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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION  
Austria

MARKET STUDY ON RUBBER CHEMICALS  
IN THE ASEAN REGION

April 1990

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FINAL REPORT

DP/RAS/85/010

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SYCIP, GORRES, VELAYO & CO.



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April 11, 1990

United Nations Industrial Development Organization  
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A-1400 Vienna  
Austria

Attention: Mr. S. Morozov  
Chief, Contracts Section

Gentlemen:

Re: Contract No. 89/131 LM  
Preparation of ASEAN Market Studies

We are pleased to submit our final report on Market Study on Rubber Chemicals in the ASEAN Region. This is one of the four market studies commissioned by UNIDO to help the Committee on Industry, Minerals, and Energy (COIME) identify, prepare, and promote projects for the ASEAN Industrial Joint Ventures (AIJV) programme. The report compilation was coordinated by the International Team Leader of Project No. DP/RAF/85/010.

This market study covered the following ASEAN countries: Malaysia, Indonesia, the Philippines, Singapore, and Thailand. It aims to:

- o identify the different groups of rubber chemicals used;
- o identify the market for each of the rubber chemicals in the different segments of the rubber industry;
- o determine the potential growth rate of rubber chemicals in the next decade;
- o investigate the present marketing and distribution networks; and
- o identify sources of supply of rubber chemicals.

The market data in the report consisted primarily of secondary information obtained from trade publications, industry associations, and government agencies. To supplement secondary data, key informant interviews with selected major suppliers and consumers of rubber chemicals were conducted. In Malaysia, representatives from MIDA and the Malaysian Rubber Research and Development Board (MRRDB) were also interviewed. We were assisted in the data gathering by our offices in the ASEAN countries.

We will be glad to discuss any question you may have on this report.

Very truly yours,

*SGV & Co.*

**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**  
**Austria**

**MARKET STUDY ON RUBBER CHEMICALS  
IN THE ASEAN REGION**

**April 1990**

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**FINAL REPORT**

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## **1. EXECUTIVE SUMMARY**

### **1.1 PRODUCT DESCRIPTION**

Products covered by this study consist of rubber chemicals, an essential component of rubber products. Their use determines the different properties of rubber products including plasticity, elasticity, toughness, hardness, softness, abrasion resistance, and impermeability. The major types of chemicals covered in this study are antidegradants, rubber accelerators, vulcanizing agents, plasticizers, and reinforcing agents.

Antidegradants consist of antioxidants and antiozonants, which include certain substances under the following chemical classifications: phenols, amine compounds, esters, and cresols. On the other hand, the most important rubber accelerators include sulphenamides, thiozoles, and thiocarbamides. The most important chemical used as a vulcanizing agent is sulphur, while the most widely used reinforcing agent is carbon black. Rubber chemicals used as processing aids (plasticizers) include aromatic staining process oil, castor oil, phthalates, polyglycols, and mineral oils.

This study focuses mainly on antidegradants, rubber accelerators, and vulcanizing agents, as these are the product groups of interest to the Malaysian Industrial Development Authority (MIDA). These three groups are the high-value, petro-based products and currently imported by Malaysia and the other ASEAN countries. The other rubber chemicals, although imported by Malaysia, are also produced in the country.

### **1.2 THE MALAYSIAN MARKET**

#### **1.2.1 Background on the Rubber and Rubber Products Industry**

Malaysia is the largest producer and exporter of natural rubber in the world but its rubber products industry remains small. The industry started in the 1930s as small, family-owned operations. In the 1970s it experienced rapid growth. Today, the rubber products industry consists of the following sectors: latex products, tires and tire-related products,

general rubber goods, industrial rubber goods, and footwear.

Rubber consumption in Malaysia increased by 199 per cent from 40,300 metric tons (MT) in 1977 to 120,400 MT in 1988, or at an average annual growth rate of 10.5 per cent. Latex products posted the most impressive increase in rubber consumption from 1982 to 1988, rising by an annual average of 18.9 per cent for the period to reach an estimated 57,713 (MT) in 1988.

Sector	Metric Tons			
	1982	1984	1986	1988
Latex products	20,405	22,722	23,893	57,713
Tires & tire-related products	18,353	19,198	18,766	25,324
General rubber goods	9,855	14,849	16,647	20,944
Industrial rubber goods	8,587	7,400	6,981	10,158
Footwear	4,973	4,246	5,191	6,189
<b>Total</b>	<b>62,173</b>	<b>68,415</b>	<b>71,478</b>	<b>120,328</b>

As in the past, rubber consumption of latex products is expected to grow the fastest for the coming years. Preliminary estimates for 1989 place rubber consumption of tires and tire-related products at 28,000 MT. Consumption by the general rubber goods sector is also expected to remain strong.

Rubber products production, on the other hand, recorded an impressive average annual growth rate of 15.1 per cent in terms of exfactory sales value from US\$39,180 million in 1970 to US\$427,670 million in 1987. Among several rubber products, only latex products and general rubber goods, and tires exhibited growth over the period from 1980 to 1985.

## 1.2.2 Demand Aspects

### 1.2.2.1 Estimated Market Size

The major types of chemicals used in Malaysia include antidegradants, rubber accelerators, vulcanizing agents, plasticizers, and reinforcing agents.

The estimated requirements for rubber chemicals in Malaysia for 1988 are shown in the table below:

Rubber Chemical	Metric Tons
Antidegradants	1,808
Rubber accelerators	1,505
Vulcanizing agents *	2,408
Plasticizers	4,515
Reinforcing agents **	30,100

\* Consist of soluble and insoluble sulphur only.  
\*\* Consist of carbon black only.

### 1.2.2.2 Exports

Malaysia also exports rubber chemicals. Export volume, however, is relatively small. The only significant export in 1989 was carbon black (4,169 MT), which was mainly sold to Indonesia.

### 1.2.3 Supply Aspects

#### 1.2.3.1 Sources of Supply

The rubber chemical requirements of the country are made available to the domestic market either through local production or importation. Among the chemicals that are locally manufactured are carbon black, whiting, china clay, zinc oxide, and stearic acid. The major local manufacturers include the following:

Product	Company
Carbon Black	Malaysian Carbon Sdn. Bhd.
Whiting	Dolomite Industries Co. Sdn. Bhd. Ban Loong Trading Co. Sdn. Bhd.
China Clay	Soon Lee Clay Factory Kaolin (M) Sdn. Bhd. United Clay Products Sdn. Bhd.
Zinc Oxide	Diamond Chemical Industrial Sdn Bhd Metakem Sdn. Bhd Metoxide Malaysia Sdn. Bhd.
Stearic Acid	Unichema Malaysia Sdn. Bhd. Acidchem (M) Sdn. Bhd. Malaysian Oleo Chemicals Sdn. Bhd. Henkel Oleochemicals (M) Sdn. Bhd. Southern Acids (M) Sdn. Bhd.

For antidegradants, rubber accelerators, and vulcanizing agents, Malaysia relies heavily on imports. These chemicals are made available to the domestic market through the local representatives of foreign principals. Some of the local representatives of major overseas suppliers of rubber chemicals are as follows:



**Foreign Principal**

---

Bayer AG, Germany  
Bunawerke Huls, W. Germany  
Du Pont de Nemours & Co., Inc.  
U.S.A.

Degussa, W. Germany  
Exxon Chemical, U.S.A  
Goodyear Chemicals, U.S.A  
Kawaguchi Chemical Ind. Ltd.,  
Japan

Lord Corporation, U.S.A.  
Monsanto Co., U.S.A.  
Polysar International,  
Switzerland  
PPG Industries Inc., U.S.A.  
Shell (UK) Chemicals Ltd.  
Shirashi Calcium Kaisha Ltd.  
Sumitomo Chemical Co. Ltd.,  
Japan  
R.T. Vanderbilt Co. Ltd.  
AKZO, Holland  
Vulnax International U.K.

**Local Representatives**

---

Bayer (M) Sdn. Bhd.  
Bayer (M) Sdn. Bhd.  
  
Du Pont Far East Inc.  
Adikem Sdn. Bhd.  
Jebaen & Jessen (M) Sdn. Bhd.  
Exxon Chemical (M) Sdn. Bhd.  
Diethelm (M) Sdn. Bhd.

Centre West Industrial Rubber  
Chemicals Supplies Sdn. Bhd.  
Harrison & Crosfield Sdn. Bhd.  
Monsanto Far East Ltd.

Behn Meyer & Co. (M) Sdn. Bhd.  
Behn Meyer & Co. (M) Sdn. Bhd.  
Tiram Kimia Sdn. Bhd.  
Shiracal (M) Sdn. Bhd.

Marubeni Corporation  
Adikem Sdn. Bhd.  
ICI (M) Sdn. Bhd.  
ICI (M) Sdn. Bhd.

**1.2.3.2 Distribution and Trade Practices**

Distribution of rubber chemicals and mode of payment are of two types. There is the direct indent, i.e., sales orders are made through the importers but delivery and payments are dealt with directly between the endusers and the principal suppliers from overseas; and the ex-stock practice, i.e., goods are imported and paid to the principal suppliers by the importers and later sold to endusers or other distributors.

Trading in Malaysia is mostly done in cash. Credit is also granted depending on the creditworthiness of the customer. Credit terms can range from 30 to 90 days.

### 1.3 EXPORT OPPORTUNITIES: OTHER ASEAN COUNTRIES

#### 1.3.1 Demand Aspects

The estimated requirements for the various types of rubber chemicals in the other four ASEAN countries for 1988 are shown below:

	Metric Tons			
	Indonesia	Philippines	Singapore	Thailand
Antidegradants	1,487	1,404	18	860
Rubber accelerators	1,239	1,170	15	716
Vulcanizing agents *	1,982	1,872	24	1,146
Plasticizers	3,716	3,510	45	2,149
Reinforcing agents **	24,775	23,400	300	14,325

\* Consist of soluble and insoluble sulphur only.

\*\* Consist of carbon black only.

#### 1.3.2 Supply Aspects

##### 1.3.2.1 Sources of Supply

Indonesia's rubber chemical requirements are met largely through importation. Rubber chemicals known to be manufactured locally in Indonesia include paraffin wax and zinc oxide. The importation of antidegradants reflected an average annual increase of 22.8 per cent from the 1986 volume of 17,039 MT to the 1988 volume of 25,707 MT. Imports of rubber accelerators from 1986 to 1988 show an average annual increase of 7.7 per cent. For plasticizers, reinforcing agents and other rubber chemicals, import volume fluctuated from 1986 to 1988.

Philippine requirements of anti-degradants, rubber accelerators, and vulcanizing agents are imported. Requirements of zinc oxide, carbon black, highly aromatic staining oil, and paraffinic process oils are sourced locally.

Singapore imports its requirements of antidegradants, rubber accelerators, plasticizers, and carbon black. Importation of phenol and its salts, an antidegradant, registered the highest average annual growth rate of 22.1 per cent from 1987 to 1989. Other categories posted either insignificant positive growth rates or negative growth rates.

In Thailand, antidegradants, rubber accelerators and paraffin wax are imported. Chemicals that are locally manufactured include carbon black and castor oil.

#### 1.3.2.2 Exports

In 1988, Indonesia exported 909 MT of antidegradants, 1,598 MT of plasticizers, and 13 MT of reinforcing agents. The export volume of rubber accelerators is nil. Exports of antidegradants and plasticizers decreased in 1988 from the 1987 levels.

From 1987 to 1989, Singapore's exports of antidegradants grew at an average rate of 24.9 per cent per annum, while exports of vulcanizing agents declined at an average annual rate of 23 per cent for the same period. Exports of rubber accelerators are minimal.

The only rubber chemicals that Thailand exported in substantial quantities in 1988 were castor oil (6,049 MT) and carbon black (3,889 MT), both of which are locally manufactured. Exports of carbon black were at the 7,000-MT level during 1986 and 1987

before declining to the 4,000-MT level in 1988.

#### 1.4 OVERALL MARKET ASSESSMENT

The following table shows the estimated requirements by the five ASEAN countries for the three major types of rubber chemicals which are of interest to MIDA, i.e., antidegradants, rubber accelerators, and vulcanizing agents. Demand for each type of rubber chemical was derived by applying the relevant compounding recipe to the total rubber consumption (natural and synthetic rubber) of a given country in 1988. In projecting the demand for rubber chemicals up to the year 2000 for a given country, the historical growth rate of total rubber consumption was then applied to the rubber chemical requirements established for 1988 by the use of the general rubber compounding recipe.

The total estimated demand by the ASEAN region in 1988 was 17,652 MT and by the year 2000, the region's projected requirements are expected to reach 49,062 MT. The economic size earlier indicated by a preliminary investigation of a plant in the ASEAN region of 10,000 MT, will be met by the rubber chemicals of interest in 1990.

Among the ASEAN countries, Malaysia, which has the highest growth rate of rubber consumption of 10.5 per cent from 1990 up to the year 2000, is projected to have the highest demand for the three major types of rubber chemicals. From a 32 per cent share of the total demand by the ASEAN region in 1988, Malaysian demand for each of the three major types of rubber chemicals is expected to increase to 33.5 per cent in 1990 to about 39 per cent by the year 2000. The demand by Indonesia, the Philippines, and Thailand come in second, third, and fourth, respectively. Singapore, having the least as well as decreasing growth rate of rubber consumption with the decline of its rubber processing industry, is projected to require the least amount of rubber chemicals from 1990 up to the year 2000.

Rubber Chemical	Country	Metric Tons					
		1988	1990	1991	1992	1995	2000
Antidegradants	Indonesia	1,487	1,795	1,973	2,188	2,878	4,615
	Malaysia	1,808	2,205	2,437	2,693	3,633	5,985
	Philippines	1,404	1,551	1,630	1,713	1,989	2,550
	Singapore	18	14	13	11	8	4
	Thailand	860	1,018	1,104	1,200	1,541	2,339
			5,575	6,581	7,157	7,785	10,049
Rubber accelerators	Indonesia	1,239	1,496	1,644	1,807	2,399	3,648
	Malaysia	1,505	1,838	2,031	2,244	3,027	4,988
	Philippines	1,170	1,292	1,358	1,428	1,657	2,125
	Singapore	15	12	10	9	6	4
	Thailand	716	846	920	1,000	1,284	1,949
			4,645	5,484	5,983	6,488	8,373
Vulcanizing agents*	Indonesia	1,982	2,394	2,831	2,891	3,838	6,153
	Malaysia	2,408	2,940	3,249	3,590	4,844	7,980
	Philippines	1,872	2,068	2,173	2,284	2,652	3,400
	Singapore	24	19	17	15	10	4
	Thailand	1,146	1,354	1,472	1,600	2,055	3,118
			7,432	8,775	9,542	10,380	13,399
<b>Total</b>		<b>17,652</b>	<b>20,840</b>	<b>22,662</b>	<b>24,653</b>	<b>31,821</b>	<b>49,062</b>

Note : \* Consist of soluble and insoluble sulphur only.

The estimated requirements of the ASEAN countries in 1988 and the projected demand from 1990 up to year 2000 for the specific type of rubber chemical are discussed below:

#### 1.4.1 Antidegradants

In 1988, the estimated requirements by Malaysia for antidegradants amounted to 1,806 MT, which is about 32 per cent of the total demand by the ASEAN region. For the same year, the demand by Indonesia and the Philippines were estimated at 1,487 MT and 1,404 MT, respectively. By 1990, 1995, and 2000, Malaysia's requirements for antidegradants are estimated to reach 2,205 MT, 3,633 MT, and 5,985 MT, respectively. Indonesian demand is projected at 1,795 MT in 1990; 2,878 MT in 1995; and 4,615 MT by year 2000; while Philippine demand is estimated at 1,551 MT, 1,989 MT, and 2,550 MT, for the same years, respectively. On the other hand, Singapore demand is expected to decline from 18 MT in 1988 to 4 MT by year 2000. Total ASEAN demand for antidegradants by the year 2000 is estimated to be 15,493 MT.

At present, all antidegradant requirements of the ASEAN countries are sourced from outside the region, mostly from the United States and Europe. Consequently, any manufacturing plant for rubber chemicals in the ASEAN would have no competition from within the region.

#### 1.4.2 Rubber Accelerators

The demand for rubber accelerators in 1988 by the five ASEAN countries was estimated as follows: Malaysia at 1,505 MT; Indonesia at 1,239 MT; the Philippines at 1,170 MT; Thailand at 716 MT; and Singapore at 15 MT. In 1990, Malaysian demand for rubber accelerators is projected at 1,838 MT, while Indonesian and the Philippines' demand are estimated at 1,496 MT and 1,292 MT, respectively. By the year 2000, total demand by the ASEAN countries for rubber accelerators would amount to 12,912 MT.

