Chapter 2

Development of the Petrochemical Industry in Malaysia

1. Capacity Building

In the early 1970's, the petrochemical industry in Malaysia was just beginning to establish its roots. A few small-scale polymer plants, wholly dependent on imported feedstock, were set up to cater for the needs of a provide the small domestic market comprising mainly plastic fabricators. The first polyvinyl chloride (PVC) plant was set up by Synthetic resins (Malaysia) Bhd in Johor Bahru. It commenced production in 1972, with a capacity of 12,000 MT per annum. This was followed by Malayan Electro-Chemical Industry Sdn Bhd's PVC plant in Prai, Penang which started commercial operations in 1973. A string of other small-scale polymer plants followed suit. Petrochemicals (M) Sdn Bhd's
GPPS plant in Johor Bahru, which was commissioned in 1974 and it subsequently became the first to start HIPS plant in 1979. In 1984, Polystyrene (M) Sdn Bhd started manufacturing GPPS in Rembau, Negeri sembilan , and later producing EPS in 1989.

These plants provided the necessary polymer resins for local fabricators serving the emerging electrical & electronics industrial sector in Malaysia. Their capital requirements were relatively low, and the technology was licensed from their joint venture partners. Raw materials feedstock such as vinyl chloride monomer (for PVC) and styrene monomer (for GPPS, HIPS and EPS) were imported from various sources such as Japan, united State and Germany.

In the early 1980's, due to vigorous upstream oil & gas exploration and production programmes undertaken by Petronas, natural gas was made available in East Malaysia and the West Coast of peninsular Malaysia. The relatively large gas reserves base provided good opportunities for exploration of this resource not only to fuel the nation's demand for energy but also to spawn other linkages of related industries. The petrochemical industry was identified as one of the sectors with tremendous potential for growth. Several strategies were developed to add value to these indigenous resources and the main thrust of the government was to manufacture products to meet the domestic requirement and to target the export markets for earning foreign exchange.

In 1984, a gas gathering system was implemented offshore Sabah, capturing flare gas from the Emarang and Erb West fields. Subsequently, a 660,000 MT methanol plant was set up to add value to the natural gas resource. Methanol is used as one of the feedstock in the production of MTBE. Methanol is also a major feedstock for the production of POM, which is a kind of engineering plastic used in mechanical part.

In Peninsular Malaysia, the completion of the Peninsular Gas Utilisation (PGU) project in stages, put in place the necessary infrastructure making available the required feedstock for the petrochemical industry. Between 1984 – 1994, four Gas Processing Plants located in Kertih, Terengganu were installed with facilities to extract ethane, propane and butane. Construction for the fifth and sixth Gas Processing Plants are ongoing and due for completion by 1998. These valuable natural gas components provide the necessary feedstock for the establishment of a world scale petrochemical industry.

Since 1990, Kertih and Kuantan are being developed as the East Coast Petrochemical Corridor. Kertih is designated as the ethylene-based centre and Kuantan as the propylene-based centre. Pasir Gudang is developing into another hub for the petrochemical industry. In 1991,Titan Petrochemicals (M) Sdn Bhd

set up and operated a LPG / naphtha-based cracker plant in Pasir Gudang producing 230,000 MT per annum ethylene and 115,500 Mt per annum of propylene. Titan is also operating a 130,000 MT per annum polypropylene (PP plastic) and a 200,000 MT per annum polyethylene (PE plastic) plant, both located in the Pasir Gudang area.

In 1992, a 300,000 MT per annum MTBE with 80,000 MT per annum propylene plant started its operation utilising propane and butane from the Kertih Gas Processing plant. The propylene output from this plant is fed into the adjacent 80,000 MT per annum polypropylene (PP plastic) plant.
Within the same year, Toray Plastics (Malaysia) Sdn Bhd started the first Acrylonitrile Butadiene Styrene (ABS) production in Prai, with an initial capacity of 35,000 MT per annum. The capacity was doubled to 70,000 MT per annum in 1994 and further increase to 160,000 MT per annum in 1997.
In 1992, BASF (Malaysia) Sdn Bhd also started production of EPS in Pasir Gudang with an annual capacity of 50,000 MT.

