growing at higher rate than that of the manufacturing sector.

## Effect of Steel Industry on National Economy

5 - The importance of the steel industry to the national economy is clear from the fact that the growth rate in steel consumption is directly related to the growth rate in the GDP. This relationship is called steel elasticity and is often used to forecast thefuture demand on steel products. A similar relationship known as steel intensity is also used for the same purpose.

A strong and economically sound iron and steel industry would help in heating up the economy and achieving the following objections:

5.1 - Intensifying the overall industrialization process due to strong interlinkage between the steel Sector and the other industrial and economic sectors.

5.2 - Saving of foreign exchange involved in imports of steel.

5.3 - Exploitation of unused natural resosurces and adding value to primary raw materials and agricultural products.

Table 2.1 Share of economic groupings in world manufacturing value added, a/ selected years, 1948 - 1982
(Percentage)

| Economic grouping | 1948 | 1953 | 1963 | 1970 | 1973 | 1975 | 1978 | 1980 | 1982 b/ |
|---|---|---|---|---|---|---|---|---|---|
| Developed market economies | 72.2 | 72.0 | 77.3 | 73.4 | 72.0 | 67.5 | 66.8 | 65.2 | 64.0 |
| Centrally planned economies | 22.1 | 23.2 | 14.6 | 17.8 | 18.7 | 22.5 | 22.9 | 23.8 | 25.0 |
| Developing countries | 5.7 | 4.8 | 8.1 | 8.8 | 9.3 | 10.0 | 10.3 | 11.0 | 11.0 |

Source: "Selected statistical indicators", paper submitted to the High-Level Expert Group Meeting Preparatory to the Fourth General Conference of UNIDO, Industrial Development Strategies and Policies for Developing Countries, held at Lima from 18 to 22 April 1983 (ID.WG.391/1), table 3.

a/ Data for 1948-1953 are in current prices. Figures for 1948-1953 were derived from data compiled according to industrial census concepts. Figures for 1963-1980 were compiled from national accounts sources for manufacturing value added expressed in United States dollars at 1975 prices.

b/ Estimate.

Table 2.2 Share of developing countries a/ in world manufacturing value added at constant (1975) prices, by industrial branches, 1963, 1973 and 1980 (Percentage)

| Industrial branch | ISIC code | 1963 | 1973 | 1980 |
|---|---|---|---|---|
| Food products | 311 | 13.6 | 13.8 | 15.1 |
| Beverages | 313 | 12.2 | 13.7 | 18.6 |
| Tobacco | 314 | 24.6 | 27.4 | 30.7 |
| Textiles | 321 | 17.4 | 17.5 | 18.7 |
| Wearing apparel | 322 | 8.0 | 9.0 | 10.2 b/ |
| Leather and fur products | 323 | 10.3 | 10.8 | 12.7 b/ |
| Footwear | 324 | 8.9 | 10.5 | 11.1 |
| Wood and cork products | 331 | 9.0 | 9.4 | 12.0 |
| Furniture and fixtures, excluding metal | 332 | 6.8 | 6.0 | 7.5 b/ |
| Paper | 341 | 6.1 | 6.9 | 8.2 |
| Printing and publishing | 342 | 5.9 | 6.6 | 6.1 |
| Industrial chemicals | 351 | 6.2 | 6.9 | 7.7 |
| Other chemicals | 352 | 13.7 | 16.2 | 18.0 |
| Petroleum refineries | 353 | 45.9 | 39.1 | 41.8 |
| Miscellaneous products of petroleum and coal | 354 | 4.8 | 12.6 | 14.6 |
| Rubber products | 355 | 9.8 | 11.6 | 14.2 |
| Plastic products | 356 | 11.3 | 8.4 | 10.2 b/ |
| Pottery, china and earthenware | 361 | 12.6 | 12.6 | 13.1 |
| Glass | 362 | 7.4 | 9.4 | 9.9 |
| Other non-metallic mineral products | 369 | 7.1 | 8.9 | 12.1 |
| Iron and steel | 371 | 5.4 | 6.7 | 10.3 |
| Non-ferrous metals | 372 | 8.3 | 8.2 | 10.4 b/ |
| Metal products, excluding machinery | 381 | 5.1 | 6.0 | 7.3 |
| Non-electrical machinery | 382 | 2.4 | 4.6 | 5.0 |
| Electrical machinery | 383 | 4.1 | 5.2 | 6.6 |
| Transport equipment | 384 | 4.6 | 6.6 | 7.5 |
| Professional and scientific equipment, photographic and optical goods | 385 | 1.3 | 1.7 | 2.1 b/ |
| Other manufacturing | 390 | 8.4 | 7.1 | 8.4 b/ |

Source: UNIDO data base; information supplied by the Statistical Office of the United Nations Secretariat, with estimates by the UNIDO secretariat.

a/ Excluding China.

b/ Estimates based on data with limited coverage.

5.4 - Stimulating the development of up-stream and down stream industries.

5.5 - Providing basic inputs for capital goods sector.

5.6 - Providing large scale employment directly within the steel industry and indirectly in other industries and sectors of the economy.

## 6 - Conclusions

6.1 - The growth rate of the agriculture and manufacturing sectors are the lowest among all economical sectors in the period 1963 - 1981.

6.2 - The percentage share of the manufacturing sector in the GDP decreased from 13.2% in 1960 to 8.1% in 1980.

6.3 - The highest growth rate among all economic sectors was achieved by the mining and quarrying sector in the period 1963 - 1983 with an annual average growth rate of 44.74% which is due to the discovery of oil.

6.4 - The share of the steel sector in the manufacturing value added according to Table (3) was 0% in 1973 and 1980. Although there is an obvious mistake in these figures, nevertheless the contribution of the iron and steel sector to the Syrian economy is very limited.

6.5 - A strong and an economically sound iron and steel industry with diversified production programme of long and flat products would help in heating up the economy and intensifying the overall industrialization process due to the strong interlinkage between the steel sector and the other economical and industrial sectors.

## CHAPTER 3

## FUTURE DEMAND, AVAILABILITY AND GAPS IN THE SYRIAN STEEL MARKET

### World Steel in Key Figures and Charts

1 - Fig. 3.1 shows the world steel production in the period from 1950 - 1983, the figures indicate the following:

1.1 - The average growth rate % per year in steel production in various periods are as follows:

| Period | Growth rate world | Growth rate Western world |
|---|---|---|
| 1950 - 1960 | 5.9 | 4.6 |
| 1960 - 1970 | 5.9 | 5.7 |
| 1970 - 1980 | 1.9 | 1.0 |
| 1970 - 1983 | 0.8 | -0.2 |

1.2 - The world record in steel production was achieved in 1979 amounting to 747 million ton, and since then production dropped to a minimum of 645 million tons in 1982 and then started to increase in 1983 and 1984.

1.3 - The world steel production was 662 million tons in 1983, which is 2.6% higher than that of 1982 with 645 million tons.

1.4 - The latest report published shows that world steel output rises by 7% in 1984, compared with 1983 as shown in Table 3.1

## World Crude Steel Production, 1950 to 1983

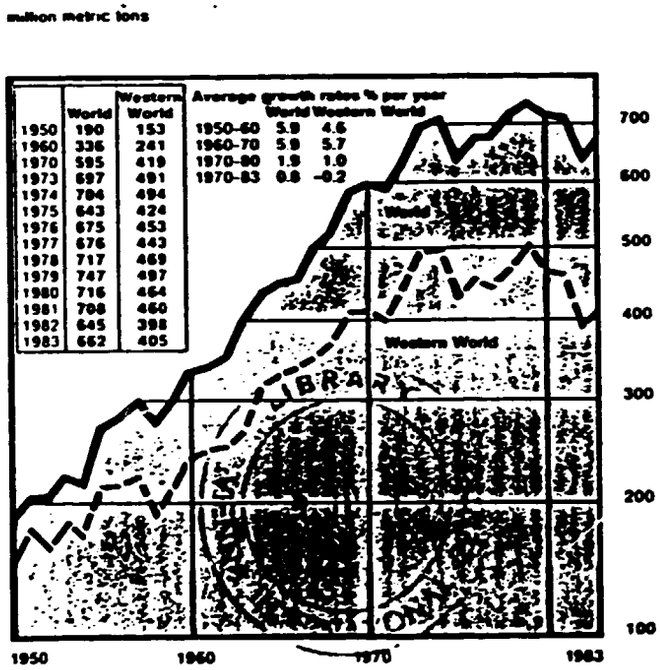



Fig. 3.1

Table 3.1

# World output rises 7% in 1984

WORLD raw steel output is estimated to have risen by 7% in 1984 to 710m tonnes, according to IISI. (This figure is slightly higher than the 707.5m tonnes estimated by the UN Economic Commission for Europe – MB Jan 15.) The ten countries with highest annual output were unchanged except for Brazil's dramatic leap from 11th to 8th position with a rise in raw steel output of 25.4% to 18.4m tonnes.

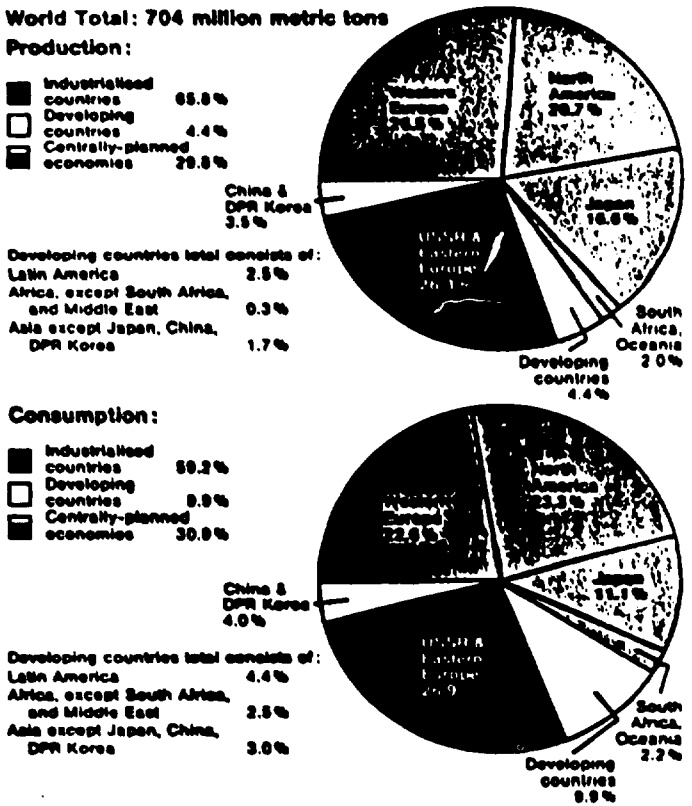
Substantial increases in output were recorded by Luxembourg, which raised production by 21.1% to 4m tonnes and Venezeula which managed a 17.7% rise to 2.7m tonnes. US output increased by 10% to 84.5m tonnes. Japan increased output by 8.7% to 105.6m tonnes while the USSR produced 155m tonnes, retaining its leading position.

## World Steel Output

| | 1983 | 1984 | '000 tonnes % change |
|---|---|---|---|
| USSR | 152.5 | 155.0 | +1.6 |
| Japan | 97.2 | 105.6 | +8.7 |
| USA | 76.8 | 84.5 | +10.0 |
| China | 40.0 | 43.7 | +9.2 |
| West Germany | 35.7 | 39.4 | +10.2 |
| Italy | 21.8 | 23.9 | +9.7 |
| France | 17.6 | 19.0 | +8.1 |
| Brazil | 14.7 | 18.4 | +25.4 |
| Poland | 16.2 | 16.3 | +0.4 |
| UK | 15.0 | 15.2 | +1.5 |
| Czechoslovakia | 15.0 | 15.2 | +0.5 |
| Canada | 12.8 | 14.7 | +14.6 |
| Rumania | 12.6 | 13.8 | +9.2 |
| Spain | 13.0 | 13.5 | +3.7 |
| South Korea | 11.9 | 13.0 | +9.4 |
| Belgium | 10.2 | 11.3 | +11.3 |
| India | 10.2 | 10.5 | +2.7 |
| South Africa | 7.0 | 7.8 | +11.7 |
| Mexico | 6.9 | 7.5 | +8.4 |
| East Germany | 7.2 | 7.2 | 0.0 |
| North Korea | 6.1 | 6.5 | +6.6 |
| Australia | 5.6 | 6.2 | +10.8 |
| Netherlands | 4.5 | 5.7 | +28.0 |
| Taiwan | 5.0 | 5.0 | −0.6 |
| Austria | 4.4 | 4.9 | +10.4 |
| Sweden | 4.2 | 4.7 | +11.7 |
| Turkey | 3.8 | 4.3 | +11.9 |
| Yugoslavia | 4.1 | 4.1 | −0.8 |
| Luxembourg | 3.3 | 4.0 | +21.1 |
| Hungary | 3.6 | 3.7 | +2.3 |
| Bulgaria | 2.8 | 2.8 | −0.9 |
| Venezuela | 2.3 | 2.7 | +17.7 |
| Argentina | 2.9 | 2.6 | −10.6 |
| Finland | 2.4 | 2.6 | +8.4 |
| Other countries | 13.7 | 14.7 | +7.3 |
| World total | 663.3 | 710.0 | +7.0 |

*Source: IISI*
*NB some 1984 figures are estimates*

## Steel Production and Consumption: Geographical Distribution, 1974




## Steel Production and Consumption: Geographical Distribution, 1983

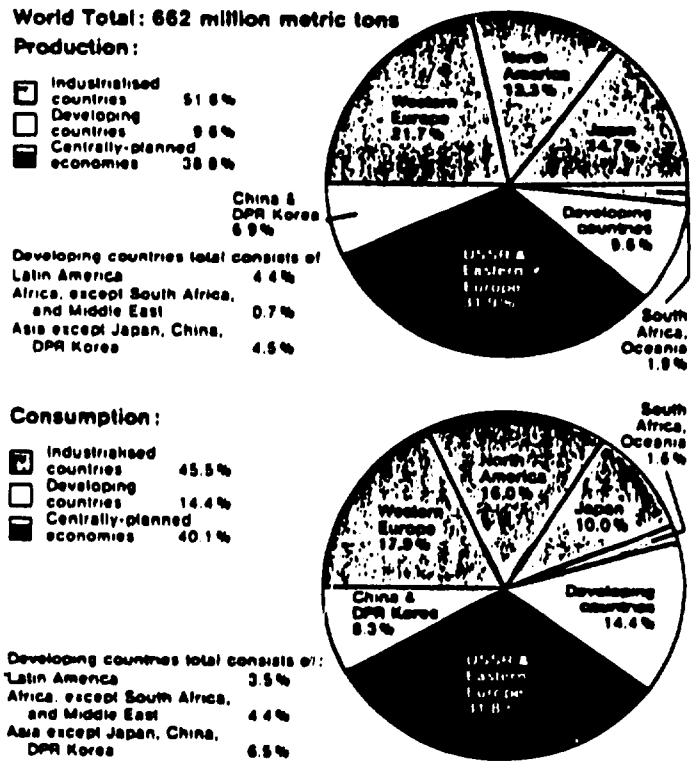



Fig. 3.2

2 - Fig. 3.2 compares the geographical distribution of world steel production and consumption in 1974 and in 1983, the figures are summarized in Table 3.2

**Table 3.2**

| Country Groupings | 1974 | | 1983 | |
|---|---|---|---|---|
| | Prodn | Consmptn | Prodn. | consmptn |
| World Total | 704.0 mt | 704.4 mt | 662.0 mt | 656. mt |
| Industrialized countries | 65.8 % | 59.2 % | 51.6 % | 45.5 % |
| Developing countri.s | 4.4 % | 9.9 % | 9.6 % | 14.4 % |
| Centrally Planned Economics | 29.8 % | 30.9 % | 38.8 % | 40.1 % |

It could be seen from the table that within the period 1974 to 1983 the prodution and consumption has decreased in industrialized countries and increased in developing countries and the centrally planned economies.

