

example of auto parts made of plastic, consideration would have to be given to the automobile policies themselves.

To establish such diverse measures, information regarding supply as a whole would be required. As a first step, statistics regarding the plastic industry must be organized. In particular, it is necessary to quickly organize consumption and inventory statistics by types of plastic resins and statistics by demand sectors.

Finally, preferably both plastic parts used as intermediate goods and final plastic processed goods should become exportable, but it would be necessary to set up growth plans tailored to specific demand sectors. For example, in intermediate goods, it would be necessary to establish plans which target at improvement of the quality of plastic parts so as to allow the final products in which they are assembled to be exportable and which thus reduce the import dependence. After that, export plans would become necessary.

Market-oriented development plans for final plastic products will be necessary.

## **Chapter 3. Exports**

### **3-1. Exports**

#### **(1) Summary**

##### **Parts**

When discussing exports of plastic processed products, it is necessary to separate them into final products and intermediate goods, but trade statistics on intermediate plastic goods are not available. In recent years, however, exports of bicycles, motorcycles, televisions, radios, fans, and other home electric appliances have been increasing. Some plastic processed parts are being used for these and clearly the importance of the plastic industry as a supporting industry is rising.

Exports of bicycles rose approximately 10-fold on a value basis from 1983 to 1988, motorcycles 27-fold, television sets 5-fold, radios 1.5-fold, and refrigerators 15-fold. (See Table III-3-1)

### Household Goods

Exports of end products of plastic have clearly been increasing. In particular, in 1987, exports grew by a large 56.5 percent compared with the previous year. In 1988 too, this trend continued, with exports growing 57.1 percent.

A recent feature of exports has been the decline in the share of the U.S. from the approximately one-quarter share of 1983 to 10 percent. Asia and Oceania now account for a 42.7 percent share of exports, Europe for 24.8 percent, and the Middle and Near East for 10 percent. In particular, exports to Asia and the Middle and Near East have increased. (See Fig. III-3-1 and Table III-3-2).

Table III-3-1. Thai Exports of Electrical Appliances and Transport Machinery

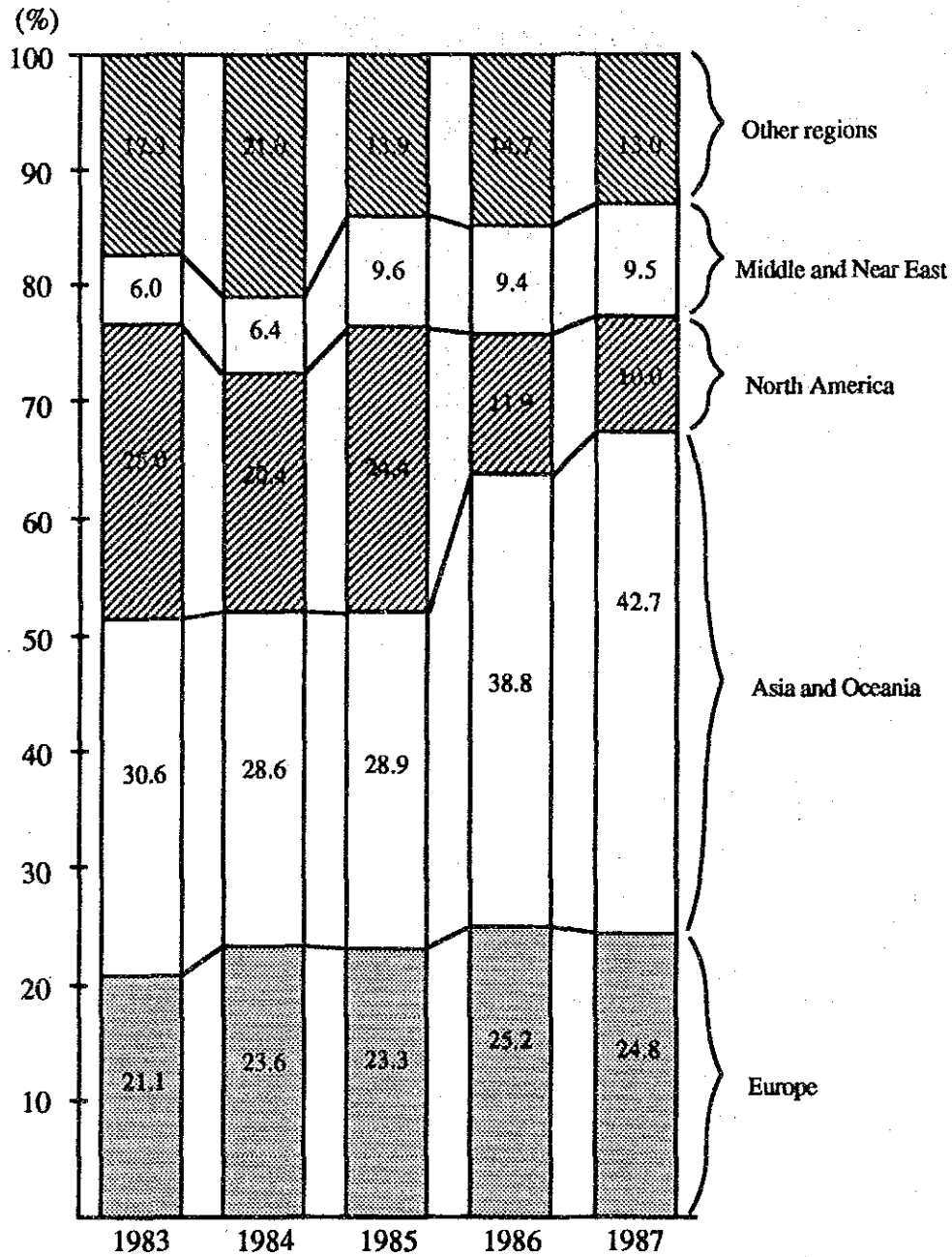
(Unit: units, 1000bahus)

	1983		1984		1985		1986		1987		1988		Remarks
	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	
Fans	49,689 (100)	26,285 (100)	71,993 (111)	229,332 (111)	207,069 (115)	30,117 (115)	450,534 (284)	74,908 (483)	235,664 (474)	126,936 (483)	-	-	Total of 850- 611, 612, 619
Radios	20,101 (100)	20,228 (100)	75,231 (164)	33,242 (164)	47,158 (107)	21,709 (107)	10,265 (52)	10,516 (149)	39,338 (195)	30,144 (149)	-	-	Total of 851- 525, 526, 851- 527
Refrigerators	4,314 (100)	16,519 (100)	5,864 (97)	16,098 (97)	15,963 (573)	94,760 (573)	36,439 (220)	153,889 (931)	38,503 (892)	65,809 (1,568)	258,959 (1,568)		
TV sets	21,135 (100)	38,205 (100)	8,235 (52)	19,936 (52)	7,104 (20)	21,680 (57)	24,359 (64)	52,730 (138)	18,606 (88)	62,757 (297)	208,252 (545)		Total of 851- 521, 527
Automobiles	16,657 (100)	16,864 (100)	13,442 (47)	7,950 (47)	3,351 (20)	3,491 (20)	42,236 (250)	116,996 (694)	117,524 (705)	179,180 (1,075)	174,665 (1,035)		
Motorcycles and scooters	404 (100)	6,501 (100)	640 (131)	8,524 (131)	794 (167)	10,912 (167)	5,952 (91)	21,173 (326)	938 (2,046)	8,266 (2,747)	178,566 (2,747)		
Three-wheel vehicles	3 (100)	76 (100)	2 (76)	58 (76)	26 (660)	502 (660)	191 (397)	33,023 (397)	725 (31,166)	935 (31,166)	8,543 (11,240)		

Source: Thai trade statistics

Note: Figures in parentheses are comparisons based on 1983 as 100.

**Fig.III-3-1. Changes in Shares of Export Destinations of Plastic Products**



Source: Prepared from Thai trade statistics.

Table III-3-2. State of Thai Exports of Plastic Products by Destination

(Unit: 1000Baht)

	1983		1984		1985		1986		1987		
	%share		%share	%change	%share	%change	%share	%change	%share	%change	
World	938,170	100	1,297,213	100	1,262,032	100	1,414,294	100	2,214,761	100	56.5
Europe	(197,904)	(21.09)	(305,693)	(23.57)	(293,723)	(23.27)	(356,326)	(25.19)	(550,193)	(24.84)	(54.4)
EC	180,328	19.22	(277,014)	21.35	238,111	18.87	336,727	23.81	503,362	26.15	49.4
Others	17,575	1.87	28,679	2.21	55,608	4.41	19,598	1.39	46,830	2.11	138.9
Asia & Oceania	(287,356)	(30.63)	(371,497)	(28.64)	(364,539)	(28.89)	(548,573)	(38.79)	(945,287)	(42.68)	(72.3)
Japan	5,083	0.54	7,722	0.60	6,035	0.48	10,756	0.76	79,731	3.60	641.2
Asian Nies (4)	175,316	18.69	191,696	14.78	219,118	17.36	335,165	23.70	559,341	25.26	66.8
Asean (4)	24,920	2.66	31,636	2.44	26,493	2.10	32,286	2.28	45,643	2.06	41.3
Oceania	66,489	7.09	116,851	9.01	92,641	7.37	138,664	9.80	204,556	9.24	47.5
China	244	0.03	180	0.01	201	0.00	88	0.00	1,593	0.00	1,700.4
Others	15,301	1.63	23,410	1.53	20,048	1.59	31,622	2.24	54,420	2.46	72.1
North America	(234,538)	(25.00)	(264,055)	(20.36)	(305,673)	(24.22)	(168,412)	(11.9)	(221,387)	(10.00)	(13.6)
U.S.A.	206,986	22.06	241,345	18.60	285,338	22.61	156,278	11.05	191,211	8.63	22.3
Canada	27,552	2.94	22,710	1.75	20,334	1.61	12,134	0.86	30,175	1.36	148.6
Latin Americas	-	-	(84)	(0.01)	(47)	(0.00)	(815)	(0.06)	(6,946)	(0.31)	(751.6)
Middle East	(55,915)	(5.96)	(81,857)	(6.31)	(121,645)	(9.64)	(132,318)	(9.360)	(210,265)	(9.49)	(58.9)
Africa	(3,73)	(0.40)	(674)	(0.05)	(806)	(0.06)	(2,126)	(0.15)	(5,885)	(0.27)	(176.7)
Europe, East	(8,474)	(0.90)	(8,714)	(0.67)	(132)	(0.01)	(345)	(0.02)	-	(0.00)	(99.9)
Others	(150,207)	(16.01)	(264,654)	(20.40)	(175,468)	(13.90)	(205,378)	(14.52)	(274,797)	(12.40)	(33.8)

Source: Thai trade statistics

A look by product shows that the main export products were tableware, kitchenware, bags, and "other containers". These products account for 70 percent of exports. (Table III-3-3)

Exports of these products to Japan have been rapidly rising. (See Table III-3-4 and Table III-3-5)

The value of exports of these plastic processed products stood at 2.2 billion bahts in 1987 and 3.5 billion bahts in 1988, but the ratio of the value in the total value of Thailand's exports is less than 1 percent.

In terms of export marketing, there are few businesses which have tried to open up markets on their own. These are products for which export promotion will be necessary in the future. The Ministry of Commerce is setting export targets for plastic products and promoting exports.

Table III-3-3. Thai Exports of Main Plastic Products

(Unit: tons, 1000 bahts)

	1983		1984		1985		1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
390710.....Baskets sieve ranks etc	103	3,361	39	1,826	86	4,090	224	9,014	228	11,056	343	10,827
390721.....Tubes and pipes	162	8,369	237	8,236	118	5,722	164	7,088	162	10,170	1,987	96,670
390723.....Tablewares and Kitchenwares	1,608	120,059	2,234	169,443	3,118	223,965	4,462	330,464	7,482	499,485	6,471	649,805
390724.....Sanitary and Plumbing fixtures Fittings	21	1,500	47	2,242	96	3,574	530	16,634	980	36,388	1,682	129,313
190725.....Electric Lamps including Shades Globes	21	2,448	14	1,714	38	6,674	56	10,982	52	9,156	-	-
390726.....Table clothing Curtains and Similar	53	2,064	63	2,440	45	7,165	203	10,418	766	20,959	343	10,826
390727.....Sun-shades, Light-shades Shades	2	262	1	181	1	103	-1	09	3	520	7	77
390728.....Rain coats	206	47,677	133	49,776	530	188,988	203	64,653	17	1,561	7	1,619
390730.....Other articles of Apparel & Clothing Accessories	11	2,562	11	2,468	27	2,651	14	1,927	60	12,440	186	49,321
390731.....Bags Jars Other Containers	5,658	189,740	11,041	351,602	13,479	472,520	21,376	723,897	30,824	1,123,785	39,695	1,808,220
390732.....Caps covers stoppers-etc	12	1,271	17	1,370	57	3,030	67	9,968	94	7,707	116	15,100
390733.....Fancy goods Statuettes Articles for Interior Decoration	16	1,082	16	1,662	19	2,225	4	832	7	1,712	-	-
390734.....Office & Stationary suppliers	15	988	15	693	21	1,474	79	3,714	66	4,686	-	-
390735.....Floats used in Fishery	3	167	-	-	15	678	14	799	18	956	9	566
390736.....Adhesive cellophane Tapes	732	80,582	736	68,117	853	89,153	924	98,220	1,428	133,927	1,431	151,095
390737.....Object of personal Adornment	20	2,498	21	5,199	29	8,769	44	11,205	68	28,541	89	27,006
390749.....Other Articles	8,770	473,505	630,246	241,247	1,262,033	1,414,295	2,214,962	3,479,595	3,479,595	3,479,595	3,479,595	3,479,595
Total	938,335	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215	1,297,215

Source: Thai trade statistic

Note: The method of classification of goods changed in 1988 so the figures cannot be strictly compared.

Table III-3-4. Exports of Bags and Containers

(Unit: Ton, 1000Bahts)

390731	1983		1984		1985		1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Bags jars other containers of plastic material												
U. Kingdom	662	19,047	1,423	47,583	3,156	119,538	3,927	142,998	6,007	232,983	2,152	301,454
Singapore	1,171	34,195	2,275	61,992	2,387	67,379	4,378	118,543	6,303	171,870	5,442	207,927
Australia	958	30,369	2,350	77,893	1,821	58,978	3,056	91,241	3,925	131,942	6,858	303,994
Germany, Fede.	639	19,287	754	21,762	1,125	35,637	2,487	85,104	3,130	108,027	3,882	171,843
Netherlands	1,084	32,662	1,780	51,603	2,103	65,661	2,910	88,184	2,966	96,120	7,889	123,714
U.S.A.	49	6,818	75	5,994	536	35,168	679	49,523	1,195	88,872	2,270	107,460
France	17	638	95	2,967	242	10,926	1,135	42,576	2,312	85,827	3,654	165,330
Belgium	3	130	1,075	28,584	384	11,246	938	28,253	1,984	64,135	2,125	105,409
Saudi Arabia	65	3,891	113	5,168	609	23,294	638	21,138	542	21,348	399	15,392
Japan	78	292	108	687	48	1,196	76	1,996	495	20,372	2,898	132,857
Other Countries	932	42,411	993	47,369	1,065	43,497	1,152	54,341	1,965	102,289	7,126	172,942
Total	5,658	189,740	11,041	351,602	13,479	472,520	21,376	723,877	30,824	1,123,785	39,695	1,808,322

Source: Thai trade statistics



Table III-3-5. Thai Exports of Tableware and Kitchenware

(Unit: Ton, 1000Bahis)

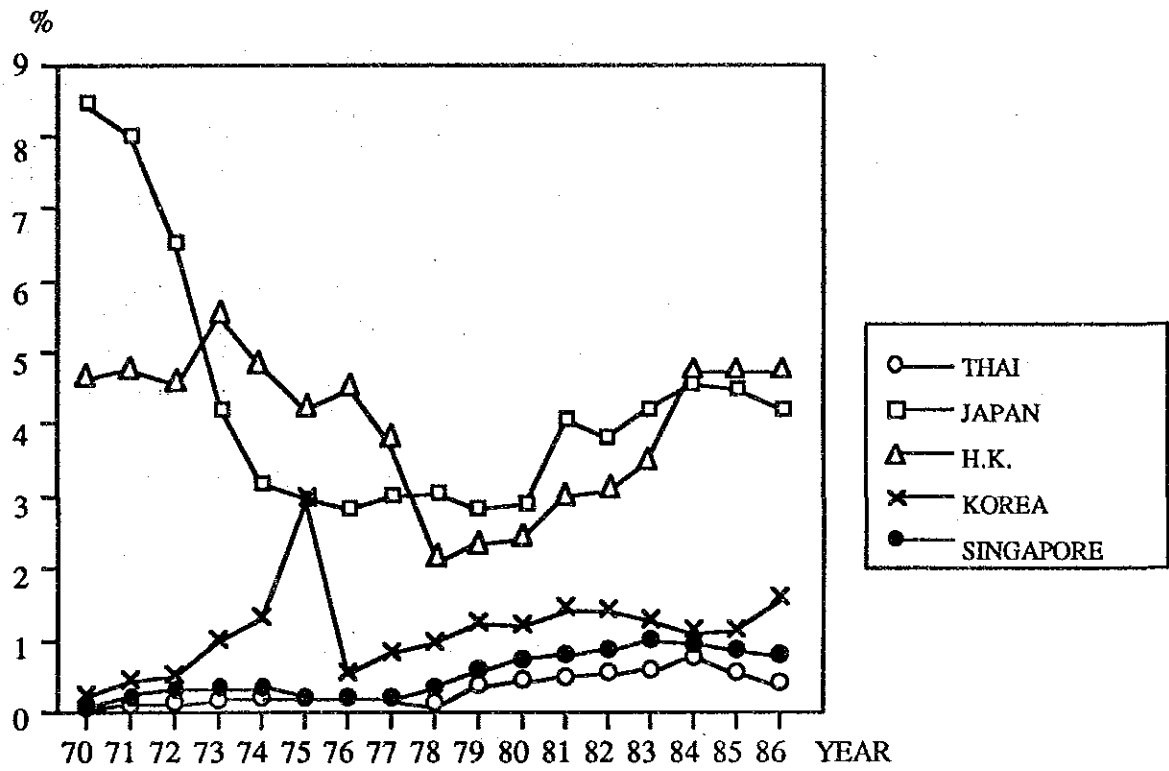
390733	1983		1984		1985		1986		1987		1988	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Tablewares and Kitchenware of plastic matter												
Hong Kong	241	13,909	306	19,723	606	31,063	842	45,256	1,242	761,28	494	47,512
Singapore	367	24,733	374	29,008	404	31,039	739	49,997	1,793	60,560	476	44,606
Saudi Arabia	225	12,416	463	18,822	459	24,237	647	35,142	771	51,2729	449	37,247
U. Kingdom	26	2,980	99	10,858	268	29,731	405	47,497	292	34,411	450	58,522
U.S.A.	87	6,963	67	5,982	498	27,826	359	25,531	496	33,831	834	73,918
France	5	840	11	2,888	25	2,687	203	14,266	424	28,889	204	17,213
U. Arab Emir	94	9,502	123	14,549	104	12,074	129	14,047	241	25,935	160	13,839
Japan	5	625	7	760	8	861	20	2,594	236	23,461	677	78,679
Australia	56	6,728	84	9,584	82	9,405	147	15,137	325	23,152	579	48,329
Kuwati	148	10,924	179	12,843	177	13,062	233	18,175	202	19,270	201	21,226
Other Countries	354	30,439	521	44,426	488	41,980	738	62,822	14,60	122,119	1,873	282,632
Total	1,608	120,059	3,234	169,443	3,119	223,965	4,462	330,464	7,482	499,485	6,417	649,805

Source: Thai trade statistics

**(2) Position of Thailand in World Market**

Thailand's exports of plastic processed products (household goods) have been higher than its imports since 1980 and this trend seemingly is becoming deeply entrenched. While Thailand has been gradually rising in its share of the global plastic processed product trade since 1970, its share of that trade stood at only 0.5 percent in 1986, small compared with the 4.8 percent of Hong Kong and the 1.6 percent of Korea. (See Fig. III-3-2 and Table III-3-6)

Fig. III-3-2. Share of Thai Trade in Plastic Products in Global Trade



Source: Prepared from UN statistics.

