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DEVELOPMENT OF THE PETROCHEMICAL INDUSTRY IN MALAYSIA[1]

by

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I. INTRODUCTION

A few decades ago it was the practice for the petroleum industries to locate refining capacity in close proximity to the source of crude oil, but the post war period witnessed a change and oil refineries were established in the regions where there was a heavy demand for the refined products. It was this change that enabled the establishment of two oil refineries in Port Dickson, Malaysia by Shell and Esso respectively.

In Malaysia, the contribution of the manufacturing industry during the years 1966 and 1967 was been significant[1/]. The gross manufacturing output increase during the years was estimated at 9.0 per cent as compared to the annual growth rate of 9.2 per cent for the period 1960 to 1965. The high rate of growth of manufacturing industry raised its share in gross domestic product (GDP) from 8.7 per cent in 1960 to 10.2 per cent in 1965 and to well over 11 per cent in 1967 and it is hoped that by the end of the First Malaysia Plan, that is by 1970, the contribution will account for 13 per cent of the GDP.

At present, there is in Malaysia some chemical industry which provides a market for some of the products obtained from the oil refineries. The sulphur and ammonia obtained from one of the refineries in quantities of 4,000 and 50,000 tons respectively per year are presently used in the manufacture of sulphuric acid, fertilizers, synthetic detergents, formic acid, etc. Further particulars of the [illegible] in Section II of this paper.

II. [illegible] IN MALAYSIA

A section of Malaysia's [illegible] is reviewed here in relation to the role it could play in the development of petrochemical industry in this country. Table I [illegible] the contribution of the chemical industry in the form value of industrial exports from West Malaysia, excluding rubber processing, basic metals (mainly tin) and palm oil.

1/ See page 62, Mid-Term Review of First Malaysia Plan 1966-1970.

Table I

Exports of manufactured products 1963 - 1967
($ millions)

	1963	1965	1967	1963-1967 absolute increase
Food industries	66	97	128	62
Textiles and footwear	4	10	14	10
Wood products	43	65	84	41
Rubber products	21	29	23	2
Chemicals and chemical products	56	65	72	16
Petroleum products	3	45	51	48
Non-metallic mineral products	1	7	14	13
Metal products and machinery	7	9	18	11
Miscellaneous manufacturing industries	7	10	15	8
Total	208	337	419	211
Total exports	2,428	2,940	2,778	350
Share of manufacturing exports	8.6%	11.5%	15.1%	-

Of the establishments engaged in various types of chemical industries, a few are manufacturers of industrial chemicals. In this group there are some that make use of materials and chemicals obtained from the petroleum refineries in their manufacture. A brief account of some of these is as follows:

Sulphuric acid

An acid plant with the total capacity of 40,000 tons per year is already in operation. At present it produces about 25,000 tons per year via the contact process and obtains part (about 4,000 tons) of its sulphur requirements from one of the local refineries. The balance of the sulphur is imported but it is anticipated that, in the near future, the total sulphur requirements of this plant

would be fully met by the local refineries.

The sulphuric acid produced is used for the manufacture of formic acid, ammonium sulphate fertilizers, alum for the purification of waters and synthetic detergents.

Hydrochloric acid

A plant for the manufacture of this acid has already been established by an international chemical company in Petaling Jaya, Malaysia, and it is capable of meeting the country's domestic needs in full.

Nitric acid

Facilities for the production of this acid by the oxidation of ammonia exist in one of the [illegible] plants. [illegible] all the acid produced in the plant is utilized in the manufacture of nitrogenous fertilizers. The ammonia for this production is supplied by [illegible] local refinery.

Manufacture of fertilizers

Two types of fertilizers [illegible] locally produced ammonia from one of the oil [illegible] are [illegible] by two different plants. One plant manufactures [illegible] the other produces [illegible] ammonium nitrate. The other [illegible] The latter has a production capacity of 40,000 tons per [illegible] of producing more than 200,000 tons per year.

Synthetic detergents

There are [illegible] plants [illegible] the manufacture of synthetic detergents. Basically, [illegible] to the production of alkyl aryl sulphonate [illegible] sulphonation is carried out [illegible] on imported alkyl aryl compounds. At present, there are no plans for the local manufacture of the hydrophobic part of the synthetic detergent molecule.