3 - Fig. 3.3 is a market flow chart of steel, it shows also the scrap cycle within the steel chart. This chart will help in organising the collection of local scrap in Syria and its supply to the local steel mill GECOSTEEL in Hama. The maximization of the amount of local scrap in the electric furnace charge of GECOSTEEL will help in reducing the production cost and decrease the foreign currency component in the cost and thus improving the overall economy of the plant.

## A MARKET FLOW CHART OF STEEL

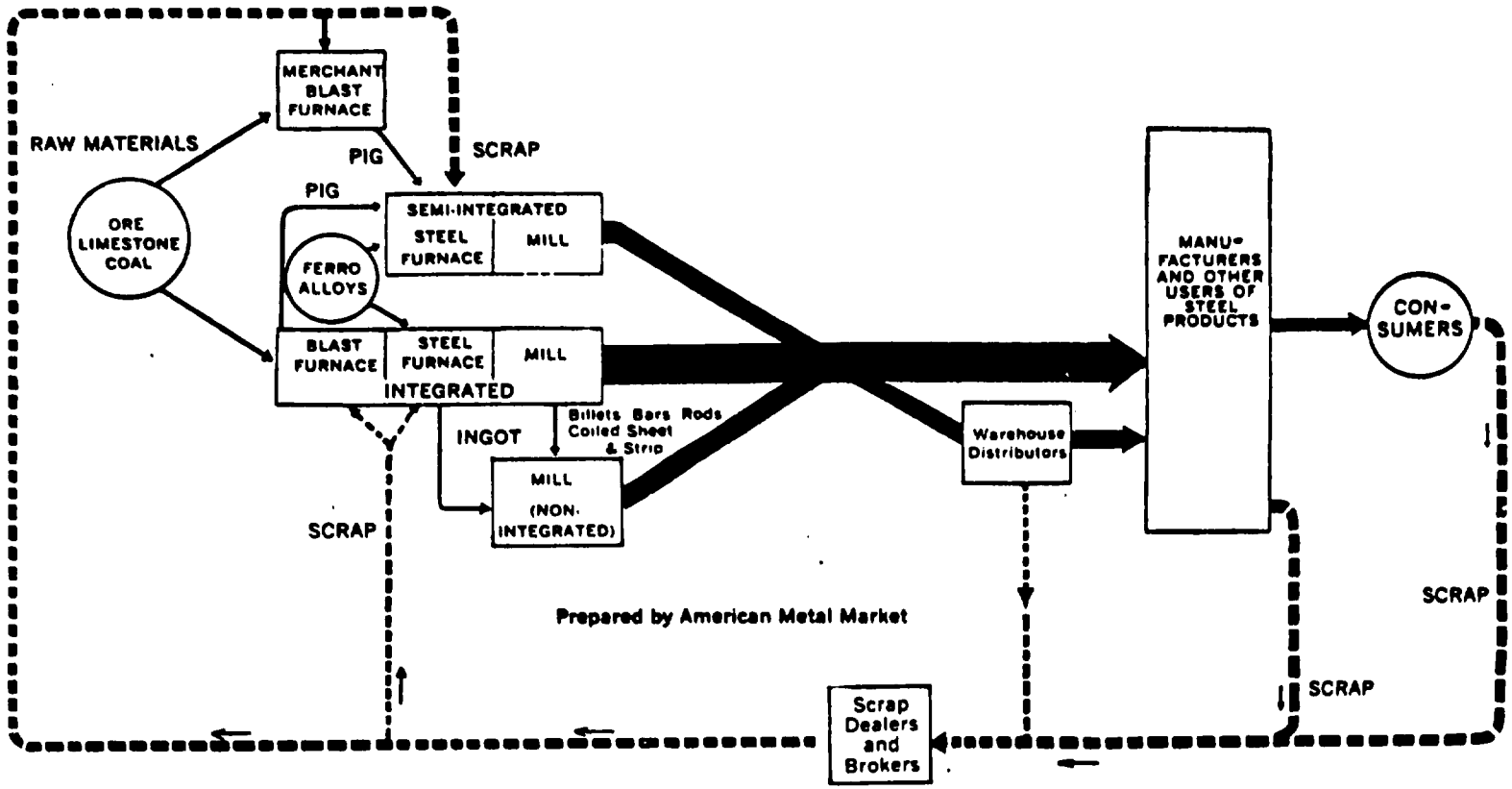



Fig. 3.3

## 4 - Future Demand For Steel Products in the Syrian Market

4.1 - The Syrian iron and steel market has been studied by various organizations and consultants namely M/s. Dastur International, The Arab Iron and steel Union and UNIDO. The Industrial Development Technical Centre-Qatar, together with Qatar Steel Company QASCO, Kobe Steel Ltd., and Tokyo Boeki Ltd. have made a feasibility study for the expansion of QASCO. The study includes a market survey for steel products in 11 countries in the neighbourhood of Qatar including Syria. It was made by macro-economic method on the basis of estimated rate of economic growth (GDP) corresponding to two alternatives as shown in Table 3.3

**Table 3.3**

| Period | GDP Growth Rate | |
|---|---|---|
| | Alt.1 | Alt. II |
| | Faster Rates of GDP Growth | Slower Rates of GDP growth |
| 1978 - 1985 | 8.5 % | 6.8 % |
| 1986 - 1990 | 7.3 % | 4.9 % |
| 1991 - 1995 | 5.8 % | 4.2 % |
| 1978 - 1995 | 7.4 % | 5.5 % |

4.2 - The market forecast presented by MECON is based on the following methods:

- end use analyses to estimate the demand for steel products in 1985 and 1990
- macro-economic methods based on co-relation of steel consumption with economic indicators were used to forecast steel demand in 2000 and 2010.

4.3 - Table 3.4 summarizes the results of the various forecasts made.

**Table 3.4**

| | Name of Organization | Year of Study | Demand for finished steel in thousands of t/y. | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1980 | 1985 | 1990 | 2000 | 2010 |
| 1 | Dastur International | 1973 | 659 | - | - | - | - |
| | of which alloy and special steel | | 16 | | | | |
| 2 | Arab Iron & Steel Union | 1976 | 1027 | 1813 | 2840 | - | 6071 |
| | of which alloy and special steel | | 11 | 57 | 72 | | |
| 3 | UNIDO Expert | 1976 | | | | | |
| | Alt. - I* | | 1294 | 2064 | 2510 | - | - |
| | Alt. - II** | | 1294 | 2064 | 2510 | | |
| 4 | IDTC,QASCO,KOBE, TOKYO BOEKI | 1980 | | | | (1995) | |
| | Alt. I | | - | 1058 | 1743 | 2389 | |
| | Alt. II | | - | 903 | 1158 | 1281 | - |
| 5 | MECON | 1980 | | 1342 | 2042 | 3675 | 5170 |

4.4 - It is difficult to say which one of these is more accurate than the others, and which will prove itself in the future since all of them depend on certain assumption and forecasting is actually an intelligent guess. It seems that MECON study is elaborate enough.

and form a reliable base for f ture planning of the steel industry in Syria. However the follow : gives the minimum and maximum forecast figures for each terminal year as given in the previous table.

| | | | |
|---|---|---|---|
| 1980 | 659,000 | - | 1,294,000 t |
| 1985 | 903,000 | - | 2,064,000 t |
| 1990 | 1,158,000 | - | 2,840,000 t |
| 1995 | 1,281,000 | - | 2,389,000 t |
| 2000 | 3,675,000 t | | |
| 2010 | 5,170,000 | - | 6,071,000 t |

## 5 - Availability

5.1 - Local steel proucts are only available from GECOSTEEL, MECON assumed that local production in 1990 will be as follows:

| | | |
|---|---|---|
| Round bars | 5.5 - 12 | 81,000 t |
| Round bars | 12 - 60 | 27,000 t |
| Total | | 108,000 t |
| Pipes/Tubes | | 18,000 t |

In its estimation for the gap, MECON took those figures for their calculations. We have no comment on them as they are reasonable and could be achieved by GECOSTEEL.

## 6 - The Gaps

For the future planning of the steel industry it is advisable to take into consideration long and short range supply gaps, as shown on Table 3.5 taken from MECON study.

**Table 3.5**

| | Product | Gaps (-) Years | | Million Tons Gaps (-)years Approximate | |
|---|---|---|---|---|---|
| | | 1985 | 1990 | 2000 | 2010 |
| 1 | Non-Flat Products | 0.736 | 1.157 | 1.2 | 1.9 |
| 2 | Flat Products | 0.308 | 0.487 | 1.0 | 1.5 |
| 3 | Pipes/tubes | 0.115 | 0.179 | 0.35 | 0.5 |
| 4 | Rails/track materials | 0.028 | 0.041 | 0.2 | 0.3 |
| 5 | Alloy & Special steel | 0.029 | 0.052 | | |
| | Total | 1.216 | 1.916 | 2.7<br>-2.8 | 4.2<br>-4.3 |

The availability of steel products from the local supplier GECOSTEEL in 1985 - 2010 is assumed to remain unchanged and equal to 126,000 tons, of which 108,000 round bars and 18,000 tons of black and galvanised pipes/tubes.

# CHAPTER 4

## THE GENERAL COMPANY OF IRON & STEEL PRODUCTS

## GECOSTEEL

## FINDINGS AND RECOMMENDATIONS

### I - Company Profile:

1 - Total Investment : Syr.L.

2 - Production Shops:

- Electric Steel Melting Shop
- Rolling Mills for Reinforcement bars and wires
- Tube Mill
- Galvanizing Plant

3 - Total Manpower: 1500

4 - Main Raw Materials and Production Requirements:

- Billets
- Hot Rolled Coils
- Scrap
- Refractories
- Graphite electrodes
- Rolling Mill Rolls

5 - Finished Products:

- Rods and wires 6 - 22 mm
- Black and galvanized pipes 3/8" - 3"

6 - Annual Sales 1984 : 227,000,000 Syr.L.

7 - Market : 100% Domestic

## II - Production Shops - Background Information

### A - The Rolling Mills

1 - The General Company for Iron and Steel Proudcts GECOSTEEL is the first metallurgical enterprise in Syria, it started its operations in 1972 with a rolling mill for the production of steel reinforcement bars based on imported billets with a designed capacity of 75,000 tons per year in two shift operation per day and according to the following product mix.

| | | |
|---|---|---|
| 7500 | tons | 6 mm diam |
| 15000 | tons | 8 mm diam |
| 22500 | tons | 10 mm diam |
| 11250 | tons | 12 mm diam |
| 11250 | tons | 14 mm diam |
| 5250 | tons | 18 mm diam |
| 2250 | tons | 22 mm diam |
| 75000 | | Total |

2 - The total production depends on the product mix because the hourly production rate of the mill varies according to bar diameter, with smaller diameters, the production falls because the weight per meter run of the bar decreases as the diameter decreases.

3 - Few years after putting the plant into operation, it was decided to operate three shifts per day, in this case the adjusted yearly capacity of the plant will be about 110 000 tons depending on the product mix.

4 - The rolling mill is equiped with a reheating furnace with a capacity of 25 tons per hour, a rod mill for the production of bars, and a wire mill for the production of wire rod, with cooling bed for the bars and a coiler for the wire rod.

5 - Since the production of the mill is far below the demand for R.C bars in Syria, it was decided to concentrate on the prodution of larger diameter from 8 - 18 mm diameter in order to achieve higher production, and to secure the smaller diameters mainly the 6 mm from foreign markets.

As a result of this policy, the wire mill was left idle most of the time, but it could be put back into operation whenever it is necessary e.g. in case of sudden sortage in the market for the wire sizes.

This policy is accepted as long as it fits in well with the national plans and the needs of the construction sector and secures higher sales revenues for the Company

6 - The optimum product mix should aim at achieving maximum production with best quality at a lower cost in order to maximize the company profits.

The profits, however, depends to a great extent on the sales price, due to the importance of this issue, it will be dealt with in greater details later.