In 1995, Petronas, in a joint venture with BP chemicals, set up an ethane-based plant producing 320,000 MT per annum ethylene. The plant expanded to produce 400,000 MT per annum of ethylene in 1997. Ethylene is being used as feedstock to a 250,000 MT per annum polyethylene (PE plastic) plant, which is also located in Kertih. 60,000 Mt per annum of ethylene from this plant is used to feed a 215,000 MT per annum ethylbenzene / 200,000 MT per annum styrene monomer plant, which was commissioned in early 1997 in Pasir Gudang. Styrene monomer is the major feedstock for polystyrene (GPPS and HIPS plastic).

In 1996, Polyesther Industry Sdn Bhd commenced a 30,000MT per annum PET plastic production palnt in Shah Alam. In the same year, Amoco Chemical (Malaysia) Sdn Bhd started to produce purified terephthalic acid (PTA) with annual capacity of 500,000 MT. Purified terephthalic acid is the main feedtstock

for PET plastic. Typical application of PET is the carbonated bottle e.g Coke and Pepsi bottle.

In May 1998, Eastman Chemical (M) Sdn Bhd put onstream a 30,000 MT per annum copolyesther (PETG) plastic plant. The output from this plant will be used in the manufacturing of electronic and medical equipment, appliance parts and heavy-gauge sheets.

Encouraged by positive government policies, fairly developed infrastructure, and the good location in the heart of a booming economic growth of Southeast Asia, Malaysia continues to expand and accelerate the development of its petrochemical industry.

A host of new petrochemical projects are in various stages of implementation. A 400,000 MT per annum vinyl chloride monomer (VCM) plant is undergoing construction in Kertih, this plant will use ethylene from the Kertih ethylene and imported Ethylene di-chloride. Adjacent to the VCM plant, a 150,000 MT per annum PVC plastic is also concurrently being constructed by Industrial Resin (M) Bhd, a joint venture among Land & General, Mitsui and Tosoh.

A second gas-based cracker is being planned in Kertih, utilising ethane and propane from the fifth and sixth Gas processing Plant in Tok Arun. The complex includes production of 600,000 MT per annum ethylene and other ethylene other derivative products such as ethylene oxide, ethylene glycol, ethanolamines and ethoxylates; and 140,000 Mt per annum oxo-alcohols utilising propylene as the feedstock. This Petronas / union Carbide joint venture is targeted to be operational by year 2000/2001.

A second propane dehydrogenation unit is also being planned in Kuantan, schedule to come onstream by 2001, as part of the existing MTBE/propylene plant expansion. The 300,000 MT per annum propylene plant will feed the

downstream units producing 160,000 MT per annum acrylic acid and 250,000 MT per annum oxo-alcohols. A joint venture company between Petronas and BASF will operate this integrated plant.

An aromatic complex, which utilises condensate from the Terengganu Refinery, is being constructed. The unit will produce 420,000 MT per annum para-xylene and 150,000 MT per annum benzene. Benzene is the feedstock for the production of styrene monomer, which subsequently use to produce PS, HIPS, EPS and ABS.

Meanwhile, the Titan Group has also started work on an integrated petrochemical complex based on naphtha / LPG feedstock in Tanjung Langsat, Johor. It is estimated to cost approximately RM 3 billion. The project will include some basic chemical production such as 330,000 MT per annum ethylene plant, a 165,000 MT per annum propylene plant, a 110,000 MT per annum benzene plant, a 60,000 MT per annum Toluene plant. The majority of the basic chemical will subsequently be used as the feedstock for plastic production like a 200,000 MT per annum (p.a.) LDPE plant, a 100,000 MT p.a. HDPE / LLDPE plant, a 200,000 MT p.a. PP plant and a 100,000 MT p.a. PVC plant. These projects are all planned for completion by year 2000 / 2001.

According to the Malaysia Petrochemical Association, today, the petrochemical industry as a whole has attracted more than RM 25 billion in Investment.
Malaysia is now entering a new era in the development of its petrochemical industry. The way forward is to plan and implement petrochemical projects on an integrated basis to maximise on the synergy. The immediate aspiration is to serve the domestic and regional market. The longer-term vision is to move towards the production of higher-end of petrochemical products such as specialty chemicals and engineering plastics and composites.