III. [illegible] MALAYSIA

The manufacture of [illegible] from petroleum is a rapidly growing and important [illegible] The industry is already firmly established in [illegible], Western Europe, [illegible] elsewhere but there still appears to be tremendous scope for future expansion.

The chemicals derived from petroleum could be divided into:

(a) The three inorganic chemicals, that is, ammonia, sulphur and carbon black; and

(b) an extensive range of organic chemicals ranging from simple solvents used in paint and lacquer manufacture to complex compounds used in the manufacture of textiles, insecticides, herbicides, rubbers, etc.

There are two oil refineries in Malaysia established by Shell and Esso but the petroleum products market is shared by five companies, namely Shell, Esso, British Petroleum, Mobil and Caltex. The first two produce their products locally while the last three merely import them.

The two refineries are jointly capable of refining about 20 to 22 million barrels of crude oil per year into the following products:

liquid petroleum gas
motor-gasolene - all types
kerosene
aviation turbine fuel
diesel fuels - all types
gas oil
fuel oils - all types
bitumen
refinery gases

A more detailed breakdown of the products produced is to be found in Table II. Additionally one of the refineries is also currently engaged in the production of sulphur and ammonia which is sold to other chemical industries engaged in the manufacture of industrial acids, synthetic detergents, fertilizers, galvanized iron sheets, etc. Brief descriptions of their uses have already been described in Section II of this paper.

Development of the petrochemical industry in the organic field necessitates heavy financial investment and as such it is generally the preserve of large concerns, primarily major chemical and oil companies. Although the naphtha required for the production of the basic starting materials such as acetylene, ethylene, propylene, butadiene, etc. can be made available by the oil companies in sufficient quantities yet factors such as :

(a) Is the chemical industry sufficiently advanced to undertake production of petrochemicals;

(b) Is there sufficient demand for the end products or intermediates to make the project financially viable;

(c) Is there sufficient technical know-how in the country; and

(d) The financial implications of such an industry;

have to be considered before embarking on a project of such magnitude.

(a) Status of the chemical industry in Malaysia

The chemical industry in Malaysia, as in the case of most developing countries, began to start from scratch soon after the country attained independence. The Government, so as to encourage its growth has provided various types of incentives in the form of income tax reliefs, tariff protection, loan facilities, making available suitable sites in industrial estates situated in different parts of the country. These estates are supplied with all the utilities, such as power, water, transport, telecommunications, port facilities, etc. Consequently, rapid industrialization took place but the chemical industry has probably not yet developed sufficiently to justify the manufacture of petrochemical intermediates with a view to further processing them into end products.

(b) Demand for end products

Given below is the demand for polyethylene, polystyrene and polyvinylchloride plastics, which were imported in primary forms during 1964 and 1968. A comparative study of the figures shows that over a five-year period there has been, on the average a fourfold increase in the demand for each of these grades of plastics.

	1964		1968	
	Quantity (cwts)	Value* Malaysian $	Quantity (cwts)	Value* Malaysian $
Polyethylene	44,447	2,56[illegible],044	200,051	8,363,313
Polystyrene	[illegible],[illegible]3	706,405	31,472	1,278,413
Polyvinyl chloride	16,310	1,075,237	64,011	3,393,220

*) Source FIDA

Should the demand continue to increase at the same rate, then by 1973 the requirements of polyethylene, polystyrene and polyvinylchloride would approximate to 40,000 - 6,300 - and 13,000 tons respectively. Simultaneously, a demand for other polyethylene products, such as acetylene, ethylene, acetic acid, glycols, etc. would be expected to grow and this would probably justify the establishment of a medium sized petrochemical industry.

(c) Availability of technical know-how

Just as in other developing countries, technical know-how will certainly be lacking but the problem is by no means insurmountable. The engineering of the plant (because of the special requirements) will probably have to be entrusted to foreign firms and consultants. While the construction of the plant is in progress, an intensive training programme for locally recruited operators will have to be launched in similar plants overseas. It will perhaps, also be necessary for foreign experts to operate the newly installed plants until local personnel are competent enough to take over.