7 - After commissioning of the electric steel melting shop in 1978, the rolling mill was operated on imported billets and billets produced by the electric steel melting shop.

When the steelmelting shop reaches its designed capacity, it will be possible to operate the rolling mills totally on locally produced billets.

Table ( ) shows that until 1984 the production of billets was not enough to meet the requirements of the rolling mills.

8 - The rolling shop has a designed capacity of 110,000 tons of bars and wire rods annually on the basis of three shift operation per day and 300 working days per year.

9 - The total manpower engaged in the mill is 400 persons including the supervisory staff and workers.

## B - The Steel Melting Shop

10 - The Steel meling shop was commissioned in 1978 and comprises two electric steel melting furnaces 25 tons each, equipped with ultra high power transformers UHP. The plant includes also 2 x 4 strands continuous casting machines for the production of square billets 100 x 100 and 80 x 80 mm, which are cut either to 6 or 3 meters according to the requirements of the rolling mills.

In addition to the main components of the steel melting shop, it comprises also a scrap yard equiped with balling presses and gas burners for scrap preparation, ladle and roof lining facilities, emergency power station 300 kW, and other auxiliary facilities.

11 - The UHP electic arc furnaces reduce the tap-to-tap time, due to a considerable reduction in the melt-down period, the most important for energy consumpltion. The UHP transformers will cause rapid heat transformer to the metallic charge under almost ideal conditions with reduced thermal losses.

12 - The tap-to-tap time for the electric furnaces is 3 hrs, the roof life is 100 heats and made from high alumina bricks, the walls are magnesite with a life varying from 170 - 180 heats, the bottom lining is sufficient for one year operation.

13 - The furnaces are operated with local and imported scrap. Sponge iron has been tested in one heat and has proved to be successful, easier and quicker in loading the furnaces but its price is more than twice the scrap price, that was never used for commercial operation.

14 - It is estimated that local scrap covers about 60% of the requirements of the electric furnaces and the rest is imported. It is expected that more scrap will have to be imported, because the capacity utilization of the furnaces until 1984 was still low and varies between 30% and 40% of the designed capacity.

15 - The main sources of the local scrap are, military sources, railway scrap, public transportation, public sector enterprises and private sector sources. The private sector scrap represents only 10% of the total local scrap.

16 - Export of local scrap is forbidden by orders of the government which also issued instruction that all governmental and public sector scrap must be handed to GECOSTEEL. The price of the local scrap is fixed by the Ministry of supply.

However, the importance of local scrap will be dealt with in greater details later.

17 - The main sources of imported scrap are Lebanon, Jordan and the Gulf States.

18 - The shop has a designed capacity of 120 000 tons of billets annually on the basis of three shift operation per day and 345 working days per year.

19 - The total manpower enganged in the shop is 546 persons including the supervisory staff and workers.

### C - <u>The Tube Mill and Galvaanizing Plant</u>

20 - The tube mill was put into operation in 1978 with two production lines for producing lingitudinally welded pipes for gas and water according to DIN specification No. 2440. The first line was designed for the production of 3/8" and 1/2" pipes and the second line for the production of 3/4", 1", 1-1/4", 1-1/2", 2", 2-1/2" and 3".

21 - The designed capacity of the plant is about 20 000 tons annually on the basis of one shift per day and according to the following product mix.

| | | | | |
|---|---|---|---|---|
| 3/8" | 378 | tons | 500 | Km |
| 1/2" | 4392 | tons | 4000 | " |
| 3/4" | 3200 | " | 2000 | " |
| 1" | 3600 | " | 1480 | " |
| 1-3/4" | 1360 | " | 430 | " |
| 1-1/2" | 1460 | " | 400 | " |
| 2" | 2350 | " | 460 | " |
| 2-1/2" | 1760 | " | 270 | " |
| 3" | 2300 | " | 270 | " |
| Total | 20800 | " | 9810 | " |

22 - Table ( ) gives the capacity chart of the pipe plant provided by the supplier.

23 - The pipe mill includes also a galvanizing plant which is capable of galvanizing about 50% of the total production of the black pipes. It is also used for galvanizing electric transmission towers.

24 - The plant depends totally on imported hot rolled coils, which is cut on sliting line in sizes corresponding to the pipe which is being produced.

25 - The plant is operating two shifts per day, and its production capacity is 90% more than that indicated in para ( ), which is based on one working shift per day. If the original product mix given in para ( ) is taken into consideration for calculating the adjusted designed capacity, the mill should be considered to have annual capacity of about 38 000 tons equivalent to about 18 600 Km.

**Table ( )**

Capacity Chart Gas and Water Pipe (DIN 2440) (Theor. Output) 3/8 - 3"

Tube Welding Line RN 40 HI 180

| N.S. (inch) | O.D. (mm) | Wall (mm) | Weight (Kg/m) | Welding Speed 100% (m/min) | Output 100% (t/yr) | Output 75% (ts/year) | Output 75% (km/year) | Required Operating hours (h/year) |
|---|---|---|---|---|---|---|---|---|
| 3/8 | 17.2 | 2.35 | 0.852 | 49 | 2.5 | 378 | 500 | 220 |
| 1/2 | 21.3 | 2.65 | 1.22 | 52 | 3.8 | 4,392 | 4,000 | 1,750 |
| | | | | | | 4,770 | 4,500 | 1,970 |

Tube Welding Line RN 90 HI 300

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3/4 | 26.9 | 2.65 | 1.58 | 60 | 5.7 | 3,200 | 2,000 | 750 |
| 1 | 33.7 | 3.25 | 2.44 | 60 | 8.8 | 3,600 | 1,480 | 550 |
| 1 1/4 | 42.4 | 3.25 | 3.44 | 60 | 11.3 | 1,360 | 430 | 160 |
| 1 1/2 | 48.3 | 3.25 | 3.61 | 60 | 13.0 | 1,460 | 400 | 150 |
| 2 | 60.3 | 3.65 | 5.10 | 60 | 18.4 | 2,350 | 460 | 170 |
| 2 1/2 | 76.1 | 3.65 | 6.51 | 60 | 23.5 | 1,760 | 270 | 100 |
| 3 | 88.9 | 4.05 | 8.47 | 52 | 26.4 | 2,300 | 270 | 116 |
| | | | | | | 16,030 | 5,310 | 1,996 |

The welding speeds supply to St. 33 steel with a carbon content up to 0.16% or with an equivalent carbon figure up to 0.25%.

## III - Production Performance and Basic Indicator

26 - The production performance will be treated systematically in accordance with the production sequence i.e. starting with the steel melting shop then followed by the rolling mill and finally the pipe mill.

### A - Steel Melting Shop Production

27 - The production of the Steel Melting Shop since it was put into operation in 1978 as well as the capacity utilization is shown below.

| Year | Production in tons | Capacity utilization %age of Designed 120,000 t/year |
|---|---|---|
| 1978 | 37,946 | 32 % |
| 1979 | 30,184 | 25 % |
| 1980 | 29,334 | 24 % |
| 1981 | 35,187 | 29 % |
| 1982 | 46,536 | 39 % |
| 1983 | 35,523 | 30 % |
| 1984 | 32,262 | 27 % |

28 - It could be easily seen from the above mentioned figures, that the production of the steel shop is not steady, and considerably below the designed capacity of the plant. The record production of the shop was achieved in 1982, amounting to 46536 tons which is equivalentto 39% of the designed capacity.

29 - Steel Industry is characterized by heavy investment and high fixed costs mainly in capital charges, depreciation and labour costs, and the only way to adjust these costs is to maximize prodution.

30 - The variable costs mainly raw materials and energy constitute very important items on the cost sheet of uhe steel produced. It will be seen also from the basic economic indicators that the efficiency of material and energy utilization needs imporvement.

31 - The reasons for this unsatisfactory performance of the plant as reported by the management of GECOSTEEL is mainly because of the high rate of labour turn over, and the relatively low wages have created an unstable situation among the labour force of the shop.

Under such conditions the well trained personnel did not find it attractive and rewarding to work in the Steel Sector and preferred to join other sectors with better and easier working conditions.

**Technical Assistance Agreement with 'Centrozap'**

32 - To overcome all these difficulties the Syrian Authorities decided to sign a technical assistance agreement with the Polish Organization "Centrozap".

33 - This agreement came into force in January 1985. The payment conditions for the tasks assigned to the Polish Side depend mainly on the objectives and results achieved in the shops covered by the agreement namely the steel making shop and the pipe mill. The rolling mill was excluded from the agreement since its performance was considered to be satisfactory.

34 - The early technical and economical results achieved from this agreement in the months of January and February seems very promissing. The production of steel in these two months amounted to 6,500 tons and 6,200 tons respectively which is equivalent to an annual rate of 76,200 tons, and is almost 64% more than the highest production achieved in 1982.

35 - In January 1985, the net savings in the production cost of the steel billets was about 2,700,000 Sy.L., after paying all contractual commitments of the Technical Assistance Agreement with "Centrozap"

## Basic Techno-Economic Indicator of the Steel Making Shop

36 - Table ( ) compares between the designed techno-economic indicator Col (1), the actual indicators of 1984 Col (2), the average indicators of January and February 1985 after the implementation of the technical assistance agreement Col (3). Col (4) gives the indicators of an efficient plant.

37 - Col. (4) showing the techno-economic indicator of an efficient plant is only given for guidance. For the proper comparison of this plant with GECOSTEEL the detailed specification and the technical featurs of both plants should be taken into consideration.

38 - The company's management is full aware of the basic indicators which need immediate attention e.g.

- Productivity
- Low material yield
- Long tap-to-tap time which means higher power consumption
- Overmaning
- Time utilization and plant stoppages

39 - Improvement of these indicator will result in higher production and lower cost. The implementation of the Technical Assistance Agreement with"Centrozap" is reflected favourably on some of the main indicators.

Table ( )
Basic Techno-Economic Indica. tors
For the Electirc Steel making Shop
EAF - C.C. Plant

| | Techno-Economic Indicator | GECOSTEEL 2 x 25 tons EAF 2 x 4 strands CC machine 100 - 80 mm & 3 - 6 meters | | | Efficient Plant 2 x 70 t.EAF 2x4 strand CC machine 150 -110 mm 3 - 6 meters |
|---|---|---|---|---|---|
| | | Designed | Actual 1984 | Jan-Feb. 1985 | |
| | | 1 | 2 | 3 | 4 |
| 1 | Designed Capacity t/y | 120 000 | 32 262 | 78-85 000 | 400 000 |
| 2 | Actual Production t/y | | | | 446 000 |
| 3 | Electric Power KWH/t | 790 | | | 686 |
| 4 | Scrap Kg/t | | 1 120 | 1 120 | 199.3 |
| 5 | Sponge kg/t | | - | - | 909.7 |
| 6 | Lime kg/t | | 40 | 40 | 40 |
| 7 | Flourspar kg/t | | 0 | 2 | |
| 8 | Fe-Mn Kg/t | | 12 | 5 | 20 |
| 9 | Fe-Si kg/t | | 2 | 2 | 3.8 |
| 10 | Fe- V Kg/t | | | | 0.19 |
| 11 | Aluminium kg/t | | | | 0.10 |
| 12 | Electrode kg/t | | 14 - 16 | 8 - 10 | 4.5 |
| 13 | Tap-to-tap time min | 180 | 4-6 hrs | 3-4 hrs | 150 |
| 14 | Yield met.charge to billets | 86.5 | 77.5 | 86.5 | 90% |
| 15 | Manpower Persons | 546 | 436 | 436 | 202 |
| 16 | Working days/year | 345 | 263 | 345 | |
| 17 | Working shifts/day | 3 | 3 | 3 | 3 |

40 - The production of concrete bars from the rolling mills since it was put into operation in 1972 as well as the capacity utilization is shown below:

| Year | Production in Tons | Capacity Utilization % age of designed 110,000 t/year |
|---|---|---|
| 1972 | 60,000 | 80 % |
| 1973 | 36,000 | 48 % |
| 1974 | 50,654 | 67 % |
| 1975 | 85,437 | 77 % |
| 1976 | 97,984 | 89 % |
| 1977 | 97,621 | 89 % |
| 1978 | 108,603 | 99 % |
| 1979 | 92,824 | 84 % |
| 1980 | 79,968 | 73 % |
| 1981 | 102,363 | 93 % |
| 1982 | 66,741 | 61 % |
| 1983 | 83,855 | 76 % |
| 1984 | 84,033 | 76 % |

The shop was working 2 shifts with a designed capacity of 75,000 tons/year until 1974, then started to work three shifts with a designed capacity of 110,000 tons/year, depending on the product mix.

41 - The rolling mill shop showed much better performance than the steel making shop, it could have achieved better results if enough billets were supplied to the mill from the steel melting shop.

42 - The record production of the shop was achieved in 1981, amounting to 102,363 tons which is equivalent to 93% of the designed capacity.

43 - A record monthly production amounting to 11,769 tons was achieved in December 1981. Monthly production exceeding 11,000 tons was reached in several months which indicates that the mill has a reserve capacity and it can achieve higher production records.

**Basic Techno-Economic Indicaaaaators of Re-Rolling Mill Shop**

44 - The basic indicators for the rolling mill shop are

1 - Capacity utilization
2 - Material yield

Capacity utilization has been discussed before. The material yield measured as the ratio between the weight of the bars produced and the weight of the billets used, should be about 95% for efficient plants. The corresponding figure for GECOSTEEL mill is not available. However, the yield in similar rolling mills in the Arab Countries will be about 80%. Material yields in rolling mills in general is very important, for bar mills the cost of material represents about 90% of the production cost.

**C - Tube Mill and Galvanizing Plant Production**

45 - Tube production from the [illegible] since it was put into operation in 1978 as well as the capacity utilization is shown below:

| Year | Production in meters | Capacity utilization % age of designed Two shifts 15 million meters |
|---|---|---|
| 1978 | 4,544,192 | 30 % |
| 1979 | 4,568,780 | 30 % |
| 1980 | 5,620,170 | 37 % |
| 1981 | 6,724,874 | 45 % |
| 1982 | 97,480 | 0.6 % |
| 1983 | 916,736 | 6 % |
| 1984 | 5,976,415 | 40 % |

Capacity utilization was based on the adjusted designed capacity for the current product mix from 1/2" to 3", amounting to 15 million meters.