As in the case of antidegradants, no ASEAN country has manufacturing capacity for rubber accelerators at present. All ASEAN requirements are sourced from outside the region. As a result, an ASEAN rubber chemical plant would have no competition within the region.

### 1.4.3 Vulcanizing Agents

Vulcanizing agents presented in the table consist only of soluble and insoluble sulphur. The estimated Malaysian demand for soluble and insoluble sulphur in 1988 was 2,408 MT. This is projected to increase to 2,940 MT in 1990; 4,844 MT in 1995; and 7,980 MT by the year 2000. Indonesian demand was estimated at 1,982 MT in 1988 and 6,153 MT by year 2000, while Philippine demand was 1,872 MT in 1988 and is projected at 3,400 MT by year 2000. The demand for vulcanizing agents for the entire ASEAN region is estimated to be 8,775 MT in 1990, increasing to slightly more than 20,000 MT by the year 2000.

Malaysia, the Philippines, and Thailand import all their sulphur requirements at present. A rubber chemical plant within the region could very well supply these requirements.

## 2. INTRODUCTION

### 2.1 BACKGROUND AND OBJECTIVES OF THE STUDY

The United Nations Industrial Development Organization (UNIDO) has been assisting the Committee on Industry, Minerals, and Energy (COIME) to identify, prepare, and promote projects for the ASEAN Industrial Joint Venture (AIJV) program. In this connection, UNIDO has engaged the services of SyCip, Gorres, Velayo and Co. (SGV & Co.) to assist in assessing the market potential of four selected product categories. The product category covered by this study is rubber chemicals, a group of substances used in giving rubber products the desired properties of plasticity, elasticity, hardness or softness, abrasion resistance, and impermeability.

The report compilation was coordinated by the International Team Leader of Project No. DP/RAF/85/010.

Requirements for rubber chemicals are closely linked with the consumption of rubber. An increase in rubber consumption would imply an expected surge in rubber chemical consumption. A preliminary investigation suggests that the economic size of a rubber chemical plant in the ASEAN region would be 10,000 metric tons, and production would have to be supported by sufficient demand in ASEAN.

This study aims to investigate the market potential for rubber chemicals in five countries, namely Malaysia, Indonesia, the Philippines, Singapore, and Thailand. The study focuses extensively on the Malaysian market.

For each country market, the study aims to:

- o identify the different groups of rubber chemicals used;
- o identify the market for each of the rubber chemicals in the different segments of the rubber industry;
- o determine the potential growth rate of rubber chemicals in the next decade;
- o investigate the present marketing and distribution networks; and



- o identify sources of supply of rubber chemicals.

## 2.2 SCOPE AND METHODOLOGY

Products covered by this study consist of rubber chemicals, an essential component of rubber products. The major types of chemicals covered in this study include:

- o antidegradants;
- o rubber accelerators;
- o vulcanizing agents;
- o plasticizers; and
- o reinforcing agents.

This study focuses mainly on antidegradants, rubber accelerators, and vulcanizing agents as these are the product groups of interest to MIDA. These three groups are the high-value, petro-based products and currently imported by Malaysia and the other ASEAN countries. The other rubber chemicals, although imported by Malaysia, are also produced in the country.

### 2.2.1 Antidegradants

Antidegradants are classified as antioxidants and antiozonants. They protect rubber goods from attack by oxygen and ozone in the atmosphere. They function by combining with, and thus interrupting, free radical chain reactions and preventing further chain degradation. Commercial age resistors are generally either of the amine type or the phenolic type. Amines are strong protective agents and are widely used in tires and other dark colored goods where discoloring or staining is not a problem. For light colored goods, alkylated phenols and their derivatives are used to give moderate antioxidant protection with minimum discoloration. These include phenol, octylphenol, nonylphenol and their salts, 4,4' - isopropylidenedi - phenol, and other derivatives of phenol-alcohols.

### 2.2.2 Rubber Accelerators

Prepared rubber accelerators reduce the time required for the vulcanization of the rubber from several hours to a few minutes. In addition, less sulphur is needed and a more uniform product is obtained.

### 2.2.3 Vulcanizing Agents

Vulcanizing agents usually consist of sulphur. Their reaction to accelerators is not well-understood, in spite of much research. However, it presumably results in an activated form of sulphur, which becomes a "sulphur bridge" within the rubber molecule, linking the molecules into a tight network structure.

### 2.2.4 Plasticizers

Plasticizers, also known as processing aids, improve the flexibility of rubber.

### 2.2.5 Reinforcing Agents

Large amounts of inert filling materials may be added to rubber. Some serve to harden or to dilute the mix. Common fillers used are carbon black, silica, and clay. Carbon black and silica, which increase the strength, resilience, and abrasion resistance, are properly known as reinforcing agents. Clay on the other hand, as a filler, usually results in a reduction of production cost, increased hardness, and better retention of shape and color. However, clay reduces tensile strength of rubber.

The market data presented in this report consist mainly of available secondary data obtained from trade publications, industry associations, and government agencies. To supplement secondary data, key informant interviews with selected major suppliers and consumers of rubber chemicals were conducted. In Malaysia, representatives from MIDA and the Malaysian Rubber Research and Development Board (MRRDB) were also interviewed.

### 3. THE MALAYSIAN MARKET

#### 3.1 BACKGROUND ON THE RUBBER AND RUBBER PRODUCTS INDUSTRY

##### 3.1.1 Industry Structure

Malaysia is the largest producer and exporter of natural rubber. It supplies about 35 per cent of the world's requirement of natural rubber and 76 per cent of natural rubber latex needs. Forty-five per cent of total cultivated area or two million hectares is under rubber cultivation.

Although Malaysia is renowned world-wide as a leading producer of natural rubber (NR), the Malaysian rubber products industry remains small. It accounts for only 0.4 per cent of world output and one per cent of world exports. The industry started in the 1930s as small, family-owned operations manufacturing products mainly for the domestic market. In the 1970s, the sector experienced rapid growth through joint ventures between foreign manufacturers and local entrepreneurs. Despite its small size, Malaysia is currently the world's largest exporter of gloves, catheters, and swimming caps.

The rubber products industry consists of the following sectors:

- o Latex products
- o Tires and tire-related products
- o General rubber goods
- o Industrial rubber goods
- o Footwear

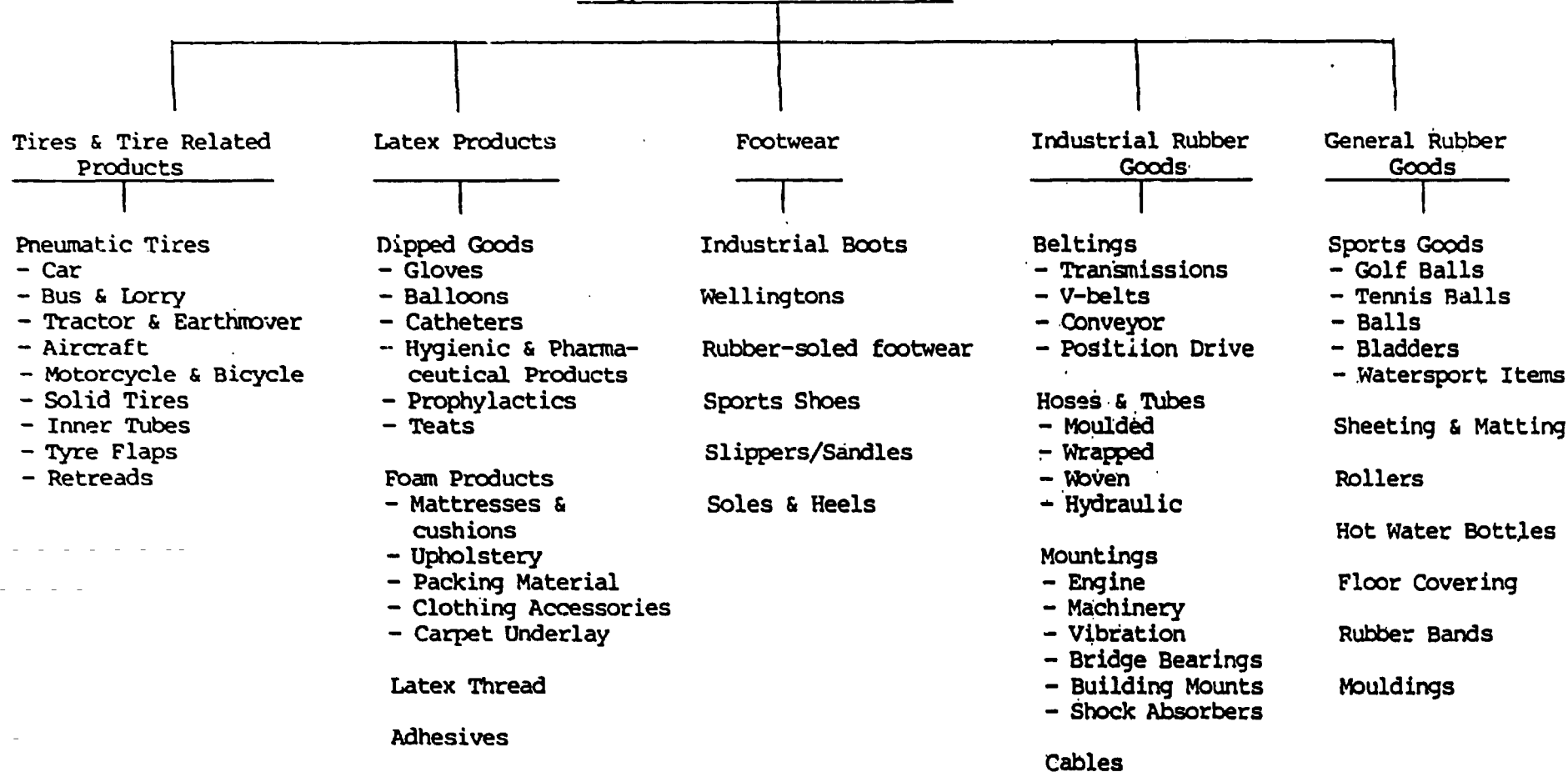
The specific products made by Malaysian rubber product manufacturers for each of the five sectors is shown in Figure 1.

In 1988, total rubber consumption of the rubber products industry was about 120,000 MT, of which, latex products accounted for 58,000 MT or 48 per cent. Tire products consumed 25,000 MT or 21 per cent and general rubber goods, 21,000 MT or 17 per cent. (See Figure 2.)

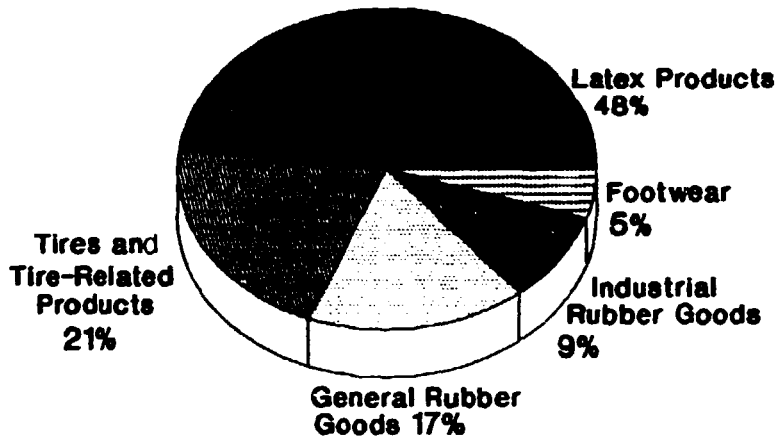
Figure 1

The Malaysian Rubber Products Industry

A Typical Rubber Product Tree



**Figure 2**  
**Malaysian Rubber Consumption**  
**by Product Sector, 1988**



Source: A Guide for Investors, prepared by the Malaysian Industrial Development Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB).

Rubber consumption in Malaysia increased by 199 per cent from 40,300 MT in 1977 to 120,400 MT in 1988 or at an average annual growth rate of 10.5 per cent. Latex products posted the most impressive increase in rubber consumption from 1982 to 1988, rising by an annual average of 18.9 per cent for the period to reach an estimated 57,713 MT in 1988. (See Table 1.)

**Table 1**  
**RUBBER CONSUMPTION BY PRODUCT SECTOR IN MALAYSIA**  
**1982 - 1988**  
**(in metric tons)**

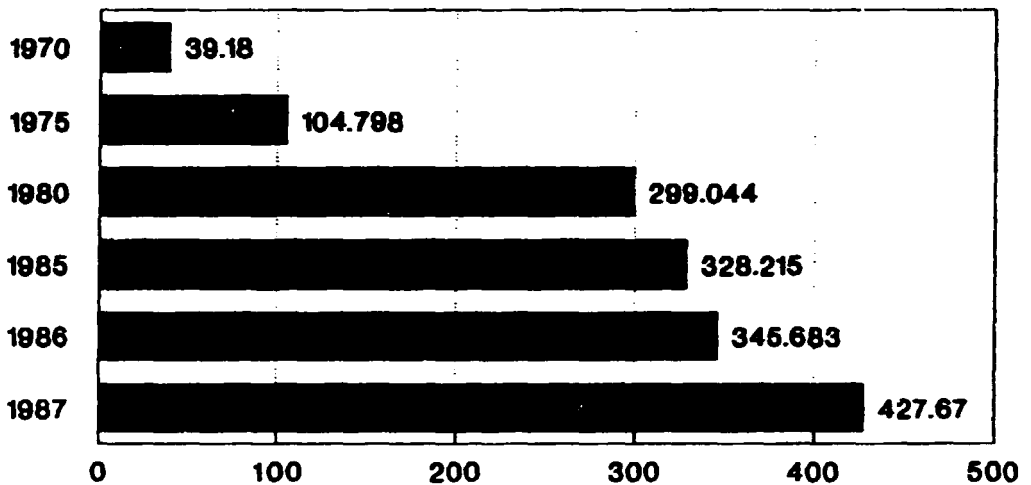
Sector	1982	1984	1986	1988
Latex products	20,405	22,722	23,893	57,713
Tires & tire-related products	18,353	19,198	18,766	25,324
General rubber goods	9,855	14,849	16,647	20,944
Industrial rubber goods	8,587	7,400	6,981	10,158
Footwear	4,973	4,246	5,191	6,189
<b>Total</b>	<b>62,173</b>	<b>68,415</b>	<b>71,478</b>	<b>120,328</b>
	=====	=====	=====	=====

**Source:** A Guide for Investors, prepared by the Malaysian Industrial Development Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB).

As in the past, rubber consumption of latex products is expected to grow the fastest for the coming years. Preliminary estimates for 1989 place rubber consumption of tires and tire-related products at 28,000 MT. Consumption by the general rubber goods sector is also expected to remain strong.

The rubber products industry has recorded an impressive average annual growth rate of 15.1 per cent in terms of exfactory sales value from US\$39,180 million in 1970 to US\$427,670 million in 1987. (See Figure 3.)

**Figure 3**  
**Production of Rubber Products**  
**in Malaysia, 1970 - 1987**  
**(in US billion dollars)**



Source: The Malaysian Rubber Products Industry.  
BBMB Economic Review, January 1988.

Over the same time frame, latex products and general rubber goods, and tires recorded the fastest growth in output among the various types of rubber products produced in Malaysia. (See Table 2.)

Table 2  
 PRODUCTION OF RUBBER PRODUCTS BY PRODUCT GROUP  
 IN MALAYSIA  
 1970 - 1987  
 (in million US\$)

Product	Exfactory Sales Value						Average Annual Growth Rate (%)		Annual Growth Rate (%)	
	1970	1975	1980	1985	1986	1987	1970-80	1980-85	1986	1987
Latex products and general rubber goods	2,334	8,084	35,972	105,552	124,878	176,345	31.46	24.02	18.31	41.21
Tires	15,889	43,091	123,420	130,703	122,712	136,388	22.75	1.15	(6.11)	11.14
Footwear	8,714	26,186	76,170	59,613	63,639	64,393	24.21	(4.78)	6.75	1.18
Inner tubes	1,963	5,533	14,123	11,315	10,214	16,872	21.81	(4.34)	(9.73)	55.39
Rubber compounds	2,485	6,111	17,388	11,526	12,086	15,785	21.48	(7.89)	4.86	30.44
Sheeting and matting	3,034	5,772	9,536	7,534	9,341	12,889	12.13	(4.60)	23.98	37.98
Foam products	4,244	9,186	20,507	960	1,801	3,561	17.06	(45.79)	4.27	255.74
Hoses and tubing	517	855	1,928	1,012	1,812	2,457	14.07	(12.09)	79.06	35.60
Total	39,180	104,798	299,044	328,215	345,883	427,670	22.54	1.88	5.32	23.72

Source: The Malaysian Rubber Products Industry, BSMB Economic Review January 1988.