Table III-3-6. Position of Thai Trade in Plastic Products in Global Market

	1970	75	80	81	82	83	84	85	88
Thailand	0.1	0.2	0.4	0.4	0.5	0.6	0.7	0.5	0.5
Japan	8.4	3.1	3.0	4.1	3.8	4.6	4.6	4.5	4.1
HongKong	4.7	4.3	2.5	3.1	3.2	4.8	4.8	4.8	4.8
Korea	0.2	3.2	1.2	1.6	1.5	1.2	1.2	1.3	1.6
Singapore	0.1	0.2	0.7	0.9	1.0	1.1	1.0	0.9	0.8
W. Germany	19.8	19.7	20.8	20.2	21.5	21.2	20.3	20.5	22.7
U.S.A.	13.4	13.2	12.7	10.4	10.0	10.0	9.8	12.6	10.2
Italy	10.4	9.0	9.1	9.1	9.4	9.4	9.2	8.8	9.1
France	7.8	10.0	8.5	8.1	8.0	8.0	7.7	7.6	7.7
U.K.	5.3	4.9	7.0	7.6	7.1	7.1	6.9	6.7	6.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0%
	918.2	2786.5	7936.2	7178.5	6953.4	7184.3	7653.5	8582.0	11387

(US\$million)

Note: Products clarified under SITC 893 are sundry goods made of plastic.  
 Source: Calculated from UN statistics for products classified under SITC892

While small in value, the export competitiveness of the products has been growing steadily. A look by the RCA shows that Thai plastic products are not higher than 1, but that the indicator is gradually rising, thus providing evidence to the above. As opposed to this, Japan, Hong Kong, and Korea have found their competitive leveling off.

Table III-3-7. Comparison by RCA

	1970	1975	1980	1985
Japan	0.5880721	0.1974953	0.1814646	0.1912806
HongKong	2.5462984	2.5716613	1.0376083	1.2030516
Korea	0.4009217	2.2388241	0.5837893	0.3133895
Singapore	0.1194470	0.1141591	0.3020467	0.2850465
Thailand	0.0973082	0.2528231	0.4597429	0.5731462

Source: Prepared from UN statistics  
 Note: RCA=Revealed Comparative Advantage Indices ( $E_i/E_h/W_i/W$ ),  
 where  $E_i$ ... i goods export value of products of h country  
 $E_h$ ... Total exports of h country  
 $W_i$  ... i goods export value of products of world as a whole  
 $W$  ... Total exports of world as a whole

When this index is over 1, it means the RCA of goods i of a country h is higher than the average level of the world and and when under 1, it means it is lower than the average level. This index is for estimating the export competitiveness of goods i of a country h.

## 3-2. Market Trends

### 3-2-1. Trends in Use of Plastics

Before going into the state of the main markets, a summary will be given of the state of use of plastics around the world. This is because plastic products are very widely used and it is necessary to develop plastic products meeting the changes in lifestyles and changes in the industrial structure.

#### (1) Personal Consumption

There are no statistics on demand for plastic processed products themselves, but it is possible to use information obtained from surveys of the consumption of plastics. Table III-3-8 shows the per capita consumption of plastics in key countries around the world. The biggest per capita consumer is West Germany at 120 kg, followed by the the main export destinations of Thai products, that is, the U.S. at 98 kg and the U.K. at 53 kg. The consumption of plastics seemingly is more due to lifestyles and the industrial structure than to differences in income. Seen on a global basis, the consumption of plastics may be said to be increasing as a general trend.

**Table III-3-8 Supply and Demand of Plastic Materials and Per Capita Consumption in Key Countries (1987)**

(Unit: 1,000 tons)

	Production	Import	Export	Domestic consumption	Per capita consumption(kg)
U.S.A.	25,313	618	2,180	23,751	98
Japan	10,032	604	1,791	8,845	72.3
W. Germany	8,392	2,896	3,905	7,383	120.1
France	3,863	1,852	2,429	3,286	59.0
Belgium	2,514	1,797	3,292	1,019	103.0
Canada	2,067	490	798	1,759	68.4
U.K.	1,871	1,912	772	3,011	53.0
Switzerland	138	598	195	541	81.7
Denmark	0	506	32	474	93.0
New Zealand	0	142	36	106	41.7

Source: Japan Plastics Industry Federation

#### (2) Utilization of Plastic

Although, there are differences between each country, generally speaking of the

total amount of plastic used, the amount used for household goods is less than 10 percent while the amount used for industrial goods is much more. (See Table III-3-9)

The demand for plastic materials for packaging is large in all of the main markets, averaging between 20 and 30 percent.

Table III-3-9. Supply and Demand of Plastic Materials and Per Capita Consumption in Key Countries (1987)

	(%)											
	Building	Packing	Electric/ Electronics	Transport	Furniture	Agriculture	Toys	Household goods	Cloth footwear	Machinery parts	Medical equipment	Others
U.S.A.	22	30	6	5	5	-	9	-	-	-	-	23
Japan	11.5	26.2	12.6	9.6	1.	2.4	1.6	8.5	1.5	4.4	0.1	20.6
W. Germany	18	22	7	13	9	7.0	3	7.0	1.0	10	2.0	1
France	16	33	9									42
U.K.	22	35	10	5	5	2	4	3	1	2	1	10
Canada	26.4	38.6	3.3	10.7	6.6	3.9	2.7	2.4	1.6	-	0.2	3.6
Switzerland	24	23	13	4	5	6	-	5	-	8	-	12

Source: Japan Plastic Industry Federation

Note: Building=Building materials, pipes, joints (excluding paints and adhesives)

Packing=Packaging materials (film, sheets, laminates, bottles, etc.), transport containers (beer containers etc.)

Electric/Electronics=Parts for automobiles, bicycles, vehicles, ships, and aircraft

Others=Including liquid resins (adhesives and paints)

### 3-2-2. Trends in Main Markets

A summary will be given here of the state of the markets of Thailand's key export destinations, the U.S. and the U.K., and Japan, which has recently been increasing its imports of Thai household goods.

#### (1) U.S.

##### 1) Import Trends

In 1987, the U.S. imported US\$3.8 billion worth of plastic household goods, giving it an import penetration of 6.9 percent. While the import penetration of these products is low, the value of imports has been rising, though slightly, in these past three years. The main regions of origin have been Canada and Taiwan. Imports from Taiwan account for 14 percent of all imports in value and 1 percent of the value of sales of plastic household goods in the U.S. Hong Kong and Korea account for 5 percent and 3 percent of imports, respectively. A trend in recent years has been for higher imports from China than ASEAN, i.e., at 1.3 percent of total import value. Imports from ASEAN account for only 0.9 percent. The position held by products of Thailand, which is only one member of ASEAN, in imports by the U.S. is therefore low. (See Tables III-3-10, III-3-11, and III-3-12)

Table III-3-10. U.S. Imports of Packaging Products  
(Unit: US\$1000, % in parentheses)

	1985		1986		1987	
Canada	67,126	(25.5)	81,071	(23.2)	92,588	(25.2)
Taiwan	44,586	(16.9)	64,106	(18.3)	73,522	(20.0)
Japan	28,812	(10.9)	45,217	(12.9)	33,147	(9.0)
HongKong	12,577	(4.8)	12,923	(3.7)	25,000	(6.8)
France	19,829	(7.5)	28,572	(8.2)	24,619	(6.7)
W. Germany	17,311	(6.6)	25,632	(7.3)	17,132	(4.7)
Singapore	1,244	(0.5)	3,080	(0.9)	5,307	(1.4)
Thailand	2,100	(0.8)	1,486	(0.4)	3,941	(1.1)
China	375	(0.1)	1,087	(0.3)	3,090	(0.8)
Malaysia	566	(0.2)	748	(0.1)	1,202	(0.2)
Philippines	324	(0.1)	398	(0.1)	583	(0.1)
Others	68,933	(26.1)	85,396	(24.4)	86,842	(23.7)
Total	263,783	(100.0)	349,716	(100.0)	366,973	(100.0)

Source: U.S. Commerce Department (Key Connections International)

Note: The Packaging mentioned above includes bags/envelops etc., containers, bottles/drums, boxes and cases, closures/caps/lids, and trays.



**Table III-3-11. U.S. Imports of Household Goods**  
(Unit: US\$1000, % in parentheses)

	1985		1986		1987	
Taiwan	108,853	(38.9)	152,711	(40.2)	196,733	(41.7)
Hong Kong	60,442	(21.6)	71,187	(18.8)	72,619	(15.4)
Canada	25,005	(8.9)	35,303	(9.3)	59,917	(12.7)
Japan	23,908	(8.5)	35,414	(9.3)	25,818	(5.5)
South Korea	4,374	(1.6)	14,797	(3.9)	21,058	(4.5)
China	745	(0.3)	2,854	(0.8)	10,408	(2.2)
Thailand	3,543	(1.3)	4,479	(1.2)	5,062	(1.1)
Malaysia	177	(0.1)	696	(0.2)	1,265	(0.3)
Philippines	66	(0.0)	0	(0.0)	667	(0.1)
Singapore	169	(0.1)	260	(0.1)	209	(0.0)
Other	52,531	(18.8)	61,797	(16.3)	77,719	(16.5)
Total	279,813	(100.0)	379,498	(100.0)	471,475	(100.0)

Source: U.S. Commerce Department (Key Connections International)

Note: The household goods mentioned above include tableware, plates, cups and saucers etc., household furnishings NSPF, nursing nipples and pacifiers, and household articles NSPF.

**Table III-3-12. U.S. Imports of Other Plastic Products**  
(Unit: US\$1000, % in parentheses)

	1985		1986		1987	
Taiwan	146,225	(17.5)	187,649	(8.3)	260,264	(20.3)
Canada	152,688	(18.2)	194,972	(19.0)	243,268	(18.9)
Japan	105,915	(12.6)	116,596	(11.4)	131,685	(10.3)
W. Germany	80,726	(9.6)	111,537	(10.9)	125,310	(9.8)
South Korea	53,204	(6.4)	66,050	(6.4)	102,304	(8.0)
Hong Kong	77,816	(9.3)	117,792	(11.5)	91,172	(7.1)
China	12,954	(1.6)	22,730	(2.2)	42,728	(3.3)
Singapore	6,709	(0.8)	4,267	(0.4)	7,862	(0.6)
Thailand	5,442	(0.7)	4,944	(0.5)	5,649	(0.4)
Philippines	1,964	(0.2)	2,368	(0.2)	3,117	(0.2)
Malaysia	556	(0.1)	413	(0.0)	990	(0.1)
Other	193,969	(23.1)	197,398	(19.2)	269,816	(21.0)
Total	838,168	(100.0)	1,026,716	(100.0)	1,284,165	(100.0)

Source: U.S. Commerce Department (Key Connections International)

Note: These products include religious articles, Christmas tree ornaments and articles of rubber or plastics NSPF

## 2) Market and Distribution

An important point in getting plastic products to penetrate the U.S. market is the price. The large sized retailers of the U.S. face competition over their market shares and are striving to shorten distribution channels as much as possible to obtain cheaper products.

From the viewpoint of the turnaround of products and inventory control, the freight costs and the response time to orders are important elements in purchasing.

Even though price is an important point, this does not mean that the buyers ignore quality. U.S. consumers seek durable products and seek products with a due balance of price and quality.

The products of the NIEs have been accepted in the U.S. market because they meet these conditions. At the same time, they have been successful because those countries have set up international trade channels.

The NIEs have been losing price competitiveness due to rising labor costs etc., giving Thailand and the other ASEAN countries a chance to take their place.

Household goods are distributed in the U.S. through established distribution channels. These distribution channels are relatively short and in recent years there has been a tendency for these to be made even tighter. In 1966, 50 percent of household goods were distributed through wholesalers, but by 1986 87 percent was being sold directly to retailers.

Among the retailers, the discount stores account for the largest share, 27.5 percent, followed by supermarkets at 11.2 percent, chain stores at 7.9 percent, and catalog and showroom sales at 5.8 percent. Hyper markets are also an important sales channel for household goods. In general, the discount stores, supermarkets, and chain stores are important distribution channels for plastic products.

Successful plastic product manufacturers are establishing ties with supermarkets, hyper markets, and other high growth distribution channels.

Exports of plastic products to the U.S. are influenced by the market trend of

household goods as a whole. Sales of household goods in the U.S. market totaled US\$31.3 billion in 1987 and US\$35.2 billion in 1988.

The market for household goods as a whole is influenced by several factors including the purchasing power of various age groups, the increase in two-income families, and changes in lifestyles. New products are required meeting these changes.

A look at the age groups shows that consumers under 25 years of age use US\$570 a year for household goods and those of 35 to 44 years of age use over twice that amount.

A total of 67 percent of all households are two-income families, with both the husband and wife working. These households have large disposable incomes and seek plastic products making their daily lives easier.

The number of households is expected to increase from the 90 million of 1988 to 120 million by the year 2000.

Looking at the future of plastic products, demand is expected to increase for kitchen products able to be used in ovens. Other growth fields are expected to be reusable food containers made of engineering plastics and products able to be used in microwave ovens.

Sales of plastic household goods are expected to grow by 2.7 percent a year until 1992.

### **3) Evaluation of Market for Thai Products**

A common feature in the U.S., the U.K., and Japan is the low degree of brand consciousness of plastic processed products on part of the consumer and the low degree of interest in the country of origin. Therefore, there is no real evaluation of Thai products per se. To promote exports, it is necessary to create an overall image of Thailand as being a supplier of superior plastic products.

The volume of imports of Thai products is relatively small, so U.S. importers and merchandisers have a low level of knowledge about Thai plastic products.

To improve this situation, the interest of U.S. plastic processing manufacturers,

retailers, importers, wholesalers, etc. in Thai plastic products must be stimulated.

(2) U.K.

1) Import Trends

The market for plastic household goods in the U.K. is characterized by the lowest degree of import penetration. This is because domestic businesses have strong services, product lines, and sales forces and, further, the added value of plastic products themselves is low, so after high transport costs, imports do not pay. What imports there are mainly come from West Germany, the Netherlands, France, and other European countries. (See Table III-3-13, III-3-14, III-3-15) Total imports of kitchenware, containers, bottles, etc. in 1988 came to 150 million pounds, of which Thai products accounted for 1.6 percent. Imports from Thailand are small when judging from overall imports of the U.K., but tripled in 1988 compared with the previous year and has been increasing for two years. (See Table III-3-13)

Table III-3-13. U.K. Imports of Plastic Tableware and Kitchenware  
(Unit: 1000 pounds, % in parentheses)

Country	1989*	1988	1987	1986	1985
Netherlands	13,626 (27.7)	13,825 (31.3)	10,529 (30.5)	8,912 (27.7)	8,113 (27.8)
W. Germany	5,086 (10.4)	4,298 (9.7)	3,656 (10.7)	3,542 (11.0)	2,339 (8.0)
Italy	3,932 (8.0)	3,375 (7.7)	2,411 (7.0)	1,439 (4.5)	1,613 (5.5)
Belgium-Lux	3,283 (6.6)	3,582 (8.1)	4,874 (14.2)	5,259 (16.3)	4,035 (13.8)
Hong Kong	2,992 (6.0)	3,156 (7.1)	2,679 (7.8)	2,073 (6.4)	1,931 (6.6)
U.S.A.	2,887 (5.9)	2,500 (5.7)	2,396 (7.0)	2,560 (8.0)	2,945 (10.1)
France	2,406 (4.9)	2,207 (5.0)	1,448 (4.2)	1,882 (5.8)	2,733 (9.4)
Taiwan	2,363 (4.9)	1,349 (3.1)	700 (2.0)	371 (1.2)	219 (0.8)
China	2,207 (4.5)	995 (2.3)	186 (0.5)	55 (0.2)	2 (0.0)
Thailand	2,082 (4.2)	1,305 (3.0)	583 (1.7)	684 (2.2)	453 (1.6)
Denmark	1,584 (3.2)	1,482 (3.4)	1,055 (3.0)	1,166 (3.7)	905 (3.1)
Ireland	785 (1.6)	1,005 (2.3)	552 (1.6)	1,105 (3.4)	988 (3.4)
Switzerland	749 (1.5)	670 (1.5)	146 (0.4)	93 (0.3)	175 (0.6)
Portugal	716 (1.5)	553 (1.3)	138 (0.4)	220 (0.7)	291 (0.9)
Japan	674 (1.4)	453 (1.0)	366 (1.0)	418 (1.3)	499 (1.7)
Sweden	479 (0.9)	628 (1.4)	175 (0.5)	214 (0.7)	186 (0.6)
Australia	461 (0.9)	639 (1.4)	245 (0.7)	379 (1.2)	224 (0.7)
Greece	415 (0.8)	708 (1.6)	629 (1.8)	265 (0.8)	252 (0.9)
Indonesia	316 (0.6)	11 (0.0)	- (0.0)	3 (0.0)	- (0.0)
Israel	342 (0.6)	90 (0.2)	107 (0.3)	367 (1.1)	153 (0.5)
Turkey	324 (0.6)	164 (0.4)	109 (0.3)	108 (0.3)	187 (0.6)
Others	1,358 (2.8)	1,212 (2.7)	1,223 (3.6)	1,082 (3.4)	893 (3.1)
Total	49,067	44,107	34,207	32,197	29,136

Source: H.M. Customs & Excise

\*1989 figures are an extrapolation of the statistics gathered during the first 10 months of the year.