46 - The production of the tube mill is considerably below the designed capacity of the plant. The record production of the shop was achieved in 1981, amounting to 6,724,874 meters equivalent to 45% of the designed capacity.

47 - The management decided to introduce the tube mill under the Technical Assistance Agreement with Centrozap for the following reasons:

1 - to increase productivity
2 - to improve quality as far as dimension tolerances are concerned
3 - to improvethe yield of accepted pipes.

According to the conditions of the Technical Assistance Agreement the rpduction should be raised to a minimum of 15 million meters in 1985 which is more than double the maximum production record achieved in 1981 amounting to about 6.5 million meters.

48 - The galvanizing plant is capable of handling 50% of the designed production of the ltube mill.

**Basic Techno-Economic Indicators of the Tube Mill Galvanizing Plant.**

49 - The basic indicator for the tube mill and galvanizing plant are:

- Capacity utilization
- Percentage of accepted tubes (first choice)
- Zn consumption in the galvanizing plant.

Capacity utilization has been discussed before. The percentage of accepted first choice tubes is 84%, and the second choice is 16%. The second choice tubes shall be reduced to 12% in accordance with the conditions of the Technical Assistance Agreement.

Zinc consumption in the galvanizing plant is running within the designed range of 80 - 130 kg/ton according to the size of the tubes.

## IV - Conclusions and Recommendations

Most of the conclusions and recommendations listed below were the result of the mutual discussions which took place with the managementof the GECOSTEEL during the visit of the UNIDO Team to the company.

However, due to shortage of time, some recommendations were not discussed with management, so it may happen that any of these recommendations is being applied.

### A - Recommendations for Current Operations

1 - It is well known that management and supervision are among the key items for successful operation of industrial enterprises. The Management of GECOSTEEL is doing its best to improve the operation

of the various production shops and the early results of 1985 are very promising. Since the plant is working 24 hrs. a day and the management shift ends in the afternoon, so it is suggested that one of the senior engineers of the plant should continue to work in order to cover the afternoon and night shifts. He should have the authorities of the General Manager in coordinating the work among the various production shops with the maintenace and services. He should also act as the counterpart of the chief of the Polish group working during the shift. His main responsibility is to make sure that the shops are working smoothly, and that he should act immediately in case of emergency stoppage in any of the production shops. His duty ends next day with the arrival of the general manager or his deputy to whom he should submit a report written on a special format to be designed specially for that purpose and to brief him with the important events which took place during his shifts and the actions he took.

2 - It is desirable that at least one Syrian Counterpart should be appointed for every member of the Polish Group.

3 - The management of the plant is highly cost minded and quality minded, in this respect it is recommended that the management will hold a monthly meeting to be attended by the shop managers and senior staff of the company. In this meeting a thorough analysis of the monthly cost sheet and cost of the year to date, will be made and to compare the actual costs with budget in order to identify the deviations and take the necessary actions to correct the situation before the end of the fiscal year. This early follow up is necessary in order to make up for the production losses of the previous months during the next months.

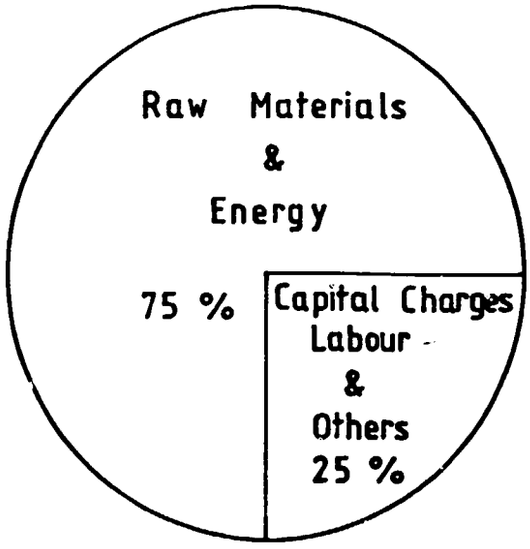
The same procedure should also take place with the monthly quality control reports which are prepared by the quality control department or section.

In the following pie-chart the major components in the product cost are shown to be materials and energy, labour and capital charges.

Materials and energy are the biggest item in the cost sheet and any improvement in those item will bring about appreciable savings in th cost.

4 - The key bottleneck in the Company now is the steel melting shop, so its productivity and efficiency has to be raised towards achievaing its designed capacity in the shortest possible time in order to secure enough billets to the rolling mills. This will improve the plant economy and reduce the foreign currency component in the cost of production.

5 - Furnace availability and tap-to-tap time of the electric arc furnaces are very important indicators they should conform with the design norms and standards. This will help in improving plant productivity, labour productivity, efficient material utilization, efficient energy utilization, better plant economics.




Tentalive Cost Components
For
"GECOSTEEL"

6 - Great improvement to the plant economics will take place when the steel plant reaches its designed capacity especially if the share of the local scrap in the furnace charge is raised to the highest maximum possible. The amount of local scrap available now is about 30 000 tons annually. The total scrap requirement will be about 135 000 tons which means that the local scrap represents about 25%.

The scrap policy should stress on the maximum utilization of local scrap. Since the government has forbidden export of local scrap, considerable amounts of scrap should have been accumulated in the country. The problem is how to organize the collection of the local scrap and to ensure its regular and maximum flow to GECOSTEEL after being cut and prepared in asccordance with the furnace requirement and specification.

This problem will need persistant efforts to be solved, but it is of great importance, as it will reduce considerably the requirements of foreign currency.

7 - The electric energy consumption in the steel furnaces is probably too high because of the long tap-to-tap time. This costly item will be reduced with the reduction of the tap-to-tap time.

8 - Electrode consumption is also too high about 14 - 16 kg/ton. Much lower electrode consumption is being reported from electric steel plant as far down as 4 - 5 kg/ton. Such low rates can only be achieved with high quality electrodes known as high density UHP grade electrodes.

9 - The performance of the rolling mills indicates that it has a reserve capacity and that it can achieve easily the designed capacity of 110 000 tons/year and even more,i the raw materials namely the billets are regularly secured for the mill operation.

10 - In order to increase the sales revenues of the rolling mills, it is recommended that the production should be shifted to the high tensile steel quality steel 52 instead of 37.

The management informed the UNIDO team that preparation for the production of high tensile steel has almost been finished and it will start within a few weeks.

11 - The production of the tube mill is considerably below the designed capacity. The management informed the UNIDO team that according to the conditions of the Technical Assistance Agreement the production will be raised to minimum of 15 million meters/yeasr. The maximum production yearly record achieved in 1981 was 6.7 million meters.

12 - The management should encourage the production shops to break the daily and monthly records previously achieved and to announce such records within the company.

13 - The selling price of the finished products is decissive factor in the profit and loss account of the GECOSTEEL. It is recommended that the selling price should be at least equivalent to that of the imported similar product i.e. CIF price + custom duties + inland transportation to the distributors.

It should be mentioned here that the export price from develpped countries are significantly lower than their home market price. This is the normal dual pricing policy of the developed countries where the steelmakers are prepared to accept lower export prices provided that they cover the direct operating costs and make some contribution to overheads. In most cases countries at the current Syrian stage of development would fix steel prices higher than the average prices of the imported similar product. The local steel industry should not be obliged to sell at lower prices than that of the imported similar products.

14 - The incentive system is a very important tool for the management to improve the plant performance. It however needs revision and adjustment periodically in order to balance its costs and benefits.

## B - Recommendation for the Future Development of GECOSTEEL

1 - The possibility of future developments of the Company has been discussed with the management for the following projects:

a - To double the production of the steel making shop by adding two more electric arc furnaces, two continuous casting machines and the necessary service equipment.

b - To double the production of the rolling mills with reasonably limited investment by adding a second reheating furnace, increase velocity of the mill and add a high speed rolling block for the production of the wire rods.

c - To expand the galvanizing plant to handle the full production of the pipe mill.

2 - It is recommended that a feasibility study should be made for the above mentioned projects. The investment decision shall depend on the results of this study.

# CHAPTER 5

# THE INTEGRATED IRON AND STEEL PROJECT

## COMMENTS AND RECOMMENDATIONS.

### Basic Information

1 - A feasibility study for the construction of an iron and steel complex in Syria was prepared by the Metallurgical and Engineering Consultants (India) Limited "MECON" dated September 1980, for the General Establishment of Geology and Minera. Resources, Ministry and Petroleum and Mineral Resources, Syrian Arab Republic.

The salient financial indices as given in the feasibility study are as follows:

| | | |
|---|---|---|
| I - | Capital cost | 6551 Million Syr.L |
| II - | Profit in third year of operation The complex is assumed to reach its designed capacity in the third year of operation. | 289 " " |
| III - | Return on equity based on Loan-equity ratio of 3:1 | 17.6 % |
| IV - | Pay back period (after interest) | 9.0 years |
| V - | Break even capacity (Third year of operation) | 81 % |
| VI - | Internal Rate of Return (IRR) | 12.8 % |
| VII - | Average Annual Profit (Over 20 years of Operation) | 630 Million Syr.L |

From the above MECON concluded that the iron and steel project is economically viable.

2 - Atkins Planning was commissioned by the Ministry of Petroleum and Mineral Resources to undertake the reviewal and evaluation of MECON study. Atkins submitted its appraisal report on April 1983.

3 - MECON was also asked to update its Feasibility Study of September 1980 in accordance with an updated set of assumptions Table (5/1) and to comment on Atkins appraisal report. MECON submitted its report on August 1983.

4 - The main assumptions used for the preparation of the original studyof MECON September 1980, the updated study of MECON August 1983 and the Appraisal Report of Atkins April 1983 are given in Table 5/1.

5 - Table 5/2 gives a comparison between the financial indices of the mining and concentration operations of the iron and steel project in the various studies.

6 - Table 5/3 gives a comparison between the financial indices of the iron and steel works in the various studies.

**Table 5/1**

Comparison between Main Assumptions

For the Various Studies ( )

| | Item Compared | MECON Sept 1980 | | Atkins April 1983 | | MECON August 1983 | |
|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | |
| 1 | Fuel Oil ex-refinery/t | 280 | S.L | 785 | S.L | 785 | S.L |
| 2 | Diesel oil ex-refinery/t | 301 | S.L | 1450 | S.L | 1450 | S.L |
| 3 | KWH (Homs) | 10 | S.P | 38.5 | S.P | 38.5 | S.P |
| 4 | KWH (Zabadani) | 10 | S.P | 41.8 | S.P | 41.8 | S.P |
| 5 | Coking Coal CIF price/t | 85.5 | $ | 75.0 | $ | 84.0 | $ |
| 6 | Port charges & Inland transportation/t coal | 4.0 | $ | 14.0 | $ | 5.81 | $ |
| 7 | Imported Lump Ore 66% Fe/t.CIF | 42.0 | $ | 36.0 | $ | 45.0 | $ |
| 8 | Imported Fine Ore 66% Fe/t.CIF | 39.0 | $ | 31.0 | $ | 42.0 | $ |
| 9 | Port charges & Inland Transportation tariff | 4.0 | $ | 14.0 | $ | 7.6 | $ |
| 10. | Local Interest rate | 5% | | Not used | | 9.0% | |
| 11 | Foreign interest rate | 8.5 % | | Not used | | 10.5 % | |
| 12 | Transportation tariff Yabous - Homs /t | 3.75 | $ | 8.0 | $ | 6.48 | $ |
| 13 | Local ore at the mine/t | 30.0 | $ | 31.66 | $ | 33.33 | $ |
| 14 | Limestone at Plant/t | 3.0 | $ | 6.9 | $ | 6.67 | $ |
| 15 | Dolomite at plant/t | 3.5 | $ | 8.5 | $ | 778 | $ |
| 16 | Dollar Exchange rate | 4.0 | S.L | 5.4 | S.L | 5.4 | S.L |

**Table 5/2**

**Comparison between the financial**

**Indices of the mining and Concentration Operations**

**in the various studies ( )**

| | Item Compared | MECON Sept 1980 | | MECON August 1983 | | Atkins April 1983 | |
|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | |
| 1 | Direct capital costs | 469.8 | MSL | 590.0 | MSL | 515.43 | MSL |
| 2 | Land site preparation | 56.0 | MSL | 108 | MSL | 29.7 | MSL |
| 3 | Capital Costs infra-structure | 126.0 | MSL | 160.0 | MSL | 132.62 | MSL |
| 4 | Production Cost/ ton concentrate | 120.0 | SL | 180.0 | SL | 170.97 | MSL |
| 5 | Cost of Imported concentrate | 86.0 | SL | 111.8 | SL | 97.2 | MSL |
| 6 | Loss/t | 84.0 | SL | 68.0 | SL | 73.8 | MSL |
| 7 | Annual Losses | 42.16 | MSL | 64.57 | SL | 73.8 | MSL |

## Table 5/3

Comparison between the financial Indices of the Iron and Steel Works in the various studies ( )

All cases asre based on 50% local ores and 50% imported ores.

| Item Compared | MECON Sept 1980 | MECON August 1983 | Atkins April 1983 |
|---|---|---|---|
| | 1 | 2 | 3 |
| 1 Direct Capital costs | 5539.6 MSL | 6740.7 MSL | 9273.0 MSL |
| 2 Land & site preparation | 1011.5 MSL | 1472.4 MSL | 589.87 MSL |
| 3 Capital costs infra structure | 1089.0 MSL | 1442.0 MSL | 829.71 MSL |
| 4 Production cost/t | 2126.0 SL | 3104.0 SL | 3926.0 SL |
| 5 Cost of product if imported CIF | 1710.0 SL | 1543.0 SL | 1489.0 SL |
| 6 Sales price* custom duties | 2500.0 SL | 2000.0 SL | - |
| 7 Sales price duteis** Exclued /t | 1900.0 SL | 1526.0 SL | 2025.0 SL |
| 8 Losses/t (4-7) | 226.0 SL | 1578.0 SL | 1901.0 SL |
| 9 Annual Losses | 203.0 MSL | 1420.2 MSL | 1663.45 MSL |
| 10 $Exchange Rate | 4.0 SL | 5.4 SL | 5.4 SL |

* The sales price of trading organisation includes customs and financial duties + 10% profit margin.