### 3.1.1.1 Latex Products

There are 42 manufacturers of latex products in Malaysia. Latex products are generally divided into dipped goods, foam products, latex thread, and adhesives. With the exception of foam products, the sector is export-oriented. The growth and performance of this sector are expected to be promising largely due to the participation of multinationals who contributed equity financing, technology, and marketing outlets.



Some of the well-known companies operating in Malaysia are as follows:

Table 3  
MULTINATIONALS IN THE LATEX INDUSTRY SECTOR  
IN MALAYSIA

Company	Country of Origin
Ansell	Australia
London Rubber Company	United Kingdom
Hutchinson Mapa	France
Fillatice Monza	Italy
Skellerup	New Zealand
Sagami and Sumitomo	Japan
Dongkuk	South Korea
Beiersdorf	Germany
Bard	United Kingdom
Travenol Laboratories	United States

Source: A Guide for Investors, prepared by Malaysian Industrial Development Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB), July 1987.

#### 3.1.1.2 Tire Industry

A survey conducted by the Malaysian Industrial Development Authority (MIDA) in 1985 indicated that total paid-in-capital of the Malaysian rubber-based companies was US\$176 million with 65 per cent Malaysian equity holdings. The tire sector accounted for 47 per cent of the paid-in-capital contribution.

Malaysia produces a wide assortment of tires ranging from passenger and commercial tires to earthmover and aviation tires. Almost all the passenger car tires manufactured are radial tires, to be used both for the original equipment as well as the replacement markets. Local manufacturers produce tires of international standards, employing modern technology and maintaining high standards of quality control. The tire

sector recorded an average growth rate of five per cent per annum from a total of 4.26 million pieces produced in 1983 to 5.17 million pieces in 1987. Unlike the latex products sector, tires are largely dependent on a variety of inputs besides NR, such as synthetic rubber (SR), carbon black, cord fabrics, steel cords and beads. There are three major tire manufacturers in the country. They are as follows:

Table 4  
MAJOR TIRE MANUFACTURERS IN MALAYSIA

Tire Manufacturers	Malaysian Equity
Dunlop Malaysia Industries Berhad	65 per cent
Goodyear Malaysia Berhad	49 per cent
IT International Sdn. Bhd.	80 per cent

Source: A Guide for Investors, prepared by Malaysian Industrial Development Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB), July 1987.

#### 3.1.1.3 Industrial and General Rubber Goods

These two sectors cover a wide spectrum of products ranging from beltings, hoses and tubings, mountings, dock fenders, automotive components, sheetings and mattings, rollers, hot water bottles, and other miscellaneous products. Most of the firms are Malaysian-owned and serve the domestic market. Many are multiproduct producers. Malaysia is a net importer of industrial rubber products.

#### 3.1.1.4 Footwear

There are 26 firms engaged in the manufacture of rubber canvas footwear, producing largely for the domestic market. With the exception of one firm, Bata Malaysia, all are Malaysian-owned. Owing to intense competition from Korea, Taiwan, and People's

Republic of China (P.R.O.C.), demand for locally manufactured footwear exhibited a declining trend during the 1980s. In response to this, the sector is currently working towards increasing productivity levels as well as producing higher value-added footwear such as fashion footwear. With the move towards fashion footwear, it is expected that demand for Malaysian footwear will pick up and with it, the consumption of rubber and rubber chemicals.

### 3.1.2 Industrial Master Plan

The Malaysian Industrial Master Plan (IMP) which was launched by the government in 1986 charts the course of Malaysia's industrialization with respect to the development strategies and programs for the decade 1986 to 1995. Basically, the IMP aims at transforming Malaysia through a leap-frogging process, from an agricultural-based small-sized economy into a full-fledged industrial country. The government has declared resource-based industries as priority industries. The rubber products industry has been singled out to play a major role in the industrialization program of the country. The IMP calls for the development of tires and tubes as the leading export earners with a targeted US\$400 million earnings by 1995 as well as latex products with US\$308.8 million and the footwear sector with US\$30 million. An interview with the Malaysian Rubber Research and Development Board revealed that the IMP is still pertinent to this day. However, the tires sector is not growing as fast while the latex sector has grown faster than expected. Promotion of the rubber products industry by the IMP results in increased demand for rubber chemicals.

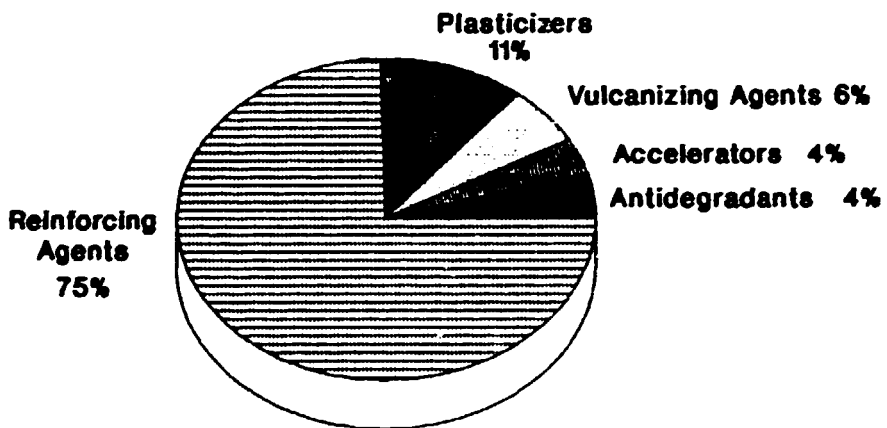
## 3.2 DEMAND ASPECTS

### 3.2.1 Estimated Market Size

Reinforcing agents make up the bulk of rubber chemical usage. The reinforcing agent estimate consists of carbon black alone, while

the vulcanizing agent estimate consists of sulphur and insoluble sulphur only. In 1988, about 75 per cent of total rubber chemical requirements was accounted for by reinforcing agents and 11 per cent by plasticizers. Vulcanizing agents contributed six per cent to rubber chemical consumption. The remaining eight per cent was equally accounted for by antidegradants and rubber accelerators. (See Figure 4.)

**Figure 4**  
**Estimated Requirements**  
**for Rubber Chemicals**  
**1988**



Source: Table 5.

Table 5 presents the estimated requirements for rubber chemicals in Malaysia in 1988.

Table 5  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS IN MALAYSIA  
1988  
(in metric tons)

Rubber Chemical	Volume <sup>/a</sup>
Antidegradants	1,806
Rubber accelerators	1,505
Vulcanizing agents <sup>/b</sup>	2,408
Plasticizers	4,515
Reinforcing agents <sup>/c</sup>	30,100

Notes: a) estimated based on total rubber consumption (natural and synthetic rubber) and general compounding recipe from the Malaysian Rubber Research Institute.

b) Soluble and insoluble sulphur only.

c) Carbon black only.

Source of basic data: 1988 Statistical Yearbook for Asia and the Pacific (United Nations).

The above estimates of rubber chemical requirements, as well as the other rubber chemical consumption estimates in this study, were based on the correlation of total rubber consumption (natural and synthetic rubber) and rubber chemical usage as determined by the general compounding recipe. This general compounding recipe includes ratios based on the quantity of rubber the chemical is used on. For example, for a compounding recipe of 1.5 PHR (part per hundred rubber), the estimated rubber consumption is multiplied by the PHR value, and then divided by 100. (The PHR is basically a percentage value.) The recipe used for this study appear in Table 6.

Table 6  
RATIOS IN THE GENERAL COMPOUNDING RECIPE FOR  
ESTIMATING THE LEVEL OF RUBBER CHEMICAL CONSUMPTION

Rubber Chemical	Ratio of Usage
Antidegradants	1 - 2 part per hundred rubber (PHR)
Rubber accelerators	1 - 1.5 PHR
Vulcanizing agents *	2 PHR
Plasticizers	5 - 10 PHR (used for dry rubber only)
Reinforcing agents **	50 PHR (used for dry rubber only)

\* Sulphur only.

\*\* Carbon black only.

Sources: Interviews  
Malaysian Rubber Research Institute.

The recipes used for plasticizers and for reinforcing agents are applicable to dry rubber only. In Malaysia, dry rubber comprised about 50 per cent of total rubber consumption from 1986 to 1988. As there are no available data for dry rubber consumption for the other ASEAN countries, it was estimated that the share of dry rubber to total rubber consumption for all ASEAN countries was 50 per cent.

### 3.2.2 Exports

Export volume of rubber chemicals in Malaysia is relatively small. Malaysia exported around 12 MT of antidegradants in 1989, mostly to ASEAN countries. Moreover, Malaysia exported around 64 MT of rubber accelerators in the same year, around 69 per cent of which went to Indonesia. Exports of plasticizers, totalling 295 MT, mostly went to Singapore (94 per cent). The only significant rubber chemical export of Malaysia in 1989 was carbon black at 4,169 MT, 89 per cent of which was sold to Indonesia. Table 7 presents the volume and value of Malaysian exportation of rubber chemicals from 1987 to 1989.

Table 7  
 EXPORTS OF RUBBER CHEMICALS OF MALA  
 1987 - 1989  
 (volume in metric tons; value in

Rubber Chemical	1987		Vo
	Volume	Value	
Antidegradants *	592	1,025,354	4,
Phenol & Its Salts	570	850,463	3,
Octylphenol, Nonyphenol & Their Isomers: Salts Thereof	-	-	
Other Monophenols	-	-	
4, 4' - Isopropylidenedi - Phenol Its Salts	n.a.	n.a.	
Other Polyphenols	n.a.	n.a.	
Phenol-Alcohols	n.a.	n.a.	
Other Derivatives of Phenol & Phenol- Alcohols	1	2,674	
Amine Function Compounds	n.a.	103,717	
Methylamine, Di- Or Tri-Methylamine & their Salts	n.a.	n.a.	
Diethylamine & Its Salts	n.a.	n.a.	
Other Acyclic Monoamines & Their Derivatives, Salts Thereof	n.a.	n.a.	
Ethylenediamine & Its Salts	n.a.	n.a.	
Hexamethylenediamine And Its Salts	n.a.	n.a.	
Other Acyclic Polyamines And Their Derivatives; Salts Thereof	n.a.	n.a.	
Cyclanic, cyclenic or cycloterpenic mono or polyamines and their derivatives; Salts Thereof	n.a.	n.a.	

**Table 7**  
**PORTS OF RUBBER CHEMICALS OF MALAYSIA**  
**1987 - 1989**  
 (volume in metric tons; value in US\$)

1987		1988		1989	
Volume	Value	Volume	Value	Volume	Value
592	1,025,354	4,230	3,891,036	12	323,079
570	850,463	3,205	3,688,772	**	2,930
-	-	-	-	**	3,444
-	-	1	7,300	6	40,775
n.a.	n.a.	-	-	2	164,561
n.a.	n.a.	†	487	3	11,465
n.a.	n.a.	**	176	**	861
1	2,674	12	21,223	-	-
n.a.	103,717				
n.a.	n.a.	n.a.	42,934	n.a.	62,453
n.a.	n.a.	n.a.	45,273	n.a.	4,374
n.a.	n.a.	n.a.	13,012	n.a.	5,002
n.a.	n.a.	n.a.	212	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	n.a.	1,069	n.a.	14,263
n.a.	n.a.	-	-	-	-



Rubber Chemical	1987		Volume
	Volume	Value	
Aniline & Its Salts	n.a.	n.a.	-
Aniline Derivatives & Their Salts	n.a.	n.a.	n.a.
Toluidines & Their Derivatives; Salts Thereof	n.a.	n.a.	-
Dephenylene & Its Derivatives; Salts Thereof	n.a.	n.a.	-
1-Naphthylamine, 2-Naphthylamine And Their Derivatives	n.a.	n.a.	-
Other Aromatic Monoamines And Their Derivatives; Salts Thereof	n.a.	n.a.	-
O-, M-, P-Phenylenediamine, Diamino- toluenes & Their Derivatives: Salts Thereof	n.a.	n.a.	-
Other Aromatic Polyamines & Their DVT Salts Thereof	n.a.	n.a.	n.
Phosphoric Esters, Their Salts & Their Halogenated Sulphonated, Nitrates or Nitrosated Derivatives	**	36,718	
Other Inorganic Esters, Their Salts & Halogenated Sulphonated, Nitrates or Nitrosated Derivatives	21	31,782	
Phosphoric Esters & Their Salts & Derivatives	n.a.	n.a.	n
Thiophosphoric Esters & Their Salts & Derivatives	n.a.	n.a.	
Other Esters of Other Inorganic Acids & Their Salts & Derivatives	n.a.	n.a.	1,
Rubber Accelerators	6	19,498	
Prepared Rubber Accelerators	6	19,498	

1987		1988		1989	
Volume	Value	Volume	Value	Volume	Value
n.a.	n.a.	-	-	-	-
n.a.	n.a.	n.a.	2,759	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	-	-	-	-
n.a.	n.a.	n.a.	973	-	-
**	36,718	-	-	-	-
21	31,782	-	-	-	-
n.a.	n.a.	n.a.	8,700	n.a.	11,237
n.a.	n.a.	-	-	-	-
n.a.	n.a.	1,010	58,146	n.a.	1,714
6	19,498	74	99,083	64	168,855
6	19,498	74	99,083	64	168,855

SECTION 2

Rubber Chemical	1987		1988
	Volume	Value	Volume
Vulcanizing Agents	n.a.	n.a.	n.a.
Plasticizers *	6	6,020	83
Crude Camphor, Nat.	n.a.	n.a.	6
Other Camphor	n.a.	n.a.	56
Castor Oil	6	6,020	21
Phthalic Anhydride	n.a.	n.a.	-
Reinforcing Agents	5,986	2,478,688	7,549
Carbon Black	5,986	2,478,688	7,549
Others			
Paraffin Wax	8	11,887	8
Hydraulic Break Fluids & Other Prep *** Liquids For Hydraulic Transmission Obtained from Bituminous Minerals	n.a.	n.a.	56,183
Lubricating Prep Cont. Petroleum Oil or Oils Obtained From Bituminous Minerals	n.a.	n.a.	12
Other Lubricating Prep Cont. Petroleum Oils or Oils Obtained From Bituminous Minerals	n.a.	n.a.	102
Lubricating Prep Cont. Petroleum Oil ***	n.a.	n.a.	11,678

n.a. - not available.

\* - numbers may not add up due to rounding.

\*\* - less than 500 kgs.

\*\*\* - quantity in liter

Source: Malaysian External Trade Statistics.

1987		1988		1989	
Volume	Value	Volume	Value	Volume	Value
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
6	6,020	83	188,584	295	205,898
n.a.	n.a.	6	29,310	1	204
n.a.	n.a.	56	131,279	54	121,792
6	6,020	21	27,995	240	20,033
n.a.	n.a.	-	-	**	63,869
5,986	2,478,688	7,549	2,182,742	4,169	2,449,593
5,986	2,478,688	7,549	2,182,742	4,169	2,449,593
8	11,887	8	4,480	36	17,473
n.a.	n.a.	56,183	328,975	31,403	62,654
n.a.	n.a.	12	17,709	65	73,488
n.a.	n.a.	102	74,350	83	48,062
n.a.	n.a.	11,678	17,709	64,513	73,488

SECTION 2

### 3.2.3 Projected Demand

Malaysian demand for rubber chemicals is estimated to grow by 10.5 per cent per annum based on the average compounded growth rate of total rubber consumption of Malaysia from 1977 to 1988. In 1990, requirements for antidegradants are projected at 2,205 MT and are expected to reach 5,985 MT by the year 2000. Demand for rubber accelerators is estimated at 1,838 MT in 1990 and 4,988 MT by year 2000. On the other hand, demand for vulcanizing agents is projected to increase from its 1990 level of 2,940 MT to 7,980 MT by the year 2000.