**Table III-3-14. U.K. Imports of Plastic Carboys, Bottles, Flasks and Similar Articles**

(Unit: 1000 pounds, % in parentheses)

Country	1989*	1988	1987	1986	1985
W. Germany	14,521 (31.9)	17,744 (41.8)	11,695 (36.1)	10,864 (38.2)	6,863 (29.7)
France	6,983 (15.4)	7,550 (17.8)	4,735 (14.6)	4,880 (17.2)	4,140 (17.9)
Netherlands	4,601 (10.1)	2,944 (6.9)	2,435 (7.5)	642 (2.3)	631 (2.3)
U.S.A.	3,285 (7.2)	3,122 (7.3)	2,896 (8.9)	1,538 (5.4)	1,822 (7.9)
Italy	2,347 (5.2)	2,086 (4.9)	2,947 (9.0)	3,944 (13.9)	2,667 (11.5)
Ireland	2,150 (4.7)	1,551 (3.6)	1,425 (4.4)	1,271 (4.5)	971 (4.2)
Denmark	1,536 (3.4)	2,244 (5.3)	2,117 (6.5)	1,544 (5.4)	2,363 (10.2)
Belgium-Lux.	1,351 (3.0)	3,184 (7.5)	877 (2.7)	830 (2.9)	397 (1.7)
Austria	1,295 (3.8)	740 (1.7)	442 (1.4)	510 (1.8)	486 (2.1)
Indonesia	613 (1.3)	0	0	0	1
Others	6,797 (14.9)	1,347 (3.2)	2,866 (8.8)	2,385 (8.4)	2,782 (12.0)
Total	45,479	45,512	32,435	28,408	21,123

Source: H.M. Customs & Excise

\*1989 figures are an extrapolation of the statistics gathered during the first 10 months of the year.

**Table III-3-15. U.K. Imports of Plastic Boxes, Crate and Similar Articles**

(Unit: 1000 pounds, % in parentheses)

Country	1989*	1988	1987	1986	1985
W. Germany	8,760 (13.1)	9,713 (15.2)	15,049 (25.2)	11,873 (21.9)	8,246 (20.2)
France	7,826 (12.1)	11,020 (17.3)	9,003 (15.1)	10,714 (19.8)	7,959 (19.5)
Denmark	6,167 (9.5)	7,972 (12.5)	4,629 (7.8)	5,349 (9.9)	3,171 (7.8)
Netherlands	5,907 (9.1)	7,733 (12.1)	6,037 (10.1)	5,180 (9.5)	4,324 (10.6)
Finland	3,815 (5.9)	3,355 (5.3)	1,882 (3.2)	810 (1.5)	391 (1.0)
Italy	3,600 (5.6)	3,192 (5.0)	6,916 (11.6)	6,224 (11.5)	5,928 (14.5)
Sweden	2,901 (4.5)	5,002 (7.8)	2,559 (4.3)	2,591 (4.8)	2,112 (5.2)
U.S.A.	2,448 (3.8)	2,545 (4.0)	1,926 (3.2)	1,839 (3.4)	1,689 (4.1)
Switzerland	2,012 (3.1)	2,109 (3.3)	2,853 (4.8)	1,751 (3.2)	1,639 (4.0)
Thailand	1,344 (2.1)	1,075 (1.7)	226 (0.4)	84 (0.2)	147 (0.4)
Belgium-Lux.	1,280 (2.0)	1,361 (2.1)	1,285 (2.2)	1,430 (2.7)	1,331 (3.3)
Hong Kong	1,004 (1.6)	1,093 (1.7)	706 (1.2)	3,028 (5.6)	429 (1.0)
Others	17,527 (27.1)	7,604 (11.9)	6,581 (11.0)	3,371 (6.2)	3,386 (8.3)
Total	64,591	63,774	59,652	54,245	40,752

Source: H.M. Customs & Excise

\*1989 figures are an extrapolation of the statistics gathered during the first 10 months of the year.

## 2) Market and Distribution

The market for plastic products is highly price competitive, as in the U.S., and the competition is forcing large discounts in the distribution sector. Further, the market for plastic products is mainly occupied by domestic manufacturers. Imports play only a small role in the market.

The main distribution channels in the U.K. for plastic products are the supermarkets, DIY, hardware stores, haberdasheries, wholesalers, and mail orders. Imports from Asia have to go through importers having connections with these distribution channels.

The percentages of sales of plastic products through these distribution channels are 35 percent for hardware stores, 30 percent for haberdasheries, 15 percent for DIY, 14 percent for department stores, and 6 percent for others.

In general, U.K. businesses consider imports from the Asian region too expensive due to the transport costs. According to the importers, even if products were sold directly to the retailers, the FOB prices would have to be 30 percent lower than domestic products.

By way of note, the average markups in sales of plastic products are as follows:

Manufacturers/Importers	Wholesalers	Retailers
100	130	135-166

Source: P-E International

Manufacturers customarily offer discounts for large orders.

Imported plastic products which have succeeded in the U.K. market have been mostly novelties with low transport costs. This shows the direction which Thailand should take in developing the U.K. market in the future.

Products imported from Asia which have succeeded in the market include plastic can openers, small flip-top bottles, knife holders, egg holders, containers, chopping boards, kitchenware, butter dishes, and bathroom accessories.

The U.K. market is characterized by development of products with balanced price and quality and further with design changes based on color. Regarding color, it is necessary to select colors suited to the lifestyle of the British. The colors themselves used tend to be limited by individual national characteristics.

### 3) Evaluation of Market for Thai Products

In the U.K., Thailand is known as a supplier of plastic products, but the products from Thailand are considered to be small bulk items. Higher added value products are not known.

Importable Thai products would be novelties with little transport costs, kitchenware consisting of combinations with metal, etc.

### (3) Japan

#### 1) State of Imports

Japan's imports of household goods and other plastic products reached US\$872 million in 1988 and US\$983 million in 1989. The main countries of origin were the U.S., Taiwan, and Korea. These three areas accounted for approximately 70 percent of all imports. Imports from Thailand constituted only a 1.7 percent share in 1988 and 3.2 percent share in 1989. The share, however, is increasing as a general trend. (See Table III-3-16)

Table III-3-16. Japan's Import of Plastic Products

(1000\$, Unit: Ton)

	1988			1989		
	Volume	Value	Share %	Volume	Value	Share %
U.S.A.	34,509	290,341	33.2	39,346	333,751	34.0
Taiwan	65,603	199,632	22.9	65,604	207,491	21.1
South Korea	41,097	130,221	14.9	41,382	133,274	13.6
Thailand	4,559	14,789	1.7	11,055	31,284	3.2
Others	39,862	237,358	27.3	49,496	277,046	28.1
Total	185,630	872,341	100.0	206,883	982,846	100.0

Source: Japanese trade statistics (according to NEBD system of JETRO)

The majority of the imports of plastic products by Japan are industrial use products. Household goods, tableware, and kitchenware account for only 8 percent or so of the imports of plastic products.

Of these, imports of household goods totaled US\$39.25 million in 1988 and US\$44.72 million in 1989 and imports of tableware and kitchenware US\$30.75 million

in 1988 and US\$35.2 million in 1989.

Imports from Thailand are mostly of household goods and tableware/kitchenware. A breakdown shows the former accounting for US\$7.57 million in 1988 (19.3 percent of the imports by Japan, second place after Taiwan) and US\$9.59 million in 1989 (21.4 percent, second place after the U.S.) and the latter accounting for US\$6.99 million in 1988 (22.7 percent, first place) and US\$7.81 million in 1989 (22.2 percent, second place). Thailand is therefore a major supplier of such products. (See Tables III-3-17 and III-3-18)

A feature of Thai products is the import of inexpensive items compared with the imports from the U.S. etc. A comparison of the unit price of tableware and kitchenware using trade statistics shows that Thai products have unit prices about one-half those of U.S. products. (See Table III-3-18)



Table III-3-17. Japan's Imports of Plastic Household Goods

(1000\$, Unit: Ton)

	1988			1989		
	Volume	Value	Share %	Volume	Value	Share %
U.S.A.	764	7,265	18.5	1,114	10,517	23.5
Thailand	1,338	7,570	19.3	2,105	9,590	21.4
Taiwan	2,813	9,804	25.0	2,555	9,287	20.8
South Korea	2,060	6,931	17.7	2,374	6,695	15.0
Others	851	7,675	19.5	841	8,640	19.3
Total	7,826	39,245	100.0	8,989	44,729	100.0

Source: Japanese trade statistics (according to NEBD system of JETRO)

Table III-3-18. Japan's Imports of Plastic Tableware and Kitchenware

(1000\$, Unit: Ton)

	1988			1989			Unit price
	Volume	Value	Share %	Volume	Value	Share %	
U.S.A.	656	5,905	19.2	956	8,578	24.4	9.0
Thailand	1,114	6,993	22.7	1,594	7,813	22.2	4.9
Taiwan	1,672	6,973	22.7	1,391	6,663	18.9	4.8
South Korea	1,546	5,057	16.4	1,882	5,276	15.0	2.8
Italy	83	881	2.9	113	1,236	3.5	10.9
W. Germany	75	846	2.8	92	1,180	3.3	12.8
China	103	473	1.5	128	918	2.6	7.2
Hong Kong	219	1,239	4.0	134	807	2.2	6.0
Netherlands	12	186	0.6	37	504	1.4	13.6
U.K.	35	617	2.0	29	436	1.2	15.0
Others	198	1,581	5.1	209	1,788	5.1	8.6
Total	5,713	30,751	100.0	6,565	35,199	100.0	5.4

Source: Japanese trade statistics

Note: Unit prices are unit prices of imports per kg.

## 2). Market and Distribution

Plastic household products come in a vast variety of types and differ according to the purpose of use. The quality demanded also differs.

A survey was run on household products commonly used in Japan asking consumers which of the following they stressed when making purchases : 1) ease of use, 2) durability, 3) sanitariness, 4) safety, 5) good color and patterns, 6) good designs and shape, 7) low price, 8) good quality, 9) lightness, 10) quality labeling and safety, or 11) manufacturer brand. Ease of use was mentioned as being stressed the most in purchases.

The priority of course differs according to the product. Consumers stress durability for trash containers, planters, and the like, good color and pattern for dishes etc., and sanitariness for chopping boards, lunch boxes, etc. This shows that measures tailored to the individual product are required when developing or selling products.

The biggest complaints Japanese consumers have about plastic products for daily use are the ease by which they become dirty, the ease by which they break, and the insufficient weight and thickness. In particular, the heaviness is a big issue in items requiring an aesthetic appearance (according to JETRO report on project for improvement of quality).

A feature of the distribution of plastic household goods in Japan is the use, in almost all cases, of wholesalers such as the following between manufacturers and retailers, supermarkets, and department stores:

- [1] Distribution channel to supermarkets  
Manufacturer --> Central general wholesaler --> Supermarket
  
- [2] Distribution channel to department stores  
Manufacturer --> Specialized department store wholesalers-->  
Department stores

This is a pattern of distribution channels seen in Tokyo and other large cities. In principle, these sell only to department stores. The products handled are mainly high priced plastic household goods with high turnovers.

[3] Distribution channel to retailers

Manufacturer --> Central wholesaler --> General retailer

Manufacturer --> Central general wholesaler --> Local wholesaler -->

Local general retailer

Relatively large general retailers in the large cities purchase from what are called "specialized retailer wholesalers" among the central general wholesalers.

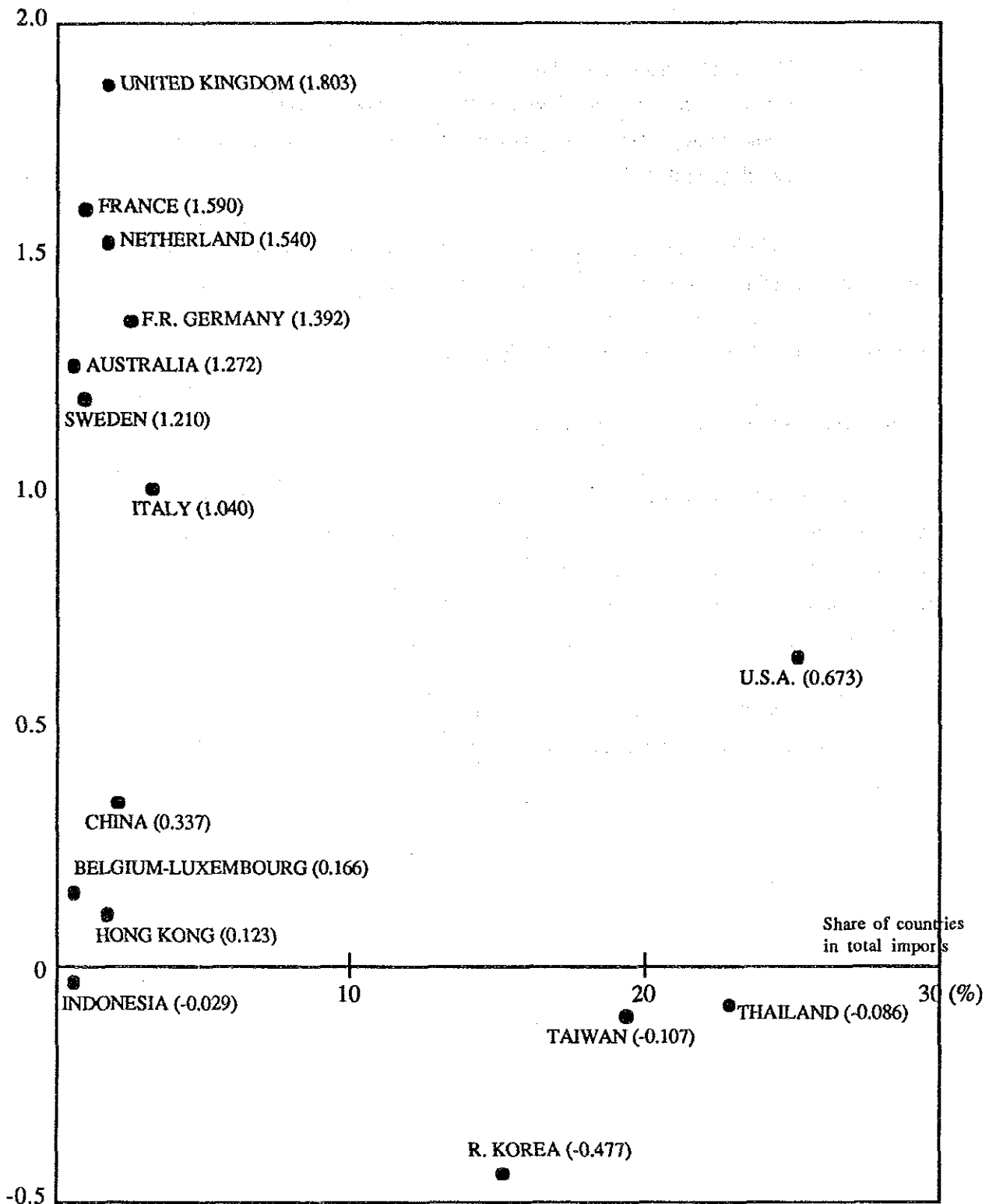
Further, general retailers in the local areas purchase through a two tier system of central wholesalers and local wholesalers.

### 3) Evaluation of Market for Thai Products

In the Japanese market, there has been remarkable growth seen in imports of tableware and kitchenware from Thailand, but there is no established evaluation of these products. The market for plastic products differs from that for textile products etc. in that the domestic companies are not particularly wary of any increase in imports. Therefore, Thailand could increase its exports in the future depending on the products it develops.

A look at the tableware and kitchenware being imported from Thailand at the present time shows that products of an average price range are being imported. (See Fig. III-3-3)

**Fig. III-3-3. Position of Products of Different Countries in Japanese Market for Imported Plastic Tableware and Kitchenware (1989)**



Note: The figures in parentheses indicate the ratio of the unit price of imports of each country divided by the average unit price of total imports of Japan minus one. When this figure is 0, it means the unit price is average in level. When minus, it means the unit price is lower than the average and when plus, the reverse.

The positions of the various countries were plotted using these figures for vertical axis and the share (%) in total imports for the horizontal axis. A look at these positions shows that Japan's imports of tableware and kitchenware are polarized into high price range products from Europe and the U.S. and average price range products from the NIEs and the ASEAN countries.

### **3-3. Current State in Competing Countries**

Exporting regions competing with Thailand in plastic products would be Hong Kong, Taiwan, Korea, etc. In this section, a look will be taken at Hong Kong and Korea.

#### **3-3-1. Hong Kong**

##### **(1) Overview**

The Hong Kong plastic processing industry first began in the 1940s as a low-wage labor-intensive industry. At the beginning, it made combs, toothbrushes, chopsticks, slippers, packaging bags, and other simple products for domestic use.

In the 1950s, Hong Kong began producing toys and plastic flowers and in early 1960s reached the peak of plastic flower production. For toys, it began by introducing technology and ideas from overseas.

By the middle of the 1960s, more sophisticated molded products were being produced and much more orders for toys were being received from other countries. In the late 1960s, plastic toys and flowers became important export products. At the same time, the products were diversified and Hong Kong began producing shoes and casings for electrical appliances, radios, cameras, etc. In the 1970s, the plastic industry further expanded its markets and shifted to higher quality items. In 1972, Hong Kong surpassed Japan in the toy sector and held that position until 1987, but flower and shoe production declined. The reasons for this were the changes in preferences of overseas consumers and the fierce competition from neighboring countries. Hong Kong continued to prosper in toys in the 1980s. On the other hand, among plastic products, household goods grew to the second most important export product after toys, though small in value.

At the same time, electronics and the advanced technology of the overseas markets made industry more complicated. The plastic product industry began to produce textiles, electrical and electronic parts, watches, jewelry, traveling equipment, handbags, copy machine parts, etc.

## **(2) Structure of Hong Kong Plastic Processing Industry**

### **1) Structure**

The number of companies in the plastic industry increased remarkably in the 1950s and the 1960s. Between 1950 and 1970, these companies increased at a rate of 33.9 percent. Between 1975 and 1988, on the other hand, the increase was 3.8 percent. Plastic product companies have accounted for 10 to 11 percent of all companies in Hong Kong since 1975. They employ about 10 percent of the workers in all industries in Hong Kong, though in 1988 this fell to 8.6 percent.

As of 1988, there were 5,572 companies, of which 1,516 (27.2 percent) were producing plastic toys. The plastic processing industry employs 72,412 workers, of which 30,675 work in toy companies, 41,737 work in the plastic flower and other processing companies.

### **2) Size of Companies**

Like in other industries, the companies in the plastic processing industry are small in size. The average number of workers per company in 1988 was 13. Companies with no more than 20 workers accounted for 85.8 percent of all companies. There were only eight companies with over 500 workers.