Figure 1 : Plastic production and consumption in Malaysia for 1997

Raw Material	Capacity (MT)	Production (MT)	Consumption (MT)
LDPE	Nil	Nil	90,000
LLDPE	160,000	140,000	100,000
HDPE	240,000	215,000	230,000
PP	210,000	180,000	200,000
PVC	80,000	70,000	130,000
EPS	50,000	45,000	35,000
PS	140,000	110,000	125,000
ABS	160,000	130,000	90,000
PET	30,000	18,000	20,000
Others	Nil	Nil	100,000
Total	1,070,000	908,000	1,120,000

Source : MPMA

Figure 2 : New capacity by year 1999 - 2001

Raw Material	New capacity (MT)	Completed by
PET	30,000	1998
PVC	250,000	1999
LDPE	200,000	2001
HDPE/LLDPE	100,000	2001
PP	200,000	2001

Source : Malaysia Petrochemical Association.

Based on the statistic compiled by Malaysia Plastic Manufacturer Association, currently Malaysia produces about 80% of her total plastic consumption. More production is expected to come on-stream by 1999 - 2001. Looking at the trend, soon Malaysia will be a nett exporter of plastic raw material.

2. The Structure of Plastic Injection Moulding Sector in Selangor

The injection moulding sector can be divided into two types. The criteria for segmentation was based on the ownership of plastic product manufactured.

(i) Own product manufacturer

In this case, the plastic company has the ownership of the plastic product manufacture. The company makes decision on product design, material selection, mould design and process selection. The company markets the finish plastic products directly to its customers who are the direct consumer of the plastic products. In this business process, plastic-moulding company will be able to introduce more added values into the plastic product. Typical examples are household products manufacturer who make plastic plates, container, plastic chair, plastic crates, plastic dustbin etc.

(ii) Custom moulder

A company that depends totally on custom moulding services for its revenue is called custom moulder. Custom moulders provide moulding services to customers, mainly in the electrical & electronic industries and the automotive industries. Examples are, computer monitor housing, keyboard components, VCR chassis, mini hi-fi front panel, plastic connectors, transformer bobbins, bumper, motorcycle fender, car door handle, mirror housing etc.

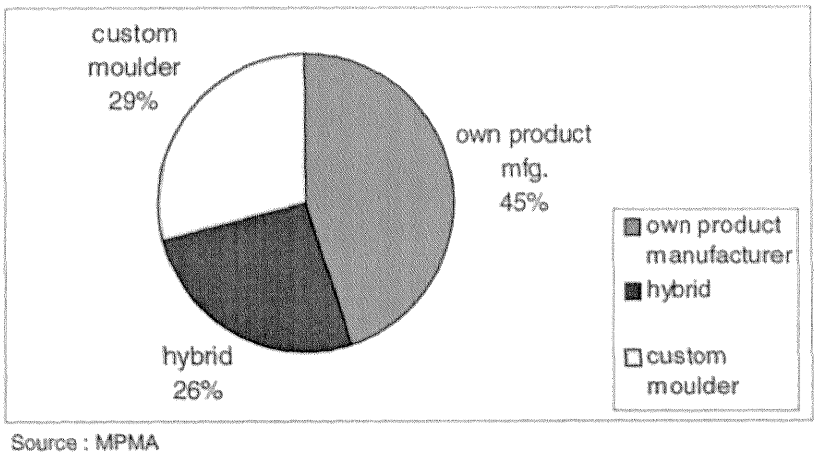
Usually, custom moulder has no ownership of the plastic product or components they manufactured. Generally, they are required to comply with the product specification provided by their customers and manufacture according to customers' requirement. In most cases, their customers will provide the mould. In some cases, customer will provide the plastic raw materials as well. In this respect, custom moulders are selling only their

services to their customers. Normally, their customers are big multinational companies like, Matsushita, Sony, JVC, Samsung, Proton, Perodua, etc.

In the early 80s, most of the multinational company obtained plastic moulding services from established plastic product manufacturers. From 1986 to early 90s, a strong increase in foreign direct investment, particularly in the electrical and electronic industry led to an increase in demand for plastic moulding services by the multinational companies. During the same period, Proton started the localisation plan to increase the local content and localisation on the plastic components was started in 1987/88. High demand on custom moulding services encourage the establishment of custom moulders. Most of the custom moulders were established during this period.

Plastic moulding is a versatile process, a company manufacture own product could also sell the moulding service to others just like a custom moulder. Likewise, a custom moulder could manufacture their own product and do the marketing. So it should not be too difficult to understand there is a group of hybrid companies whom manufacture own product as well as provide custom moulding services.

Figure 3 : Structure of injection moulding companies in Selangor – 1997.

