CHAPTER 3

MALAYSIAN EPS INDUSTRY BACKGROUND AND DEVELOPMENT

This chapter attempts to familiarise the reader with the Expandable Polystyrene (EPS) industry in Malaysia. The first section describes the product itself while the second section touches on the overall development of EPS in Malaysia. In the third section, a description of the companies involved in EPS moulding businesses in the central part of Malaysia is presented. The manufacturing process of producing expanded polystyrene foams as moulded by these companies is explained in the fourth section of this chapter. The types of inputs to the manufacturing process are also revealed here The major input items which are to be purchased by the moulders are described in the fifth section.

3.1 What is EPS?

EPS, which stands for expandable polystyrene, is a plastic material invented by a German company, BASF in the early nineteenth century. It is produced by polymerisation of the basic material styrene which is a petrochemical derivative and with the impregnation of a blowing agent called pentane. The latter, which is a gas, is included so as to help in the expansion of the EPS during the steaming process.

Depending on the process parameters and material type, the EPS can be expanded up to 60 times which would result in a foam called **expanded polystyrene (EP)** of density close to only 16kg/m thus accounting for its lightness. Just for comparison, water has a density of 1000kg/m3.

It is this lightness property that makes EP a suitable material for packaging, insulation and void-filling and these constitute the major bulk of its application in the world. Other minor applications include advertising (where it is used for decorative purposes) and flotation blocks (due to its buoyancy in water).

In the last ten years or so, there were some criticisms of EPS from the environmentalist groups who mistakenly thought that the material contains ozone depleting chemicals (ODC) . But the truth surfaced that EPS uses only pentane and does not use any ODC in its processing . The confusion lies in the fact that there were two types of polystyrene foams - EPS and extruded polystyrene (XPS). The latter was the one that had used ODC at one time and hitherto, the companies involved in XPS production had also eradicated the use of ODC by substituting them with other safer chemicals.

3.2 EPS development in Malaysia

Before we proceed further it is necessary to elaborate on the inter-relationship between EPS companies and EPS **moulding** companies. The former produce expandable polystyrene (EPS) in the form of raw materials whilst the latter purchase these raw materials and mould them into expanded polystyrene (EP) according to the requirements of their customers.

One of the first EPS moulding companies in Malaysia started operations in the mid nineteen seventies and during the early days, the consumption of EPS was somewhat small compared to existing production requirements as is evident in Table 3.1

Year	1988	1989	1990	1991	1992
Consumption	3000	5000	8000	12000	15000

Table 3.1 EPS material consumption in metric tons for Malaysia .

(Source : Malaysian Plastic Manufacturers Association)

Throughout Malaysia there are about 30 companies involved in EPS moulding business. These companies are located nearby the major industrial area in Malaysia and there are three major clusters:

1) Northern - centred around Penang

2) Central - centred around Klang Valley

3) Southern - centred around Johor Bahru

The main reason why the EPS moulders prefer to be located near to the customers is that the EPS foams are rather bulky items and the cost of transporting these can be very high if the distance travelled is far.

The growth of EPS moulding companies can be attributed to the increase in output of the Electronics and Electrical sector in Malaysia. This sector consumes a lot of EPS because of the demand for packaging materials in the form of EPS foams The foams act as a cushion to the electrical and electronics goods which must be transported from one place to another. The cushions had been designed to withstand shocks and bumps that may occur during the transport journey. Incidentally, the relatively low cost of EPS packaging makes it a cost effective material for packaging consumer electrical and electronic goods like televisions, audio equipments, video players, air-conditioners, microwave ovens, vacuum cleaners and many others. EPS material is also a common packaging item for component electronics like picture tube trays, in-house component trays, coil-trays and so on.

Table 1 shows the growth recorded in the various categories of the electrical and electronics sector according to MITI report 1994 .