### **3) Production Trends**

In 1987, Hong Kong produced 27 billion HK dollars worth of plastic products, of which toys and accessories accounted for 33.4 percent, plastic chassis and parts for radios, computers, cassette tape recorders, and other electrical equipment for 9.9 percent, dolls for 5.6 percent, and household goods, covered by this survey, for 4.2 percent.

### **4) Related Industries**

#### **[1] Plastic Materials**

There are 342 companies producing plastic materials, of which two produce resins and 296 are recycles of plastic. The remainder are compounders which mix pigments and materials.

Despite the development of this related industry, Hong Kong produced domestically only 13 billion HK dollars worth of materials and imported 64 billion HK dollars worth.

## [2] Molds and Dies

The mold and die industry has a long history and began exports in the 1960s.

Most plastic processors in Hong Kong make their own molds and dies in-house. Less than 25 percent of the molds and dies are for domestic use. The majority of the high quality molds and dies are for export. Hong Kong must, however, import large size precision engineering molds and dies.

Hong Kong is making little use of CAD-CAM systems and computerized machinery is of a low level.

Related organizations are working on the mold and die sector. The Hong Kong Productivity Center (HKPC) offers training, consulting, and technical and laboratory services in the field of molds and dies. The HKPC has also introduced technology for computer simulation and analysis of the flow of plastics in injection molding.

The Vocational Training Council has established a training center for precision molds and dies. The training bureau of the association is also operating a machine shop and metalworking training center.

## [3] Molding Machines

In the 1960s, Hong Kong began production of copies of imported machines. At the present time, it is producing computer controlled plastic molding machines.

There are 16 manufacturers producing injection molding machines. These both supply the domestic market and export overseas. Most of these are new entries in the field established with an eye on the rapid growth of demand for plastic molding machines in the China market.

There are many problems remaining with these machines, however, compared

with high class imports.

#### **[4] Cost Composition**

In general, materials account for 71.6 percent of the costs and labor for 18.1 percent.

### **(3) Export Trends**

#### **1) Main Export Destinations**

The U.S. has been a main market for Hong Kong plastic products since the 1950s. Hong Kong increased exports to that country from 140 million HK dollars in 1960 to 6,244 million HK dollars in 1987. In 1988, however, exports fell to 4,599 million HK dollars. The share of the U.S. in its total exports, which was 50.7 percent in 1985, fell to 38.8 percent in 1988. The decline in the share of the U.S. in recent years has been a major feature of Hong Kong's exports.

The second largest market after the U.S. used to be the U.K., but this position was taken over by China in 1987. In terms of value, exports to the U.K. fell from the 22.5 percent of 1960 to 6.8 percent in 1988, with China becoming correspondingly greater in importance. (Table III-3-19)

#### **2) Main Products**

The main export items are plastic toys and dolls and decorations, which are outside of the scope of the present survey. Exports of household goods are only about one-sixth of those of toys and dolls. Hong Kong's exports of plastic products are shifting from those of simple molded plastic products to higher added value products using plastics. Hong Kong's industries as a whole are developing as centers of design and packaging and at the same time are shifting low added value, labor intensive production to China. The same trend is visible in the plastic industry. Exports of decorations, packing, bags, and closures have been increasing. (See Table III-3-20)

#### **3) Strategy for Development of Overseas Markets**

The Hong Kong plastic processing companies are satisfied with the U.S. market,



but are not satisfied with the European market. This is because the European market is very finely segmented and thus the share of Hong Kong in that export market is small.

The means being taken to eliminate the problems faced in market development are reduction of production costs, improvement of product quality, reduction of prices, and establishment of factories in China.

Methods used to increase exports are creation of new products, improvement of product designs and quality, and maintaining close contacts with buyers.

As to sales methods, direct sales are frequent in exports to the U.S., Europe, and China. Most companies are not interested in sales methods.

Regarding introduction of products, the general method used is to introduce products by advertising or letter. Other methods mentioned were participation in trade fairs.

The activities of the TDC and trade magazines were given high marks as means for developing foreign markets.

Market information is obtained from exporters, sales agents, trade related documents, trips overseas, and the data base of the HKPC.

#### **4) Methods of Industrial Promotion**

- **Investment Promotion**

While not solely for the plastic processing industry, Hong Kong established the ONE-STOP unit for promotion of general investment and established investment offices in key countries around the world.

- **Educational Facilities**

Hong Kong has two universities and two industrial colleges and also enjoys a flow of students returning home from study abroad, but the plastic processing industry finds it difficult to attract these new graduates.

There are five technical schools established by the Vocational Training Council (VTC) as facilities for training craftsmen and technicians.

• Others

The HPKC offers technical courses at all times for technical training in plastics.

**Table III-3-19. Key Export Destinations for Hong Kong Plastic Products**

(Unit: 100Million \$)

	1960	1965	1970	1975	1980	1985	1986	1987	1988
U.S.A.	140 (53.4)	370 (56.1)	934 (61.5)	948 (48.2)	2,376 (38.8)	5,140 (50.7)	6,303 (49.6)	6,244 (45.0)	4,599 (38.8)
China	*	7 (1.1)	*	*	81 (1.3)	609 (5.7)	788 (6.2)	1,240 (8.9)	1,673 (14.1)
U.K.	59 (22.5)	103 (15.6)	161 (10.6)	201 (10.2)	536 (8.8)	701 (6.6)	826 (6.5)	953 (6.9)	802 (6.8)
Australia	12 (4.6)	24 (3.6)	47 (3.1)	119 (6.0)	268 (4.4)	491 (4.6)	502 (3.9)	511 (3.7)	507 (4.3)
W. Germany	3 (1.1)	15 (2.3)	56 (3.7)	128 (6.5)	427 (7.0)	486 (4.6)	563 (4.4)	611 (4.4)	460 (3.9)
Canada	11 (4.2)	31 (4.7)	62 (4.1)	92 (4.7)	193 (3.2)	445 (4.2)	528 (4.2)	539 (3.9)	407 (3.4)
Others	37 (14.1)	109 (16.5)	259 (17.1)	479 (24.4)	2,243 (36.6)	2,536 (23.7)	3,206 (25.2)	3,778 (27.2)	3,399 (28.7)
Total	262 (100.0)	659 (100.0)	1,519 (100.0)	1,967 (100.0)	6,124 (100.0)	10,678 (100.0)	12,716 (100.0)	13,876 (100.0)	11,847 (100.0)

Source: Hong Kong trade statistics

Note: Figures in parentheses indicate share of total exports (%)

**Table III-3-20. State of Hong Kong Exports of Key Plastic Products**

(Unit: 100 Million HK\$)

Major items with trade code*	1988	1987	1986	1985	1984
Toys, dolls	5,859 (46.8)	7,735 (54.8)	7,944 (60.7)	6,932 (63.5)	8,299 (66.1)
Arts articles (893999)	2,490 (19.9)	2,484 (17.6)	1,760 (13.4)	1,074 (9.8)	929 (7.4)
Packing bags, closures (893101, 893109)	1,342.8 (10.7)	960.3 (6.8)	684.1 (5.2)	556 (5.0)	587 (4.6)
Household/Decorative Articles (893991, 821994, 821997)	851.2 (6.8)	871.3 (6.1)	767.6 (5.8)	628.5 (5.7)	678.4 (5.4)
Travelling goods and bags (831013, 831017, 831020, 831025, 831028, 831034, 831037, 831093, 831094)	464.4 (3.7)	557.1 (3.9)	560 (4.2)	550.5 (5.0)	685.8 (5.4)
Garments and clothing accessories (842913, 842914, 848211, 848212, 848213, 848215, 848216, 848218 848219, 899832)	454.5 (3.1)	356.5 (2.5)	282.4 (2.1)	218 (1.9)	219.7 (1.7)
Slippers and footwear (851014, 851015)	302.8 (2.4)	358 (2.5)	346 (2.6)	328 (3.0)	448 (3.5)
Office/School supplies (893940)	255.4 (2.0)	265.7 (1.8)	237.8 (1.8)	167.1 (1.5)	165 (1.3)
Ornamental Articles (893300)	154.8 (1.2)	115.4 (0.8)	91 (0.7)	80.9 (0.7)	61 (0.4)
Artificial Flowers (899931)	152.7 (1.2)	221 (1.5)	234 (1.7)	248 (2.2)	335 (2.6)
Lamp fittings (812428)	87 (0.7)	124 (0.8)	107 (0.8)	93 (0.8)	86.9 (0.7)
Sanitary Articles (893200)	38 (0.3)	20.4 (0.1)	20.7 (0.1)	14.9 (0.1)	28 (0.2)
Watch Strap (894223, 894232, 894235, 894236)	37.6 (0.3)	19.8 (0.1)	20.3 (0.1)	14.4 (0.1)	10.3 (0.08)
Others	13.8	12.7	14.4	13.4	18.0
<b>Total</b>	<b>12,503.9</b>	<b>14,101.2</b>	<b>13,069.3</b>	<b>10,918.7</b>	<b>12,551.1</b>

Source: Hong Kong trade statistics

Note: Figures in parentheses indicate share of total exports (%)

**Table III-3-21. Value of Hong Kong exports of plastic products 1984 - 88**  
(Value HK\$ Million)

Trading Code (see Appendix I)	1984	1985	1986	1987	1988
812428	86.9	93	107	124	87
821994	0.77	0.78	0.82	4.6	4.4
821997	1.7	1.6	3.2	2.4	1.6
831013	260	181.1	195.7	181	132.9
831017	141.7	109	101.5	107	84.6
831020	407	2.9	3.6	5.0	4.8
831025	526.	34.6	36.8	31.5	20
831028	65.6	57.9	60.5	47.3	38.9
831034	3.4	1.8	2.7	2.8	1.9
831037	5.2	2.8	2.278	4.5	8.0
831093	130.4	144	147	173	171.3
831094	22.2	16.5	10	5	2
842913	58	46.1	48.9	48	48.6
842914	6	2.14	1.8	2	3.5
848211	23.9	20.4	23.4	19	14.1
848212	8.9	16.8	18.5	16	21.6
848213	4.2	1.52	7.2	5	5.1
848215	3.9	5.5	N/A	N/A	N/A
848216	10.4	8.5	3.4	4.6	7.1
848217	10.3	14.4	20.3	19.8	37.6
848218	29.1	26.5	34.6	45.5	86.6
848219	11.3	14.6	22	32.4	57.5
851014	210	174	154.5	130	86.8
851015	238	154	191.5	228	216
893101	350	368.8	466.3	591.7	717.8
893109	237	187.1	217.8	368.6	625
893200	28	14.9	20.7	20.4	38
893300	61	80.9	91.0	115.4	154.8
893910	0.2	0.031	0.039	N/A	N/A
893936	18	13.2	14.2	12.5	13.7
893940	765	167.1	237.8	265.7	255.4
893991	676	626.2	763.6	864.3	845.2
893992	0.03	0.16	0.253	0.258	0.15
893993	0.4	0.76	N/A	N/A	N/A
893994	43	60.5	N/A	N/A	N/A
893999	929	1,073.9	1,760	2,484	2,490
894223	734	452	608	80	171.9
894232	90	70.9	74	81	162.4
894235	6,141	5,172	5,800	5,717	4,112
894236	1,334	1,236.6	1,462	1,857	1,414
899832	64	76	122.6	184	210.3
899931	335	248	234F	221	152.7

Source: Hong Kong trade statistics

Note: 812428 Lamps lighting fittings and parts plastics  
821994 Furniture NES of plastic materials  
821997 Parts NES of rattan/plastic coated rattan  
831013 Handbags of plastic materials  
831017 Wallets purses of plastic materials

831020 Trunks and suitcases of plastic  
831025 Travelling bags of plastic  
831028 Shopping bags haversacks and toilet cases of plastic  
831034 Satchels of plastic  
831037 Brief cases of plastic  
831093 Travel goods NES of plastic  
831094 Sports bags of plastic  
842913 Outer garments mens of plastic coated fabrics  
842914 Outer garments boys of plastic coated fabrics  
848211 Garments mens boy plastic  
848212 Garments womens girls plastic  
848213 Garments babies plastic  
848215 Underwear babies plastic  
848216 Gloves plastic  
848217 Watch straps plastic  
848218 Belts for apparel plastic  
848219 Clothing accessories plastic  
851014 Slippers plastics  
851015 Footwear plastic  
893101 Polyethylene packing bag  
893109 Articles for packing of goods and plastic closures  
893200 Plastic sanitary/toilet articles  
893300 Plastic ornamental articles  
893910 Polyvinyl chloride (PVC) tiles and flooring  
893930 Plastic roller venetian blinds  
893940 Plastic office school supplies  
893991 Table household decorative articles of plastics  
893992 Transparent film cut to shape  
893993 Decorative laminates  
893994 Plastic beads  
893999 Other articles of art plastic materials  
894223 Dolls plastic  
894232 Toys plastic with electric motor radio controlled  
894235 Toys plastic not containing electric motor  
894236 Toys plastic with electric motor not radio controlled  
894832 Button plastic  
899931 Artificial flowers plastic

## **5) Plastic Industry Organizations and Government**

### **[1] Industrial Organizations**

#### **a. Organizations active for industry as a whole**

**The Chinese Manufacturers Association of Hong Kong (CMA)**

**Federation of Hong Kong Industries (FHKI)**

**Activities: Negotiations with government, organization of trade missions, inquiries, sponsoring of trade fairs**

#### **b. Plastic related organizations**

**Hong Kong Plastic Manufacturers Association**

**Hong Kong & Kowloon Plastic Products Merchants United Association**

**Chiu Chau Plastic Manufacturers Association Company**

**The Hong Kong Polyethylene Tubing Manufacturers Association**

**Activities: Representation of interests of industry before the government, dispatch of missions, particularly active with respect to Japan, West Germany, and the U.S.**

### **[2] Government and Private Sector Activities**

The government and plastic industry are engaged in various joint activities despite the fact that Hong Kong adopts a hands-off policy in industry:

#### **a. Establishment of Plastic Technology Center**

Recently, the government has joined with private sponsors and established the Plastic Technology Center in the Hong Kong Polytechnic so as to supply information on plastic technology.

#### **b. Establishment of Hong Kong Plastic Council**

The Hong Kong Plastic Council was established under the assistance of the FHKI. All plastic related companies may join as members. The purpose of the council is to provide advice to the government on matters relating to plastic companies and to propose means of resolution of problems.

**[3] Others**

As a trade organization, there is the TDC (Hong Kong Trade Development Council). This sponsors trade fairs, makes press releases, and supplies business information.

### **3-3-2. Korea**

#### **(1) Overview**

Korea's plastic processing industry was producing electrical sockets, sheets, etc. using phenol and urea resins in the 1930s. In the 1950s, it was importing and processing thermoplastic resins and in the early 1960s it was producing phenol, urea, melamine, unsaturated polyester resins, polvinyl acetate, acrylic emulsion resins, and alkyd resins for paints. From the late 1960s to the early 1970s, it moved to the production of PVC using acetylene and EDC, constructed the Isan Petrochemical Estate, and began production of PE, PP, PVC, and PS. Since 1973, it has been using naphtha from crude oil to produce PE and PP. It has further been expanding the Isan Petrochemical Complex, building the No. 2 Lisen Petrochemical Complex, and begun production of PE, PP, PVC, ABS, and SAN there. It further has plans for the production of engineering plastics and for a third petrochemical complex.

As a result, it is self-sufficient in all materials except for some specialty ones and in fact has an excess supply of some items.

In 1989, the per capita plastic consumption reached 57 kg (compared with 80 to 100 kg of the U.S and Japan).

At the present time, the problem being faced by the Korean plastic Industry is the dissipation of its export price competitiveness due to soaring domestic wages. One leading company is taking the step of establishing joint ventures in South Asia.

#### **(2) Structure of Korean Plastic Processing Industry**

##### **1) Structure**

In 1987, total production of the plastic processing industry reached about 2900 billion won, accounting for 2.4 percent of total industrial production. The industry further accounted for 2.6 percent of the total workers in the industrial sector.

##### **2) Size of Companies**

A look at the ratio of companies by the number of employees shows that there are



only 18 companies with over 300 workers, 0.7 percent of the whole. The remaining 99.3 percent of the companies are medium or small in size. In particular, there are 2,371 companies with no more than 50 workers, 87 percent of the whole. Most of the companies in this industry are also small in terms of capital.

### **3) Production Trends**

In 1989, Korea produced 2.39 million tons of plastics, of which 110,000 tons went for daily use items and 349,000 tons for machine parts.

### **4) Related Industries**

#### **[1] Plastic Materials**

With the exception of some engineering plastics, almost all plastic materials are produced domestically. The rate of self-sufficiency in the five most important general use resins rose from 94 percent in 1987 to 104 percent in 1988, providing a firm foundation of self-sufficiency.

#### **[2] Molds and Dies**

The government realized the weakness of the mold and die industry in the 1970s and established a program for intensive promotion of the same, but has not been able to achieve the desired results due to the small size of the companies and the underdeveloped state of their technical capabilities. However, Korea is capable of supplying itself with plastic molds where precision is not required. The recent jump in wages, however, has resulted in a decline in the competitiveness of domestic molds and imports, though small, of cheap Chinese molds.

Molds requiring precision, such as blow molds, vacuum molds, compression molds, and foam molds are being imported from Japan. According to industry sources, the ratio of imports to total demand is about 10 percent.

#### **[3] Molding Machines**

Up until the 1960s, Korea relied almost completely on imports of molding machines, but starting in the 1970s, domestic production of machinery was promoted and

now the majority of machines such as extrusion machines, injection molding machines, and blow molding machines can be made domestically. Some machines are even being exported. However, production of molding machines is relatively backward compared with other machinery. The majority of the machines produced tend to be made in parallel with other machinery rather than being made by specialized manufacturers. As a result, there are problems in the quality of the machines.

As a recent trend, there have been notable cases of imports of automated machinery from Japan and West Germany aimed at labor savings due to the rising wages in Korea.

## **5) Cost Composition**

While there are some differences between the large companies and the medium and small sized ones, 73 percent of the costs are for materials, 8.2 percent for labor, and 18.8 percent for other expenses.

## **(3) Export Trends**

### **1) Product Trends**

The value of exports of Korean plastic products increased from US\$950 million in 1986 to US\$1,730 million in 1987 and US\$2,370 million in 1988. Exports in 1989 probably grew only 5 to 6 percent due to the appreciation of the won, the soaring prices of raw materials, and the slackening of overseas demand.