Table 8  
PROJECTED DEMAND FOR RUBBER CHEMICALS IN MALAYSIA  
1990 - 2000  
(in metric tons)

Rubber Chemical	1990	1991	1992	1995	2000
Antidegradants	2,205	2,437	2,693	3,633	5,985
Rubber accelerators	1,838	2,031	2,244	3,027	4,988
Vulcanizing agents*	2,940	3,249	3,590	4,844	7,980
Plasticizers	5,513	6,092	6,731	9,082	14,983
Reinforcing agents**	36,753	40,612	44,876	60,548	99,750

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

### 3.3 SUPPLY ASPECTS

#### 3.3.1 Local Manufacturers

The selection of the rubber product industry as a key industry in the Malaysian Industrial Master Plan was based not only on the availability of natural rubber but also on its utilization of other resource-based products. These consist of the rubber chemical components for the production of rubber products which include carbon black, whiting, china clay, zinc oxide, and stearic acid. A list of the major

local manufacturers of these rubber chemicals follows:

Table 9  
MAJOR LOCAL MANUFACTURERS OF RUBBER CHEMICALS  
IN MALAYSIA

Product	Company
Carbon Black	Malaysian Carbon Sdn. Bhd.
Whiting	Dolomite Industries Co. Sdn. Bhd. Ban Loong Trading Co. Sdn. Bhd.
China Clay	Soon Lee Clay Factory Kaolin (M) Sdn. Bhd. United Clay Products Sdn. Bhd.
Zinc Oxide	Diamond Chemical Industrial Sdn Bhd Metakem Sdn. Bhd Metoxide Malaysia Sdn. Bhd.
Stearic Acid	Unichema Malaysia Sdn. Bhd. Acidchem (M) Sdn. Bhd. Malaysian Oleo Chemicals Sdn. Bhd. Henkel Oleochemicals (M) Sdn. Bhd. Southern Acids (M) Sdn. Bhd.

Source: A Guide for Investors, prepared by the Malaysian Industrial Development Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB), July 1987.

### 3.3.2 Imports

The bulk of rubber chemical requirements of Malaysia is sourced from other countries. Major country sources by chemical include:

#### o Antidegradants

For phenol, major sources are Brazil, Japan, and Singapore. Amine is sourced from U.S.A, Germany, and Netherlands, while esters come from the United Kingdom.

o Rubber Accelerators

Belgium, Federal Republic of Germany, and the United Kingdom are the major country sources for rubber accelerators.

o Plasticizers

Plasticizers are supplied by P.R.O.C., Italy, and Japan.

o Reinforcing Agents

Reinforcing agents are imported from the U.S.A, Australia, and Singapore.

Table 10 shows the volume and value of importation of rubber chemicals in Malaysia for the period 1987 to 1989. The highest importation value recorded during the period was for phenol and its salts, an antidegradant.

The import volume for the various commodity classifications which include rubber chemicals may be much higher than historical demand of rubber chemicals by the rubber processing industry. This can be explained by the fact that not all imports classified under the categories given in the import tables can be used as rubber chemicals by the rubber processing industry. This explanation holds true for the rest of the countries covered by this report.

Table 10  
 IMPORTS OF RUBBER CHEMICALS OF MALAYSIA  
 1987 - 1989  
 (volume in metric tons; value in US\$)

Rubber Chemical	1987		1988	
	Volume	Value	Volume	Value
Antidegradants *	9,546	14,606,313	21,461	31,000,000
Phenol & Its Salts	8,296	5,587,589	18,294	23,000,000
Octylphenol, Nonyphenol & Their Isomers Salts Thereof	n.a.	n.a.	12	
Other Monophenols	n.a.	n.a.	561	1,000,000
4, 4' - Isopropylidenedi - Phenol Its Salts	n.a.	n.a.	42	
Other Polyphenols	n.a.	n.a.	103	
Phenol-Alcohols	n.a.	n.a.	11	
Other Derivatives of Phenol & Phenol- Alcohols	326	2,599,877	134	
Amine Function Compounds	n.a.	3,219,563	n.a.	
Methylamine, Di-Or Tri-Methylamine & their Salts	n.a.	n.a.	n.a.	
Diethylamine & Its Salts	n.a.	n.a.	n.a.	
Other Acyclic Monoamines & Their Derivatives, Salts Thereof	n.a.	n.a.	n.a.	
Ethylenediamine & Its Salts	n.a.	n.a.	n.a.	

SECTION 1



Table 10  
 PORTS OF RUBBER CHEMICALS OF MALAYSIA  
 1987 - 1989  
 (volume in metric tons; value in US\$)

1987		1988		1989	
Volume	Value	Volume	Value	Volume	Value
9,546	14,606,313	21,481	31,660,568	23,193	16,471,289
8,296	5,587,589	18,294	23,377,999	5,108	8,932,298
n.a.	n.a.	12	176,197	4	43,937
n.a.	n.a.	561	1,063,649	69	989,041
n.a.	n.a.	42	178,788	21	85,291
n.a.	n.a.	103	605,133	86	547,535
n.a.	n.a.	11	9,897	11	24,521
326	2,599,877	134	723,442	129	723,442
n.a.	3,219,563	n.a.	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	508,620	n.a.	413,047
n.a.	n.a.	n.a.	169,391	n.a.	89,485
n.a.	n.a.	n.a.	185,042	n.a.	816,438
n.a.	n.a.	n.a.	13,514	n.a.	170,019

SECTION 2

Rubber Chemical	1987		Volume
	Volume	Value	
Hexamethylenediamine And Its Salts	n.a.	n.a.	n.a.
Other Acyclic Polyamines And Their Derivatives; Salts Thereof	n.a.	n.a.	n.a.
Cyclanic, cyclenic or cycloterpenic mono or polyamines and their derivatives; Salts Thereof	n.a.	n.a.	n.a.
Aniline & Its Salts	n.a.	n.a.	n.a.
Aniline Derivatives & Their Salts	n.a.	n.a.	n.a.
Toluidines & Their Derivatives; Salts Thereof	n.a.	n.a.	n.a.
Dephenyamine And Its Derivatives; Salts Thereof	n.a.	n.a.	n.a.
1-Napthylamine, 2-Napthtylamine And Their Derivatives	n.a.	n.a.	n.a.
Other Aromatic Monoamines And Their Derivatives; Salts Thereof	n.a.	n.a.	n.a.
O-, M-, P-Phenylenediamine, Diamino-toluenes & Their Derivatives: Salts Thereof	n.a.	n.a.	n.a.
Other Aromatic Polyamines & Their DVT Salts Thereof	n.a.	n.a.	n.a.
Phosphoric Esters, Their Salts & Their Halogenated Sulphonated, Nitrates or Nitrosated Derivatives	**	203,358	n.a.
Other Inorganic Esters, Their Salts & Halogenated Sulphonated, Nitrates or Nitrosated Derivatives	924	2,995,926	n.a.
Phosphoric Esters & Their Salts & Derivatives	n.a.	n.a.	454
Thiophosphoric Esters & Their Salts & Derivatives	n.a.	n.a.	134

1987		1988		1989	
Volume	Value	Volume	Value	Volume	Value
n.a.	n.a.	n.a.	31,463	n.a.	94,350
n.a.	n.a.	n.a.	235,847	n.a.	371,636
n.a.	n.a.	n.a.	310,626	n.a.	201,056
n.a.	n.a.	n.a.	11,540	n.a.	4,259
n.a.	n.a.	n.a.	7,272	n.a.	4,254
n.a.	n.a.	n.a.	16,001	n.a.	5,900
n.a.	n.a.	n.a.	471,092	n.a.	504,532
n.a.	n.a.	n.a.	190,821	n.a.	124,514
n.a.	n.a.	n.a.	30,317	n.a.	60,430
n.a.	n.a.	n.a.	665,486	n.a.	348,988
n.a.	n.a.	n.a.	331,774	n.a.	23,517
**	203,358	n.a.	n.a.	n.a.	n.a.
924	2,995,926	n.a.	n.a.	n.a.	n.a.
n.a.	n.a.	454	304,715	7,613	105,021
n.a.	n.a.	134	275,130	89	343,430

Rubber Chemical	1987		1988
	Volume	Value	Volume
Other Esters of Other Inorganic Acids & Their Salts & Derivatives	n.a.	n.a.	1,716
Rubber Accelerators	779	2,345,378	949
Prepared Rubber Accelerators	779	2,345,378	949
Vulcanizing Agents	n.a.	n.a.	n.a.
Plasticizers *	1,479	3,120,562	1,659
Crude Camphor, Nat.	12	28,214	14
Other Camphor	n.a.	n.a.	313
Castor Oil	1,464	982,095	1,321
Phthalic Anhydride	3	2,110,253	11
Reinforcing Agents	2,553	2,419,401	55,249
Carbon Black	2,553	2,419,401	55,249
Others			
Paraffin Wax	7,401	4,702,683	22,906
Hydraulic Break Fluids & Other Prep Liquids For Hydraulic Transmission Obtained from Bituminous Minerals ***	n.a.	n.a.	491,178
Other Lubricating Prep Cont. Petroleum Oils or Oils Obtained From Bituminous Minerals	n.a.	n.a.	367
Lubricating Prep Cont. Petroleum Oil *** or Oils Obtained From Bituminous Minerals	n.a.	n.a.	223,550

n.a. - not available.

\* - numbers may not add up due to rounding.

\*\* - less than 500 kgs.

\*\*\* - quantity in liter

Source: Malaysian External Trade Statistics.

	1987	1988		1989	
	Value	Volume	Value	Volume	Value
a.	n.a.	1,716	1,766,812	10,063	1,444,348
79	2,345,378	949	3,119,030	633	2,516,416
79	2,345,378	949	3,119,030	633	2,516,416
a.	n.a.	n.a.	n.a.	n.a.	n.a.
179	3,120,562	1,659	14,478,763	946	3,794,217
12	28,214	14	42,515	**	130
a.	n.a.	313	678,523	149	419,707
464	982,095	1,321	9,956,932	793	719,439
3	2,110,253	11	3,800,793	4	2,654,941
553	2,419,401	55,249	3,243,112	16,849	4,379,834
553	2,419,401	55,249	3,243,112	16,849	4,379,834
401	4,702,683	22,906	5,145,932	9,869	3,923,121
n.a.	n.a.	491,178	1,012,977	139,603	265,855
n.a.	n.a.	367	1,216,977	288	816,178
n.a.	n.a.	223,550	644,481	355,768	606,114

SECTION 2

The above rubber chemical requirements are made available to the domestic market through local representatives of foreign principals. The top three chemical suppliers in Malaysia are ICI (M) Sdn. Bhd., Bayer (M) Sdn. Bhd., and Monsanto Far East Ltd. Trade interviews revealed that prices among the three are relatively the same. Those of rubber chemicals that come from the eastern block and Japan, however, are about ten per cent cheaper. (See Table 11 for a list of major overseas suppliers of rubber chemicals.)

Table 11  
LOCAL REPRESENTATIVES OF MAJOR OVERSEAS SUPPLIERS  
OF RUBBER CHEMICALS IN MALAYSIA

Foreign Principal	Local Representatives
Bayer AG, Germany	Bayer (M) Sdn. Bhd.
Bunawerke Huls, W. Germany	Bayer (M) Sdn. Bhd.
Du Pont de Nemours & Co., Inc. U.S.A.	Du Pont Far East Inc.
Degussa, W. Germany	Adikem Sdn. Bhd.
Exxon Chemical, U.S.A.	Jebaen & Jessen (M) Sdn. Bhd.
Goodyear Chemicals, U.S.A.	Exxon Chemical (M) Sdn. Bhd.
Kawaguchi Chemical Ind. Ltd., Japan	Diethelm (M) Sdn. Bhd.
Lord Corporation, U.S.A.	Centre West Industrial Rubber Chemicals Supplies Sdn. Bhd.
Monsanto Co., U.S.A.	Harrison & Crosfield Sdn. Bhd.
Polysar International, Switzerland	Monsanto Far East Ltd.
PPG Industries Inc., U.S.A.	Behn Meyer & Co. (M) Sdn. Bhd.
Shell (UK) Chemicals Ltd.	Behn Meyer & Co. (M) Sdn. Bhd.
Shirashi Calcium Kaisha Ltd.	Tiram Kimia Sdn. Bhd.
Sumitomo Chemical Co. Ltd., Japan	Shiracal (M) Sdn. Bhd.
R.T. Vanderbilt Co. Ltd.	Marubeni Corporation
AKZO, Holland	Adikem Sdn. Bhd.
Vulnax International U.K.	ICI (M) Sdn. Bhd.
	ICI (M) Sdn. Bhd.

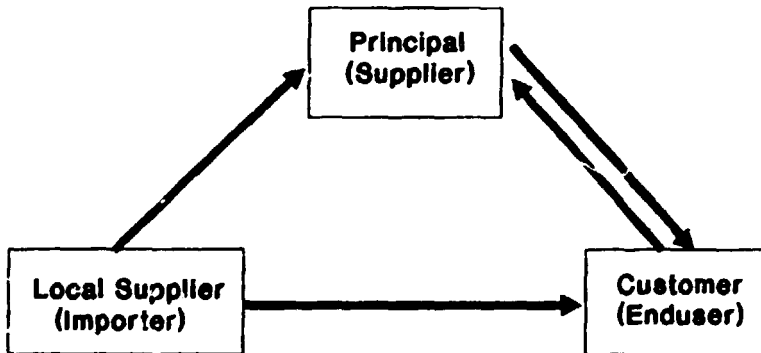
Source: A Guide for Investors, prepared by the Malaysian Industrial Authority (MIDA), and Malaysian Rubber Research and Development Board (MRRDB), July 1987.

### 3.3.3 Distribution and Trade Practices

Rubber chemicals are locally available in Malaysia either from local manufacturers or from importers. Trade interviews revealed that local manufacturers cater mainly to the domestic market. For imports, transactions go through the local representative of the foreign principal. Delivery of goods and payment are of two types: direct indent and ex-stock.

In direct indent, sales orders are made through the importers but delivery of goods and payments is transacted directly between the endusers and the principal suppliers from overseas. (See Figure 5.)

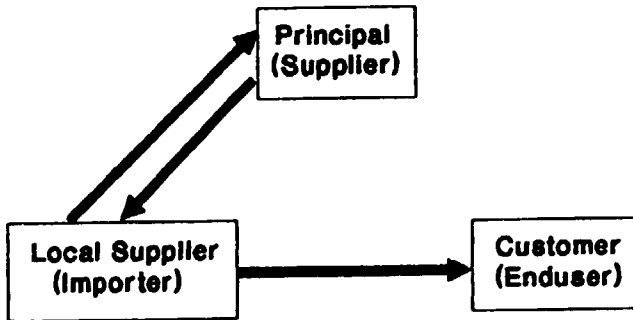
**Figure 5**  
**DIRECT INDENT PRACTICE**



Source: Trade Interviews.

In ex-stock practice on the other hand, goods are imported and paid to the principal suppliers by the importers, and later sold to endusers or other distributors. (See Figure 6.)

**Figure 6**  
**EX-STOCK PRACTICE**

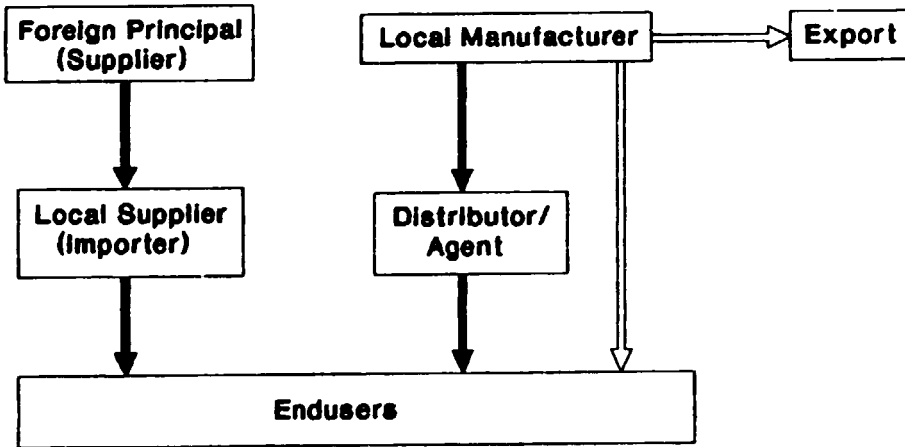


Source: Trade interviews.



Shown below is a diagram illustrating the general distribution practice for rubber chemicals in Malaysia.

**Figure 7**  
**MARKETING AND DISTRIBUTION NETWORKS**  
**OF MALAYSIA**



Legend: Solid lines mean major distribution channel.

Source: Trade Interviews.

Trading in Malaysia is mostly done in cash. Credit is also granted depending on the customer's creditworthiness. Credit terms can range from 30 to 90 days. (See Table 12.)

