

UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL



Distr. GENERAL
E/CN.14/AS/II/2/h/1
6 October 1965
Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA AND
CENTRE FOR INDUSTRIAL DEVELOPMENT
Symposium on Industrial Development in Africa
Cairo, 27 January - 10 February 1966

ENGINEERING PRODUCTS IN UAR

(Presented by the Government of

The United Arab Republic)

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Engineering products represent a branch of manufacturing industries which apparently seems to be simple and easy to establish. Any standard workshop can make a variety of these products on a limited scale. The quality will not be however always up to standard, and the cost will be incredibly high. Establishing industries for engineering products have to be based on carefully worked out feasibility studies, correct estimation of plant size, investment requirements & manufacturing costs, also on thorough investigations of local possibilities which would eventually justify taking such a step.

The UAR, being one of the most active developing countries, has collected a wealth of experience in industrialization problems which may be useful for other developing countries having similar local and international circumstances. Engineering industries are appealing and attractive to many developing countries but experience showed that they involve several difficulties and need careful study before deciding on establishing them, otherwise they may become a parasite to the country's economy and retard the wheels of development instead of accelerating them.

Industries based only on assembly operations of knocked down imported parts, although sometimes considered as a first phase of industrialization, cannot be considered a step towards industrialization because their added value represents a very small per cent. In most cases economical considerations do not justify even the slightest participation of locally manufactured parts and the operation remains for a long time confined only to mere assembly operations of kits whose importation cost, in some cases, exceeds the cost of the finished item. Such industries bring about very little saving in trade balance, and do not present basic contribution to industrial progress of the country.

Classification of Engineering Products

Engineering products belong to that sector of manufacturing industries in which raw materials (mostly in semi-finished or finished form) are transformed into finished goods ready for marketing as consumer's goods, capital equipment or service facilities.

In Standard Industrial Trade Classification (S.I.T.C.), engineering products come under the following 5 classes (Table 1), namely:

1. Fabricated metal products
2. Machinery
3. Electrical machinery, equipment
4. Transportation equipment
5. Professional, photographic and optical goods, watches and clocks

Under each of these classes are further **sub-divisions** which can be taken as indicative of groups of engineering products of similar nature mostly with respect to their usage.

When elaborating the industrialization programs of the UAR, engineering products had different aspects when selected, and their classification was looked upon in different ways:

A. In the First Program (1957-1960) they came under the sector of manufacturing industries and were classified into:

- a. General consumption products
- b. Fabricated metallic structures
- c. Road and rail transport equipment
- d. Internal combustion engines
- e. Sea and river transport equipment
- f. Electrical products
- g. Consumer's goods
- h. Machine tools, hand and cutting tools and fasteners (these were listed under the iron and steel sector) .

- B. In the Second Program (1960-1965) they appeared as a separate sector covering the following groups of products:
- a. Road, rail, sea and river transport equipment and replacement parts thereof
 - b. Electrical and electronic equipment
 - c. Pumps
 - d. Replacement parts for various equipment, textile, petroleum and transport
 - e. Miscellaneous engineering products
 - f. Timber industries

C. In the Third Program (1965-1972) which concentrates on heavy industries, their classification was as follows:

- a. Capital equipment, fabricated metal structures and tools
- b. Transportation equipment road, rail, river and sea
- c. Miscellaneous engineering products; metal containers, metal furniture and household equipment, pumps, fasteners, optical and laboratory instruments, toys, timber etc...

It is evident from the aforementioned classifications that UAR followed more or less the SITC classification.

Engineering products before and in Industrialization Programs

It is well known, that industry flourishes and expands as factors encouraging its establishment and extension prevail. In the case of engineering products, such factors were in the past very few and limited to special cases in which manufacturing of a main product (not necessarily an engineering product) necessitated the manufacture of another engineering product as an auxiliary one e.g. food products and their requirements of containers & packing.

The circumstances which influenced the establishment of industries for engineering products can be summarized in the following points:

1. The local demand on engineering products in general is comparatively low for two reasons:
 - a. The comparatively low standard of living in the UAR which did not exert enough demand on such products.
 - b. The small population which did not exceed 21.5 millions till 1952

The limited requirements of the UAR were therefore mostly imported from abroad except in the cases where the products required simple operations that could be carried out by low or medium skills, such as simple fabricated metal structures, window and door frames, kerosene stoves ... etc.