Much of these exports consisted of bags, fishing gear, and other plastic using products not covered by this survey. Daily use items accounted for only a slight share of these exports - US\$28 million as of 1987. Like with Hong Kong, exports of Korean plastic products are moving more to an emphasis on higher added value products using plastic. (See Tables III-3-22 and III-3-23)

### **2) Export Channels**

The plastic processing industry is mostly comprised of cottage sized companies and is characterized by short run production of diverse items. There are few specialized companies and the industry relies on domestic demand. Therefore, the export ratio is

lower than would be expected from the number of companies and production. With the exception of some of the large companies, the industry relies almost completely on the domestic market. Further, it mostly supplies semifinished goods rather than finished ones. In exports, the large companies generally export directly. The small and medium sized companies, as will be understood from the fact that 97.6 percent of their production goes to the domestic market, have little chance for export and even when they do mostly do so indirectly.

### **3) Product Development**

The small and medium sized companies, which primarily produce for the domestic market, produce based on samples and specifications supplied by their customers. Korean industrial associations considered that only 15 percent of export products are developed independently by the Korean manufacturers.

### **4) Development of Overseas Markets**

Overseas markets are being developed aggressively by the large corporations by dispatch of salesmen overseas, invitations to foreign buyers and mass merchandisers, dispatch of samples overseas, invitations to buyers to attend domestic exhibitions etc., while small and medium sized enterprises most often contact general trading companies or large sized manufacturers to obtain orders for production. They sometimes also use the guidebooks of the Korean Trade Agency (KOTRA), Korean Trade Association, and other export promotion organizations. Further, there are market development activities such as the dispatch of overseas market development missions by the Korean Plastic Industry Cooperative Association.

Table III-3-22. Korean Exports of Plastic Products (1985 to 1987)

Unit: tons, US\$1000)

No.	Commodity	1985		1986		1987		Remarks (main export country)
		Weight & Quantity	Value	Weight & Quantity	Value	Weight & Quantity	Value	
893991A	Bobbins, spools, reels and other similar products	28.0	77.0	62.9	206.4	184.7	951.3	
8939918	Other	53.5	144.1	52.2	385.4	199.9	1,477.4	Japan USA, Kuwait
89311	Articles for the conveyance or packing of goods	342.5	717.3	474.0	860.6	937.9	2,169.7	
89312	Other	184.0	465.8	188.2	618.4	314.4	1,086.6	U.S.A. Japan Belgium
89321	Baths	-	-	0.1	2.7	-	-	
89322	Basins	2.5	4.9	0.5	2.1	0.7	2.5	
89323	Water-closet seats	0.0	0.2	0.7	1.6	4.2	10.5	
89329	Other	63.7	219.4	103.4	365.1	217.5	863.4	U.S.A. Japan, France
8933	Ornamental articles and objects of personal	9.8	225.1	108.5	1,575.5	48.9	864.3	
89394	Office or school supplies	16.1	54.3	42.3	162.9	122.6	419.5	
84821	Articles of apparel and Accessories	355.9	1,044.0	537.2	1,715.9	524.3	2,012.4	
9035	Articles for electric lighting	1.5	7.0	2.9	27.0	0.9	9.5	
89393	Roller blinds, venetian blinds similar articles and parts thereof	0.0	226.4	-	-	-	-	
893992	Table or kitchen utensils	116.2	192.9	306.5	505.5	506.4	933.2	
89399	Other	3,049.4	6,440.7	5,909.0	11,929.6	7,041.6	17,058.0	U.S.A Denmark, Japan
899963	Fans and hand screens, frames and handles therefor and part of fans & handles	-	-	0.0	0.1	-	-	
89989	Corset busks and similar supports	12.7	42.9	0.0	0.1	-	-	
893993	Table cloths and other similar products	40.5	92.6	-	-	0.1	0.0	
893994	Labels and Tags	0.0	1.0	19.1	44.6	5.2	89.0	
893995	Adhesive tapes with case	16.8	29.5	2.1	6.2	3.0	7.3	
Total		4,293.1	9,985.1	7,809.6	18,409.7	10,112.3	27,954.6	

Source: Korea Trade Statistic

**Table III-3-23. Korean Exports of Plastic Products (1988 to 1989)**

(Unit: Ton, 1000Bahts)

No.	Commodity	1988		1989	
		Weight& Quantity	Value	Weight& Quantity	Value
8932111	Baths and shower baths	0.2	1.4	29.3	73.9
8932112	Wash-Basins	0.9	4.5	-	-
893212	Lavatory-seats and covers	11.9	62.6	8.0	41.7
893213	Bidets	-	-	-	-
893219	Other	125.2	612.0	90.5	377.9
893191	Buaes, Cases, Crates, and articles	385.5	1,233.9	391.6	1,450.0
893111	of polymers of ethylene	1,944.6	4,000.7	1,555.7	2,633.7
893119	Of other plastics	83.1	593.3	165.0	914.9
893192	Carboys, bottles, flasks and similar articles	13.8	78.0	4.0	18.4
893193	Spools, cops, bobbins and supports	60.0	295.9	28.5	150.5
893194	Stoppers, lids caps and other closures	15.7	113.7	38.6	285.9
893199	Other	109.0	491.4	82.6	274.6
893321	Tableware and kitchenware	820.7	2,062.4	828.4	1,881.1
8933291	Soap dishes and boxes	0.1	3.0	6.5	34.9
8933292	Table cloths and other similar articles.	-	-	0.0	0.4
8933299	Other	67.9	456.0	78.7	371.0
<b>Total</b>		<b>3,638.6</b>	<b>10,008.8</b>	<b>3,307.4</b>	<b>8,508.9</b>

Source: Korea Trade Statistics

Note: According to the exchange of statistics, the volume of 1988 and 1989 are different.

#### **(4) Industrial Promotion Policies and Export Promotion Policies**

##### **1) Industrial Promotion Policies**

There are no measures for promotion of the plastic processing industry per se, but various measures have been taken for promotion of small and medium sized companies. These include financial support and tax incentives for technical development, establishment of information systems, business conversion, overseas relocation, and promotion for changing to big industry.

##### **2) Programs for Training Plastic Technicians**

The Korean Job Management Corporation serves as the public organization for vocational training. However, it does not provide training of skilled workers for all fields.

3) As an organization of plastic processing manufacturers, there is the Korean Plastic Industry Cooperative Association, which boasted 704 members as of 1989. Its activities include the provision of technical information, the promotion of technical guidance programs, the promotion of exports, and the promotion of the establishment of industrial estates for the plastic sector. The industry is pressing forward with plans for construction of a technical training center for resolution of the shortage of expert technical staff. It is scheduled to prepare its basic plans in 1990 and complete the project within two years. This organization also provides suggestions to the government on the tax system, financing, etc. and also participates in overseas trade fairs, participates in seminars relating to the industry, introduces business partners, etc. It deliberates when necessary with government organizations (Small and Medium Enterprise Promotion Corporation) for technical guidance and introductions.

#### **3-4. Export Targets**

The Thai Ministry of Commerce establishes targets every year for exports of Thai plastic products.

The target for exports of plastic products in 1990 is as follows:

Since the value of exports in 1989 is estimated at 4.8 billion bahts, target of 6.0

billion bahts has been set for exports in 1990. This anticipates a growth of 25 percent over the previous year.

### **3-5. Problems and Countermeasures**

(1) In exporting plastic products, it is necessary to give separate consideration to parts and household goods.

(2) Regarding parts, the question is whether there has been complete import substitution in the domestic market. Production of parts depends largely on the procurement plans of companies manufacturing end products. In many cases, parts manufacturers are able to sell parts because of close ties with such companies. It would be impossible for an independent parts manufacturer in Thailand to suddenly walk into a manufacturer of final products and make a sale.

Planned measures are required to increase such ties. This would require increasing the reliability of Thailand's plastic processing technology. First, it would therefore be necessary to prepare plans for raising the level of technical competence.

(3) In exporting household goods, there are two types of commodities: those where the price factor comes first and those where nonprice factors take priority. When exporting plastic products, the products are generally low in added value and the transport costs account for a large percentage of the sales price, so the regions where they are price competitive are limited. In developing markets, it is therefore necessary to take a regional strategy differentiating between Europe, the U.S., the Middle and Near East, the ASEAN countries near to Thailand, and East Asia, including Japan. Therefore, information regarding the market trends in each of these regions would have to be collected. This would be impossible for individual companies to do. An industrial organization and the Ministry of Commerce's DEP would have to collect the information.

Regarding products where the nonprice factors are predominant, while much depends on the product design capabilities of the individual companies, it is necessary to produce export products matching the lifestyles in the export destinations. In that sense, Thai companies should participate in the major global trade fairs on daily use items and make use of the same as opportunities for development of new products. To increase the frequency of participation, consideration may be given to joint participation by the plastic industry association.

Development of new plastic products includes not only mechanical development, but creation of new products along with the appearance of new plastics. For example,



there are the plastic products usable in microwave ovens. This type of product development cannot be handled by individual companies alone.

Research in such plastics and their use in new products should be handled by a public organization. Where this type of research is impossible, further, the public organization must shoulder the task of collecting and disseminating this type of information.

(4) According to reports from different areas, Thailand is not recognized as a supplier of plastic products. When participating in trade fairs, it is necessary therefore to positively participate in conferences etc. and to push the image of Thailand's plastic industry.

For such activities, it would be necessary for joint participation of the Ministry of Industry etc. in trade fair activities previously handled only by the Ministry of Commerce.

(5) In exports, research on the distribution systems of the different countries is necessary. These distribution systems are based on historical factors and therefore differ considerably by country. Development of export routes in line with the distribution situations in the different countries is necessary. Dissemination of such information is also considered a proper activity of an export promotion organization.

(6) The plastic industries of Hong Kong and Korea are now trying to shift from household goods etc. to more higher added value products. Plastic products are diverse in type, even already developed ones, and diverse in the required technology as well. To deal with this, Hong Kong industrial organizations have established a technical information center etc. in cooperation with government agencies. Further, the Korean Plastic Industry Cooperative Association is pushing forward with plans for construction of a technical training center. These activities of Thailand's competitors would be of reference to the Thai plastic industry.

(7) In the export of plastic products, note must be taken of one trend. The import dependence of plastic products used for household goods, as seen from the market situation in the U.S. and the U.K., is extremely low. The share in imports of manufactured goods is at its highest 0.9 percent in the U.K. and a small 0.1 percent in Japan. For this reason, it is very necessary that the makers supply household goods that meet the needs of export markets.

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**Note: Information on key markets and the current state of competition from other countries contained in this chapter is based on the Survey of the Market and Survey of Competing Countries by JICA.**

## **Chapter 4. Production Activities and Technology**

In the plastic processing industry, the type of company differs tremendously depending on the type of product manufactured. This is because the fields in which plastics are used are extremely diverse, so not only the quality and performance demanded of plastic processed products, but also the business practices of the industries to which those processed products belong differ.

The applications of plastics may be roughly classified into packaging materials, building materials, agricultural and fishery materials, household goods, and industrial parts. Each of these represent different industries. Here, we have taken up industrial parts and household goods and surveyed the production activities and technology in the same mainly from the standpoint of production technology. The results and problems are explained below.

### **4A. Plastic Industrial Parts**

A classification by type of company of the 12 manufacturers of plastic industrial parts surveyed gives Table III-4A-1. That is, it is possible to divide them into Group I companies which are manufacturers specializing in plastic parts and produce genuine parts, Group II companies which primarily engage in metalworking but also produce genuine plastic parts, Group III companies which are comprehensive plastic processing manufacturers which produce plastic processed products other than parts as well, and Group IV companies which are manufacturers of nongenuine plastic parts.

Among the Group I companies are many manufacturers of external parts for audio equipment and manufacturers of motorcycle parts. These specialize in certain areas of technology and are high in technical level in most cases.

The Group II companies are somewhat special and originally were manufacturers of metal work, but along with the conversion of the materials of their products, entered into the plastic processing industry. Both the companies here are foreign capital affiliates.

The Group III companies are general manufacturers of plastic processed products and produce not only industrial parts, but also household goods, packaging materials, agricultural materials, and plastic products of numerous other fields. All of these are Thai capital manufacturers and fall into the group of large Thai companies. In these companies,

the ratio of industrial parts to the total value of production is from 20 to 30 percent.

The Group IV companies are manufacturers of motorcycle batteries. These do not ship to motorcycle manufacturers, but sell everything on the market and also export some, about 30 percent, of the production to the Middle and Near East etc.

The companies surveyed may be classified into the above four groups according to their mode of business, and the problems found as a result of the survey may also be classified according to these groups.

**Table III-4A-1. Classification of Manufacturers of Plastic Industrial Parts**

Types of parts	Manufacturers of industrial parts		General plastic processing manufacturers
	Specialized plastic processing	Primarily metal working, some plastics	
Genuine parts	(Group I) 6 companies	(Group II) 2 companies	(Group III) 3 companies
Nongenuine parts	(Group IV) 1 company	—	—

#### 4A-1. Planning and Development of Products

##### 4A-1-1. Planning and Development System

Plastic industrial parts may be roughly classified into parts for home electric appliances, electronic equipment (including audio equipment), motorcycles, and automobiles. In the case of home electrical and electronic equipment, the assembly companies visited for the current survey made 10 to 20 percent of the parts in-house and contracted out the remaining 80 to 90 percent to domestic Thai plastic processors. In the case of motorcycles, the assembly manufacturers did not produce any of the plastic parts at all, but contracted out everything to domestic Thai processors. Nevertheless, in the case

of automobiles, the rate of procurement of domestic Thai processors was 10 to 30 percent, with the remaining 70 to 90 percent being imported in the form of plastic molded parts. This, however, invites an increase in the packaging and shipment costs and is one of the main problems which assembly manufacturers would like to solve. Note that the assembly manufacturers do not engage in any in-house production at all.

As mentioned above, the modes of production and procurement differ depending on the type of the industrial parts, but all of the planning and development is performed by the assembly manufacturers, and the processing manufacturers do not, with one exception, participate at all in the process. Even among the assembly manufacturers, one of the foreign capital affiliated ones producing completely for export had all of its product planning and development handled by its joint venture parent company. The other companies, however, were dealing primarily with the domestic Thai market and only secondarily with exports, so the local assembly manufacturers took charge to ensure that new products fit the needs of the Thai market. Even in this case, however, the materials are set, the molds are designed (and in some cases fabricated), and other technical development is handled by the overseas parent companies based on these plans.

#### **4A-1-2. State of Planning and Development Personnel**

With the exception of the manufacturers of the Group II companies in Table III-4A-1, processing manufacturers do not have personnel specializing in planning and development of industrial parts and rather wait for orders from assembly manufacturers. These processing manufacturers have little desire of their own to participate in the planning and development activities of the assembly manufacturers or to develop products or production technology together with the assembly manufacturers or material manufacturers and in fact do not feel any need for the same. The two companies belonging to Group II, however, have their own brand of products and engage in independent planning and development.

#### **4A-1-3. Capability of Planning and Development**

With the exception of the manufacturers belonging to Group II, the parts manufacturers are engaged entirely in subcontracted production and do not have planning and development capabilities. At the present time, these manufacturers are not particularly concerned about the situation because of the continually increasing demand.

In Japan, the relationship between parts manufacturers with high levels of management competence and technology and assembly manufacturers generally involves the former producing parts according to basic ideas supplied by the latter. The parts manufacturers themselves determine the final designs and raw materials and make or order molds.

As shown in Fig. III-4A-1, 11 automobile assembly manufacturers have more than 200,000 related parts manufacturers, among which there is severe competition. Therefore, they have a tendency to specialize in specific products and base their sales activities on their planning and development abilities. These planning and development capabilities represent a support base for assembly manufacturers in terms of technology and product quality.

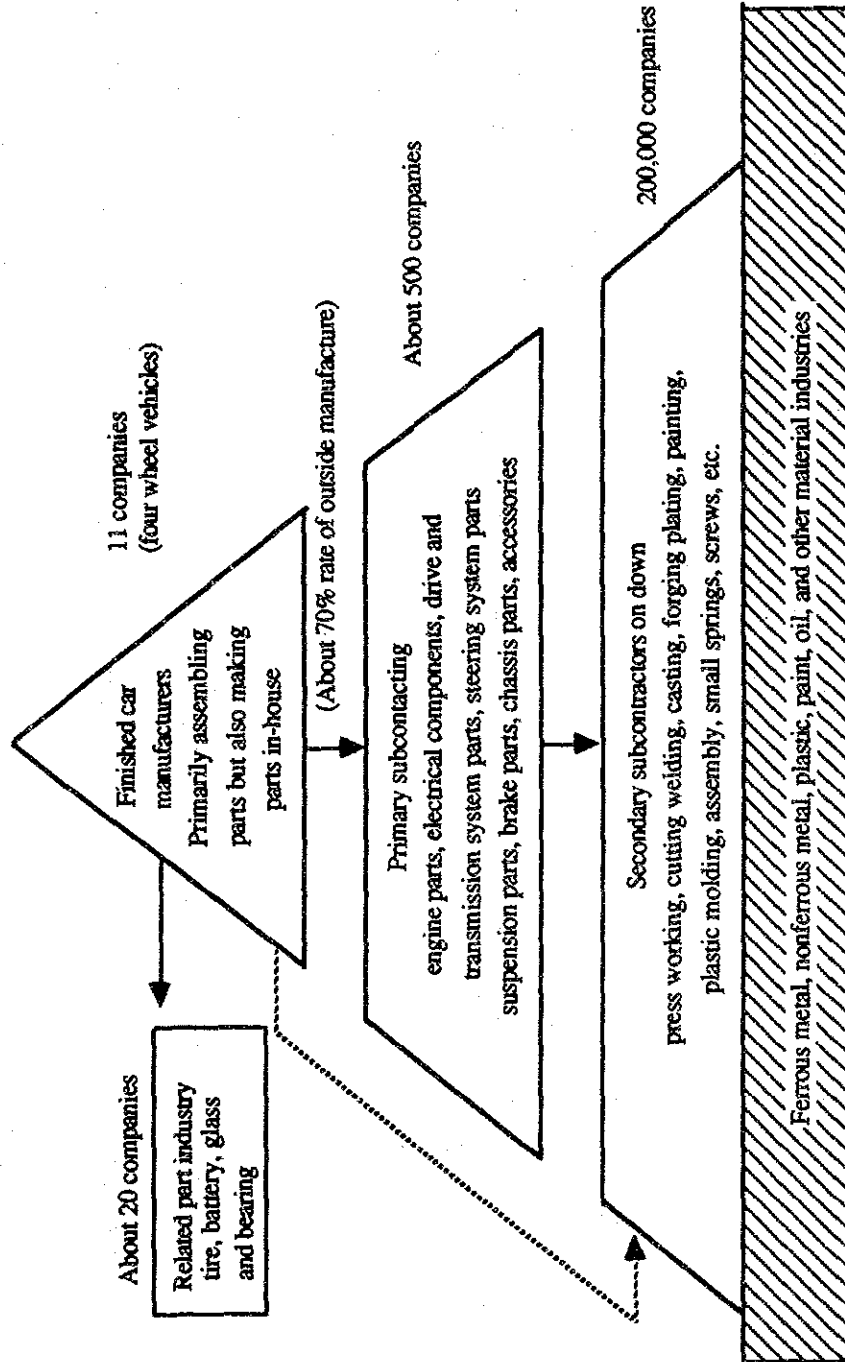
On the other hand, in Thailand, as shown by Table III-4A-2, there are 12 automobile assembly manufacturers (14 before 1987) and as many as 25 foreign automobile manufacturers have assembly contracts with the 12. However, there are only 10 or so plastic processing manufacturers which have the ability to supply auto parts.