Year/ Category	1991	% growth	1992	% growth	1993	% growth
Group	203	29	227	12	262	16
Radio and TV sets,etc	329	62	436	32	508	17
Semiconductors and other electronic components	172	18	179	4	206	15
Cables and wires	282	51	311	10	357	15

Table 3.2 Indices of Industrial Production for Electrical and Electronics (base year 1988 = 100)
(Source: Malaysia International Trade and Industry Report 1994)

Comparing Tables 3.1 to Table 3.2, one can see the effect of the presence of the electronics and electrical sector has on the increase in demand for EPS raw materials.

According to the Malaysia International Trade and Industry Report 1994, it was revealed that the industrial sector was the main stimulus to the growth of the Malaysian economy. The manufacturing sector alone expanded by 12.5% in output for the year 1993, higher than the 10.5% achieved in 1992. Its contribution to GDP increased from 28.9% to 30.1% between 1992 and 1993. With this expansion, the manufacturing sector accounted for 71% of Malaysia's export earnings in 1993 compared to 68.6% in 1992. The strong growth in manufacturing sector is attributed to the implementation of policies and strategies as announced by the government in the Sixth Malaysian Plan. There were various measures undertaken to develop the manufacturing industry and one goal was to form a conducive environment for foreign investors. The reduction of import tariffs and the setting up of Investment Guarantee Agreements (IGAs) are examples of such steps taken by the government to make Malaysia a preferred investment location. IGAs are established to provide security and confidence to foreign investors.

Malaysia had promoted both FDI and domestic investment (DI) in the manufacturing sector as a source of economic growth. Liberal policies like allowing 100% foreign equity ownership in export oriented projects had attracted a large number of foreign investors to Malaysia.

FDI flows into the manufacturing sector increased significantly in the late 1980s with a peak of US$234 billion in 1990. It was also the government's intention to allow the local investors to exploit the expanding opportunities arising from this influx of FDIs. Joint ventures and higher local participation was encouraged and by 1993, DI registered a higher magnitude of investment than FDI for the first time since 1987.

3.3 EPS development in the central Malaysia region

There are nine EPS moulders in the central region and they serve the requirements of EPS packaging for the Shah Alam, Klang, Petaling Jaya, Bangi, Sungei Way, Senawang industrial zones , to name a few.

Out of these nine moulders, two started operating in the 1970s and these companies are wholly-owned by local businessmen.

In the early 1980s, three more companies emerged to compete with the existing two moulders and again the shareholders of these firms are locals

It was only in the late 1980s, that saw the influx of three foreign joint-venture companies involving in the EPS foam manufacturing business. One interesting observation is that it was also during this time that the FDIs started to overtake the DIs in terms of investment in Malaysia as touched on in Chapter 2.1. It was also during this time that a local company had decided to sell 48% of its share to foreign investors from Singapore and Japan. One more local firm was established to make up the present population of nine moulders in the central region.

Out of the four joint-ventures, two have Japanese shareholders one has Singapore partners whilst the remaining one has both Japanese and Singapore shareholders. The percentage of foreign shareholding cannot exceed 50% as the government had set the ruling that the moulders must be controlled by locals.

All the foreign partners have considerable experience in the EPS foam industry in their home country and the main reason quoted by most of them for coming into Malaysia is geographical diversification of their businesses. Some had even been coaxed by their home country customers to relocate to Malaysia because of the latters' plans to set-up manufacturing facilities in Malaysia.

In terms of the size of paid-up capital, the joint-ventures exceeded that of the local firms. The former invested in millions whereas the latter only pumped in a couple of hundred thousands as initial paid-up capital. One reason could be the fact that the local firms which are relatively established, had throughout the years plough back their retained profits as reinvestment. During the first two to three years, the joint-ventures usually could not make generate enough revenue to sustain their businesses and cash calls were needed.

The moulders in the central region supplied some 90% of their output to the electronics and electrical sector in the form of moulded EP foams . The remaining 10% is supplied to construction projects in the form of insulation boards, to the middlemen in the foam of fish boxes or foam boxes and for decorative purposes.