Table 12  
DISTRIBUTION AND TRADING PRACTICES IN MALAYSIA

Supplier	Source	Distribution Practice	Trade Terms
Revertex (M) Sdn. Bhd.	Local Production	20% sold direct to endusers 80% sold to agent/distributors	Mostly trade in cash and 30 days credit
Beng Teong Trading	P.R.O.C.  Local Production	Mostly sold directly to endusers  90% sold to the local market, both endusers and agents 10% exported to Singapore and South Thailand	Mostly trade in cash or L.C., old customers are given 60 days credit, new customers are given 30 days credit
ICI Chemical	France Holland England	30% to 50% direct indent 50% to 70% ex-stock	Trade in cash before delivery, and credits given depending on client reliability, up to 90 days credit
Bayer (M) Sdn. Bhd.	Germany	50% direct indent 50% ex-stock Sold direct to endusers	Trade in cash term and credit given up to 90 days depending on customer creditworthiness
Malaysian Carbon	Local Production	80% sold to local market and all are directly sold to endusers	Trade in cash before delivery, or normal credit terms depending on customer creditworthiness
Nonsanto Far East Ltd.	Belgium	100% direct to endusers 50% direct indent 50% ex-stock	60 - 90 days depending on the creditworthiness of customer

Source: Trade Interviews.

#### 4. THE INDONESIAN MARKET

##### 4.1 BACKGROUND ON THE RUBBER AND RUBBER PRODUCTS INDUSTRY

Indonesia is the second biggest natural rubber producer in the world after Malaysia, with 2.6 million hectares of land devoted to rubber. Indonesia's rubber production has in recent years been in the range of one million tons per annum; in 1988 the country produced 1,235,000 MT of natural rubber, accounting for 24.4 per cent of global output. The bulk of the country's production is exported, and Indonesia is also the second largest supplier of natural rubber in international markets.

Indonesia's rubber resources meet the needs of the following industries:

- o tires and tire-related products
- o footwear industry
- o latex products
- o industrial rubber goods.

The tire and footwear industries are the largest users of rubber accounting for 35 per cent and 34 per cent, respectively, of annual consumption of rubber. The remaining 31 per cent goes to the latex products and industrial rubber goods industries.

Domestic consumption of tires has grown sluggishly, at an annual rate of .2 per cent from 1986 to 1988. Slow growth has been attributed to decreased purchasing power as well as the entry of recapped tires. This may be offset by the ever increasing number of motor vehicles in the country. Also, bright prospects in foreign markets have made tire exports a priority in the government's agenda. Export demand will be fuelled by the continuing appreciation of several foreign currencies against the rupiah.

Prospects for the Indonesian footwear industry appear to be much brighter. The domestic consumption of rubber shoes in Indonesia totalled 35,363,900 pairs in 1987, an eight per cent increase over the previous year. However, it is in the export market where Indonesian footwear has shown dramatic growth from 39,250 pairs in 1983 to 484,331 pairs in 1987, increasing by an annual average of 87 per cent. This growth can be traced to increasing demand in European countries like the United Kingdom (U.K.), Holland, West

Germany, and Belgium. A number of new factories are scheduled to be constructed in the coming years.

## 4.2 DEMAND ASPECTS

### 4.2.1 Estimated Market Size

The estimated 1988 requirements of rubber chemicals in Indonesia were led by reinforcing agents which consist basically of carbon black. This was estimated at 24,775 MT or about 75 per cent of total demand.

The major user of carbon black is the tire industry, estimated to account for about 80 per cent of total imports. The balance of the 20 per cent is accounted for equally at 10 per cent each by the flashlight battery manufacturing industry and the print ink, paint, and other industries.

The major country sources of Indonesia of carbon black include Australia, Taiwan, South Korea, Malaysia, Singapore, and Thailand.

Various types and grades of carbon black are imported by Indonesia. These include the following: high abrasion furnace, general purpose furnace, and intermediate super abrasion furnace. However, importation volume of carbon black is projected to decline in the next few years due to the anticipated start up of commercial operations of a carbon black plant in the country, P. T. Continental Carbon Resti Pertiwi (CCRP). Aside from CCRP, other carbon black projects are being looked into by potential investors.

Indonesian demand for antidegradants, rubber accelerators, and vulcanizing agents constitute about 14 per cent of total requirements for rubber chemicals. (See Table 13.)

Table 13  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS IN INDONESIA  
1988  
(in metric tons)

Rubber Chemical	Volume
Antidegradants	1,487
Rubber accelerators	1,239
Vulcanizing agents*	1,982
Plasticizers	3,716
Reinforcing agents**	24,775

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

Source of basic data: 1988 Statistical Yearbook for Asia and the Pacific (United Nations).

These above estimates were based on the total rubber consumption of Indonesia in 1988 (99,100 MT) and the general compounding recipe of rubber products.

#### 4.2.2 Demand Projections

Demand for rubber chemicals is estimated to grow by 9.9 per cent per annum based on the average annual growth of Indonesian rubber consumption from 1977 to 1987. By the year 2000, requirements for rubber chemicals are projected to reach the following levels: antidegradants - 4,615 MT; rubber accelerators - 3,846 MT; vulcanizing agents - 6,153 MT; plasticizers - 11,537 MT; and reinforcing agents - 76,911 MT. (See Table 14.)

Table 14  
PROJECTED DEMAND FOR RUBBER CHEMICALS IN INDONESIA  
1990 - 2000  
(in metric tons)

Rubber Chemical	1990	1991	1992	1995	2000
Antidegradants	1,795	1,973	2,168	2,878	4,615
Rubber accelerators	1,496	1,644	1,807	2,399	3,846
Vulcanizing agents*	2,394	2,631	2,891	3,838	6,153
Plasticizers	4,488	4,933	5,421	7,196	11,537
Reinforcing agents**	29,923	32,886	36,141	47,973	76,911

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

#### 4.3 SUPPLY ASPECTS

##### 4.3.1 Local Production

Indonesia's rubber chemical requirements are met largely through importation. Rubber chemicals known to be manufactured locally in Indonesia include paraffin wax (an antidegradant) and zinc oxide (an activator).

##### 4.3.1.1 Paraffin Wax

Paraffin wax is often used as a protective covering for rubber products such as conveyor belts and v-belts and as an auxiliary material in other industries.

The only paraffin wax processing plant in Indonesia is in Balikpapan, East Kalimantan, owned by the state-owned oil company, Pertamina. The factory produces solid paraffin wax with an annual capacity of 51,000 MT.

#### 4.3.1.2 Zinc Oxide

Four companies in Indonesia manufacture zinc oxide. Together, these companies have an estimated annual production capacity of 4,200 MT with a utilization rate ranging from 80 to 100 per cent.

#### 4.3.2 Imports

Rubber chemicals play a vital role in the rubber industry. The production of rubber products depends on the availability and the price of these chemicals. Since local production of rubber components is limited to natural rubber, zinc oxide, and paraffin wax, producers of rubber products rely on the importation of rubber components and rubber chemicals.

The 1986 to 1988 rubber chemical imports are shown in Table 15. The imports of antidegradants show an average annual increase of 22.8 per cent from the 1986 volume of 17,039 MT to the 1988 volume of 25,707 MT. The 1986 to 1987 import volume of rubber accelerators increased by about five per cent from 2,081 MT to 2,191 MT, and further increased the following year by 10.2 per cent with a volume of 2,415 MT, for a two-year annual average growth rate of 7.7 per cent. For plasticizers, reinforcing agents, and other rubber chemicals, import volume fluctuated from 1986 to 1988.

Table 15  
 IMPORTS OF RUBBER CHEMICALS OF INDONESIA  
 1986 - 1988  
 (volume in metric tons; value in thousand US\$)

Description	1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value
Antidegradants	17,039	27,453	12,720	30,370	25,707	50,102
Phenol and its salts	9,030	6,096	9,741	7,265	16,700	21,677
Octyphenol, nonphenol and their isomer salts	-	-	815	2,212	-	-
Phosphoric esters their salts and their halogenated nitrosated derivatives	465	914	541	2,374	509	4,039
Phosphoric esters and their salts and derivatives	1,020	5,105	-	-	-	-
Other esters of their inorganic acids and derivatives	-	-	561	3,181	693	4,142
Amine function compound	6,227	13,792	775	14,440	7,200	10,053
Other acyclic monoamines	92	419	119	604	209	645
Other aromatic monoamines and their derivatives; salts thereof	205	247	176	302	160	1,546
Rubber Accelerators	2,081	5,759	2,191	6,042	2,415	8,038
Prepared rubber accelerators	2,081	5,759	2,191	6,042	2,415	8,038



Description	1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value
Vulcanizing Agents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Plasticizers	68,830	44,921	9,095	9,029	34,844	26,561
Crude camphor	285	247	176	302	145	351
Castor oil	87	70	43	32	106	126
Phthalic anhydride	86,558	44,604	8,876	8,695	34,593	26,084
Reinforcing Agents	33,818	24,146	30,771	21,177	40,997	30,088
Carbon black	33,818	24,146	30,771	21,177	40,997	30,088
Others	5,352	2,560	1,449	1,057	1,193	916
Paraffin wax	5,352	2,560	1,449	1,057	1,193	916

n.a. - not available.

Source : Trade Statistics of Indonesia.

#### 4.3.3 Exports

In 1988, Indonesia exported 909 MT of antidegradants, 1,598 MT of plasticizers, and 13 MT of reinforcing agents. Exports of antidegradants and plasticizers decreased in 1988 from the 1987 levels. (See Table 16.)

Exports of antidegradants and reinforcing agents in 1988 from Indonesia went mostly to Singapore. Exports of plasticizers mostly went to countries outside ASEAN.

It must be emphasized at this point that the following classifications of export commodities may include items not at all used by the rubber processing industry. Consequently, given figures may overstate the actual amount of rubber chemicals exported by a considerable margin. This qualification also holds true for the rest of the countries covered by this study.

Table 16  
 EXPORTS OF RUBBER CHEMICALS OF INDONESIA  
 1986 - 1988  
 (volume in metric tons; value in thousand US\$)

Description	1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value
Antidegradants	71	184	3,273	4,566	909	1,381
Other derivatives of phenol and phenol alcohol	-	-	-	-	74	219
Phosphoric esters their salts and their halogenated sulphonated nitrates or nitrosated derivatives	-	-	118	958	-	-
Other esters of their inorganic acids and their salts and derivatives	-	-	5	39	7	35
Amine function compound	71	184	49	62	48	48
Aniline derivatives and their salts	-	-	3,101	3,507	780	1,078
Rubber Accelerators	-	-	-	-	-	-
Vulcanizing Agents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Plasticizers	1	-	2,525	2,088	1,598	960
Crude camphor	1	8	9	2	2	1
Castor oil	-	-	16	11	1,096	524
Pthalic anhydride	-	-	2,500	2,076	500	435

Description	1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value
Reinforcing Agents	-	-	-	-	13	16
Carbon black	-	-	-	-	13	16
Others	-	-	1,449	506	13,797	1,594
Paraffin wax	-	-	1,449	506	4,797	1,594
Other prep. containing petroleum oil and oils obtained from bituminous minerals	-	-	-	-	9,000	n.a.

\* Less than US\$1,000.

n.a. - not available.

Source : Trade Statistics of Indonesia.

## 5. THE PHILIPPINE MARKET

### 5.1 BACKGROUND ON THE RUBBER AND RUBBER PRODUCTS INDUSTRY

#### 5.1.1 Rubber Industry

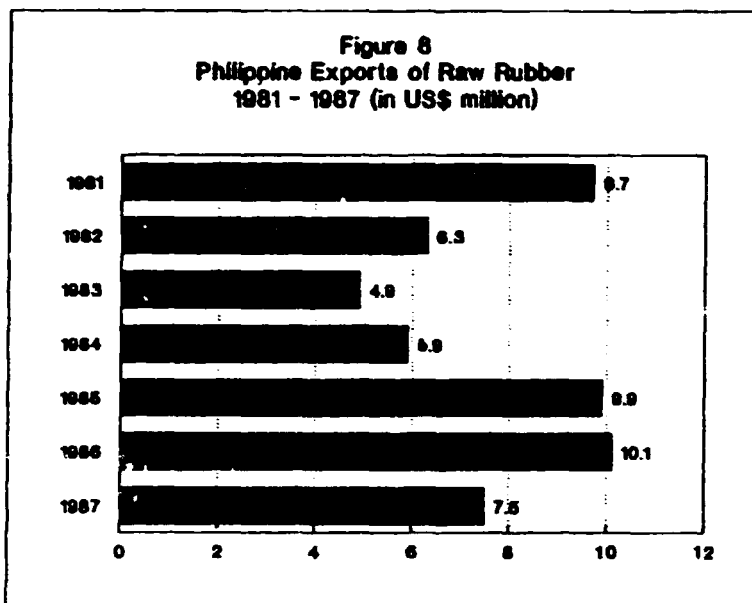
The Philippines is one of the few countries in the world located within that area ten degrees north and south of the equator where the rubber tree can grow and produce latex. Introduced by Malaysian traders more than eight decades ago, the rubber industry is one of the oldest industries in the country today.

Ranking among the top ten natural rubber producers in the world, the Philippines' output increased at an annual average of four per cent from 69,900 MT in 1983 to an estimated 85,000 MT in 1988.

The Philippines' rubber plantations are found mostly in the island of Mindanao, particularly in the provinces of Bukidnon, Agusan del Sur, Zamboanga del Norte, Zamboanga del Sur, and Basilan.

From 1981 to 1987, the country's exports of natural rubber increased at an annual rate of 3.25 per cent. Export earnings averaged US\$7.7 million annually. (See Figure 8.) Major Philippine markets include the United States, Taiwan, South Korea, and Malaysia.

Philippine consumption of rubber, including both natural and synthetic rubber, was estimated at around 93,600 MT in 1988.



### 5.1.2 Rubber Products Industry

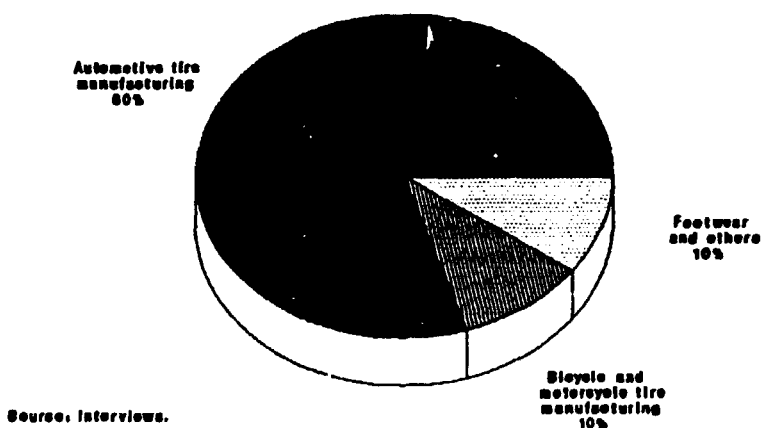
More than 150 companies produce a wide range of rubber products from giant earthmover tires and marine fenders to wear components, machinery and automotive parts, rubber footwear, o-rings, feeding nipples, all types of gloves, and many others. Most of the local rubber companies serve only the domestic market.

Many of these companies are located in Metro Manila while the rest operate in provincial key cities such as Bacolod, Cebu, Cagayan de Oro, and Davao.

Of the chemicals used solely for compounding rubber in the Philippine rubber products manufacturing industry, an estimated 80 per cent goes into automotive tire manufacturing. Main users are the three tire manufacturers in the Philippines, namely; Goodyear Tire and Rubber Co., Philtread Tire and Rubber Co., and Sime Darby International Tire Co., whose manufacturing plants are all located in Metro Manila. An estimated 10 per cent of these chemicals are used for manufacturing bicycle and motorcycle tires, while the remaining 10 per cent is used for the manufacture of footwear, automotive/industrial

products, latex, foam and other rubber goods.  
(See Figure 9.)

**Figure 9**  
**Demand Structure for Rubber Chemicals**  
**in the Philippines**



## 5.2 DEMAND ASPECTS

### 5.2.1 Estimated Market Size

#### 5.2.1.1 Antidegradants

Philippine consumption of antidegradants (excluding paraffin wax) was estimated at 1,404 MT in 1988. Although paraffin wax is used as an antidegradant of rubber products, it was categorized separately since it is also used in pharmaceuticals,

cosmetics, electronics, and several other industries.

The most widely used anti-degradants in the country consist of polymerized 1,2-dihydro-2,2,4-trimethylquinoline (generic abbreviation: TMQ) which accounted for 30 per cent of the apparent demand for antidegradants; N-(1,3-dimethylbutyl) N'-phenyl-p-phenylene diamine (abbreviation: 6PPD) which took up 26 per cent of the consumption of antidegradants; N-isopropyl-N'-phenyl p-phenylenediamine (abbreviation: IPPD) which took up 19 per cent; and styrenated phenol which represented 13 per cent of the demand for antidegradants. (See Table 17.)