In addition, these 10 companies receive orders not only for auto parts, but also for motorcycle and household electrical appliance parts, which differ in terms of quality demands.

To promote exports of parts as well as finished products, plastic processing manufacturers including the above 10 would be required to improve quality as opposed to concentrating on mass production. Therefore, it is important for them to select the priority items and improve their capabilities in terms of planning and development. For this purpose, it is recommended that each plastic processing manufacturer cooperate with the development section of an assembly manufacturer and study what processing manufacturers might produce.

Each assembly manufacturer is planning to increase local procurement of parts and hopes that processing manufacturers improve their planning and development capabilities.

Fig. III-4A-1. Structure of Auto Part Industry of Japan



Source: *Jidosha Zairyo no Shintenkai* (New Developments in Automobile Materials), Toray Research Center

Table III-4A-2 Automobile Assembler of Thailand

No.	Manufacturer	Model	Type	Source	CC	No. of Cyl		
1.	Bangchan General Assembly Co., Ltd.	HONDA CIVIC 5M/T	G	JPN	1,500	4		
		HONDA CIVIC 4M/T	G	JPN	1,500	4		
		HONDA ACCORD 5M/T	G	JPN	2,000	4		
		HONDA ACCORD 4M/T	G	JPN	2,000	4		
		OPEL KADETT 1.6	G	WG	1,600	4		
		OPEL KADETT 1.8i	G	WG	1,800	4		
		OPEL REKORD 2.2i	G	WG	2,200	4		
		OPEL REKORD 2.3D	D	WG	2,300	4		
		HOLDEN COMMODORE	G	AUS	2,800	6		
2.	Isuzu Motor Thailand co., Ltd.	KB (PICK-UP)	D	JPN	2,500	4		
		NKR (<5tons)	D	JPN	2,700	4		
		NKR (5-10 tons)	D	JPN	3,600	4		
		NPR (5-10 tons)	D	JPN	4,000	4		
		FSR (5-10 tons)	D	JPN	5,000	6		
		FTR (10 tons up)	D	JPN	6,000	6		
		FVM (10 tons up)	D	JPN	6,500	6		
		FVZ (10 tons up)	D	JPN	6,500	6		
		FXM.(10 tons up)	D	JPN	6,500	6		
		FXZ (10 tons up)	D	JPN	6,500	6		
3.	NEW ERA., LTD. (Kanasuta General Assembly Co., Ltd.)	FORD LASER 1.3	G	USA	1,300	4		
		FORD LASER 1.5 HB	G	USA	1,500	4		
		FORD TELSTAR	G	USA	1,600	4		
		FORD TELSTAR LB	G	USA	1,800	4		
		FORD (PICK-UP)	G	USA	1,600	4		
		FORD (PICK-UP)	D	USA	2,200	4		
4.	Siam Automotive Industry Co., Ltd.	NISSAN (PICK-UP)	G	JPN	1,600	4		
		NISSAN (PICK-UP)	D	JPN	2,500	4		
5.	Siam Motor & Nissan co., Ltd.	MARCH	G	JPN	1,000	4		
		SUNNY	G	JPN	1,300	4		
		SENTRA 1.3	G	JPN	1,300	4		
		SENTRA 1.5 H/T	G	JPN	1,500	4		
		PULSAR	G	JPN	1,500	4		
		BLUEBIRD	G	JPN	1,800	4		
		SKYLINE	G	JPN	2,000	4		
		CEDRIC	G	JPN	2,000	4		
		CEDRIC	G	JPN	3,000	6		
		SUBARU 1.8GR	G	JPN	1,800	4		
		ALFA GIULIETTA	G	ITA	1,800	4		
				NISSAN TRUCK				
				UG 780 EU (5-10 tons)	D	JPN	6,800	6
				CW 30 MHRE (10 tons up)	D	JPN	11,670	6
		CW 20 MHL (10 tons up)	D	JPN	11,670	6		
6.	Sucosol & Mazda Industry co., Ltd.	MAZDA FAMILIA(PICK UP)	G	JPN	1,000	4		
		MAZDA FAMILIA (PICK UP)	G	JPN	1,200	4		
		MAZDA MAGNUM (PICK UP)	G	JPN	1,600	4		
		MAZDA MAGNUM (PICK UP)	G	JPN	2,200	4		
		MAZDA 323	G	JPN	1,300	4		
		MAZADA 323 HB	G	JPN	1,300	4		
		MAZDA 626	G	JPN	1,800	4		
		MAZDA 626 HB	G	JPN	1,800	4		
		MAZDA 626 (Diesel)	D	JPN	2,000	4		



No.	Manufacturer	Model	Type	Source	CC	No. of Cyl		
7.	Thai Hino Industry Co., Ltd.	KM (5-10 tons)	D	JPN	4,000	4		
		KR (10 tons up)	D	JPN	6,500	6		
		FB (5-10 tons)	D	JPN	4,000	4		
		FE (10 tons up)	D	JPN	6,500	6		
		FF (10 tons up)	D	JPN	6,500	6		
		GD (10 tons up)	D	JPN	6,500	6		
		KT (10 tons up)	D	JPN	6,000	6		
		FL (10 tons up)	D	JPN	9,500	6		
		FM (10 tons up)	D	JPN	9,500	6		
		TOYOTA TRUCK						
		DYNA (less than 5 tons)	D	JPN	3,000	4		
		DYNA (less than 5 tons)	D	JPN	3,500	4		
		DYNA (5-10 tons)	D	JPN	4,000	4		
		8.	Thai Swedish Assymby Co., Ltd.	VOLVO 240 GLM	G	SWE	2,300	4
VOLVO 240 GLA	G			SWE	2,300	4		
VOLVO 760 GLEM	G			SWE	2,300	4		
VOLVO 760 GLEA	G			SWE	2,300	4		
RENAULT R9	G			FRA	2,300	4		
9.	Thonburi Automotive Assembly Plant Co., Ltd.	BENZ W. 124 230E	G	WG	2,300	4		
		BENZ W. 124 300E	G	WG	3,000	6		
10.	Toyota Motor Thailand Co., Ltd.	CORONA 1.8 GL	G	JPN	1,800	4		
		CORONA 1.8GL (A/T)	G	JPN	1,800	4		
		CORONA 1.6GL	G	JPN	1,600	4		
		CORONA 1.6 XL	G	JPN	1,600	4		
		COROLLA GL	G	JPN	1,300	4		
		COROLLA XL	G	JPN	1,300	4		
		STARLET XL	G	JPN	1,300	4		
		CROWN STD	G	JPN	2,000	4		
		CROWN SS	G	JPN	2,800	6		
		HILUX (PICK UP)	G	JPN	1,600	4		
		HILUX (PICK UP)	G	JPN	2,000	4		
HILUX (PICK UP)	D	JPN	2,400	4				
11.	MMC Cittipol Co., Ltd. (Mitsubishi)	LANCER 1.3	G	JPN	1,300	4		
		LANCER 1.5	G	JPN	1,500	4		
		LANCER 1.6	G	JPN	1,600	4		
		L 200 (PICK UP)	D	JPN	2,500	4		
		TRUCK						
		FN516MRDH 1 (10 tons up)	D	JPN	6,500	6		
		FN517MRDH 1 (10 tons up)	D	JPN	6,500	6		
FN527 MRDH 1 (10 tons up)	D	JPN	6,500	6				
12.	Y.M.C.Assembly Co., Ltd.	BMW 316/4	G	WG	1,800	4		
		BMW 318i	G	WG	1,800	4		
		BMW 520i	G	WG	2,000	6		
		PEUGEOT 305GL	G	FRA	1,600	4		
		PEUGEOT 505GR	G	FRA	2,000	4		
		CITROEN BX 16	G	FRA	1,600	4		
		CITROEN CX 20	G	FRA	2,000	4		
		PEUGEOT 505 (PICK UP)	D	FRA	2,300	4		

Source: Industry in Thailand; Japan Chamber of Commerce.

#### **4A-1-4. Future Trends**

At the present time, assembly manufacturers of household electrical appliances and electronic equipment order 80 to 90 percent of their plastic parts from outside plastic processing manufacturers and make the remaining 10 to 20 percent in-house. The assembly manufacturers, however, are dissatisfied with the quality of parts ordered out. In particular, the demands on quality are severe for external parts and there are various problems with these, such as extremely small scratches, tone, uneven color, offcentered printing, and uneven thickness. Therefore, two of three assembly manufacturers indicate an intention of raising their rates of in-house production in the future.

As for motorcycle parts, 100 percent of the parts are ordered out. About 70 percent of the molds, however, are imported from Japan. The plastic materials are also either supplied or designated as to the grade. On the other hand, the Thai market is relatively large and local assembly manufacturers are pressing forward with development of models and designs fitting the Thai market.

Turning to automobiles, while there are differences according to the assembly manufacturers, in case of the Japanese affiliated joint venture companies, 70 to 90 percent of the plastic parts are imported from Japan. The remaining 10 to 30 percent is produced by local processing manufacturers. The parts produced locally are small in size and do not require sophisticated technology, such as battery trays, wheel caps, side moles, etc. For the automobile assembly manufacturers, too, the import of plastic parts means extremely higher costs due to the packing costs, shipping costs, and tariffs. Therefore, automobile assembly manufacturers are working to raise the rate of local procurement of plastic parts, but this would necessitate as a precondition a major improvement in local economic policies and technical expertise.

#### **4A-2. Production**

##### **4A-2-1. Molding Methods**

The main molding method used for industrial parts is injection molding. Injection molding is the best in terms of the precision of dimensions and the production efficiency. However, thermoforming (vacuum and compression molding) is used for large, relatively simple design parts such as inner housings of refrigerators and blow molding is used in cases of large parts and bottle shaped parts.

The above molding technologies have been established locally and use is being made of numerous of the latest molding machines.

#### **4A-2-2. State of Facilities**

##### **(1) Molding Machines**

Table III-4A-3 and Table III-4A-4 show the main plastic molding machines held by the assembly manufacturers and the parts makers visited in the current survey.

Among the assembly manufacturers, manufacturers of household electrical appliances and electronic equipment have a certain number of molding machines and are moving in the future toward greater in-house production. Many of them are planning to increase the number of their molding machines. Note that all of the molding machines currently owned were made in Japan.

On the other hand, assembly manufacturers of motorcycles and automobiles do not have plastic molding machines in-house. Instead, they supply outside processing manufacturers with molds, materials or designate grades of materials, and provide detailed assistance in mold maintenance etc. For mold maintenance and technical guidance, there are companies which call upon engineers from Japan etc. whenever needed and there are companies which establish separate companies in Thailand for engineering services, station technicians there, and have these perform the technical guidance.

A look at the size of the manufacturers of plastic industrial parts shows, as seen in Table III-4A-4, that with the exception of three firms, all the companies had over 200 employees - placing them among the largest companies in Thailand. Company B has 80 workers, but specializes in the production of plug cords for home electric appliances and is a medium sized specialized manufacturer with its own management ideas. As its main processing equipment, it has extremely small sized injection molding machines suited for the production of plug cords. It appears to be operating stably.

**Table III-4A-3. State of Stock of Molding Machines of Assembly Manufacturers**

(Unit: units)

Industry	Co.	Molding machines			Molds (including supplied units)
		Injection	Vacuum	Etc.	
Home electric appliances and electronics	A	—	—	—	Japanese, some Korean
	B	3 +3 (added)	2	—	Japanese (80%) Thai (20%)
	C	8	3	Foam	Japanese (35%) Taiwanese(35%) Thai (30%)
Motorcycles	D	—	—	—	Japanese (80%) Thai (20%)
	E	—	—	—	Japanese (50%) Thai (50%)
Automobiles	F	—	—	—	—
	G	—	—	—	Japanese (80%) Thai (20%)

Note: Size of injection molding machines (clamping force)

Co. B 280T, 350T, 650T (same size set being added) / Co. C 100T, 300 to 650T

**Table III-4A-4. State of Stock of Processing Facilities of Industrial Part Processing manufacturers**

Industry	Co.	No. of employee	Processing facilities (units)		Molds
			Injection molding machines	Other equipment	
Home electric appliances	A	300	10 (100-850T)	Silk screens 12 Surface treatment equipment	Customer 100%
	B	80	13 (1.5-5.0 OZ)	—	Own 70% Customer 30%
	C	40	6 (100-550T)	Hot stamping Silk screens Roll printing	Customer 100%
Home electric appliances & motorcycles	D	620	52 (22-1,300T)	Silk screens Spray booths	Own 80% Customer 20%
	E	206	15 (55-450T)	Silk screens	Customer 100%
	F	350	50 (22-850T)	Blow molding machines 4 Silk screens	Own 100% (of which, 95% made in-house)
Automobiles, motorcycles & home electric appliances	G	390	10 (60-350T)	Ultrasonic welding machines Vacuum deposition machines	Own 100%
	H	200	13 (20-850T)	Silk screens Metal plating	Own 70% Customer 30%
	I	573	23 (60-1,200T)	Silk screens	Own 90% Customer 10%
	J	2,000	81 (30-1,400T)	Compression molding machines 121	Own 95% Customer 5%
Automobiles & motorcycles	K	791	—	Vacuum molding machines 2	Own 100%
	L	120	10 (0.5-22 OZ)	Silk screens	Own 100%

Note: Figures in parentheses indicate clamping force of injection molding machines.

With the exception of Company B and Company K, the parts processing manufacturers are equipped with large numbers of general use injection molding machines of sizes from 20 tons to 1,400 tons clamping force. The most prevalent models are in the 300 to 800 ton class. Eighty percent of the injection molding machines are made in Japan and most of the rest are made in Singapore and Taiwan, but West German and Australian makes were also seen. Most of the Japanese makes were new high performance models. Company C and D have been introducing such machines that enable automatic extraction of molded products by robots and further, at company C, hopper loader and automatic mold temperature control facilities were provided to all of injection molding machine.

Note that Company K is not really a plastic processing manufacturer, but a manufacturer of metal springs, but has vacuum molding machines and is producing hot formed sheets for fender inner liners of automobiles.

As for other processing facilities, 80 percent of the companies have secondary processing equipment for finishing the surfaces of the shaped articles or bonding. All the companies also have pulverizers for recycling of scrap and extruders.

A look at the deployment of the equipment in the factories shows there are no problems with space. Still, there is a lack of fine attention paid to placement of molds, materials, products, and scrap around the main molding machines and to raising the levels of work efficiency and safety of the operators. The degree of cleanliness and order in a factory reflects the state of management of that factory and its productivity. A brief glance shows many companies with insufficient cleanliness and order.

## **(2) Peripheral Equipment**

Various types of peripheral equipment are required for full use of the performance of the main molding machines. Dryers are required for the supply of materials and temperature control apparatuses are required for the molds. Dryers were being used when forming water absorbent materials such as nylon, but almost no mold temperature control facilities except at Company C were installed. Despite the molding machines being of the latest, high performance models, there is insufficient investment in peripherals, so the performance of the molding machines cannot be fully realized, resulted to lower product quality and production efficiency. In particular, a noticeable phenomenon was the frequent occurrence of burrs in the shaped articles. Further, there are many cases of warping in the shaped articles. These are problems which frequently occur in cases

where molding conditions are not suitably set and controlled.

Almost of the companies have secondary processing equipment for finishing the surfaces of the shaped articles or bonding. All the companies also have pulverizers for recycling of scrap and extruders for mixing and granulation.

Almost none of the companies had the equipment necessary for blending materials, however. Only several companies had tumbler type blenders for mixing color master batches.

Note that the main equipment for surface decoration was simple, hand operated silk screen printing machines, but there were also companies with spray booths. In general, surface decoration is the most important process in terms of the determining the external appearance of products, so the assembly manufacturers often handle this on their own. The spray coating, plating, etc. of plastic parts require large sized facilities, further, and only a very limited number of processing manufacturers have these facilities.

### **(3) Testing and Inspection Facilities**

A look at the flow of work in the factories shows that the first check point is the receipt of the materials and adjuvants. In the processing manufacturers surveyed, however, there were almost no facilities for testing incoming materials.

Next is the tests in the production processes. There were two factories which, like in Japan, placed limit samples of products next to the molding machines. There were also many factories which placed jigs for inspection of dimensions of shaped articles and inspections of warping and other shape factors.

Turning to inspections of products before shipment, substantially all of the manufacturers had equipment for inspection dimensions such as calipers, micrometers, etc. Twenty to 30 percent of the companies had scales for inspection of the weight of the products. Visual inspections were performed for the external appearance and color.

A company of joint-venture with foreign capital has started plastic part production with modernized inspection and testing equipments such as latest three demention profile measuring and optical thickness measuring instrument, and up-dated organization in-house.

As mentioned above, therefore, in general, the companies are equipped with extremely rudimentary inspection equipment. Nowhere was there seen facilities for testing product performance or various material tests.

#### **(4) Molds**

The assembly manufacturers ordinarily import 70 to 80 percent of their molds and supply them to the processing manufacturers. The remaining 20 to 30 percent of the molds are fabricated in Thailand based on drawings obtained from the overseas parent companies and are supplied to the processing manufacturers or used in-house by the assembly manufacturers themselves.

The rate of supply of molds to the processing manufacturers from the customers ranges from 0 to 100 percent and completely differs depending on the management policies of the respective processing manufacturers. The large sized, local capital manufacturers generally have in-house mold fabrication divisions and a high rate of in-house fabrication, with them even handling some outside orders. The molds fabricated in Thailand, however, are limited to ones for relatively simply shaped parts. The molds required for producing larger sized parts or parts with greater precisions cannot be fabricated due to technical limitations. Further, even the molds which can be fabricated, when more sophisticated, are higher in fabrication cost and require longer delivery times compared with those from Korea, Taiwan, or Japan. Recently, however, there has been a succession of investments by Japanese mold manufacturers in Thailand and the activities of MIDI have begun to pick up steam. Further, the technical vocational schools, colleges, and other higher educational organizations have begun to pour effort into education regarding molds for plastic forming, so gradually effort is being made to improve the performance and reduce the costs of Thai molds.

Note that there are also numerous molds imported from Korea and Taiwan in addition to Japan.

### **4A-2-3. Production Control**

#### **(1) Summary of Production System**

With the exception of the three Companies G, K, and L shown in Table III-4A-4,



all the industrial part processing manufacturers produce based on received orders. Therefore, they do not produce their own brands of products or on an anticipatory basis. Some processing manufacturers, however, print production numbers or molds with logo marks on each part for the purpose of quality control.