(d) Availability of finance

In order to ensure the complete utilization of all the products of a cracking plant (ethylene, propylene, butalene, etc.) and obtain advantages of economies of scale, it is advisable that complexes be established in which a cracking unit acts as a centre supplying basic petrochemicals to surrounding plants which, in turn, produce plastics, synthetic fibres, synthetic rubber and other industrial chemicals. Establishment of such complexes would, however, entail very heavy expenditure, for instance it has been estimated 1/ that 40,000 to 50,000 tons per year polyethylene plant would require a non-recurrent capital cost of about Malaysian $45,000,000 and an annual recurrent expenditure of around Malaysian $35,000,000. A petrochemical complex based on naphtha cracking, producing ethylene, propylene and butylenes and utilizing only ethylene to produce polyethylene, with a capacity of 50,000 tons of ethylene would involve a capital expenditure in installation costs of about Malaysian $100,000,000 and a recurrent annual expenditure of about Malaysian $40,000,000. Should, however, it be desired to fully utilize all the cracker products, then the investment would probably run into Malaysian $1,000,000,000.

On account of the heavy costs involved and as petrochemical industry

1/ Source PIDA

thrives best in regions where chemical industry constitutes an important factor, it is understandable that in Malaysia, as perhaps in many other newly developing countries, the development of petrochemical industry must necessarily await or at most parallel the development of chemical industry into an important sector of the economy, for only in such an environment will there exist a substantial market for raw materials of petroleum origin.

IV. CONCLUSIONS

The recovery of sulphur and its utilization in the manufacture of sulphuric acid, ammonium sulphate fertilizer and synthetic detergents is already in existence.

Similarly, the manufacture of carbon black, nitric acid and nitrogenous fertilizers from raw materials of petroleum sources has also been established.

The petrochemical manufactures of certain varieties of carbon black, plastics, synthetic adhesives for Malaysia's fast expanding plywood industry, alkyl aryl hydrocarbons, acetylene and ethylene cannot be accurately forecast at this stage. Detailed surveys are necessary on the possible growth of industries that will be consumers of the above chemicals. Perhaps a complete feasibility study needs to be undertaken in collaboration with some foreign experts before concrete steps are taken to advance the petrochemical industry.

Table II

WEST MALAYSIA: Retained local production of petroleum products

Commodity Description	1964		1965		1966	
	Q'ty tons	Value $	Q'ty tons	Value $	Q'ty tons	Value $
1. Motor spirit refined excl. aviation (gasoline)	159,641	34,695,251	150,157	42,842,403	189,363	51,151,433
2. Aviation spirit (ATF/Avtur & Avi-gas) and Kerosene	91,602	10,395,936	96,466	4,137,432	110,63[illegible]	18,[illegible],718
3. Other petroleum spirit having a flash point below 73°F	–	–	–	–	–	–
4. Vaporising oil	–	–	–	–	–	–
5. High speed diesel fuel (gasoil)	321,724	33,046,909	383,[illegible]3	39,571,[illegible]5	431,471	43,[illegible]
6. Other diesel fuel (industrial & marine diesel fuel)	79,312	7,291,1[illegible]	84,11[illegible]	7,167,[illegible]1	95,2[illegible]	[illegible],350,47[illegible]
7. Fuel oil	523,943	24,[illegible]18,76[illegible]	561,585	30,[illegible]00,[illegible]1	[illegible]5,030	37,1[illegible],41[illegible]
8. Asphalt/bitumen & bitumen mixtures	50,[illegible]	[illegible],340,407	56,4[illegible]	[illegible],678,5[illegible]	[illegible]7,[illegible]	4,[illegible]
9. L.P. gases val	53,647	586,[illegible]1	293,811	1,[illegible]3,671	534,905	[illegible],[illegible]1,40[illegible]
10. Fuel oil components	255,[illegible]00	5,[illegible]11,310	106,817	2,44[illegible],[illegible]	–	–
11. Gasoline components	945	55,397	1,345	62,594	–	–


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