** The sales price of the project products ex-works

## Comments and Recommendations

7 - Due to shortage of time, it was not possible for the expert to study all the documents of the project. The documents handed over to the expert are given in Appendix 3. It is therefore deemed necessary to take this point into consideration while reading the following comments and recommendations.

### A - Comments and Recommendations on the Financial Indices of the Project

8 - The financial indices of the project whether for the mines and the concentration plant table 5/2 or for the integrated iron and steel works Table 5/3 cannot justify the construction of an iron and steel complex in Syria with such enormous investment. As a matter of fact it will be risky, under the assumptions given in Table 5/1, to take any decision for starting up the construction of the project. It will represent a heavy burden on the Syrian Economy and its added value may turn to be negative. In such a case, it will be better for the country to import its requirements from the different iron and steel products necessary to keep the various economic sectors running.

9 - The main reason for the unsatisfactory financial indices can be summarized as follows:

**The Iron & Steel industry is capital intensive, energy intensive, involves the transportation of huge tonnage of raw material, and due to its nature it has a long gestation period, i.e. needs a long time to reach its designed capacity. The assumptions given in table 5/1 has worked against the project in all the above mentioned features.**

9 -1 As far as the capital is concerned, it has increased because the [illegible] exchange rate has increased from 4.4 S.L. to [illegible] S.L. i.e.

an increase of 35 %. The local interest rate has increased from 5% to 9% equivalent to 80% increase, the foreign interest rate has increased from 8.5% to 10.5% i.e. an increase of 23.5%. In addition to all this the loan equity ratio is 3:1 which is too high for the steel plant especially in the frist few years of operation. All these factors has been reflected on the production cost in an adverse manner.

So it is recommended to finance the steel project under similar conditions as those of the infrastructure project i.e. using soft loans with reasonable grace period, low interest rate and long-repayment period. For steel projects it is also essential to keep the loan equity ratio as low as possible.

9 -2 The energy prices has been considerably increased, the fuel oil has increased by 180%, the diesel oil 383%, KHW(Homs) 285% KWH (Zabadani) 318%.

Due to the importance of the steel industry in the industrialization process whether in developed or developing countries it usually receives strong support from the governments concerned by various ways and means, in order to keep the flow of steel to other industrial sectors within reasonable prices, to enable their industrial products to remain competitive in the world market.

Table 5/4, and 5/5 compares the prices of electric power, and natural gas for the industry in the Arab Gulf States

## Table 5/4

## Comparison of Electric Power Prices

| State | KWH Local Currency | KWH Equivalent Dollar |
|---|---|---|
| Iraq | 7 - 30 Fils | 1 - 2.5 Cent |
| United Arab Emirates | 0.04 - 0.07 Dir | 0.93 - 1.0 Cent |
| Bahrain | 16.0 Fils | 8.48 Cent |
| Saudi Arabia | 0.05 S.R. | 1.46 Cent |
| Oman | 20 Baiza | 5.78 Cent |
| Qatar | 0.06 - 0.065 QR | 1.10 - 1.65 Cent |
| Kuwait | 1 - 2 Fils | 0.35 - 0.70 Cent |

## Table 5/5

## Comparison of Natural Gas Prices

| State | 1000 cu Feet 1000 000 B.T.U Local currency | 1000 cu Feet 1 000 000 B.T.U Equivalent Dollar |
|---|---|---|
| Iraq | N.A. | N.A. |
| United Arab Emirates | 7.25 Fils | 200 cent |
| Bahrain | 188.5 - 282.5 | 50 - 75 cent |
| Saudi Arabia | 1.75 S.R | 50 cent |
| Oman | 1.01 O.R | 293 cent |
| Qatar | 0.77 Q.R | 21.3 cent |
| Kuwait | 16 Fils | 5.6 cent |

| | | | | | |
|---|---|---|---|---|---|
| Iraqi Dinar | = | 100 Fils | Saudi Riyal | = | 100 Halalat |
| UAE Dirham | = | 100 Fils | Oman Riyal | = | 1000 Baiza |
| Bahraini Dinar | = | 1000 Fils | Qatari Riyal | = | 100 Dirham |
| Kuwaiti Dinar | = | 1000 Fils | | | |

It is therefore recommended to supply the steel project with subsidized energy prices.

9 -3 Inland transportation rail tariffs has been increased by 73% for MECON updated report and 113% for Atkins appraisal.

Since steel industry involves the transportation of huge tonnage of raw materials, the transportation costs represent a considerable item on the cost sheet of the final product and any increase in the transportation costs will affect the economy of the plant unfavourably.

It is therefore recommended to transport the raw materials and products at a special rail and road tariffs which is the normal practice whether in developed or developing countries.

9 -4 The assumptions given in Table 5/1 has increased the production cost from 2126 S.L. to 3104 S.L./ton, i.e. an increase of 46%. The sales price has decreased from an average of 2500 S.L. to 1900 S.L. i.e. a decrease of about 24%.

As far as the selling price is concerned it is recommended that the selling price of the products ex-works should not be less than that of the imported similar product in the local market.

## B - Comments and Recommendations on Mining and Beneficiation.

10 - Iron ore mines may be regular or irregular as far as the chemical composition and the physical properties. The irregular mines need an extensive number of bore holes to be able to assess the ore body precisely.

11 - In two iron ore mines in one of the Arab States the actual quantity of the run of mine ore was never as expected in the feasibility study report in spite of the great efforts made in the assessment of the ore deposit before actual exploitation.

12 - It is therefore, recommended that further studies should be continued on the ore deposit and a large sclae mining test producing 10 - 20 thousand tons should be made, and to carry further investigations on the ore produced from the test including, chemical, physical,mineralogical, concentration, sinterability, reducibility tests. Special reference should be given to detremental elements such as AS, Cr, alkalies. The presence of such elements above the maximum allowable limits can cause enormous losses to the plant.

The characteristics and behaviour of the ore in the various stages of processing crushing, screening, blending, concentration, sintering, pelletizing and smelting in the furnace should be very well known before any investment decision is made to avoid any unpleasant surprises in the future which might be very costly. This has already happened in some developing countries.

13 - It is mentioned in the project documents that reduction roasting followed by grinding and low intensity magnetic seperation yielded the best results, the concentrate (magnetic fractions) weighing 55 to 63% assayed 50 to 53% Fe.

But it was dicided to adopt the dry high intensity magnetic separation for the pilot stage study at the NML (India) in view of non-availability of reducing gas and also scarcity of water at the mine site in Syria.

14 - After the availability of natural gas in Syria it appears worthwhile to reconsider the magnetizing roasting followed by low intensity magnetic separation. As far as the scarcity of water is concerned, we believe that modern engineering design can arrive at an efficient closed water system whereby the consumption of make up water can be minimized. If this route proves it feasibility the present unfavourable situation of the project may change. Table 5/6 compares the analysis of the concentrate obtained by HIMS with that obtained by magnetizing roasing and LIMS.

**Table 5/6**

Complete Chemical Analyses

of Concentrates (  )

| Constituent | HIMS % | Magnetizing Roasting & LIMS % |
|---|---|---|
| Fe | 38.1 | 50.4 |
| FeO | 0.7 | 3.4 |
| $SiO_2$ | 15.0 | 16.1 |
| $Al_2O_3$ | 5.9 | 6.1 |
| CaO | 6.42 | 6.6 |
| MgO | 0.78 | 0.88 |
| LOI | 9.36 | 9.04 |
| S | 0.08 | 0.06 |
| P | 0.58 | 0.48 |
| $TiO_2$ | 0.18 | 0.21 |
| MnO | 0.21 | 0.19 |
| Na | 0.19 | 0.18 |
| K | 0.03 | 0.04 |
| Free C | Nil | Nil |
| Moisheve | 0.24 | -0.58 |

## C - Comments and Recommendations on the Iron and Steel Works

### Plant Site

15 - It is clear from the studies that Homs has been chosen for the plant site after thorough examination of six other alternatives and Tartous came second after Homs. One must also admit that dicisions does not always follow the results of the economical calculations. As an example we take the number of blast furnaces proposed, the economic calculations were in favour of one blast furnace with higher capacity, but the decision was taken in favour of two blast furnaces for reasons which are beyond theoretical calculations.

The same also applies to the plant site, as it might be worthwhile reconsidering Tartous for the plant site for the following reaons:

1 - The plant will need about 1.1 million tons of coking coal which will have to be unloaded in the harbour most probably in a stock yard, and then loaded in the train, transported and unloaded in the plant in a stock yard and then later charged to the batteries. Most of those excessive and costly operations, in additon to the material losses in each step, will be eliminated if the plant is constructed along the sea side near Tartous where it will have its own quay and as soon as the ship is there, the coal is considered to be available to the coke batteries. It will not be necessary to keep a coal sotck at the harbour and a coal stock at the plant, as this means dead capital costing money and raising the production cost.

It happened in an integrated plant in an Arab Country that the coke ovens suffered from lack of coking coal while there was thousands of tons in the stock pile at the harbour, but there was shortage in rail transportation facilities.

What has been said about coking coals applies to all other improted raw materials and production requirements i.e. iron ore if imported manganese ore, refractories, ferroalloys, scrap, spare parts etc.

One should also not forget that if this industry starts in any country it will keep going almost indefinitely, now it might be based on certain iron ore deposit, when this deposit is depleted it will keep going on other sources. That is why the modern trend now is to build the steel industry on the sea shore because of the huge transportation involved in this industry and for the reasons which were previously explained.

Finally it should be remembered that the mischoice ofthe plant site can raise the operating costs of the plant considerably during all its life.

**Energy**

16 - It is estimated that the total fuel oil requirement of the plant will amount to 165 400 tons annually. After the availability of the natural gas, it is recommended that the oil should be replaced by gas. Natural gas besides being cleaner fuel, easy to control, easy to handle, will allow the corresponding amount of liquid fuel to be exported and to generate foreign currency. Natural gas is not easy to export it has to be liquified at a relatively high cost.

17 - It is foreseen in the project to include an emergency power plant with a generating capacity of 36 MW. For an emergency power station, this might be too big. If this situation have resulted from the choice of electrically driven blowers for the blast furnaces then it will be recommended to study the alternative of using steam turbo blowers or gas turbo blowers for the blast furnaces.

**Coke Ovens**

18 - It is recommended to postpone the construction of the coke ovens to a later stage of project development and to start the project on the basis of imported coke for the following reasons:

18 - 1 To reduce the initial capital requirement

18 -2 To reduce the burden of starting up such a relatively complicated iron & steel complex.

18 -3 The coking plant will produce a number of by-products and unless these products are efficiently used or sold at a reasonable price, the production cost of the coke will be seriously increased. The coke rate in an iron and steel plant is one of the biggest items on the operation cost sheet. The management will always have to keep an eye on the coke rate and the coke price.

18 -4 It might be said that transportation and handling of coke will generate too much fines. This should not be a problem because the fines will be needed for the sintering plant. The blast furnace burden will be composed of 85% sinter and 15% lump ore.

18 -5 The water requirement for the coke oven plant, if postponed, could be used for more urgent needs e.g. for Ore concentration using the wet low dintensity masgnetic seperation. The water may also be used for blast furnace slag processing.

**Blast Furnaces**

19 - Inspite of the fact that one high capacity blast furnace is more economical than two blast furnaces because of lower capital cost and lower operating cost, it is still more advisable to have two blast furnaces specially for the first iron and steel complex in a developing country.

20 - In modern blast furnaces coke ratio can be considerably reduced, and more hydrocarbons can be injected. It is recommended as mentioned before to inject natural gas instead of fuel oil. In order to maximize injection of natural gas, the blast should be enriched with oxygen. Oxygen injection is far better than the steam injection proposed for the blast furnaces. Steam injection will cool the combustion zone infront of the tyres and will reduce the amount of hydrocarbon which can be injected. Oxygen injection will

increase the temperature of the combustion zone and allow more natural gas to be injected. It is therefore recommended to enrich the blast furnace with oxygen.

21 - The profit margin of iron and steel plants is usually low. The economy of the industry can be improved by the proper utilization of the by-products and by further processing of the rolled products into fabricated steel products. It was noticed in the project the blast furnace slag will not be granulated, so it is recommended to reconsider this decision and to study the production of granulated slag, foam slag or slag wool.

22 - Itis advisable to make provisions for charging the blast furnaces with crushed and prepared pig iron scrap or other suitable metallic scrap.

23 - The blast furnace slag composition should be suitable for the manufacture of blast furnace slag cement after being granulated.

Steel Melting Shop

24 - It is foreseen in the project tc include two mixers 1300 ton each in the steelmelting shop. Some engineering organizations consider the second mixer as unnecessary investment. For example, the two integrated plants which were built in Egypt, one in the fifties and the other in the seventies, both were equipped with one mixer each.

On the other hand, and from the operational point of view two mixer will ensure smoother and less interrupted operation. This is almost similar to the issue of having one or two blast furnaces. The mixer is usually put out of operation once every 18 months for about 40 days for relining, with the mixer out of operation, the production of the steel shop is usually below its normal level. So it is advisable to have to mixers.

25 - The project envisages two bottom blown basic oxygen converters of 120/130 to capacity each.

Any steelmaker in a developing country knows very well what does it mean to have about 120 tons of molten steel in a perforated bottom converter. Any mistake the 120 ton molten will be on the ground causing enormous damage to the equipment and great losses in production. So it is recommended to use the top blown oxygen converter.