Molds are usually supplied from the customers, but in the case of domestic fabrication, there is the problem of longer fabrication times compared with imported molds. Regarding the plastic materials, general use grades of LDPE, HDPE, PS, and PVC are produced domestically, but these are often not suited for industrial parts. In particular, special compounds etc. cannot be procured domestically. In the final analysis, almost all raw materials for industrial parts are imported at the present time.

A look at the activities for securing orders shows that the processing manufacturers do not engage in positive activities for this purpose and merely wait for manufacturers to place orders. The three companies G, K, and L, however, engage in independent activities for securing orders.

## **(2) Production Control**

In Thailand, there are fewer industrial parts manufacturers with the ability to supply assembly manufacturers than there are assembly manufacturers, so the processing manufacturers engage in small run production of diverse items. Therefore, productivity differs tremendously depending on the level of the production control.

Production control includes production planning, materials control, process control, quality control, inventory, delivery control, and maintenance and repair of facilities. While there was a considerable difference among the parts processing manufacturers visited, some relatively good companies were also seen.

Looking at the materials purchased, much of it was raw materials, adjuvants, and parts required for part assembly. If one were to add up all the required materials for the part, the total would easily come to several thousand to 10 thousand or more items. Some companies were seen which organized these neatly and engaged in sufficient inventory control. However, even the best companies have yet to computerize their inventory control.

In terms of process control, many companies were managing data on the rate of

materials loss, the rate of defective products, labor productivity per group, etc. Two companies were recording personal productivity of workers and feeding back the information into the worker evaluations.

Quality control was being performed mostly by inspection. About 70 percent of the manufacturers had staff specializing in inspection work. In many factories, the process inspections and shipment inspections were being performed by the same groups. In other companies, veteran machine operators were designated as the inspection personnel and these simultaneously checked quality, gave guidance on work methods, and made improvements while making the rounds of the production processes. In one company, the president was very knowledgeable about technology and strict on quality and therefore ingenious measures were seen all over the production processes. This company enjoyed high levels of quality and a high productivity as well.

On the other hand, several companies were seen in which the insides of the factories were messy, pellets of materials were strewn over the grounds, and the management situation appeared poor. Such companies had low product yields and low levels of quality.

As mentioned above, there are already differences in product quality and costs between companies which are well managed and strive to improve work at all time (many of them being foreign capital affiliates) and companies insufficiently managed, with low awareness of quality on the part of the factory managers, and not enthusiastic about improvement. There are signs that these differences will grow larger in the future.

### **(3) Materials Procurement**

Procurement of the main materials, plastic resin, is not that big a problem, but since the companies rely on imports, the delivery periods and prices are unstable.

Problems sometimes occur regarding the quality of the materials received. At this time, the processors sometimes consult with their own customers so as to have them change the product specifications somewhat so as to enable the received materials to be used in some way or another. The customers are most interested in the delivery dates of the parts and in the worst case will sometimes want the delivery commitments to be met even with some change in the parts specifications, preferring to deal with quality by some other means so as to prevent a reduction in the quality of the finished products.

There are domestic stock points of dyes and adjuvants other than the main materials and the processing manufacturers do not import them directly, so there are no particular problems there.

Note that the small and medium sized processing manufacturers purchase plastic resins from trading companies and domestic brokers and that there are no major problems with procurement of materials other than price.

#### **(4) Manufacturing Costs**

The materials costs represent a major share of the total manufacturing costs of plastic industrial parts. While there are differences according to the processing manufacturers, these account for about 55 to 65 percent of total costs. In the case of use of high priced engineering plastics, generally most of the products are extremely small in size, so the mold cost and personnel cost are relatively greater and the cost of the materials in the product cost becomes small, falling to as low as 30 to 40 percent.

#### **4A-3. Product Evaluation**

The main aspects of products evaluated in the factory inspections were the product outer appearance (scratches, color, flow marks, weld marks, striping, scorches, etc.), product dimensions, printing, plating, etc.

Looking at the external appearance of the products, flashes are removed by hand work, so the edges of almost all products show traces of cutting. By way of note, in Japan, the molding is performed in a way so that no flashes are produced. Further, gate marks are kept from being noticeable by using the pin gate or tunnel gate method and also by taking great pains in the placement of the gates. Flow marks and weld marks are particularly easily observed in products with dark colors. Audio equipment and the like are usually colored black and for this reason alone the mold structures become complicated. In addition, processing manufacturers take great care in the molding conditions relating to the fluid characteristics of the resins. In Thailand, there are numerous problems in these respects and satisfactory quality is not achieved except in the foreign capital affiliated manufacturers.

Product dimensions which are important in the shipment inspections were not

posing any substantial problem. A look at the printing, plating, and other surface decorative techniques, however, shows that the international level has not yet been reached due to the fact that the treatment technology of the local processing manufacturers is not sufficient in terms of the treatment of the underlying surface or management of solvents. Such surface decorated products would not be readily accepted in the international market. Therefore, the assembly manufacturers must order external parts of export products requiring printing or plating from specialized foreign capital affiliated processing manufacturers.

#### **4A-4. Technology**

##### **4A-4-1. Technical Knowhow and Level of Same**

###### **(1) Molding Materials**

In the case of industrial parts, the assembly manufacturers supply the grade of materials or designate the materials to be used when placing their orders. On the other hand, the processing manufacturers receiving orders do not receive sufficient knowhow from the assembly manufacturers on the performance and functions required for plastic parts, so do not give consideration to the same in the selection of materials for the parts. Further, plastic resins come in numerous types and further are blended in various types to form compounds, so are unlimited in number. It may be said without exaggeration that the materials differ for each part. It is extremely difficult to collect and use the knowledge and information regarding such complicated plastic materials. The processing manufacturers, however, are situated between the assembly manufacturers and the manufacturers of the plastic materials and must have the knowledge and ability enabling them to participate in development of materials by the manufacturers of plastic materials so as to satisfy the demands for quality of the assembly manufacturers. The factors determining the quality of plastic processed products are the physical properties of the materials and the processing conditions, so when developing new products, it is necessary for the processing manufacturers to participate from the stage of development of the materials.

In Thailand, it is judged that even the large processing manufacturers have a low level of understanding of molding materials. In other words, they mold parts using the supplied materials and supplied molds under the designated conditions. They were not seen as trying to understand the relationship between product quality and molding

materials or to truly absorb the technology when engaging in production.

## **(2) Design of Molded Articles**

The processing manufacturers do not design the industrial parts and do not have the ability to do so. Even the local affiliates of assembly manufacturers may engage in considerable planning of products to meet market needs, but none of them have sufficient design capabilities for parts. The specific designs for parts are handled by the parent companies in Japan etc. However, four of the seven assembly manufacturers surveyed this time were considering establishing design capabilities for themselves, as local assembly manufacturers, in the future.

## **(3) Molds**

The main technical problems in molds are [1] design, [2] fabrication, and [3] operability, economy, and product quality from the processing manufacturer's standpoint. [1] and [2] are problems of the mold manufacturers, so we will take up mainly [3] here.

What first struck the eye in all of the factories of the processing manufacturers surveyed was the large number of flashes on the molded articles. There are various causes for flashes, but one may first of all point to the low precision of the molds. Next, the volume of the sprue runners is somewhat large and therefore the amount of recycled material increases. Some further ingenuity is required in the position and size of the gates. By way of note, in Japan, there are numerous pin gates and when the molding is finished and the article is removed from the mold, the gate portions are automatically cut, thus finishing the product without requiring further human work.

Next, a look at the relationship between the molding materials and mold design shows that it is necessary to sufficiently understand the shrinkage ratio, temperature and fluid characteristics, amount of gas generated, heat degradation, and other characteristics of the molding materials and incorporate the same in the mold designs.

In general, molds made in Thailand suffer from the problems mentioned above. On the other hand, even the molds supplied from the assembly manufacturers cannot necessarily be said to be of a high technical level in many cases. The reason is economics. There are cases when used molds are supplied and cases where molds are supplied made by cheap fabrication methods. The Thai market is a small one, so it is necessary that the

molds can be depreciated by a small amount of products and sufficient funds are not used for the molds. Therefore, extremely cheap molds are made and the imperfections in the molds are compensated for by human workers.

#### **(4) Size of Molded Articles and Capacities of Molding Machines**

The injection molding machines in the companies visited were of a size of 20 to 1,400 tons clamping pressure, with molding machines of sizes suited to the sizes of the molded articles being used. Some factories, however, were seen which were making small sized products with large sized molding machines and thus operating with a mismatch of the size of the molded articles and the capacities of the molding machines.

#### **(5) Molding Conditions**

Among the molding conditions, the molding cycle time most affects the productivity. It is important for all the companies to expend maximum effort to shorten the molding cycle time as much as possible while maintaining the quality.

In Thailand, the molding cycles are judged to be much longer than in Japan. To shorten the molding cycles, it is necessary to optimize the overall molding conditions such as the state of kneading of the plastic resin, the temperature of the molten plastic, the cooling conditions of the molds, fine temperature control for specific locations, and the position and number of knock pins required for removal of the products. Next, it is necessary to shorten the mold exchange time. In Thailand right now, manufacturers are forced to engage in short-run production of numerous items and the shortness of the time and adeptness of exchanging the molds has a large effect on productivity. By way of note, mold exchange work is completed in several minutes in Japan.

The molding machines are mostly operated by women, with a single female operator stationed at each molding machine. Another female worker is often stationed therefore for removing the flashes from products taken out from the machine. In some factories, a single operator operated the molding machine and also handled the deflashing work. By way of note, in Japan, there has been much headway in labor saving measures, such as automation of molding machines and automation of deflashing work, and a single operator handles about three machines. With personnel costs rising each year in Thailand, automation and labor saving measures are becoming important in Thailand as well.

The rate of defective products in the companies is an average 5 to 10 percent at present. This is extremely high when compared with the less than 1 percent rate of Japan. The main reason for the high rate is the lack of progress in optimization of molding conditions, though there are other reasons as well.

#### **(6) Secondary Processing**

Secondary processing for molded articles includes printing, painting, adhesion, welding, etc. Among the processing manufacturers visited, about 80 percent were equipped with silk screens and spray booths, but the processing technology has not reached a level acceptable on the international market. In particular, there are problems in the printing of household electrical appliances and electronic equipment, such as the weakness of the print fastness, peeling, and off-centering. The reasons for the weakness of the print fastness and the peeling are the overuse of silicone agents for product removal in the molds and the incomplete surface treatment of the print foundation.

Another matter which became clear through the current survey was that the assembly manufacturers require the following new secondary processing technologies:

##### **[1] Inner Foam Method of Urethane**

This technology is used for the large interior parts of automobiles and refrigerators. The technology entails the injection of urethane inside a hollow molded article and causing the urethane to foam inside the article.

##### **[2] Flocky Processing**

In this technique, a base cloth or plastic sheet is coated with an adhesive, then piles (staple fibers) are sprayed on the coated surface by the force of static electricity so as to implant piles vertically on the coated surface. This is then passed through an oven to harden the adhesive. This technique enables the production of various types of cloths and sheets with piles. The method is being widely used not only for flat fabrics, but also for various shaped parts and packaging materials.

##### **[3] High Frequency Welding**

When welding together plastic parts, if there is no suitable adhesive such as a polyolefin, the method is adopted of melting the plastic to bind the parts together. At this time, only the parts to be joined are heated and melted by high frequency vibration (ultrasonic waves).

Some of these technologies have already been established in Thailand, but due to business factors, not all of the assembly manufacturers can use them. That is, it is necessary to further promote the spread of technology new to Thailand to enable more sophistication in parts.

**(7) Others**

The testing and inspection system has to some extent been established, but it is necessary to toughen up much more the quality specifications and raise the awareness of quality control on the part of the operators of the molding machines themselves. For this, QC activities at the workplace would probably be effective.

**4A-4-2. Technical Training**

**(1) In-House Education**

The in-house education given to general workers is primarily on-the-job training. Some companies offer technical staff (graduates of vocational schools etc.) overseas training or training in domestic educational organizations.

**(2) Education by Industrial Organizations**

The only education and training organization set up by an industrial organization is the Thai Petrochemical Industry and Trade Association, but the association has only the following training equipment and has only a few extremely rudimentary molding machines:

Injection molding machines	1
Blow molding machines	1
Air-cooled type inflation film making machines	1
Water-cooled type inflation film making machines	1
Heat sealers	1
Drop testers	1

Therefore, the training is limited in content to the rudimentary handling of molding machines.



Classroom instruction is provided on the nature (physical properties) of plastic resin, but there are no practice facilities. Therefore, sometimes the trainees go to the TPI factory and practice handling very rudimentary melt indexers etc.

### **(3) Education by Public Organizations and Educational Organizations**

The vocational schools and junior colleges have recently made progress in the establishment of courses and educational facilities for plastic processing. Among these, the Samutprakarn Technical College has ambitious plans for expansion and is steadily installing facilities with the aid of the UNDP (United Nations Development Programme) and the ILO. Another three schools have courses related to plastic processing technology. In all cases, however, the emphasis is on mold making technology. The educational system and curriculum on the most basic aspect, plastic resins, are rudimentary. The curriculum on plastic resins is almost all textbook study and there is little lab or practical training. Therefore, the facilities for teaching the properties of plastic resins are extremely poor. Looking at the instructors too, there are few with experience in plastic resins. Most have mechanical engineering backgrounds. Therefore, the instructors are knowledgeable about metal materials, but appear to be poor in knowledge regarding polymer materials.

As public testing organizations, there is the DSS (Department of Science Service) of the MSTE (Ministry of Science, Technology & Energy) which has some capabilities in analysis of materials.

There are plans for incorporation of a training course for plastic processing technology in the Eastern Industrial Promotion Center, for which plans are proceeding as part of the regional promotion program of the DIP. These plans, however, also seemingly stress handling of molding machines. Almost no consideration is given at the present to training engineers in analysis and testing of materials.

## **4A-5. Problems and Countermeasures**

### **4A-5-1. Problems**

#### **(1) Lack of Planning and Development Capabilities of Products**

The current manufacturers of industrial parts go about their businesses completely passively and do not engage in almost any positive activities at all to secure orders.

Behind this is believed to be, as a major factor, the special nature of the Thai industrial structure. That is, along with the rapid industrialization in Thailand, numerous foreign capital assembly manufacturers established operations in Thailand, but the basic industries for supporting these assembly manufacturers could not be developed fast enough to keep up with them. As seen in the automobile industry, there are as many as 25 foreign automobile assembly manufacturers, but only 10 or so plastic processing manufacturers which can supply parts to the same - a completely reverse situation from normal. Therefore, the plastic processing manufacturers enjoy a complete sellers' market. Of course, it is also a fact that the technical level is low and the assembly manufacturers and material manufacturers cannot participate in planning and development in the same manner as processing manufacturers in the advanced countries, but the problem is really that the managers are satisfied with the status quo and have no desire to take part in the development of new products.

However, to promote Thai exports, it is necessary to promote the ability of Thailand itself to develop products. This will require that not only the local assembly manufacturers, but also the processing manufacturers themselves participate in the development of new products.

## **(2) Immaturity of Molding Technology**

The underdeveloped state of the molding technology is very noticeable, what with the large number of burrs on the molded articles and the 5 to 10 percent rate of defective products. The injection molding machines themselves are good, with considerable numbers of the latest models introduced, but they are not being used to full performance. The reasons are [1] the lack of peripheral equipment, [2] the low performance of molds, [3] the insufficient grasp of the characteristics of the molding materials, and [4] the lack of knowledge about what molding conditions to set. These problems cannot be resolved just by training in techniques of operation of molding machines.

## **(3) Immaturity of Secondary Processing Technology**

The secondary processing technology for surface decoration, such as printing, hot stamping, and metal plating, is inferior. The surface decoration has a major effect on the external appearance of the product and determines the product value, so this technology is extremely important. Due to the low level of this technology, orders cannot be placed with local capital processing manufacturers for export use audio equipment etc.

#### **(4) Immaturity of Knowledge and Technology Regarding Molding Materials**

Industrial parts are made using numerous types of plastic materials in addition to general use plastics, such as complicated compounds, polymer alloys, and high performance engineering plastics. The lack of the ability to analyze these materials, test them, and obtain a full grasp of their physical properties is blocking product development and the improvement of molding technology.

To promote the advancement of plastic processing technology, it is necessary to promote all together the molding technology, mold technology, and technology of molding materials.

#### **4A-5-2. Countermeasures for Solving the Problems**

##### **(1) Necessity for Positive Planning and Development**

The assembly manufacturers are gradually moving in the direction of planning products suitable for the needs of the Thai market. Further, they are being confronted with the need to raise the rate of local procurement of parts. In view of this, it is recommended that parts processing manufacturers maintain frequent contact with research sections in addition to development sections of assembly manufacturers and that they adopt an attitude of innovation and voluntarily establish cooperative development systems to develop items to be produced using their own technologies. This will allow them to technically complement the assembly manufacturers in specific fields such as molding technology and materials technology.

In addition, it is necessary for parts processing manufacturers specializing in a certain technology to be able to develop products while improving quality and productivity and for this purpose they must have technical strategies to plan the introduction of technology through technical cooperation with overseas parts manufacturers.

In Thailand, there are few domestic materials manufacturers and the plastic resins which are supplied are only general use grades and cannot be immediately used as materials for industrial parts. Therefore, the processing manufacturers have to make

greater effort to assemble sufficient knowledge and information regarding molding materials, and reflect result of the effort to develop processing materials forming the leadership for assembly manufacturers and material manufacturers.

## **(2) Setting of Higher Targets for Product Quality**

There are a large number of flashes on the molded articles, the printing is off-centered and easily peels off, and there are numerous other problems. Greater improvement of the level of technology is required in all areas of primary and secondary processing technology. To promote this, it is necessary to set much higher targets for product quality. The Thai market is not that strict on quality, so both managers and engineers do not consider the current quality levels to be that great a problem. This is the biggest factor delaying the improvement of quality.

The Thai plastic industry requires some framework aiming at the creation of products of equal quality as in the advanced industrialized countries and enabling the quality and technical levels of the advanced industrialized nations to be learned through the state of their products, processing facilities, and further actual production control.

Further, the situation of recent Thai plastic processing industry does gradually not allow to receive the merits based on labor intensive type industry. The cheaper wages give no more functions for competitiveness in the market. Therefore, to realize more improvement of product quality and productivity, the industry is coming into the period when it has to plan to be mechanized in introducing higher performance facilities, including robot mechanisms equipped with processing and peripheral facilities.