Table 17  
ESTIMATED CONSUMPTION OF ANTIDEGRADANTS BY CHEMICAL  
1988  
(in metric tons)

Rubber Chemical	Estimated Consumption	% to Total
Polymerized 1,2-dihydro-2,2,4-trimethylquinoline	421	30
N-(1,3-dimethylbutyl) N'-phenyl-p-phenylene diamine	385	26
N-isopropyl-N'-phenyl p-phenylenediamine	267	19
Styrenated phenol	183	13
Butylated hydroxy toluene	56	4
Diphenylamine and acetone	28	2
4,4'-butylidenebis-16-tert-butyl-M-cresol	28	2
Not available	56	4
<b>Total</b>	<b>1,404</b>	<b>100</b>

Sources of basic data: Interviews

1988 Statistical Yearbook for Asia and the Pacific  
(United Nations).

#### 5.2.1.2 Rubber Accelerators

Demand for rubber accelerators was estimated at 1,170 MT in 1988. Of this total, an estimated 74 per cent was accounted for by four specific chemicals: 2-(morpholiniothio) benzothiazole (generic abbreviation:

MBS) which took up 30 per cent of the demand for rubber accelerators; 2,2'dithiobis (benzothiazole) (generic abbreviation: MBTS) which accounted for 20 per cent; N-tert-butyl-2-benzothiazole sulfenamide (abbreviation: TBBS) which accounted for 14 per cent of demand; and 2-mercaptobenzothiazole (abbreviation: MBT) with 10 per cent of rubber accelerator consumption in 1988. The balance of 26 per cent is taken up by such accelerators as benzothiazole disulfide (7%), diphenyl guanidine (5%), tetramethyl thiuram disulfide (4%), and six other chemicals. (See Table 18.)

Table 18  
ESTIMATED CONSUMPTION OF RUBBER ACCELERATORS BY CHEMICAL  
1988  
(in metric tons)

Rubber Chemical	Estimated Consumption	% to Total
2-(morpholiniothio) benzothiazole	351	30
2,2' dithiobis (benzothiazole)	234	20
N-t-butyl-2-benzothiazole sulfenamide	164	14
2-mercaptobenzothiazole	117	10
Benzothiazole disulfide	82	7
Diphenyl guanidine	58	5
Tetramethyl thiuram disulfide	47	4
Tetramethyl thiuram monosulfide	35	3
N-cyclohexyl-2-benzothiazole sulfenamide	23	2
Zinc diethyl dithiocarbamate	23	2
An activated blend of MBTS and DPG	23	2
Zinc dibutyl dithiocarbamate	12	1
Zinc dimethyl dithiocarbamate	1	*
<b>Total</b>	<b>1,170</b>	<b>100</b>

\* Less than one per cent.

Sources of basic data: Interviews  
1988 Statistical Yearbook for Asia and the Pacific (United Nations).



#### 5.2.1.3 Vulcanizing Agents

Consumption of vulcanizing agents (consisting mostly of both soluble and insoluble sulphur) by the Philippine rubber products industry was estimated at 1,872 MT in 1988.

#### 5.2.1.4 Plasticizers

The consumption of plasticizers and softeners in the manufacture of rubber products in the Philippines in 1988 was estimated at 3,510 MT. Accounting for 69 per cent of this is highly aromatic staining process oil, which is manufactured locally. Other chemicals used as plasticizers and softeners in the Philippines include paraffinic process oil, pine tar, and alkylated naphthenia and aromatic hydrocarbon resins.

#### 5.2.1.5 Reinforcing Agents

Carbon black is widely used as a reinforcing agent in the manufacture of rubber products. The apparent consumption of carbon black in the Philippines for 1988 was estimated at 23,400 MT, most of which was locally sourced. The tire industry (includes automotive, bicycle, and motorcycle tires) uses around 95 per cent of the carbon black manufactured in the Philippines, while the balance is consumed by manufacturers of paints and inks and other rubber products.

A summary of the estimates of Philippine rubber chemical demand discussed above is shown in Table 19. These figures were arrived at using the general rubber compounding recipe mentioned earlier in this report.

Table 19  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS  
IN THE PHILIPPINES  
1988  
(in metric tons)

Rubber Chemical	Volume
Antidegradants	1,404
Rubber accelerators	1,170
Vulcanizing agents *	1,872
Plasticizers	3,510
Reinforcing agents **	23,400

\* Soluble and insoluble sulphur only.  
\*\* Carbon black only.

Source of basic data: 1988 Statistical Yearbook for Asia and the Pacific (United Nations).

#### 5.2.2 Demand Projections

The growth rate used (5.1 per cent) in the following projections was based on the average growth rate from 1977 to 1987 of total rubber consumption in the Philippines. Table 20 shows the projected Philippine demand for rubber chemicals from 1990 up to year 2000.

Table 20  
PROJECTED DEMAND FOR RUBBER CHEMICALS IN THE PHILIPPINES  
1990 - 2000  
(in metric tons)

	1990	1991	1992	1995	2000
Antidegradants	1,551	1,630	1,713	1,989	2,550
Rubber accelerators	1,292	1,358	1,428	1,657	2,125
Vulcanizing agents*	2,068	2,173	2,284	2,652	3,400
Plasticizers	3,877	4,075	4,283	4,972	6,376
Reinforcing agents**	25,848	27,166	28,561	33,146	42,506

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

Philippine demand for antidegradants in 1990, estimated at 1,551 MT, is projected to increase to 2,550 MT by the year 2000. The projected 1990 demand for rubber accelerators of 1,292 MT is expected to reach 2,125 MT by year 2000. Moreover, Philippine consumption of vulcanizing agents is expected to grow from the projected 1990 level of 2,068 MT to 3,400 MT by year 2000.

### 5.3 SUPPLY ASPECTS

#### 5.3.1 Sources of Supply

Antidegradants, rubber accelerators, and most other rubber chemicals are imported, except for zinc oxide, carbon black, highly aromatic staining oil and paraffinic process oils (plasticizers). Zinc oxide is manufactured locally by three companies, while carbon black is manufactured in the Philippines by only one company, Columbian Carbon Phils., Inc. Aromatic staining oil is manufactured by Petrophil Inc.

Sulphur, which is used as a vulcanizing agent in the manufacture of rubber products, is totally imported from abroad, although one chemical company (Chemphil Manufacturing Corporation) processes imported sulphur physically and then sells it to the local market. It is sold in three grades: ground sulphur (rubbermakers' grade), raw sulphur, and insoluble sulphur.

There are three manufacturers of zinc oxide in the Philippines. These include Winsteel Manufacturing Co. Inc., which has an annual production capacity of 3,600 MT; Metoxide Phils. Corporation, with an annual production capacity of 1,200 MT; and South Pacific Chemical Industries, Inc. These three companies have a combined zinc oxide production equivalent to about 70 per cent of local consumption in 1988.

Columbian Carbon Phils. Inc. is the sole manufacturer of carbon black in the Philippines. In 1988, it had an annual plant capacity of 17,000 MT and a production level of about 14,000 MT, resulting in a capacity utilization of 82 per cent. Aside from catering to the domestic market (particularly the tire manufacturing industry), the company exports carbon black to Asian countries. In fact, export sales account for about 10 per cent of the total sales of the company. Philippine exports of carbon black in 1988 totalled 901 MT, of which 66 percent went to Indonesia and 33 percent went to Thailand.

#### 5.2.2 Distribution and Trade Practices

Most of the imported rubber chemicals used in the Philippines is manufactured by three companies: Monsanto Chemical Co. (USA); Bayer (West Germany); and Uniroyal Chemical Co. (USA). Monsanto and Bayer have their own sales offices here in the country which facilitate the importation of rubber chemicals by their major clients -- Goodyear, Sime Darby, Philtread, Manhattan Rubber and Plastic Manufacturing Corporation, Jonson Manufacturing Company, Rubberworld Phils., etc. Smaller orders are coursed through their respective exclusive distributors. Dearborn Chemicals is the exclusive distributor of Monsanto Chemicals. For Bayer, Trust Chemicals is the exclusive

distributor in the Philippines, while ArtChem is the exclusive distributor for Uniroyal Chemicals.

The large customers usually purchase locally manufactured rubber chemicals directly from the manufacturer. For example, Goodyear sources its zinc oxide requirements directly from Metoxide Phils. Corp. and Winsteel Manufacturing Co., Inc., while it sources its carbon black requirements directly from Columbian Carbon Phils. Inc. As a matter of fact, Columbian Carbon Phils. Inc. directly sells carbon black to around 35 customers, 90 per cent of which are located in Metro Manila.

Most of the local manufacturers of rubber chemicals allow anywhere from 15 to 90 days of credit on purchases of their products by old customers. The specific credit period depends on company policy. On the other hand, "cash on delivery" or prepaid deliveries is the norm for newer customers.

In particular, for big customers like tire manufacturers, Columbian Carbon Phils. Inc. consigns a certain amount of carbon black in the customer's warehouse, taking note of the decreases in the consigned volume after an agreed period of time. An invoice is then issued, after which payment is expected within two to three days.

6. THE SINGAPORE MARKET

6.1 BACKGROUND ON THE RUBBER AND RUBBER PRODUCTS INDUSTRY

Singapore produces neither natural nor synthetic rubber, and consequently the country's rubber requirements have to be sourced from abroad. As shown in Table 21, Singapore imported a total of 975,800 MT of natural rubber (NR) and 5,900 MT of synthetic rubber (SR) in 1988. Sources of NR imports by Singapore include Malaysia, which supplied 562,400 MT (57.6%), Indonesia, which supplied 266,400 MT (27.3%), Thailand, which accounted for 97,700 MT (10%), and Myanmar, which provided 5,400 MT (0.6%). Other countries accounted for the balance totalling 43,900 MT, or 4.5 per cent of Singaporean NR imports in 1988.

Table 21  
IMPORTS, EXPORTS, AND DOMESTIC CONSUMPTION  
OF RUBBER IN SINGAPORE  
1988  
(in metric tons)

	Latex -----	Total Rubber -----
NR Imports:		
Malaysia	n.a.	562,400
Indonesia	100	266,400
Thailand	-	97,700
Myanmar	-	5,400
Others	-	43,900
<b>TOTAL NR IMPORTS</b>	<b>n.a.</b>	<b>975,800</b>
<b>NET SR IMPORTS</b>	<b>500</b>	<b>5,900</b>

	Latex	Total Rubber
	-----	-----
NR Exports to:		
U.S.A.	1,300	102,400
F.R. of Germany	3,100	31,600
France	2,900	31,300
Italy	700	23,100
Yugoslavia	0	17,100
Spain	400	16,000
U.K.	2,300	14,600
U.S.S.R.	13,300	13,700
Belgium/Lux.	100	10,400
Netherlands	600	7,800
Poland	800	1,400
Other Europe	5,000	39,600
P.R.O.C.	12,000	124,000
Brazil	500	81,200
Japan	500	79,200
Taiwan	11,100	36,900
Korea, Rep. of	600	30,300
Argentina	3,200	24,400
Iran	800	18,200
Canada	-	18,200
Columbia	400	11,900
Australia	800	10,200
Egypt	1,200	8,400
Israel	200	6,700
Mexico	300	2,900
Venezuela	300	6,900
Others	12,600	188,600
TOTAL EXPORTS	75,000	957,000
Consumption:	n.a.	1,200

N.B. - Doublecounting of rubber trans-shipments through Singapore was estimated to be about 30,000 MT per month for 1988.

However, about 98 per cent of Singaporean imports of rubber, or 957,000 MT were exported during 1988. P.R.O.C. was the largest single buyer of Singaporean NR exports, accounting for 13 per cent of NR exports (124,000 MT), followed by the United States, which received 10.7 per cent (102,400 MT). Other large buyers include Brazil with a volume of 81,200 MT

(8.5%), Japan with a volume of 79,200 MT (8.3%), and European countries with a volume of 206,600 MT (21.6%).

Rubber consumption of Singapore in 1988 was very small, estimated at 1,200 MT.

The rubber processing industry in Singapore is a shrinking industry. The 16 establishments involved in rubber processing in 1978 decreased steadily to five establishments in 1987. (See Table 22.) Moreover, the production output of the industry decreased from a total volume of 374,000 MT in 1978 to a total of only 81,000 MT in 1987. This represents an average annual decline of 15.6 per cent. For the same period, the value of output decreased by an annual average of 15.8 per cent, from US\$352.4 million in 1978 to US\$74.9 million in 1987.

Table 22  
SELECTED INDICATORS OF THE  
RUBBER PROCESSING INDUSTRY IN SINGAPORE (a)  
1978 - 1987

Year	No. of Establishments (b)	No. of Workers	Value Added to Output Ratio (%)	Volume (in '000 MT)	Total Value of Output (in US\$ Million)
1978	16	2,092	4.6	374	352.4
1979	15	2,044	7.5	446	538.1
1980	14	1,977	4.9	381	491.5
1981	12	1,826	4.8	340	365.7
1982	11	1,303	5.6	294	230.9
1983	10	980	7.8	202	202.9
1984	8	689	4.0	207	188.6
1985	7	516	4.6	101	76.0
1986	7	425	6.3	76	58.3
1987	5	216	6.4	81	74.9

Notes: a) Covers only establishments with 10 or more workers.  
b) Establishment is defined as a manufacturing unit engaged in one industrial activity in a single location.

Source: Singapore, Economic Development Board  
Report on the Census of Industrial Production.



From 1978 to 1987, the most important types of output of the Singaporean rubber processing industry were processed Smoked Sheet Rubber (SSR), Standard Indonesian Rubber (SIR), Technically Specified Rubber (TSR), and packed Visually Graded Sheet Rubbers (RSS), which during the period accounted for more than 90 per cent of the output of the industry. (See Table 23.) Packed SIR and Standard Malaysian Rubber (SMR) were produced in Singapore in small quantities from 1978 to 1981, but production for these particular types of processed rubber were nil from 1982 up to 1987. Packed crepe was manufactured in Singapore from 1978 up to 1987, but in very insignificant quantities.

Table 23  
 TYPES OF OUTPUT OF THE SINGAPORE  
 RUBBER PROCESSING INDUSTRY  
 1978 - 1987  
 (volume in thousand metric tons; value in million US\$)

Year	Processed SSR, SIR, TSR		Packed SIR, SMR		Packed RSS		Packed Crepe	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
1978	118	107.5	9	7.3	238	227.0	11	10.5
1979	131	153.5	13	15.7	291	354.3	11	14.7
1980	125	160.6	17	21.6	230	296.9	9	12.3
1981	109	116.8	11	11.7	218	235.2	2	2.0
1982	75 (a)	59.2 (a)	-	-	217	170.3	2	1.5
1983	57 (b)	53.7 (b)	-	-	143	147.7	2	1.5
1984	55 (b)	51.2 (b)	-	-	151	136.4	1	1.0
1985	42 (b)	31.5 (b)	-	-	54	41.0	5	3.5
1986	32 (c)	23.6 (c)	-	-	40	31.1	4	3.6
1987	31 (b)	28.3 (b)	-	-	47	44.2	3	2.5

Notes: a) SSR and TSR only.  
 b) SSR only.  
 c) SSR and SIR only.

Source: Singapore, Economic Development Board  
 Report on the Census of Industrial Production.

## 6.2 DEMAND ASPECTS

### 6.2.1 Estimated Market Size

Demand for rubber chemicals in Singapore was estimated based on the correlation of rubber consumption and rubber chemical requirements using the general compounding recipe. The estimated requirements for rubber chemicals in 1988 are shown in Table 24.

Table 24  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS IN SINGAPORE  
1988  
(in metric tons)

Rubber Chemical -----	Volume -----
Antidegradants	18
Rubber accelerators	15
Vulcanizing agents *	24
Plasticizers	45
Reinforcing agents **	300

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

### 6.2.2 Demand Projections

Consumption of rubber (natural and synthetic) in Singapore declined at an annual average of 11.3 per cent from 1977 to 1988. Since trends in the rubber industry have a direct influence on the consumption of rubber chemicals in Singapore, an average annual growth rate of -11.3 per cent was assumed in projecting the rubber chemical requirements of Singapore from 1990 up to year 2000. (See Table 25.)

Table 25  
PROJECTED DEMAND FOR RUBBER CHEMICALS IN SINGAPORE  
1990 - 2000  
(in metric tons)

	1990	1991	1992	1995	2000
Antidegradants	14	13	11	8	4
Rubber accelerators	12	10	9	6	4
Vulcanizing agents*	19	17	15	10	6
Plasticizers	35	31	28	19	11
Reinforcing agents**	236	209	186	130	71

\* Soluble and insoluble sulphur only.  
\*\* Carbon black only.