26 - An Iron & Steel Complex of the size foreseen in the project generates considerable amounts of scrap especially at its initial stages of operation. No facilities were provided in the project to break, cut and prepare the scrap to be used as coolant in the converter. It is also necessary to have facilities to separate the iron metallics from the converter slag.

It is recommended that scrap generated from the various production shops to be studied and the necessary facilities to be included in the plant for its preparation.

In some cases pig iron scrap may be charged into the blast furnaces so it is recommended to study this point and make provisions for it.

The scrap preparation facilities should, however, be capable of handling and treatment of very heavy prices such as iron and steel frozen ladles.

27 - It is recommended to carry out pilot scale calcining tests on the dolomite for manufacture of linings for the oxygen converters. The same also should be applied on the limestone.

28 - Provisions should be made in the continuous casting plant to allow for continuous-continuous operation.

29 - Provision should also be made for the disposal of the liquid steel remaining in the ladle in case of sudden interruption of the continuous casting maching while the steel is being cast.

**Rolling Mills**

30 - It is recommended for the wire mill to consider th replacement of the no twist finishing group having a maximum speed of 65 m/sec. with a modern no twist finishing block with speed as high as 80 - 90 m/sec. This will increase the wire mill considerably.

**Product Mix**

31 - It is stated in MECON study that the bulk of the deficits of finished rolled steel in Syria by the year 1990 will be in the category of non flat products (1.16 Mt/yr). Although a gap of about 0.49 Mt/yr. will exist for flat products by 1990 the demand of individual products like HR Plates, HR sheets, CR sheets, tin plates, galvanised sheets, etc. are rather small for their economical prodution in a commercial plant.

MECON therefore, recommended that the proposed iron and steel plant should go for the production of non-flat products for which two fairly economic capcity rolling mills would cover the bulk of gap of 1.16 Mt by 1990. The two rolling mills proposed will have the following capacities.

| | | |
|---|---|---|
| Mill 1 - | Round bars 6 - 12 mm | 400 000 tons/y |
| Mill 2 - | Round bars 14 - 50 mm | 310 000 tons/y |
| | & Medium sections | 190 000 tons/y |
| | | --- |
| | Total of the Second Mill | 500 000 tons/y |

The product mix of the two mills will be as follows.

| | Product | Size Range in mm | Annual/production in tons |
|---|---|---|---|
| 1 - | Round bars | 6 - 12 | 400,000 |
| 2 - | Round bars | 14 - 50 | 310,000 |
| 3 - | Square bars | 12 - 45 | 10,000 |
| 4 - | Flat bars | 25 x 5 - 120 x 15 | 40,000 |
| 5 - | Angles | 25 - 80 | 100,000 |
| 6 - | Channels | 40 - 80 | 30,000 |
| 7 - | Tech. Section | 80 - 60 | 10,000 |
| | Total | | 900,000 |

Our comments on the product mix proposed by MECON are as follows:

31.1 - It is recommended to consider the gap at the year 1995, because such a project will need about 10 years from the date when the discision is taken to go ahead with the project until it is commissioned and the prodution reaches its designed capacity. Long time is needed for planning, negotiations of tenders, arrangement of finance, construction, equipment manufacture and erection, commissioning, achieving the designed capacity the infrastructure, projects connected with the plant. This means that the deficits of the finished steel products will be more that considered by MECON.

31.2 - The bulk of the prodcution as proposed in MECON study will be bars and wires amounting to 710,000 tons ie. 79% of the production of the two mills and 21% sections.

31.3 - The prodution proposed for the project is 100% long products of which 79% is round bars. Such product mix will not help very much in speeding up the industrialization process in Syria.

31.4 - Flat products have much greater influence on industrialization than long proucts. In industrial countries the ratio of flat products to long products in their steel consumption is much higher than in developing countries, as shown in the following table taken from MECON study.

| Country | Flat to nonflat (excl. pipes, tubes, alloy & Special Steel) | |
|---|---|---|
| | 1965 | 1976 |
| Japan | 1.3 | 1.9 |
| West Germany | 1.2 | 1.9 |
| U.S.A. | 1.8 | 2.6 |
| U.K. | 1.2 | 1.9* |
| Brazil | 0.9 | 1.4 |
| Syria | 0.2 | 0.3 |
| | 0.2 | 0.4** |

* 1975 ** 1978

31.5 - The present flat products plants have much higher capacity than the gap expected in flat products in Syria by 1990 or 1995. Steel plant equipment manufacturers are recently engaged in designing flat product plants which will be suitable for limited flat proudct market. One of those manufacturers is the Austrian Firm Voest Alpina.

31.6 - The expert strongly believe that developing countries should not contract for any new technology unless it has proved itself technically and economically for a reasonable length of time and has been tested and operated under various working condition, so that one should be able to see it operating and examine its daily, monthly and yearly records of operation. However, this case is different

because the technology available involves huge investment and has a very high capacity, and that there is no other choice except to consider this new technology.

31.7 - It is therefore suggested that the competent authorities in Syria may try to contact the suppliers of this new technology and that it might be possible to reach an agreement with any of them to buy a flat mill with this new design provided that the contract will be made under very special conditions in connection with the price and technical know-how.

31.8 - If this proposal will turn to be successful then, it will be worthwhile to consider replacing one of the long product mills by a flat mill.

## Management and Capacity build-up

32 - It is recommended that the management of the project after being commissioned shall concentrate on the main activity of the project. The management of the infrastructure projects such as townships, rail transportation, port development, power transmission lines, etc., shall be made by the competent government authorities, and the investment of these projects to be included in their budget.

33 - The capacity build up or the learning curve of the project as proposed by MECON assumes that the plant will reach 40% of its designed capacity in the first year, 80% in the second year and 100% in the third year.

It is advisable to assume that the plant will reach its designed capacity after five years of operation. It is important to note that most of the steel plants in developing countries haves not reached their designed capacity and if it was reached. they were not able to maintain it. The capacity utilization of iron and steel plants in developing countries is usually low. The capacity utilization of steel plants in developed countries is also low due to market pressures and not because of poor plant operation.

There is now a great deal of restructuring of the iron and steel industry in developed countries to overcome the market pressures and to improve capacity utilizations along with the overall economics of the industry.

34 - Before commissioning the plant, it will be interesting to compare between a technical assistanat agreement, or a full management agreement, with a highly qualified consultant. The consultant should be chosen from among the best steelmakers in the world.

It should however be stated that full management agreements are very expensive but is will help in reaching the designed capacity in a short period perhaps as suggested by MECON, but at a very high cost. It will not help in training the members of the local management staff since the discisions will all be in the hands of the consultants.

On the other hand technical assistance agreements are cheaper, but not so effective as full management agreement in reaching designed capacities, under technical assistance agreement the local management staff will have much better opportunity for training since the responsibility of running the plant and decision making will be in the hands of the local management.

Fig. 5/1 shows the effect of management on production and Fig. 5/2 shows production build up of Steelmaking at various works(1).

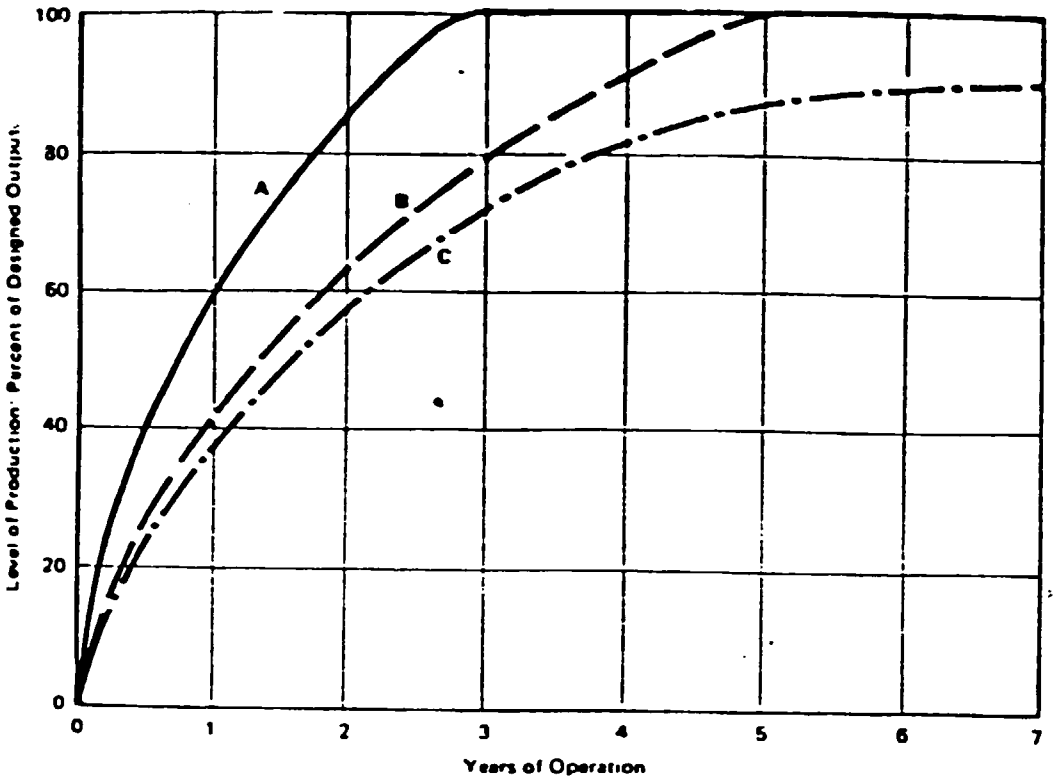



FIGURE 5/1 - EFFECT OF MANAGEMENT ON PRODUCTION

The importance of good management in this context is demonstrated in Fig. 5/1 Case A is the 'learning curve' representing a rapid and efficient build-up of production in a well-managed plant. The other two curves illustrate what may happen if management is not of this quality. The rate of build-up may be slowed down, delaying the attainment of full output, as in Case B, in which an extra two years are taken to achieve this target. Or the designed output is never reached, and the works operates permanently at below its maximum potential throughout, as in Case C.

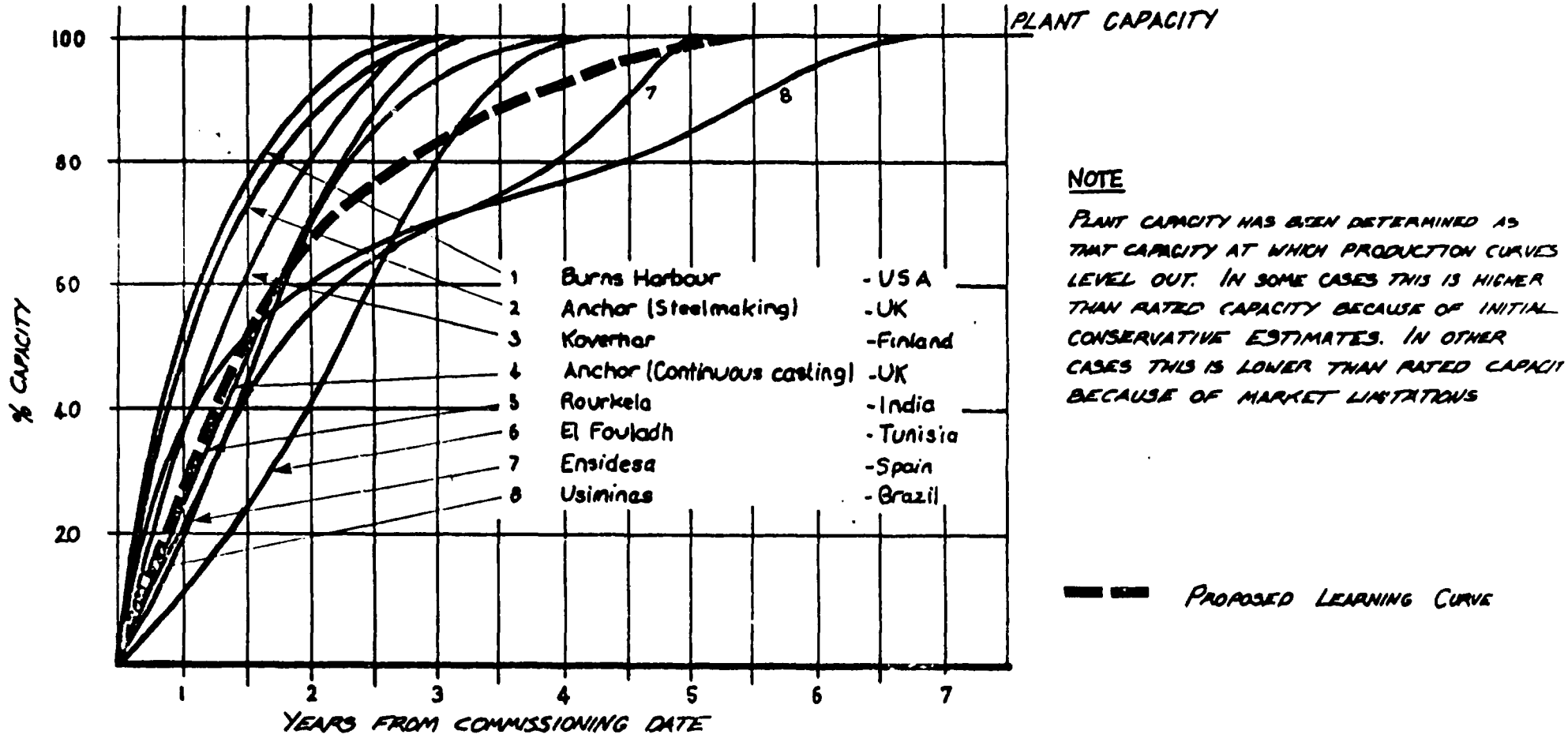



Figure 5/2 Production Build-up of Steel Making at Various Work ( )

5/23

## APPENDIX I

## PROJECT DOCUMENTS

- Project Background
- Team Members and Work Assignments
  - Syrian Experts
  - UNIDO Experts

## Project Activities

UNIDO will set up a working team under the responsibility of the backstopping officer of Regional and Country Studies Branch comprising four consultants, with appropriate expertise in industrial planning, food-processing, plastics and fertilizes, textile and engineering industries.