According to records published by Malaysian Plastic Manufacturers Association, the total consumption in Malaysia was 15000 metric tons for the year 1992.

Out of this, 5000 metric tons or one third was estimated to be used in the central region. The total revenue of the nine EPS moulding companies in the central region of Malaysia was estimated at RM52 million in 1992. The five companies interviewed contributed to about 83% of the total revenue of EP foams in 1992.

3.4 EPS moulding process and process inputs

Before we proceed to discuss on the inputs requirement of the EPS moulders, it would be useful to understand the basic process details of an EPS moulding plant . The typical process flowchart of such a plant can be summarised as follows:

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
RAW MATERIAL	PRE-EXPANSION	AGING	MOULDING	DRYING	PACKING	STORING

In Stage 1, the raw material is the EPS which is purchased from outside sources. These come in the form of solid beads which are packed in octabins, metal drums or woven sacks. Octabins are paper carton packaging which usually contains one metric ton of EPS raw materials. The drum and woven bag usually stores 250 to 400 kg of material. One peculiarity of EPS raw material is that there is a shelf life of less than 6 months. Based on this short shelf life, the moulders would not stock much of the raw materials. The process of pre-expansion involved the steaming of EPS raw materials in a machine called the pre-expander. This stage is called pre-expansion because there is a second expansion at a later stage (the moulding stage).

The input at this stage is primarily steam. This steam comes from a boiler which usually feeds on diesel or petrol. There are conventional types of boilers using wood as a source of fuel but these are rare in Malaysia.

In stage 3, the aging process is basically a natural one whereby the pre-expanded beads are channelled into tall silos. These silos have large surface areas and the silos are made of canvas-like material which is breathable. The idea is to allow the pre-expanded beads to stabilise by allowing the entrapped steam or water to escape and be replaced with air. After hours of aging, the material is ready to be pressurised into the moulding machines which constitute Stage 4 of the process flowchart. Pressurisation is achieved by means of compressor which operates on electricity. By the word pressurised, the moulders explained that the aged beads are "forced" into the machines so that sufficient amount of beads can enter the machine. Strictly speaking, the machine is fitted with a mould which is where the beads are directed. The mould is made of aluminium and has a main function of shaping the finished EP foams. To summarise, there are three type of equipment required at this stage and these are compressor, moulding machine and moulds.

During the moulding process, steam is used to expand the beads a second time and in the process, fusion of beads occur. Water is used to cool down the moulded EP foams and also to stabilise the foam.

In the Drying process, there are two methods employed : natural or oven. In the natural process, the finished EP foams are left in the open to dry naturally. As the natural process can be quite time-consuming, some companies would use an oven to dry their finished goods. Once dried, the finished goods are packed according to customers' requirement and stored in anticipation of future delivery.

3.5 Major inputs to be purchased

From the previous section, we can summarise the input requirements of the EPS moulders as follows :

a) EPS raw materials

b)Plant and Machineries - Moulding machine, compressor, boiler, drying oven

c) Moulds

The above categorisation was made based on the fact that each group has their own purchasing patterns. This shall be discussed in the coming sub-sections.

A random check was made on the validity of the above inputs categorisation with the rest of the moulders throughout Malaysia. It was discovered that the same list of purchase inputs apply to the other region moulders as well.

3.5.1 EPS raw materials

There are two local sources of EPS raw materials in Malaysia and these are from local production houses BASF (M) Sdn Bhd and Polystyrene Sdn Bhd. The total nameplate capacity of both sources is 65000 metric tons.

Due to the location of BASF in the Pasir Gudang Free Trade Zone , there is a 20% import restriction imposed by the government and as such the available material for local consumption by the two suppliers is 25000 metric tons.