The demand for antidegradants and rubber accelerators are projected to decline from their projected 1990 level of 14 MT and 12 MT, respectively, to an estimated four MT each by the year 2000. Likewise, consumption of vulcanizing agents is expected to go down from an estimated 19 MT in 1990 to around six MT by year 2000.

### 6.3 SUPPLY ASPECTS

#### 6.3.1 Imports

Imports of rubber chemicals from 1987 to 1989 show that imports of phenol and its salts (an antidegradant) registered the highest annual growth rate of 22.1 per cent annually during the period. Castor oil (a plasticizer) showed a relatively modest growth rate of 12.6 per cent. Other categories posted either insignificant positive growth rates or negative growth rates. (See Table 26.)

Table 2F  
 IMPORTS OF RUBBER CHEMICALS OF SINGAPORE  
 1987 - 1989  
 (volume in metric tons; value in thousand US\$)

Rubber Chemical	1987		1988		1989 *	
	Volume	Value	Volume	Value	Volume	Value
Antidegradants	17,109	53,200	23,735	70,492	24,401	53,660
Phenol & Its Salts	8,677	6,197	14,499	17,915	12,932	15,115
Other Phenol & Phenol Alcohols	1,544	4,015	1,983	4,856	1,471	4,172
Amine-Function Compounds	n.a.	4,505	n.a.	7,030	2,704	9,115
Other Oxygen-Function Amino Compounds	6,888	38,483	7,253	40,691	7,294	25,248
Rubber Accelerators	164	466	305	801	165	526
Rubber accelerators (Prepared)	164	466	305	801	165	526
Vulcanizing Agents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Plasticizers	24,380	24,643	24,419	26,972	24,589	26,340
Other Ketone & Quinone Function Compounds	7,567	7,731	8,300	9,394	8,843	9,853
Castor Oil	359	381	372	604	453	476
Animal & veg. oils boiled oxidised etc.	874	1,084	1,190	1,673	389	547
Diocetyl Orthophtalates	7,864	7,302	9,554	8,279	8,998	6,721
Other Polycarboxylic Acid & Derivatives	7,695	8,145	6,003	7,122	7,904	8,743

Rubber Chemical	1987		1988		1989 *	
	Volume	Value	Volume	Value	Volume	Value
Reinforcing Agents	4,808	4,386	5,139	4,997	3,922	4,335
Carbon Black	4,808	4,386	5,139	4,997	3,922	4,336

n.a. - not available.

\* - Annualized.

Source: Foreign Trade Statistics of Singapore.

Most of the biggest exporters of rubber chemicals to Singapore come from the developed countries. For example, Japan, West Germany, and the United States are among the largest sources of rubber chemical imports. Only in the sourcing of carbon black do the top two exporters come from developing countries: P.R.O.C. and Malaysia.

### 6.3.2 Exports

"Exports" in this section refers to domestic exports. This pertains to exports of Singapore origin and comprise primary commodities grown or produced in Singapore and goods which have been transformed in Singapore including those with imported materials or parts.

Table 27 presents the exports of rubber chemicals of Singapore from 1987 to 1989. Exports of antidegradants grew at an average rate of 24.9 per cent per annum from 1987 to 1989, while exports of vulcanizing agents declined at an average annual rate of 23 per cent for the same period. Exports of rubber accelerators are minimal.

Singapore's biggest importer of rubber chemicals in the ASEAN region is Malaysia. In 1988, Malaysia accounted for more than half of Singapore exports of antidegradants, rubber accelerators, and vulcanizing agents. Moreover, Malaysia imported about 25 per cent of Singapore exports of plasticizers and about 14 per cent of exports of reinforcing agents.

Table 27  
 EXPORTS OF RUBBER CHEMICALS OF SINGAPORE  
 1987 - 1989  
 (volume in metric tons; value in thousand US\$)

Rubber Chemical	1987		1988		1989 *	
	Volume	Value	Volume	Value	Volume	Value
Antidegradants	937	16,979	1,582	28,880	1,461	27,066
Phenol & Its Salts	-	-	-	-	3	13
Other Phenol & Phenol Alcohols	-	-	-	-	2	11
Amine-Function Compound	n.a.	492	n.a.	681	165	478
Other Oxygen-Function Amino Compounds	937	16,487	1,582	28,199	1,291	28,564
Rubber Accelerators	4	6	6	10	2	4
Rubber Accelerators (Prepared)	4	6	6	10	2	4
Vulcanizing Agents	22,052	2,868	21,933	5,149	13,067	2,213
Sulphur	22,052	2,868	21,933	5,149	13,067	2,213
Plasticizers	2,615	2,019	1,444	2,210	1,144	1,651
Other Ketone & Quinone Function Compounds	420	744	584	1,187	302	525
Castor Oil	-	-	-	-	-	-
Animal & veg. oils boiled oxidised etc	1,892	899	242	343	212	204
Diocetyl Orthophtalates	214	259	430	516	469	706
Other Polycarboxylic Acid & Derivatives	89	117	188	170	161	216

Rubber Chemical	1987		1988		1989 *	
	Volume	Value	Volume	Value	Volume	Value
Reinforcing Agents	4,121	6,814	2,681	5,072	3,635	6,360
Carbon Black	4,121	6,814	2,681	5,072	3,635	6,360

n.a. - not available.

\* - Annualized.

Source: Foreign Trade Statistics of Singapore.

## 7. THE THAILAND MARKET

### 7.1 BACKGROUND ON THE RUBBER AND RUBBER PRODUCTS INDUSTRY

#### 7.1.1 Rubber Production

From 502,000 MT in 1981, Thailand's output of natural rubber increased steadily to 974,900 MT in 1988. (See Table 28.) This puts Thailand as the third largest producer of natural rubber in the world after Malaysia and Indonesia, producing almost twice the combined output of its two closest rivals, India and P.R.O.C., in 1988. Moreover, its share in the world production of natural rubber has also increased from only 8.6 per cent in 1967 to 19.3 per cent in 1987.

However, Thailand lacks a synthetic rubber manufacturing capacity of its own, and so demand for the product has to be filled entirely from imports. Japan, Taiwan, the United States, France, and West Germany constitute the major suppliers of synthetic rubber to the Thai economy.

Table 28  
PRODUCTION, EXPORTS AND CONSUMPTION  
OF NATURAL RUBBER IN THAILAND  
1981 - 1988  
(in thousand metric tons)

Year	Production	Exports	Domestic Consumption
1981	502.0	476.0	28.9
1982	562.2	546.7	29.0
1983	588.0	552.5	32.1
1984	629.2	595.6	31.6
1985	721.9	684.9	32.7
1986	782.1	755.2	39.6
1987	921.6	873.2	47.1
1988	974.9	906.4	57.3

Source: Rubber Research Institute (Thailand).



### 7.1.2 Rubber Exports

As shown in Table 28, Thailand exported about 93 per cent of its natural rubber production in 1988. In fact, the country has exported an average of 94.9 per cent of its natural rubber production from 1981 to 1988, while consuming only slightly more than five per cent of its production during the same period.

Five companies account for some 70 - 80 per cent of Thailand's entire export trade in rubber. The Teck Bee Heng Co. Ltd. (also known as Yang Thai Pak Tai Co. Ltd.) and Huay Chuan Co. Ltd. are estimated to account for more than 50 per cent of Thailand's rubber exports. The others are Nusuntara Co. Ltd., Sing Thai Mining Co. Ltd., and Pattanakit Rubber Co. Ltd., which together handle about 25 per cent of the country's rubber exports.

The main export market for Thailand's natural rubber has traditionally been Japan, and has generally accounted for more than half of Thailand's total rubber exports. Reaching a peak of almost 70 per cent in 1981, Japan's share has declined steadily with attempts to diversify the country's export markets. Nonetheless, it still remained a high 46 per cent in 1987. Secondary export markets include P.R.O.C., the United States, and Singapore, among others. (See Table 29.)

Table 29  
EXPORTS OF NATURAL RUBBER OF THAILAND  
BY COUNTRY OF DESTINATION  
1981 - 1987  
(in thousand metric tons)

	1981	1982	1983	1984	1985	1986	1987
Japan	332.9	320.9	322.1	333.8	347.9	373.5	401.8
P.R.C.C.	10.0	31.8	39.9	41.8	59.4	70.7	133.5
USA	42.1	48.1	72.0	67.7	81.2	85.7	92.9
EC (a)	12.7	13.8	10.8	28.5	41.6	67.9	65.3
Singapore	31.9	54.0	49.2	64.1	49.5	37.8	55.6
Malaysia	17.2	18.0	16.4	14.3	15.3	10.8	28.9
Eastern Europe (b)	13.8	18.8	15.1	16.9	20.5	14.4	21.5
Other Europe	0.7	3.5	3.1	7.4	19.7	17.1	11.5
Others	14.7	37.8	23.9	31.0	49.8	77.3	62.2
Total	476.0	546.7	552.5	605.5	684.9	765.2	873.2

(a) Includes Belgium, France, Italy, Luxembourg, Netherlands, Portugal, Spain, the UK and West Germany.

(b) Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania and the USSR.

Source: Rubber Research Institute (Thailand).

### 7.1.3 Rubber Consumption

Although Thailand is one of the world's largest producers of natural rubber, both the size and the raw material requirements of the Thai rubber products industry remain relatively modest. From 1977 to 1988, domestic consumption of natural rubber grew at an average rate of 8.7 per cent per annum, totalling 57,300 MT in 1988. This figure is only about six per cent of its 1988 production output of 974,900 MT.

As shown in Table 30, the manufacture of car tires and tubes is the most important activity in the Thai rubber goods industry. For the first half of the 1980's, consumption by the tire and tube industry accounted for well over half of the total natural rubber requirements of Thailand, dipping to 47.7 per cent in 1986. The production of rubber bands and rubber gloves has

also gained in significance in recent years, although the increase of the needs of the rubber gloves industry has been much more dramatic. From practically nil from 1981 to 1985, the rubber demand of Thai gloves manufacturers has risen to 4,800 tons in 1986, outpacing the consumption of even the footwear industry, which, through the 1980s, has been a traditionally important sector of the rubber goods industry in Thailand.

Table 30  
DOMESTIC CONSUMPTION OF NATURAL RUBBER BY INDUSTRY  
1981 - 1986  
(in thousand metric tons)

Industry	1981	1982	1983	1984	1985	1986
Car tyres	18.6	16.9	20.5	19.5	17.9	18.9
Rubber bands	1.8	2.3	2.5	2.7	6.0	5.7
Gloves	-	-	-	-	-	4.8
Shoes and sandals	2.7	3.5	3.7	3.3	3.1	3.9
Other elastics	0.7	0.8	0.9	1.0	1.0	1.5
Vehicle parts	0.9	1.1	1.0	1.1	1.0	1.0
Footwear parts	0.4	0.4	0.6	0.3	0.4	0.6
Tyre retreading	1.3	1.4	0.7	1.0	0.9	0.5
Foam rubber goods	0.1	0.2	0.1	0.1	0.2	0.5
Battery cases	0.4	0.4	0.4	0.6	0.4	0.4
Carpet backing	0.1	0.2	0.1	0.3	0.3	0.3
Belts	0.3	0.3	0.2	0.2	0.3	0.2
Hoses	0.2	0.3	0.2	0.1	0.2	0.2
Rice polishers	0.4	0.2	0.1	0.2	0.1	0.2
Balloons	0.1	0.1	0.1	0.2	0.1	0.1
Motorcycle tyres	0.1	0.1	0.1	0.1	0.1	-
Other	0.8	0.8	0.9	1.0	0.7	0.8
Total	28.9	29.0	32.1	31.7	32.7	39.8

Source: Rubber Research Institute (Thailand).

The Thai rubber products industry is highly diversified and produces a wide range of goods. It is fragmented, with a proliferation of small companies with only one product line. Moreover, the industry has been turning towards exports markets from its beginnings in import substitution. At the same time, it meets domestic requirements for a wide range of rubber-based consumer and industrial products.

## 7.2 DEMAND ASPECTS

### 7.2.1 Estimated Market Size

The following estimates of rubber chemical requirements of Thailand are based on computations involving only natural rubber consumption and does not include consumption of synthetic rubber. This is because there is no available data on the synthetic rubber consumption nor on total rubber consumption of Thailand. For this reason, the estimated demand figures may be understated.

#### 7.2.1.1 Antidegradants

An estimated 860 MT of antidegradants were consumed in Thailand in 1988.

#### 7.2.1.2 Rubber Accelerators

Estimated demand for rubber accelerators in Thailand in 1988 was around 716 MT. As there is no local production of rubber accelerators in Thailand, this demand is sourced totally from abroad.

#### 7.2.1.3 Vulcanizing Agents

Around 1,146 MT of vulcanizing agents, consisting mostly of sulphur, were consumed by the Thai rubber processing industry in 1988.

#### 7.2.1.4 Plasticizers

An estimated 2,149 MT of plasticizers were utilized by Thailand in 1988.

#### 7.2.1.5 Reinforcing Agents

The material used for the last 60 years or more for improving elasticity and tensile strength of rubber has been carbon black. Every pound of rubber used in tire treads require at least one-half pound of carbon black; tubes require more, and carcasses only slightly less. In Thailand,

approximately 14,325 MT of carbon black was consumed in 1988. Based on interviews, an estimated 80 per cent of the carbon black consumption in Thailand is used by the tire industry. Although some carbon black is imported, most carbon black consumed in Thailand is locally produced.

A summary of the demand for rubber chemicals in Thailand in 1988 appears in Table 31 below. As was done for the other countries in this report, a general rubber compounding recipe was used in arriving at these estimates.

Table 31  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS IN THAILAND  
1988  
(in metric tons)

Rubber Chemical -----	Volume -----
Antidegradants	860
Rubber accelerators	716
Vulcanizing agents *	1,146
Plasticizers	2,149
Reinforcing agents **	14,325

- \* - Soluble and insoluble sulphur only.
- \*\* - Carbon black only.

Source of basic data: 1988 Statistical Yearbook for Asia and the Pacific (United Nations).

#### 7.2.2 Demand Projections

Thai consumption of natural rubber grew from 1977 through 1988 at an annual average rate of 8.7 per cent. Assuming that the growth rate of demand for rubber chemicals follows the trend of natural rubber consumption, Table 32 gives

the projected demand by Thailand for antidegradants, rubber accelerators, vulcanizing agents, plasticizers and reinforcing agents from 1990 through year 2000.

Table 32  
PROJECTED DEMAND FOR SELECTED RUBBER CHEMICALS IN THAILAND  
1990 - 2000  
(in metric tons)

	1990	1991	1992	1995	2000
Antidegradants	1,016	1,104	1,200	1,541	2,339
Rubber accelerators	846	920	1,000	1,284	1,949
Vulcanizing agents *	1,354	1,472	1,600	2,055	3,118
Plasticizers	2,539	2,760	3,000	3,853	5,847
Reinforcing agents **	16,926	18,399	19,999	25,686	38,981

\* Soluble and insoluble sulphur only.

\*\* Carbon black only.

Demand for antidegradants is expected to increase from the projected 1990 level of 1,016 MT to around 2,339 MT by year 2000. On the other hand, requirements for rubber accelerators and vulcanizing agents are projected at 846 MT and 1,354 MT, respectively, in 1990. By the year 2000, it is anticipated that demand for rubber accelerators and vulcanizing agents would reach 1,949 MT and 3,118 MT, respectively.

### 7.3 SUPPLY ASPECTS

#### 7.3.1 Sources of Supply

Most of the rubber chemicals used in Thailand are imported. Among the chemicals imported are antidegradants, rubber accelerators, and paraffin wax, while those that

are locally manufactured include carbon black and castor oil.

Around 461 MT of rubber accelerators were imported by Thailand in 1988. (See Table 33.) Rubber accelerators are imported mostly from Belgium, which accounted for 54.4 per cent of the volume of rubber accelerators imported in 1988. Japan is the second biggest supplier, accounting for about 17.8 per cent of rubber accelerator imports. The United Kingdom, West Germany, and the U.S. also supplied rubber accelerators to Thailand in 1988.