This UNIDO team will have as its counterparts four national consultants who will co-operate closely in the field as well as in evaluating findings and diagnoses. The two partners will jointly define the qualifications required of the local associate consultants and the terms and duration of their respective participation in the project as defined above.

On the Syrian side, the Special Economic Advisor to the Minister of Industry will supervise Syrian participation in the project. He will co-operate with the UNIDO backstopping officer in elaborating a detailed programme for the project and in defining the terms of its implementation. He will assist in, and advise on, the selection of local consultants and the revision of the study before finalization by UNIDO.

UNIDO will present the final report in English and Arabic to the Syrian Government. The report will contain a comprehensive synthesis of the findings as well as a list of proposals and recommendations. An official version of the report will be published subsequently by UNIDO on consultation with the Syrian authorities. The publication replaces a 1979 Joint UNIDO/ECWA Industry Division study which was not published.

## Special considerations

This project represents a continuation of UNIDO efforts to analyse industrial development and future growth prospects in developing countries and suggest strategy, policy adjustments and programmes to improve the performance of the industry and enhance its degree of self-sustainment and export possibilities.

Immediate objectives

The projects will identify strategy options, general sectoral policy for the industry and sectoral schemes for a better capacity utilization and a further optimal development of the industry.

The output will be presented to the Syrian authorities and will enable the initiation of operational programmes of assistance to the local industrial unions and industries which, while occupying a leading place in the industry and economy, are presently faced with structure and policy inadequancies.

Project output

Project output will consist of a study diagnosing industrial policies and structure, proposed strategy and a broad definition of action-oriented schemes in relevant sectors and areas.

Project objectives

1. To prepare detailed diagnosis of the problems related to development, pinpointing their origin, location, and impact, in connection with the industry and the general economy, the roots of those problems and bottlenecks in the country's strategic orientations, and/or in the dynamics and modalities of the industrial process as well as in the regional and international environment.

2. To rationalize the industrial sector and enhance its productive performance, while multiplying both its intra-linkages and linkages with the agricultural sector and the general economy.

3. To propose, in the light of the above, a general policy for future industrial development including the identification of new branches and/or sub-sectors as well as the expansion or reorientation of existing sectors. The project will also suggest alternative methods of organization and input improvements of production and management, increase output and enhance marketing, particularly in the most vital industrial branches, so as to ensure the activation, consolidation and strengthening of the general process of industrialization. It will also explore further inter-sectoral complementarity and seek self-reliance.

4. To assess conditions and means for an optimal utilization of the present production capacities through better technology application and reproduction and more rational use of equipment.

5. To formulate short-term and long-term programmes to implement the policies described above. The project will aim to adjust the orientation of expansion in the industrial branches while enhancing the economy efficiency and performance within each branch.

6. To propose schemes to supply spare parts to the industry through the qualitative and quantitative development of national maintenance facilities and the local manufacture of spare parts as well as supporting centres of excellence and training programmes. These proposals will be formulated to enable the sustainment of those branches and production sequences which are considered as the most favourable for the consolidation and further development of the industry, both in the public sector and in private small- or medium-scale enterprises.

7. To assess the problems of local manpower availability, qualifications and employment patterns and define global and sectoral policies for industrial labour covering reassignment of manpower, education, training, and wage adjustments.

8. To assist in evaluating the surplus of industrial production that is, or must be, exportable through an evaluation of the present industrial export activity, assess export potential in other branches, and make action-oriented proposals for new exports opportunities in the relevant sectors. In so doing, the project will also suggest necessary changes in the modes of production and its techniques, as well as in product specification in the relevant industries.

9. To evaluate the private industry sector, its share of production, areas of action, performance and contribution to export activity. This will enable an identification of production branches and processing sequences where the private sector can further develop its activity to enhance the manufacturing export capacity of the country. The project will suggest a preliminary strategy to improve the situation of foreign trade through adequate structural consolidation and re-orientation of the industry.

PART B - NARRATIVE

Background

1. The Syrian Arab Republic was one of the first developing countries to promote a dynamic import substitutive industry in the early 1950s. Significant qualitative changes took place during following decade in the economic structure and industrial policies, which led to considerable expansion and transformation in the sectors of agriculture and foreign trade together with the establishment of an oil-extractive sector. Those changes were realised through an expansion of the state sector which embraced particularly large-scale industry and foreign trade, irrigation and electricity and systems of land ownership. Several new economic branches were developed.

2. During the last ten years, the State has achieved a tremendous expansion of industrial investment in infrastructure and foreign trade, while adding entirely new manufacturing sectors based on oil and gas, mineral and agricultural raw materials, and primary mineral production. Infrastructures have been expanded, together with a diversification of production-oriented, and social components. The volume of machinery and capital goods and their weight in foreign trade also increased dramatically.

3. This was achieved through enormous investments and capital spendi the industry, often at high economic and social costs. The pricing of several agricultural products needs to be reassessed while ensuring reasonable economic production costs in many food-processing and agro-industries.

4. While the industrial and manufacturing sectors have attained significant growth and diversification, their performance is below standard: many Syrian products are of low quality and difficult to market. The growth of the Syrian industry at its early stages found an outlet in the Syrian market and in those of neighbouring countries. As the latter were extremely under-industrialized, they provided ready markets for Syrian products. During the last two decades, however, new industries and equipment similar to those in Syria, were set up in the same neighbouring countries and grew increasingly competitive. The small- and medium-scale sectors of Syrian industry were particularly affected both by machinery wear, skilled labour drain and an absence of an appropriate and coherent marketing strategy. Both for large- and small-scale industries, an awareness emerged of the necessity for an export strategy, as well

an strategies for sharing and specialization by Syrian and other similar industries of the Arab Meditarranean and West Asian subregion.

5. Because of the rapid rate of industrialization, as well as the newness of many of the industries described above, the country has not been able to run its industrial enterprises efficiently, nor utilize fully its production capacities. At the same time, the national development plans have suffered from a lack of clarity and precision in terms of strategic options and inter-sectoral linkages. The private sector has been discouraged from entering industry and the traditional textile sector underwent a crisis on account of insufficient re-investiment and loss of skilled labour; the large, nationalized textile companies suffered from overemployment and under-management. The same situation applies to the equally traditional food industries. However, the acute crisis facing the textile and food industries is also attributable to a lack of adjustment and subsequent restructuring to counteract competetive production in the neighbouring countries. Thus, in the absence of a clear exports strategy, increasing protectionism on the Western European markets, aggressive export policies of South-East Asian industrialists and over-secured markets of the Soviet Union and other socialist countries that import Syrian textiles, are affecting Syrian industries and are subsequently discouraging restructuring and adjustment programmes and measures.

6. Syrian industry is faced with common problems of low productivity, under-utilization of capacities, shortage or inappropriateness of skills, maintenance and management deficiencies. In the traditional sectors, there are the additional problems of hardware aging and software collapse. In the new industries, there is a shortage of skills and an insufficient mastering of new technologies and production processes.

7. There is an overall need in Syria to reassess the import substitution strategy, up-grade extracted natural resources and intensify inter-sectoral linkages. In view of the significant expansion and diversification of the manufacturing industries, the country needs to define a complementary export strategy.

8. A thorough examination should be made of the structural problems of the industrial sector by focusing both on new industries specializing in local traditional textiles and food processing and on new manufacturing branches and production sequences. Simultaneously, the agriculture-industry and inter-branch linkages should be assessed to ascertain the degree of vertical integration in those branches. A relatively broad diagnosis is required of the general problems encountered in the industry namely employment, productivity, production, organization and management, maintainance etc... .

9. Similarly, the industrial aspects, objectives and implications of the countr Development Plan should be reviewed in the light of the present structural problems and major trends in the industrial process. Taking into consideration the degree of development and diversification attained by the industry, there is a need to define a new subregional status for Syrian manufacturers. Finally, the industrial export policy and practices should be assessed against a background of growing protectionism and insufficient growth of exports.

10. Furthermore, the previous UNIDO study prepared jointly with ECWA, on the Syrian industry was judged by the Syrian Authorities as not reflecting the important expansion and the new trends of the Syrian industry in the years 1980-1983; thus it was impossible to reply substantively on the findings of that study, for an assessment of future prospects and current strategic options and for a definition of alternative options or shifts in policy. This was stressed during an official visit by the Syrian Minister of Industry and through a subsequent exchange of correspondence between the latter and the Executive Director of UNIDO. In this connection, the Regional and Country Studies Branch which was explicitely requested to undertake a new in-depth study, has included in its programme a project to implement the study along the lines defined in the project.

11. The project will benefit from full and active support, in the field, from the Syrian Ministry of Industry and other competant authorities, including the Supreme Plan Authority, the Ministry of Oil and Minerals, the Ministry of Economy and Foreign Trade, the Ministry of Labour and Social Affairs as well as the heads of local industrial sectoral unions and other bodies.

12. Finally, the project will formulate options for industrial strategy and suggests subsequent adjustment. Alternative industrial diversification within linkages schemes and programmes will be outlined, including adjustment of employment conditions, raw material allocation, technology improvements and product range changes. The project will provide assistance to the Ministry of Industry in defining the main problems ecountered and offering solutions including proposals for staff training. The project will aim at identifying exports strategy options, policies and measures especially in those areas currently facing problems as well as other areas where new products are or will be earmarked for exportation, bearing in mind the framework for exports and the international process of restructuring and adjustment in relevant sectors.

13. The project will take into consideration growth in similar products of neighbouring countries and will suggest schemes of co-ordination and marketing within the Arab region and the eventual role to be played by Syria in the region-wide process.

SYRIAN EXPERTS

Mr. Nizar ABDALLAH

5. Work assignment

Assessment of domestic resources relevant to industrial activity and their pattern of effective utilization in the present industrial sector in Syria.

Dr. Rizkallah HILAN

5. Work assignment

- Analyze the pattern of industrial development in Syria since the early 70s
- Assess the techno-economic interlinkages of industry with the overall economy

Dr. Mustafa JAKOUS

5. Work assignment

- Analytical review of past developments in the Syrian industry especially since 1973
- Assessment of structural changes in industry
- Analysis of the textile and agro-industries - technological, financial, organizational and marketing problems
- Co-ordination of the work of the national experts with the UNIDO team and proposing parts of the first draft of the general report
- Review of key Government policies and measures currently used for promoting industrial development

Dr. Issam KHORY

5. Work assignment

Review of previous and the current five year plans for industrial development so as to identify current investment allocations, assessment of explicit or implicit sectoral priorities and supporting policies. Preparation of report for inclusion in overall study report.

Ms. Maria Paula DI PIETROGIACOMO

5. Work assignment

**Preparation and compilation of preliminary data and activities at Headquarters; co-ordination of the work of UNIDO team consisting of data collection and organization of interviews and general co-ordination in the field and assistance in drafting final report with special contribution on present and future industrial and trade relations of Syria with the EEC countries.**

Dr. Issam El-ZAIM

- Launching of study through UNIDO field mission in Syria to work out diagnosis of the Syrian industry and economy with the aim to make broad assessment of general characteristics, industry and other sectors interlinkages, vertical integration in the main industrial branches, manpower, technological and marketing problems and prospects for the recommendation policy decisions globally and in related sectors and later of a proposal for industrial strategy for Syria for the next ten years.

Dr. Abud Bakr MOURAD

5. Work assignment

Economic analysis of the Syrian steel and agricultural machinery industry covering:

- role in industrial sector as a whole
- techno-economic linkages with other industries
- current production structure in terms of product range, corporate structure, employment, capital stock, capacity, etc.
- key features of the two industrial subsectors:
  - technology (state, developments, R&D relating to products and processes
  - vertical integration
  - import content
  - export performance
  - marketing
  - costs of key material inputs in international comparison
- scope for co-operation in the region
- adjustment requirements: strategic options
- recommendations for government policies and institutional measures

The assignment will entail:

- 8 working days in Syria with visits to selected authorities and plants
- 9 working days in Vienna for report writing

Mr. Jamil WAKIM

5. Work assignment

Economic analyses of the Syrian refining, petrochemicals and fertilizers industry covering:

- role in industrial sector as a whole
- techno-economic linkages with other industries
- current production structure in terms of product range, corporate structure, employment, capital stock, capacity, etc.
- key features of the two industrial subsectors:
  - technology (state, developments, R&D relating to products and processes
  - vertical integration
  - import content
  - export performance
  - marketing
  - costs of key material inputs in international comparison
- scope for co-operation in the region
- adjustment requirements : strategic options
- recommendations for government policies and institutional measures

The assignment will entail:

- one week stay in Vienna
- 23 days in Syria with vistis to selected authorities and plants

# APPENDIX II

## ORGANIZATIONS VISITED

## APPENDIX II

## ORGANIZATIONS VISITED

### A - UNIDO - Vienna

- Prof. Dr. Essam Al Zaim
- Mr. Tanaka — Computer Expert, Steel Industry Applications
- Dr. Nijhawan
- UNIDO Library
- UNIDO Documentation Center

### B - Organizations in Vienna

1 - Austroplan, Austrian Engineering Company Limited
- Dip. Ing.E.Krimmel, Technical Director
- Dipl Ing P.Bornemisza, Project Manager (Metallurgy)

### C - UNDP - Damascus Office

- Mr. — Resident Representative
- Mr. Badawi — Deputy Resident Representative
- Mr. Omar Sh.Ibrahim — Liaison Officer UNDP
- Dr. Yehia Kassab
- Mr. Elias Meshabek

## D - Ministry of Industry and its Organizations

### 1 - The Ministry

| | |
|---|---|
| - H.E. Mahmoud Kadour | Minister of Industry |
| - Dr. Mustafa Jamous | Consultant to the Minister |

### 2 - General Organization for Engineering Industries

| | |
|---|---|
| - Eng. Mamdouh El-Menajid | General Director |
| - Eng. Hassan Kassab | Deputy General Director |
| - Dr. Daoud Bishara | Asstt. General Director |
| - Eng. Antonios Sabagh | Production Manager |
| - Dr. Abdel Hafiz Dalati | Economist |

### 3 - General Company of Iron and Steel Products "GECOSTEEL"

| | |
|---|---|
| - Eng. Walid Asfar | General Director |
| - Eng. Zoher El-Sahn | Deputy General Director |
| - Eng. Mohammad Zakkr | Production Manager |
| - Mr. Walid Halak | Financial Manager |

## E - Ministry of Petroleum and Mineral Resources, and its Organizations

### 1 - The Ministry

- Dr.Eng.Essa Ibrahim Youssef
  Deputy Minister for Mineral Resources

2 - **The General Establishment of Geology and Mineral Resources**

| | | |
|---|---|---|
| - | Dr. Mohamad Sch. Nagieb | General Director |
| - | Dr. Fawaz Roumani | |
| - | Mr. M. Atassi | |

F - **Ministry of Supply and Internal Trade**

1 - **Organization of Internal Trade and Construction Materials**

| | | |
|---|---|---|
| - | Mr. Omar Baradi | General Director |
| - | Mr. Abdel Salam Gaafer | Deputy General Director and Manager of Metal Dept. |

C - **Ministry of Planning**

| | | |
|---|---|---|
| - | Mr. Radi Karawani | Industrial Planning |

H - **Arab Iron and Steel Union**

| | | |
|---|---|---|
| - | Eng. Abed El-Amir | Office Manager, Damascus |

## APPENDIX III

## DOCUMENTS RECEIVED

A - From the General Establishment of Geology and Mineral Resources.