The demand of EPS in Malaysia for 1994 is 16500 metric tons and therefore there is an excess supply situation. Despite this excess situation, there are several international players that are importing their EPS materials into Malaysia and these includes Shell, Arco, Sekisui and Dyno. The respective production locations are Britain, America, Japan and Singapore.

The price of EPS raw materials is competitive and product differentiation is difficult in view of the fact that moulders ,in general, can overcome product deficiencies by controlling process parameters . The raw materials can take up to 50% of the cost of their finished goods and as such, moulders are always negotiating with the suppliers on the source of EPS raw materials. Contracts can vary from a month to six months depending on the market situation, relationship between supplier and customer and competitive strategy.

3.5.2 Plant and Machineries

The most expensive investment here is the moulding machine which is actually the most important machine in the EPS moulding factory. This is because the finishing of the EP foams depends very much on the functioning of the moulding machine. Though the other process stages also can affect the product outcom4e, the moulding machine can control the fusion, the density and appearance of the finished goods. Therefore the moulders usually go through a detail purchase decision process before purchasing the moulding machine.

The pioneers in moulding machine come from Germany where EPS technology was first developed. German suppliers like Erlenbach and Kurtz had a long history in making moulding machines and todate is still regarded as industry forefronters. Along the years, other suppliers of different nationality like Daisen (Japan), Hirsh (Europe) and Dae Kong (Korea) started to compete with the German suppliers in this region. Due to the sophistication of the moulding machine, no local supplier can be found hitherto. Lead time for these machines can be as long as six months. The total number of moulding machines throughout Malaysia is estimated at 293 as of the year 1994. 67% of these machines are of German origin and 20% are from Japan.

The other machineries found in the EPS moulding factories are the compressor, boiler and oven and these can be viewed as supporting machineries because they supply the necessary air(pressure), steam and drying functions, respectively.

The compressors are usually bought from locally established firms but these firms import the compressors from overseas (Europe, United States of America or Japan) and at best only serve as a minor assembly line. Lead time for compressors can be a month or two depending on the stock situation.

There are three local suppliers of boilers todate in Malaysia whom are active in supplying not only to the moulding industry but also to other industries where steam is required. Boilers are capital investments and are only purchased by moulders at production start-up or in eventual expansion only. Most moulders have a tendency to maintain their boilers well and some had lasted for more than ten years.

In the case of oven purchase, due to its simplicity and varying customers' requirements, local contractors are sought to fabricate this equipment.

Purchase frequency of plant and machineries is less than that of raw materials because of the heavy investment required (some machines can cost up to half a million Ringgit per unit). Usually a moulder would purchase two to four moulding machines as start-up to his operation and later add one or two machines a year depending on the demand. Due to the high quality of the moulding machines, some machines are more than ten years old and are still functioning.

3.5.3 Moulds

In order to fulfill a customers' order, the moulder must fabricate a mould to the specifications of the customer. Usually a shop drawing or a sample of the foam to be moulded is given to the moulder by the customer. With this, the moulder would sub-contract out the mould fabrication to mould-makers. There are a few mould-makers in Malaysia and those like Etontech (Johor) have been in business for over a decade. In Malaysia, there is no moulders fabricating their own moulds eventhough in other countries like Japan and Singapore have such a practice. The mould-makers can be considered almost as skilled workers as precision of moulds is usually plus or minus 1mm.

Some moulds could have been imported from the home country due to the insistence of the customers. An example was that the Taiwanese company Capetronic had at one time transferred moulds from its home production plant to Malaysia so as to continue the production run in Malaysia.

But this practice is diminishing due to price competitiveness and the ability of local mould-makers to meet the short lead time required (as low as 2 weeks)

On the average, the EPS moulding companies would fabricate about 30 moulds per year.Cost of each mould varies because of the different sizes of machine to cater for. Also quality of moulds can vary depending on the time given to fabricate and the reputation of mould-makers. It is the usual practice of moulders to charge the cost of mould fabrication back to their customers but due to stiff competition, the moulders may subsidise by charging less.