The establishment of factories did not prove feasible in most cases because the small scale copy principle could not be adopted due to the nature of many of the engineering industries. The limited number of local products could not compete with the imported articles and export market could never therefore be cultivated to booster the manufacture of engineering products.

2. The principal raw materials required for manufacture were not available in the UAR, and the few factories established till 1958 depended wholly on imports. The variety of the necessary material was large and required continued search in the world market. Iron and steel semi-finished products such as bars, sheets, and sections represented little difficulties but non-ferrous and stainless steels demanded big efforts to procure at reasonable prices due to fluctuations in their price level. In comparison with cotton, textile, food and building materials products whose sources for principal raw materials are local, many engineering products lacked therefore a very important factor, viz. that the principal raw material with correct specifications was not available. This difficulty, being recognized in due time, was overcome later partially by the erection of the steel mill at Helwan & the non-ferrous rolling mills which started production in 1954 to 1958 and on a broader front by the 0,5 million ton strip mill and 1,2 million ton integrated extension of the Helwan mill and extensions in other steel mills to produce special steels and the big number of plants which are to produce non-ferrous products.

3. Engineering products depend largely on good foundries and well equipped forges for supplying cast iron, steel and non-ferrous castings as well as forged parts to be processed by various forming,

machining and heat treatment operations. The casting and forging techniques must also be well advanced and in many cases foundries have to be mechanized and forging shops ought to be well equipped for dye-forging and hot stamping to be able to supply high class semi-finished products. Such foundries and forges require high investments and are never rentable unless they have defined big customer industries to co-operate with. Because these big customers did not exist in the past, existing foundries operated only on jobbing operations, their technique remaining more or less primitive, and the only advanced foundries were those supplying the UAR's military factories and the three cast iron pipes factories.

The establishment of automotive industries in 1958, capital equipment and other heavy industries during coming seven years represents permanent customers for first class foundries and well equipped forges, and makes it imperative to establish them at the same time other heavy plants are erected.

4. Engineering products require an advanced technical standard for their processing and a big reserve of know-how to enable their manufacture at a high technical standard and low cost. Their production in industrially advanced countries is backed up by a huge fund of research work, experimentation and prototype work which require big expenditures, which only big industrial concerns can afford. The personnel employed by producers of such products have extensive experience in the manufacturing processes and in the handling of equipment performing such processes most of which have become special purpose equipment.

The UAR as well as all industrially developing countries are not in a position to immediately embark on such research programs and to elaborate new designs and processing data for each product. The less expensive and time saving procedure is to buy such experience and know-how from well established producers. Training of personnel who will be engaged in relevant production has to be carried out either abroad or locally with the assistance of specialized experts well acquainted with the respective production.

5. The UAR's investors were not familiar with industry in general, and were not ready to take such risk so long as they could invest their savings in the traditional way known to them, namely in land and real estate.

Few engineering products were manufactured in the UAR as mentioned before but none of them could be manufactured on a large scale or in mass production for the above-mentioned reasons and because of the big capital investments required for establishing well equipped factories.

The only well established engineering industries, were till 1956, of military nature: rifles, guns and ammunition. Such products must be produced on a high technical level because of their nature and of the big requirements.

Table (2) gives an approximate list of the engineering products which were manufactured in the UAR in 1952 before a defined policy for industrialization was laid, also industrialization programs elaborated since 1957. Few of these could be described as successful and advanced e.g. containers, electric bulbs, and wooden furniture. The main reason for their success was either that they had to be produced on a relatively large scale or that many operations could be carried out by hand and required unskilled or medium skilled low paid labour. In 1957 the First Industrialization Program was elaborated and implemented during the years 1957-1960. It included about 60 projects for engineering products, most of which were for new products, the rest being extensions to existing production at that time. These projects, their production capacity and their estimated capital investments are listed in Table (3). This extensive program could not be executed till 1960. Only projects marked (S) were executed and started production till the end of 1960. Those marked (+) could not be executed till now, mostly because intensive studies could not prove the feasibility of their execution. The investments needed for the projects which could not be completed till June 1960 were included in The Second Industrialization Program (1960-1965) which was integrated to The General Plan for Economic and Social Development of the UAR and included projects classified as follows:

	No. of Projects	Total investment L.E.000
A. Rail and Road transport equipment	6	18670
B. Sea & River transport equipment	1	1863
C. Electrical & Electronic equipment	5	1798
D. Pumps	1	358
E. Replacement parts	4	3740
F. Miscellaneous	18	1870
G. Wood products	4	890
	<hr/> 39	<hr/> 29189

Table (4) shows these projects in detail, their estimated investments and products. Since preliminary studies and investigations carried out on these projects were more intensive than those for The First Program projects, and owing to experience gained in implementing the First Program most of the projects coming under The Second Program were executed till June 1965. Only projects marked (+) could not be entirely completed, and were included in The Third Industrialization Program (1965-1972).

It can be noted from Table (4) that the sizes of projects became larger than those of Table (3) relevant reasons being:-

1. Increase in local requirements of consumer's goods due to increase in population and rise in standard of living.
2. Widening of industrial circle in all sectors creating new demands on engineering products such as replacement parts, products required to feed other industries e.g. automotive feeding industries, also those needed for serving other projects such as transformers, switch gear, cables, electric motors & machine tools.
3. Bigger demand created by other sectors of the economic structure of the UAR e.g. agricultural tractors, diesel engines, transport equipment, petrol and irrigation pumps etc... as a consequence of the integrated general development schemes of the UAR.

4. Establishment of export markets for some products e.g. small domestic appliances.

5. The nature of some engineering industries which necessitates establishing them on a large scale for improved economy and better rentability e.g. the automotive industry. The dependence of this industry on feeding industries to about 50% of the parts of almost every type of vehicle necessitates the establishment of these industries on advanced basis and in size big enough to cover also the local demand on replacement parts for most of the UAR's fleet estimated at about 200,000 vehicles in 1964. The automotive industry represents, in this case, the basic permanent customer whose requirements represent the bulk of production programs for feeding industries. Although the production program of road transport equipment in the Third Program has been enlarged, it did not yet reach the size that enables the UAR's automotive industry to produce at competing world market prices, nor did the total requirements of the UAR justify establishing some of the automotive feeding industries e.g. electric equipment, fuel injection equipment and panel instruments.

Closer studies of difficulties that handicap the progress of engineering products industries in particular and other industries in general revealed the following two facts:

1. Most of raw materials needed for engineering industries had to be imported e.g. cold rolled steel sheets, bars and sections of special specifications, foundry pig-iron, forging steels, tool steels as well as non-ferrous metals and plastics raw materials which represent a big drain on foreign currency and an unfavourable influence on trade balance. The only available local raw materials are commercial hot rolled plates, sheets and sections that could be only used in fabricated metal structures.

2. All capital equipment even the simplest types of conveyors, cranes and metal forming equipment have to be imported from abroad which represented another unbalance in the UAR's foreign trade. Trials,

1961
1962
1963
1964

however, succeeded in manufacturing some machinery such as simple presses, wood working machinery and some chemical and food industry equipment, and in giving rise to the possibility of enlarging this scope by establishing well equipped factories for producing a wider range of capital equipment.

These two facts led to the decision of broadening the scope of engineering products in The Third Industrialization Program to include the production of capital equipment and of other industrial sectors to satisfy the requirements of engineering products industries of all raw materials including semi-finished parts like castings and a bigger variety of forgings.

Projects covered by the Third Industrialization Program include extensions of existing factories as well as establishment of new ones for new products. They can be classified into the following groups:

<u>Products</u>	No. of projects	Estimated capital investment L.E.000
<u>1. Machinery and equipment</u>		
a. Industrial equipment and fabricated structures	8	81009
b. Metal forming machinery	1	19215
c. Tools	4	4785
<u>2. Transport Equipment</u>		
a. Road transport equipment	18	62969
b. Rail transport equipment	5	10620
c. River & sea transport equipment	1	8790
<u>3. Electrical and electronic equipment</u>		
a. Electric conductors and cables	2	5079
b. Electric machinery and equipment	14	13464
c. Electronic equipment	2	3675
d. Refrigeration & air conditioning units	1	4000
<u>4. Miscellaneous products</u>		
a. Metal containers	4	1427
b. Household appliances	4	1807
c. Miscellaneous	17	17969
		<u>234809</u>