B - From the General Company of Iron and Steel Products "GECOSTEEL"

## APPENDIX III

### Documents Received from Organizations Visited

**A - From the General Establishment of Geology and Mineral Resources**

1 - MECON Stage (1) Report, Volume One Market Study
dated March, 1980

2 - MECON Stage (2) Report, Volume One
dated September, 1980.

3 - Review and Appraisal of the Integrated Steel Project. Atkins Planning
dated April, 1983.

4 - MECON Stage (2) Report, Updating of Costs
dated August 1983.

5 - Summary of Test Results on Ore beneficiation

6 - Report on Mineral Resources in Syrian Arab Republic
dated 1984.

**B - The General Company of Iron and Steel Products "GECOSTEEL"**

1 - Production and Sales Tables for the Steel melting shop, Rolling Mills, Tube Mill.

2 - Capacity chart for the tube mill.

## APPENDIX IV

## NATIONAL STATISTICS TABLES
## SYRIAN ARAB REPUBLIC

TABLE 1 INTERNATIONAL COMPARISONS OF ECONOMIC PERFORMANCE.
(AT 1975 PRICES)

SYRIAN ARAB REPUBLIC

| Measure | Year or period | Country | Western Asia | Developing countries Total |
|---|---|---|---|---|
| GDP per capita (US $) | 1963 | 468 | 958 | 324 |
| | 1970 | 472 | 1254 | 409 |
| | 1981 | 857 | 1557 | 533 |
| MVA per capita (US $) | 1963 | 52 | 83 | 48 |
| | 1970 | 45 | 130 | 68 |
| | 1981 | 69 | 175 | 101 |
| Total exports/capita (US $) | 1963 | 226 | 458 | 76 |
| | 1970 | 170 | 643 | 109 |
| | 1981 | 105 | 700 | 124 |
| Total imports/capita (US $) | 1963 | 106 | 124 | 54 |
| | 1970 | 106 | 154 | 73 |
| | 1981 | 323 | 723 | 142 |
| Total exports/GDP (percent) | 1963 | 48.32 | 47.82 | 23.52 |
| | 1970 | 36.06 | 51.33 | 26.59 |
| | 1981 | 12.27 | 44.96 | 23.30 |
| Total imports/GDP (percent) | 1963 | 22.62 | 13.00 | 16.61 |
| | 1970 | 22.41 | 12.32 | 17.80 |
| | 1981 | 37.67 | 46.43 | 26.68 |
| Gross capital formation per capita (US $) | 1963 | 86 | 95 | 53 |
| | 1970 | 84 | 136 | 78 |
| | 1981 | 227 | 457 | 137 |
| Growth of GDP per capita(%) | 1963-1970 | 0.38 | 3.77 | 3.13 |
| | 1970-1981 | 5.72 | 2.43 | 2.67 |
| Growth of MVA per capita(%) | 1963-1970 | -1.87 | 6.80 | 4.71 |
| | 1970-1981 | 2.65 | 3.24 | 3.96 |

Source: Statistics and Survey Unit, UNIDO. Based on data supplied by the UN Statistical Office, with estimates by the UNIDO Secretariat.

TABLE 2 COMPARATIVE GROWTH RATES BY ECONOMIC SECTOR.
(AT 1975 PRICES)

SYRIAN ARAB REPUBLIC

| Sectors | Period | Country | Western Asia | Developing countries Total |
|---|---|---|---|---|
| Agriculture | 1963-1970 | -2.10 | 2.27 | 2.37 |
| | 1970-1981 | 8.02 | 2.85 | 2.74 |
| | 1963-1981 | 4.05 | 2.63 | 2.77 |
| Mining & quarrying | 1963-1970 | 81.08 | 7.48 | 9.61 |
| | 1970-1981 | 8.27 | 3.52 | 0.88 |
| | 1963-1981 | 44.74 | 6.24 | 4.69 |
| Manufacturing | 1963-1970 | 1.31 | 9.87 | 7.37 |
| | 1970-1981 | 6.45 | 6.39 | 6.52 |
| | 1963-1981 | 4.80 | 7.74 | 7.20 |
| Utilities | 1963-1970 | 9.90 | 10.44 | 9.34 |
| | 1970-1981 | 15.39 | 10.88 | 9.41 |
| | 1963-1981 | 14.06 | 10.30 | 9.44 |
| Construction | 1963-1970 | 5.05 | 7.21 | 5.99 |
| | 1970-1981 | 14.45 | 13.10 | 7.96 |
| | 1963-1981 | 11.64 | 9.87 | 7.51 |
| Services | 1963-1970 | 4.73 | 7.28 | 5.83 |
| | 1970-1981 | 10.33 | 7.91 | 6.03 |
| | 1963-1981 | 8.31 | 7.51 | 6.65 |

Source: Statistics and Survey Unit, UNIDO.
Based on data supplied by the UN Statistical Office, with estimates by the UNIDO Secretariat.

TABLE 3 DISTRIBUTION OF GDP BY SECTOR OF ORIGIN.
(AT 1975 PRICES)

SYRIAN ARAB REPUBLIC

| Year | Agriculture | Mining & quarrying | Manufacturing | Utilities | Construction | Services | GDP |
|---|---|---|---|---|---|---|---|
| | (Percentage) | | | | | | (million $) |
| 1960 | 21.5 | 0.2 | 13.2 | 0.6 | 6.3 | 58.1 | 1663.1 |
| 1961 | 26.4 | 0.2 | 12.3 | 0.6 | 5.8 | 54.8 | 1743.5 |
| 1962 | 33.4 | 0.2 | 10.3 | 0.5 | 4.3 | 51.2 | 2336.4 |
| 1963 | 31.0 | 0.2 | 11.1 | 0.5 | 4.7 | 52.5 | 2348.6 |
| 1964 | 31.9 | 0.1 | 11.2 | 0.5 | 4.3 | 51.9 | 2487.3 |
| 1965 | 31.8 | 0.1 | 10.9 | 0.6 | 3.9 | 52.6 | 2473.5 |
| 1966 | 26.2 | 0.1 | 11.7 | 0.7 | 4.9 | 56.4 | 2313.8 |
| 1967 | 30.3 | 0.1 | 11.2 | 0.7 | 3.7 | 54.0 | 2474.3 |
| 1968 | 25.7 | 0.1 | 10.8 | 0.7 | 4.9 | 57.8 | 2615.4 |
| 1969 | 24.7 | 5.4 | 9.6 | 0.7 | 5.1 | 54.5 | 3137.0 |
| 1970 | 20.2 | 9.1 | 9.5 | 0.8 | 4.6 | 55.6 | 2951.9 |
| 1971 | 19.7 | 10.4 | 10.0 | 0.8 | 5.4 | 53.6 | 3232.2 |
| 1972 | 25.1 | 10.1 | 8.7 | 0.8 | 5.5 | 49.7 | 3768.4 |
| 1973 | 15.9 | 10.3 | 9.8 | 1.1 | 5.1 | 57.8 | 3567.3 |
| 1974 | 21.4 | 9.6 | 8.9 | 1.1 | 5.7 | 53.3 | 4517.3 |
| 1975 | 17.9 | 11.7 | 7.4 | 1.1 | 4.6 | 57.3 | 5597.6 |
| 1976 | 19.5 | 11.0 | 7.8 | 1.0 | 6.7 | 53.9 | 6052.1 |
| 1977 | 17.0 | 10.2 | 7.7 | 1.3 | 7.0 | 56.8 | 5900.5 |
| 1978 | 18.6 | 9.5 | 8.1 | 1.2 | 6.7 | 55.8 | 6414.0 |
| 1979 | 16.2 | 9.3 | 6.3 | 1.4 | 8.5 | 58.3 | 6754.3 |
| 1980 | 20.2 | 8.1 | 7.1 | 1.3 | 6.9 | 56.3 | 7376.7 |
| 1981 | 17.5 | 8.7 | 8.1 | 1.5 | 7.1 | 57.1 | 8023.2 |

Source: Statistics and Survey Unit, UNIDO. Based on data supplied by the UN Statistical Office, with estimates by the UNIDO Secretariat.

TABLE 4 GROSS OUTPUT AND VALUE ADDED IN MANUFACTURING.
(AT CURRENT PRICES)

SYRIAN ARAB REPUBLIC (currency=Pound)

| Description (ISIC) | Gross output (millions) Producer val. 1973 | Gross output (millions) Producer val. 1980 | Share in total (percentage) 1973 | Share in total (percentage) 1980 | Value added (thousands) Producer val. 1973 | Value added (thousands) Producer val. 1980 | Share i (perce 1973 |
|---|---|---|---|---|---|---|---|
| TOTAL MANUFACTURING(300) | 3505 | 13217 | 100.0 | 100.0 | 1493000 | 4312000 | 100.0 |
| Food products(311) | 915a/ | 3244a/ | 26.1a/ | 24.5a/ | 377000a/ | 1116000a/ | 25.3a/ |
| Beverages(313) | ... | ... | ... | ... | ... | ... | ... |
| Tobacco(314) | ... | ... | ... | ... | ... | ... | ... |
| Textiles(321) | 1547b/ | 4227b/ | 44.1b/ | 32.0b/ | 663000b/ | 1886000b/ | 44.4b/ |
| Wearing apparel,except footwear(322) | ... | ... | ... | ... | ... | ... | ... |
| Leather products(323) | ... | ... | ... | ... | ... | ... | ... |
| Footwear,except rubber or plastic(324) | ... | ... | ... | ... | ... | ... | ... |
| Wood products,except furniture(331) | 57 | 158 | 1.6 | 1.2 | 27336 | 69345 | 1.8 |
| Furniture,except metal(332) | 221 | 615 | 6.3 | 4.6 | 108664 | 275655 | 7.3 |
| Paper and products(341) | 11 | 33 | 0.3 | 0.3 | 3927 | 8041 | 0.3 |
| Printing and publishing(342) | 40 | 110 | 1.1 | 0.9 | 17073 | 34959 | 1.1 |
| Industrial chemicals(351) | 306c/ | 2828c/ | 8.7c/ | 21.4c/ | 89000c/ | 189000c/ | 6.0c/ |
| Other chemicals(352) | ... | ... | ... | ... | ... | ... | ... |
| Petroleum refineries(353) | ... | ... | ... | ... | ... | ... | ... |
| Misc. petroleum and coal products(354) | ... | ... | ... | ... | ... | ... | ... |
| Rubber products(355) | ... | ... | ... | ... | ... | ... | ... |
| Plastic products(356) | ... | ... | ... | ... | ... | ... | ... |
| Pottery,china,earthenware(361) | 7 | 62 | 0.2 | 0.5 | 3670 | 23000 | 0.2 |
| Glass and products(362) | 13 | 85 | 0.4 | 0.6 | 7060 | 32000 | 0.5 |
| Other non-metallic mineral prod.(369) | 73 | 442 | 2.1 | 3.3 | 38270 | 165000 | 2.6 |
| Iron and steel(371) | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0.0 |
| Non-ferrous metals(372) | 40 | 177 | 1.1 | 1.3 | 15642 | 48925 | 1.0 |
| Fabricated metal products(381) | 170 | 761 | 4.9 | 5.8 | 93694 | 291650 | 6.3 |
| Machinery,except electrical(382) | 65 | 291 | 1.9 | 2.2 | 28914 | 90250 | 1.9 |
| Machinery electric(383) | 23 | 104 | 0.7 | 0.8 | 12640 | 39425 | 0.8 |
| Transport equipment(384) | 5 | 21 | 0.1 | 0.2 | 1580 | 4750 | 0.1 |
| Professional & scientific equipm.(385) | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0.0 |
| Other manufactured products(390) | 12 | 52 | 0.3 | 0.4 | 5530 | 38000 | 0.4 |

Source: Statistics and Survey Unit, UNIDO. Based on data supplied by the UN Statistical Office, with estimates by the UNIDO Secretariat.

Footnotes: a/ 3110 includes 3130 3140
b/ 3210 includes 3220 3230 3240
c/ 3510 includes 3520 3530 3540 3550 3560

# APPENDIX V

## REFERENCE LIST

## APPENDIX V

## LIST OF REFERENCES


1 - Various studies prepared by Atkins Planning For Egypt and the Gulf Organization for Industrial Consulting, Doha-Qatar.

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11 - Sources : Organization visited Appendix No.2 and Documents Received Appendix No. 4.