Table 33  
IMPORTS OF RUBBER CHEMICALS OF THAILAND  
1986 - 1988  
(value in thousand US\$)

Rubber Chemical	Unit of Volume	1986		1987		1988	
		Volume	Value	Volume	Value	Volume	Value
Antidegradants	ton	2,992	9,853	3,106	14,782	5,552	19,704
Phenol (chemically pure & its salts)	ton	812	739	68	48	n.a.	n.a.
Phenol (hydroxybenzene) & its salts	ton	n.a.	n.a.	n.a.	n.a.	1,138	1,534
Amine compounds	ton	2,054	8,447	2,809	13,852	n.a.	n.a.
Amine function compounds	ton	n.a.	n.a.	n.a.	n.a.	3,568	14,941
Inorganic esters & their salts, & their halogenated, sulphonated, nitrated derivatives	ton	129	867	220	882	n.a.	n.a.
Phosphoric esters and their salts, including lactophosphate; their halogenated, sulphonated, nitrated or nitrosated derivatives, and esters of inorganic acids and their salts; their halogenated, sulphonated, nitrated or nitrosated derivatives	ton	n.a.	n.a.	n.a.	n.a.	840	3,229

Rubber Chemical	Unit of Volume	1986		1987		1988	
		Volume	Value	Volume	Value	Volume	Value
Rubber Accelerators	ton	396	833	466	1,089	461	1,255
Prepared rubber accelerators	ton	396	833	466	1,089	461	1,255
Vulcanizing Agents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Plasticizers							
Camphor	ton	161	275	327	613	236	536
Castor oil, modified, inedible	liter	47	63	32	48	n.a.	n.a.
Castor oil, not chemically modified, inedible	ton	n.a.	n.a.	n.a.	n.a.	9	22
Reinforcing Agents	ton	3,129	2,158	3,522	2,481	4,716	3,202
Carbon black	ton	3,129	2,158	3,522	2,481	4,716	3,202
Others	ton	51,997	12,261	55,053	13,564	59,163	13,469
Paraffin wax	ton	10,057	5,264	10,537	5,364	n.a.	n.a.
Paraffin Wax containing by weight less than 0.75% of oil	ton	n.a.	n.a.	n.a.	n.a.	7,085	4,190
Other oils & other products high temperature coal tar, similar products in which the weight of the aromatic constituents exceeds that of the non-aromatic constituents	ton	41,940	6,997	44,516	8,200	52,078	8,279

n.a. - not available.

Source: Foreign Trade Statistics of Thailand.

Castor oil is used in the pharmaceutical, lubricating, paint nylon industries aside from the rubber industry. That production is approximately 500 to 550 MT per annum. Some castor oil is imported but the amount brought into the country is decreasing due to increasing availability of local supply.



Although carbon black is manufactured locally in Thailand by one company (Thai Carbon Black Co., Ltd., with a 1988 production output of 31,000 MT), some 4,716 MT were imported in 1988. Around 35.5 per cent of total imports was sourced from P.R.O.C., while around 26.5 per cent was sourced from Taiwan. Imports also came from Australia, the United States, and the Philippines, among others.

Thailand imported 7,085 MT of paraffin wax in 1988. Imports of paraffin wax came mostly from P.R.O.C., accounting for 53.4 per cent of paraffin wax imports in 1988, while imports from Japan accounted for 18.1 per cent in the same year. Other sources of paraffin wax include Indonesia, the United States, and Switzerland.

### 7.3.2 Exports

The only rubber chemicals that Thailand exported in substantial quantities in 1988 were castor oil (6,049 MT) and carbon black (3,889 MT). Both chemicals are locally manufactured. (See Table 34.) Exports of carbon black were at the 7,000-metric ton level during 1986 and 1987 before declining to its 1988 level.

The most significant ASEAN export market for rubber chemicals from Thailand is Malaysia. In 1988, Malaysia imported 27 per cent of the total volume of rubber accelerators exported from Thailand. Moreover, Malaysia also imported around 21 per cent of total Thai exports of reinforcing agents.

Table 34  
 EXPORTS OF RUBBER CHEMICALS OF THAILAND  
 1986 - 1988  
 (volume in metric tons; value in thousand US\$)

Rubber Chemical	1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value
Antidegradants	-	-	*	3	*	27
Amine compounds	-	-	*	3	n.a.	n.a.
Amine function compounds	n.a.	n.a.	n.a.	n.a.	*	27
Rubber Accelerators	1	3	4	8	11	24
Prepared rubber accelerators	1	3	4	8	11	24
Vulcanizing Agents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Plasticizers	-	-	11	33	6,049	5,779
Camphor	-	-	11	33	n.a.	n.a.
Castor oil, not chemically modified, inedible	n.a.	n.a.	n.a.	n.a.	6,049	5,779
Reinforcing Agents	7,385	3,607	7,453	2,848	3,889	1,731
Carbon black	7,385	3,607	7,453	2,848	3,889	1,731
Others	*	**	-	-	16	6
Paraffin wax	*	**	-	-	n.a.	n.a.
Other oils & other products high temperature coal tar, similar products in which the weight of the aromatic constituents exceeds that of the non-aromatic constituents	n.a.	n.a.	n.a.	n.a.	16	6

\* Less than 500 kgs.

\*\* Less than US\$ 500.

n.a. - not available.

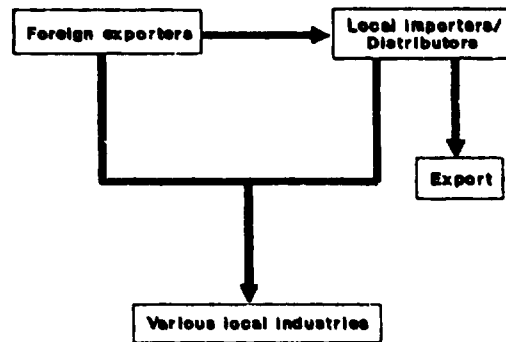
Source: Foreign Trade Statistics of Thailand.

### 7.3.3 Distribution and Trade Practices

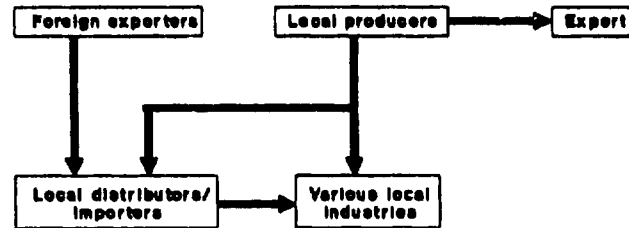
Figure 10 below shows the channels used in the distribution of rubber chemicals in Thailand. Antioxidants, antiozonants, and rubber accelerators, which are totally imported, get to the endusers either directly from foreign exporters or indirectly from local importers and distributors.

For chemicals that are both manufactured locally and imported, local distributors and importers still act as middlemen between foreign exporters, local producers and the endusers. However, some direct purchases can be made from the local manufacturers.

**Figure 10**  
**Marketing and Distribution Networks**  
**of Thailand**



**Purely imported  
rubber chemicals**



**Imported and  
locally produced  
rubber chemicals**

## 8. OVERALL MARKET ASSESSMENT

As mentioned in an earlier section, demand for each type of rubber chemical was derived by applying the relevant compounding recipe to the total rubber consumption (natural and synthetic rubber) of a given country in 1988. In projecting the demand for rubber chemicals up to the year 2000 for a given country, the historical growth rate of total rubber consumption was then applied to the rubber chemical requirements established for 1988 by the use of the general rubber compounding recipe. Table 35 shows the historical consumption of natural and synthetic rubber by the respective ASEAN countries:

Table 35  
HISTORICAL RUBBER CONSUMPTION  
OF ASEAN COUNTRIES  
1977 - 1988  
(in thousand metric tons)

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate
Malaysia	40.3	41.9	43.9	49.2	51.4	62.2	70.4	68.4	75.2	71.5	87.6	120.4	10.5%
Indonesia	35.0	40.0	45.0	48.0	59.0	66.0	68.0	74.0	80.0	93.0	90.2	99.1	9.9%
Philippines	54.0	53.0	59.5	62.6	64.6	64.6	68.0	71.0	84.6	n.a.	89.1	93.6	5.1%
Singapore	4.5	4.4	4.4	3.2	1.8	1.6	1.3	2.1	1.8	1.7	n.a.	1.2	-11.3%
Thailand *	23.0	25.7	29.0	28.1	28.9	29.0	32.1	31.7	32.7	39.6	47.1	57.3	8.7%

n.a. - not available.

\* - Natural rubber only.

Source: 1988 Statistical Yearbook for Asia and the Pacific (United Nations)  
Bank Dunia Economic Review.

The following table shows the estimated requirements for the five major types of rubber chemicals by the five ASEAN countries in 1988, and their projected requirements in 1990, 1991, 1992, 1995, and year 2000.

Table 36  
ESTIMATED REQUIREMENTS FOR RUBBER CHEMICALS  
BY THE ASEAN COUNTRIES  
1988 - 2000  
(volume in metric tons)

Rubber Chemical	Country	1988	1990	1991	1992	1995	2000
Antidegradants	Indonesia	1,487	1,795	1,973	2,168	2,876	4,615
	Malaysia	1,806	2,205	2,437	2,693	3,633	5,985
	Philippines	1,404	1,551	1,630	1,713	1,989	2,550
	Singapore	18	14	13	11	8	4
	Thailand	860	1,016	1,104	1,200	1,541	2,339
			5,575	6,581	7,157	7,785	10,049
Rubber accelerators	Indonesia	1,239	1,496	1,644	1,807	2,399	3,846
	Malaysia	1,505	1,838	2,031	2,244	3,027	4,988
	Philippines	1,170	1,292	1,358	1,428	1,657	2,125
	Singapore	15	12	10	9	6	4
	Thailand	716	846	920	1,000	1,284	1,649
			4,645	5,484	5,963	6,488	8,373
Vulcanizing agents <sup>8</sup>	Indonesia	1,982	2,394	2,631	2,891	3,838	6,153
	Malaysia	2,408	2,940	3,249	3,590	4,844	7,980
	Philippines	1,872	2,068	2,173	2,284	2,652	3,400
	Singapore	24	19	17	15	10	6
	Thailand	1,146	1,354	1,472	1,600	2,055	3,118
			7,432	8,775	9,542	10,380	13,399
Plasticizers	Indonesia	3,718	4,488	4,933	5,421	7,196	11,537
	Malaysia	4,515	5,513	6,092	6,731	9,082	14,963
	Philippines	3,510	3,877	4,075	4,283	4,972	6,376
	Singapore	45	35	31	28	19	11
	Thailand	2,149	2,539	2,760	2,800	3,853	5,847
			12,935	16,452	17,891	19,483	25,122

Rubber Chemical	Country	Metric Tons					
		1988	1990	1991	1992	1995	2000
Reinforcing agents**	Indonesia	24,775	29,923	32,886	36,141	47,973	76,911
	Malaysia	30,100	36,753	40,612	44,876	60,548	99,759
	Philippines	23,499	25,848	27,166	28,551	33,146	42,500
	Singapore	300	236	209	186	130	71
	Thailand	14,325	16,926	18,399	19,999	25,686	38,981
		92,900	109,686	119,272	129,753	167,483	258,219
<b>Total</b>		<b>124,487</b>	<b>146,978</b>	<b>159,825</b>	<b>173,869</b>	<b>224,426</b>	<b>346,015</b>

Notes : \* Consist of soluble and insoluble sulphur only.  
 \*\* Consist of carbon black only.

It is projected that by the year 2000, the total requirements for rubber chemicals would reach 346,015 MT. However, when only the rubber chemicals of interest to MIDA, i.e., antidegradants, rubber accelerators, and vulcanizing agents, are considered, total projected requirements for year 2000 would amount to 49,062 MT. The economic size earlier indicated by a preliminary investigation of a plant in the ASEAN region of 10,000 MT, will be met by the rubber chemicals of interest in 1990.

Among the ASEAN countries, Malaysia, which has the highest growth rate of rubber consumption of 10.5 per cent from 1990 up to the year 2000, is projected to have the highest demand for the five major types of rubber chemicals. From a 32 per cent share of the total demand by the ASEAN region in 1988, Malaysian demand for each of the five major types of rubber chemicals is expected to increase to 33.5 per cent in 1990 to about 39 per cent by the year 2000. The demand by Indonesia, the Philippines, and Thailand come in second, third, and fourth, respectively. Singapore, having the least as well as decreasing growth rate of rubber consumption with the decline of its rubber processing industry, is projected to require the least amount of rubber chemicals from 1990 up to the year 2000.

The estimated requirements of the ASEAN countries in 1988 and their projected demand from 1990 up to year 2000 for each specific type of rubber chemical are discussed below:

## 8.1 ANTIDEGRADANTS

In 1988, the estimated requirements by Malaysia for antidegradants amounted to 1,806 MT, which is about 32 per cent of the total demand by the ASEAN region. For the same year, the demand by Indonesia and the Philippines were estimated at 1,487 MT and 1,404 MT, respectively. By 1990, 1995, and 2000, Malaysia's requirements for antidegradants are estimated to reach 2,205 MT, 3,633 MT, and 5,985 MT, respectively. Indonesian demand is projected at 1,795 MT in 1990; 2,878 MT in 1995; and 4,615 MT by 2000; while Philippine demand is estimated at 1,551 MT, 1,989 MT, and 2,550 MT, for the same years, respectively. On the other hand, Singapore demand is expected to decline from 18 MT in 1988 to 4 MT by year 2000. Total ASEAN demand for antidegradants by the year 2000 is estimated to be 15,493 MT.

At present, all antidegradant requirements of the ASEAN countries are sourced from outside the region, mostly from the United States and Europe. Consequently, any manufacturing plant for rubber chemicals in the ASEAN would have no competition from within the region.

## 8.2 RUBBER ACCELERATORS

The demand for rubber accelerators in 1988 by the five ASEAN countries was estimated as follows: Malaysia at 1,505 MT; Indonesia at 1,239 MT; the Philippines at 1,170 MT; Thailand at 716 MT; and Singapore at 15 MT. In 1990, Malaysian demand for rubber accelerators is projected at 1,838 MT, while Indonesian and the Philippines' demand are estimated at 1,496 MT and 1,292 MT, respectively. By the year 2000, total demand by the ASEAN countries for rubber accelerators would amount to 12,912 MT.

As in the case of antidegradants, no ASEAN country has manufacturing capacity for rubber accelerators at present. All ASEAN requirements are sourced from outside the region. As a result, an ASEAN rubber chemical plant would have no competition within the region.



### 8.3 VULCANIZING AGENTS

Vulcanizing agents presented in the table consist only of soluble and insoluble sulphur. The estimated Malaysian demand for soluble and insoluble sulphur in 1988 was 2,408 MT. This is projected to increase to 2,940 MT in 1990, 4,844 MT in 1995, and 7,980 MT by the year 2000. Indonesian demand was estimated at 1,982 MT in 1988 and 6,153 MT by year 2000, while Philippine demand was 1,872 MT in 1988 and is projected at 3,400 MT by year 2000. The demand for soluble and insoluble sulphur for the entire ASEAN region is estimated to be 8,775 MT in 1990, increasing to slightly more than 20,000 MT by the year 2000.

Malaysia, the Philippines, and Thailand import all their sulphur requirements at present. A rubber chemical plant within the region could very well supply these requirements.

### 8.4 PLASTICIZERS

In 1988, the total demand for plasticizers was estimated at 13,935 MT. Of this amount, Malaysia accounted for 4,515 MT, Indonesia for 3,716 MT, and the Philippines for 3,510 MT. By 1990, 1995, and year 2000, the demand by the ASEAN region for plasticizers is projected at 16,452 MT; 25,122 MT; and 38,734 MT, respectively.

The only country within the region that manufactures rubber plasticizers (highly aromatic process oils and paraffinic process oils) is the Philippines. Unfortunately, no data regarding Philippine production capacities are available.

### 8.5 REINFORCING AGENTS

Among the five major types of rubber chemicals, demand for reinforcing agents by the ASEAN region, more specifically for carbon black, is estimated to be the highest. In fact, from 1988 up to the year 2000, demand for carbon black is estimated to be 75 per cent of the total demand for rubber chemicals. From an estimated requirement of 92,900 MT in 1988, demand by the ASEAN countries is projected to increase to 109,686 MT in 1990; 167,483 MT in 1995; and 258,219 MT by the year 2000.

Carbon black, used as a major reinforcing agent for tires and other rubber products, is produced in Malaysia, the Philippines, and Thailand. The sole Philippine manufacturer has an annual production capacity of 17,000 MT, with plans of doubling that capacity. On the other hand, Thai manufacturers have an annual production capacity of 35,000 MT. In Indonesia, it is anticipated that carbon black production facilities of P. T. Carbon Black Resti Pertiwi (CBRP) will be operational this year. Its estimated annual production capacity will be 24,000 MT. Aside from CBRP, five other carbon black projects are in the pipeline with an estimated production capacity of 170,000 MT.