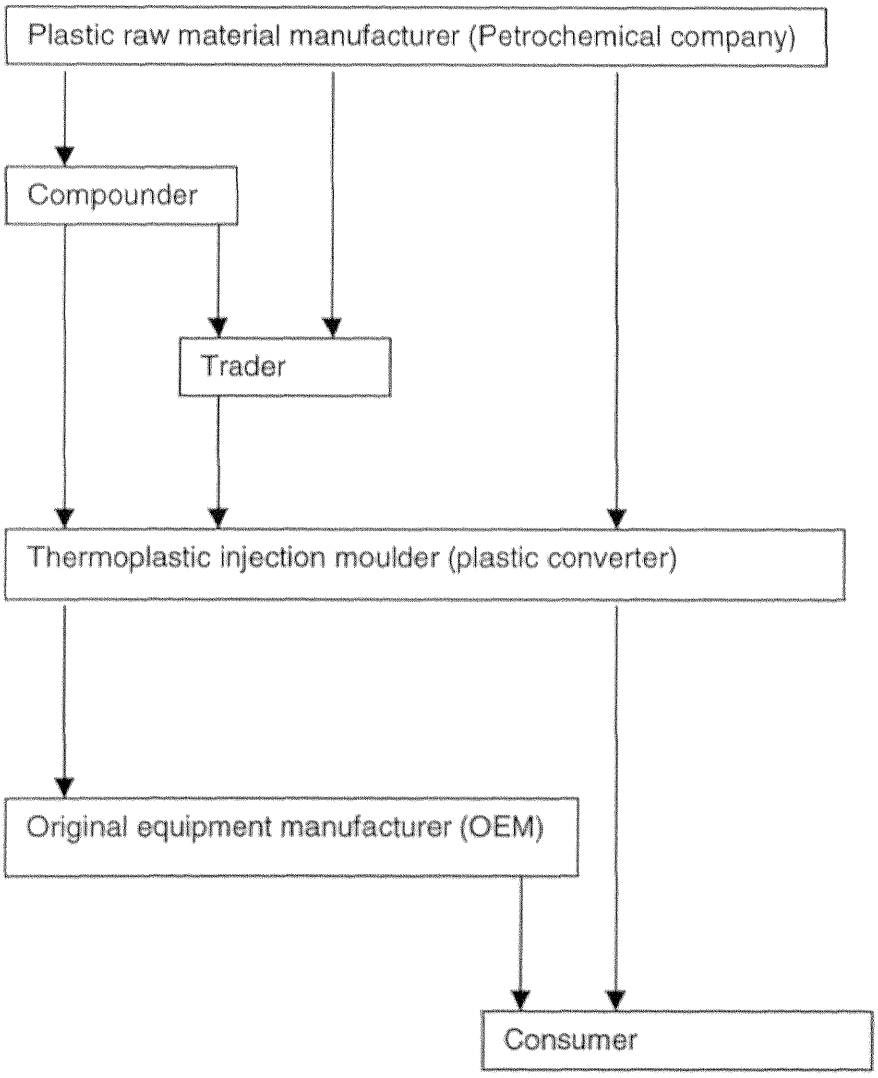


Source : MPMA

In Selangor, the statistic shows that there are 55% (29% + 26%) of the injection moulding companies involved in custom moulding business. Only 26% of them are marketing 100% custom moulding services. Hybrids are companies which manufacture their own product at the same time also sell moulding services to the other company. For this research, only the own product manufacturer and the custom moulder will be analysed.

Table 1, 2 and 3 provide more detail information about individual firm in Selangor (please see appendix).

Figure 4 : Flow-chart of thermoplastic raw material



In Malaysia, plastic raw materials are produced by the *petrochemical companies* such as Titan, Petronas, Polystyrene Malaysia, Industrial Resin Malaysia etc. The petrochemical companies have 3 major outlets for their products. The first outlet is to supply the plastic raw material directly to plastic converter. The second channel is supply the plastic raw material to *compounder* who will modified the plastic raw material to meet end-user requirement, for example a colour compounder will add colour pigment to the plastic raw material. The third outlet is supplied plastic raw material to *traders* and subsequently traders supply the raw material to plastic converter. In Malaysia, traders are also importing plastic raw material from neighbouring countries like Singapore, Thailand, Japan, Korea, etc for local consumption. Any company is allowed to import plastic raw material to supply to the local company. There are at least, 50 companies involve in some kinds of the plastic trading business. This is a healthy economic environment to ensure that competitively priced raw materials are available.