## **(3) Augmentation of Public Plastic Technology Centers**

Public organizations are taking measures to provide training in handling of molding machines and training in metalworking for fabrication of molds, but almost no measures are being taken in either the public or private sector regarding research and dissemination of technology regarding molding materials. Plastic processing technology is an integral combination of technology in three sectors: plastic materials, molding machines, and molds, and if even one of the technologies is missing, it becomes impossible to make plastic processed products internationally competitive in quality and cost.

In practice, research, testing, and analysis of plastic materials and determination of their physical properties would require sophisticated specialized knowhow and expensive facilities, so individual processing manufacturers would find it extremely difficult to secure their capabilities on their own. Therefore, as part of the country's industrial policies, public organizations should be equipped with such functions and should offer education and guidance to processing manufacturers and assistance in product development. In implementation of this, close contact would have to be maintained with industrial organizations and education organizations.

#### 4B. Plastic Household Goods

Below, a description will be made of not only the companies manufacturing household goods, including one company which was not only manufacturing all sorts of household goods such as tableware, stationery, and small sundry items, but also one company manufacturing parts for sanitary equipment (such as sinks, water faucets, and handles) and another company specializing in the manufacture of name plates for attachment to machinery.

##### 4B-1. Planning and Development of Products

The product planning and development spoken of here mainly mean planning of various products and include little elements of technical development.

Of the 13 companies surveyed engaged in the processing of plastic household goods, five were engaged in independent planning and development of products. The others relied on plans of their customers (more precisely the parties placing the orders). (See Table III-4B-1.)

**Table III-4B-1. Classification of Product Planning and Development**

Co.	Size	Party performing planning and development	Production method	Sales method (most domestic)	Main products
A	Large	Customer or self	Anticipatory	Direct sales/agents	Melamine tableware, furniture, etc.
B	Large	Customer	On order	Direct sales	Sanitary equipment
C	Large	Self	Anticipatory	Agents	Stationery
D	Large	Self	Anticipatory	Agents	Sundry goods
E	Medium	Self	Anticipatory/ on order	Direct sales/agents	Small sundries (table items etc.)
F	Large	Customer	On order	Direct sales	Cosmetic containers
G	Large	Customer	On Order	Direct sales	Nameplates
H	Medium	Customer	On order	Direct sales	Cosmetic containers
I	Small	Customer	On order	Direct Sales	Bottles
J	Medium	Self	Anticipatory	Agents	Sundry items
K	Large	Customer	On order	Direct sales/agents	Sundry items
L	Medium	Customer	On order	Direct sales/agents	Melamine tableware
M	Small	Customers (agents)	On order	Agents	Stationery

Note: Sizes are classified as follows: Large: 200 or more employees, Medium: 50 to 199 employees, Small: Less than 50 employees

There was not much of a relation between whether companies were engaged in independent planning and development and their size.

Seen from another viewpoint, it is possible to consider if overall company activities are independent or largely rely on customers. Considered in this way, a common point among the companies engaged in independent planning and development was that they sold their products to nonspecific markets and were not limited as to certain customers. Further, their methods of sales and distribution were not direct sales to customers placing orders, but sales through agents (wholesalers). Further, looking at the production methods, they did not engage in production on order, where one produces only in accordance with orders received from customers, but adopted the anticipatory production system wherein they produced based on their own judgement and forecasts of trends in the markets or among agents.

Are these companies forced to proceed with independent planning and development because they were using such sales and production methods or are they able to using such sales and production methods because they were planning and developing products on their own? Which of these is closer to the truth is not clear, but whatever the case the end result is good.

A look at the five companies doing their own planning and development shows that two of them were particularly large in size, even in the classification of large companies, and were structured to enable planning and development on an organized basis, while the other three did not undertake these on a systematic basis but largely relied on the business sense and ability of their individual managers which had a large impact on the steps taken by the companies.

Samples are collected from overseas or information is collected from specialized overseas journals regarding plastic processing or specialized journals regarding packaging. Based on these samples or information, prototypes of new products are made. At this time, the opinions and feelings of the agents, retailers, etc. are solicited and at the same time knowledge obtained up until then is used so as to make modifications, corrections, and improvements to ensure broad acceptance in the Thai market and to ensure uniqueness and novelty of the products. In some cases, new brand marks or characters are given. These new prototype products are used to ensure market acceptance.

Trying to estimate future trends, planning and development of products, as mentioned earlier, are deeply tied in with the business activities of a company, i.e., production and sales, so if companies relying on customers for product planning were to move in the direction of in-house product planning, there is a good chance this would bring about major changes in business activities as well. Therefore unless there is some push from the outside, it is considered that it would be very difficult to make any changes in the way products are planned.

## **4B-2. Production**

### **4B-2-1. Molding Methods**

The typical methods of processing plastic household goods include compression molding, injection molding, blow molding, extrusion, and inflation. These are widely utilized throughout Thailand.

In general, compression molding is used for melamine tableware, injection molding for buckets etc., blow molding for hollow bottles, and inflation for film. The same situation may be seen in Thailand.

Of these, no survey was made this time of companies engaged in inflation molding.

### **4B-2-2. State of Facilities**

#### **(1) Molding Machines**

Table III-4B-2 shows the number of molding machines installed by type.

Almost all of the companies actually visited are processing typical small items such as household sundry goods and cosmetic containers in particular among general household goods and reflecting this in part, the ratio of installation of injection molding machines among the different types of molding machines is an overwhelmingly high 69 percent, the same trend as seen in Japan and other countries.

Next most numerous are compression molding machines, accounting for about 27 percent. One reason for this is that the compression molding machines are for making



melamine tableware and in Thailand this field is monopolized by five to six firms, including two of the companies surveyed. In particular, Company A is a superlarge manufacturer and has a large number of machines. This was a main reason for the high ratio. In addition, some blow molding machines and extrusion machines are installed, but the ratios of these are in the single digit range and the numbers of the machines are small. This reflects the fact that the products which can be made by blow molding or extrusion are considerably limited, the productivities of the two types of molding machines are high for the necessary number of these limited products, and thus numbers of machines are not required.

Next, mention will be made of the specifications of molding machines referring to the case of injection molding machines. (See Table III-4B-3.) A look at the size of the machines according to the magnitude of the clamping pressure shows that with the exception of an extremely small model of 0.75 tons made by one company for itself, machines of various sizes from 20 tons to a maximum 1400 tons are being used. Two companies have installed injection molding machines of over 1000 ton pressure, though these two companies are using them for processing their other lines of production, industrial parts, as well. Leaving aside these and looking at just the injection molding machines for just processing household goods, they are of 20 to 850 ton pressures. Turning now to notable machine specifications other than the clamping pressure, two of the companies surveyed have installed the latest models of injection molding machines, with one company in particular installing a high class machine equipped with automatic preheating control for the material resin hopper and a robot for taking out finished shaped articles.

**Table III-4B-2. State of Installation of Molding Machines**

Co.	Injection molding machines	Blow molding machines	Extrusion molding machines	Compression molding machines
	No.	No.	No.	No.
A	81			121
B	52			
C	26	2	3	
D	32			
E	16	Several		
F	54			
G	14			
H	18			
I	4	4		
J	9			
K	About 50	4		6
L				15
M	4			
Total	360 (about 69%)	10-15 (about 3%)	3 (about 1%)	142 (about 27%)

**Table III-4B-3. Specifications of Injection Molding Machine**

Company	Clamping pressure of injection molding machines
A	30-1400T
B	22-1300T
C	50-220T
D	40-750T
E	20-360T
F	20 to 180T (with robot)
G	0.75-220T
H	25-980T
I	20g/shot
J	300-850T
K	
L	
M	Several 100 g/shot

The countries in which the molding machines were manufactured are now discussed. (Table III-4B-4)

All of the blow molding machines are made in Thailand, each believed to offer sufficient performance. Extrusion machines are imported from Japanese and Hong Kong in a ratio of 2:1. One reason why Japanese model machines were selected is probably that the companies have strong ties with Japan in terms of products which are exported.

The compression molding machines (melamine use) used are of foreign make (Japanese and West German) in the case of the largest company, while another company also used Japanese makes. All the injection molding machines were of Japanese make except for a handful of Hong Kong and West German models.

Thai machine manufacturers have not yet reached the point where they can sufficiently handle molding machines requiring sophisticated specifications such as compression molding machines and injection molding machines and therefore Thailand must rely on foreign, particularly Japanese, machines.

**Table III-4B-4. Countries of Manufacture of Molding Machines**

Company	Injection molding machines	Blow molding machines	Extrusion molding machines	Compression molding machines
A				Japanese and W. German (121)
B	All Japanese (52)			
C		All Thailand (2)	Japanese and Hong Kong (3)	
D	All Japanese (32)			
E	All Japanese (16)	All Thailand		
F	Japanese and W. German (54)			
G	Almost all Japanese (14)			
H	All Japanese (18)			
I	Japanese and Hong Kong (4)	All Thailand (4)		
J	All Japanese (9)			
K	Almost all Japanese (50)			Unknown (6)
L				All Japanese (15)
M	Unknown (4)			

Note: Figures in ( ) show the number installed

## (2) Peripheral Facilities

Of the peripheral facilities, the ones which are important in that they are closely tied in with the state of operation of a company, its power, and future orientation are the facilities for storage and mixing of raw material resin, facilities for recycling runners, burrs, and defective products, and secondary processing facilities for the molded articles.

Mention will be made of the facilities for storage and mixture of raw material resin and for recycling runners, flash and defective products. (See Table III-4B-5.)

Among these, facilities for storage were not present in any of the companies. There are only a few companies which use large amounts and they use flexible containers. Other companies keep it in bags and stack it in warehouses (used in common for raw materials, products, and other materials) or in storage spaces near the molding machines. The amount of resins used totals at most 150 tons/month and in almost all cases is 20 to 80 tons/month, definitely not a large amount. Further, the amounts include several types of resins and are purchased from several resin suppliers, so the amounts received of each item are small. For example, even if a company were to purchase 50 tons/month of one resin from one company, that would be delivered in the form of 2000 bags of 25 a month, which converts to 300 bags processed every four to five days, so the present system is sufficient. Even when the amount consumed becomes close to 100 tons/month, it is possible to deal with it by receiving it in flexible containers or giving consideration to the place for placing it. In any case, there is no need to consider establishing tanks or other storage facilities.

Mixing facilities for the raw material resin etc. were present in eight of the 13 companies, with these eight having simple tumbler type blenders for mixing different resins together (resins of different grades and resins of the same grade but made by different manufacturers) or resins and dyes. Of the five companies not having blender facilities, three were producing products not requiring mixture with dyes, and one and probably the other as well of the remaining two was handling small lot sizes, so could get along with manual mixing.

**Table III-4B-5. Facilities for Storage, Mixing and Recycling of Materials**

Item	Number of companies installing them	Percent of 13 companies surveyed
Tanks or other material storage facilities	0	0
Blenders	8	62
Crushers for processing runners, burrs, and defective products	12	92
Granulating machines and extrusion machines for same	4	31
Reference data		
Amount of raw material resin used		
120 to 260 tons/month	4	
20 to 75 tons/month	6	
5 tons per month	1	

Second, there are the processing facilities for runners, flash, and defective products. (See Table III-4B-5.)

All but one company, i.e., 12 companies, had crushers. Four companies, further, recycled the runners etc. with granulating machines. Regarding the handling of runners, burrs, and defective products, 12 of the 13 companies, except the one specializing in melamine molding and including the one without a crusher, mixed them in with virgin material and recycled them. In the case of melamine products, recycling is not possible and therefore the material is scrapped. In recycling, consideration is given to use only for producing products not demanding high quality, for example, products other than those for which colorlessness or transparency are required. This method is considered sufficient and nothing which would pose any problems was found.

Table III-4B-6 shows the status of installation of the secondary processing facilities of important molded articles.

The secondary processing spoken of here means the processing applied to raise the commodity value of plastic processed products and to improve their appearance and includes printing, plating, and other processing. Companies which manufacture products requiring such processing all have the necessary facilities.

**Table III-4B-6. State of Installation of Secondary Processing Facilities**

Item	Number of companies installing them	Percent of 13 companies surveyed
Silk screens	8	62
Hot stamping, Spray booth	7	54
Examples of installation of special facilities		
Electropainting UV curing Supersonic stamping		Company F
Plastic plating Vacuum sputtering equipment (being installed)		Company G

Regarding printing and other decoration, nine of the 13 companies have some sort of printing or decorative facilities. Of the four which do not, one contracts this work out and one performs plating and does not require printing and so there were no problems. Details for other two companies were not available. In the majority of the cases, silk screen and hot stamping facilities were both provided as decorative facilities. The demands for quality for decoration of household use sundry goods are not particularly high compared with those for industrial parts etc., so the present facilities may be considered sufficient. Under these circumstances, note should be taken of the measures taken by two companies specializing in the production of special products. First, one company is producing nameplates and uses plastic plating technology. Further, it is present installing facilities to enable it to use vacuum sputtering technology for production of its products. The other company specializes in the production of cosmetic containers (compact cases, lipstick cases, etc.) and takes great pains as to the finish and appearance of the products due to the nature of cosmetic commodities. In addition to the usual decorative facilities, it has facilities for surface treatment such as electropainting, supersonic stamping, and UV curing and makes use of the same. The assembly line, which includes these processes, is provided in a "clean room". This company, even in its molding process, as mentioned earlier, uses the latest, high performance injection molding machines equipped with automatic preheating control of the raw material resin hopper and a robot for removing products.

### **(3) Testing Facilities**

None of the companies surveyed was testing the properties or characteristics of the raw material resin and further none of them were even inspecting the resin when received. Therefore, none had any testing facilities for the same (chemical analysis, physical testing equipment, etc.)

As to the testing and inspection of molded products, due to part to the above attitude, no tests are performed, only inspections. Even the inspections, with a few exceptions, are limited to inspections of the external appearance and dimensions and rarely conduct inspections of the weight. Therefore, the companies merely have tools, rather than facilities.

Further, these inspections are performed almost all during the actual processing by process workers as a matter of routine. Just five of the large companies, further, had independent quality testing sections for performing inspections. One noteworthy company

used a superior system of inspection of designating different persons for making the measurements and for judging the results.

In the future, if companies wish to expand their businesses outward, they will have to establish and improve their systems and facilities for testing and inspecting quality.

#### **(4) Molds**

Most of the technical problems in the molding relate to the molds. The quality of the molds is the decisive factor in the determination of the overall level of technology in a considerable proportion of cases.

Table III-4B-7 shows the state of development and procurement of molds.

First, let us consider the development of molds. In this case, it is necessary to consider along with Table III-4B-7 whether the companies use production on order or anticipatory production and whether they do the product planning in-house or not, from Table III-4B-1. When considered in this way, the following may be said.

Of the eight companies primarily developing molds on their own, five, or 60 percent, were planning products on their own and five, also 60 percent, were engaged in anticipatory production.

**Table III-4B-7. State of Development and Procurement of Molds**

Co.	Development of molds	Procurement of molds	Others
A	95% by own company	95% made in-house, 5% outside orders	Has mold making joint venture. Uses CAD, CAM
B	Customer	Customer and outside orders (to subsidiary)	Has mold making joint venture
C	Own company	Made in-house (from molding base) and outside orders (large sizes imported, small sizes obtained domestically)	Maintenance done in-house
D	Own company	Outside orders (Domestic)	Maintenance done in-house
E	Own company	Outside orders (imports and domestic) -> currently switching to in-house production (from mold base)	Maintenance done in-house
F	Own company	Almost all outside orders (domestic). Only complicated ones made in-house.	Maintenance done in-house
G	Own company and customer	Customer and outside orders (domestic)	—
H	Customer	Customer and outside orders (domestic)	Has maintenance division, but does only simple work
I	Customer	Customer and outside orders (domestic)	—
J	Own company	Outside orders (domestic)	Maintenance also ordered out
K	Own company	Almost all made in-house. Some outside orders (domestic)	Maintenance done in-house
L	Own company	Made in-house	—
M	—	Almost all made in-house	—

One the other hand, there are three companies which develop molds on their own, but rely on their customers for product planning and engage in production on order, in other words, companies which rely on their customers for the key portions of their business activities. Of these three companies, one specializes and has deep experience in the injection molding of high quality, but small size cosmetic containers. It has reached the level of in-house development of molds. Further, one company specializes in compression molding of melamine tableware. The remaining one company is a medium sized manufacturer manufacturing various items, but suffers from problems in technology and management and therefore for which it is questionable if the in-house development of molds is a good thing.

Summarizing the features of the firms accounting for the majority, 60 percent, of the companies, it may be generally concluded that companies solid enough to enable them



to plan products on their own and engage in anticipatory production using their own judgement have sufficient capabilities so that they will naturally move in the direction of developing molds on their own. In general, these companies possess some degree of capability to develop molds.

Consideration must be given to the kind of molding machines used and their specifications and what kind of products are produced. These details are shown in Tables III-4B-7 and III-4B-2, 3.

There are eight companies fabricating molds in-house (including contracting out fabrication to subsidiary mold manufacturers). Of these, three companies are considered to be fabricating them in-house as a means of cutting costs. That is, one is a manufacturer specialized in compression molding of melamine tableware, one is a manufacturer of copies of products with low quality demands, and the last is a manufacturer with technical and management problems.

Two of the remaining five companies making molds in-house operate under completely different circumstances from the fore-mentioned three companies and are superlarge Thai plastic molding companies with mold making subsidiaries.

The other two of the companies making molds in-house were manufacturers which used to order the molds from the outside (imports or domestic makes) but were moving in the direction of in-house fabrication by the purchase of molding bases. These two companies should be highly praised for their attitude of trying to move themselves in a better direction, in consideration of the evaluation of their products on the market and their past history of development. The remaining company fabricates difficult molds in-house and orders out general ones to domestic manufacturers, supplying its own designs and drawings, and further maintains the molds itself. This company not only was installing the latest, high performance injection molding machines, as mentioned in III-4B-2-(1), but also had superior secondary processing facilities among its peripheral facilities, as stated in III-4B-2-(2), and further has taken great pains in its testing facilities and organization, as alluded to in III-4B-2-(3). Judged overall, this company is superior in management and this is reflected in technical aspects as well, resulting in a high level of technology.

There were nine companies contracting out their mold making work, of which one was contracting out only a little and doing the rest in-house and another was switching

over to in-house fabrication, these both being mentioned among the companies making molds in-house. Further, there were another two companies both making molds in-house and contracting them out, and these two have already been discussed.

There were three companies contracting mold work out and receiving molds from their customers. These three companies had the common feature of engaging in production on order, being supplied with their main molds by their customers, and contracting out the simple ones. That is, they tended strongly to rely on their customers by nature.

There were two companies procuring their molds only from outside contractors. Of these, one was producing relatively simple products and was experiencing no particular problems with its contractors. The other, in contrast, was taking a very noteworthy approach of using local domestic mold manufacturers and providing guidance through its various dealings so as to get them to fabricate acceptable molds.

The various cases of mold fabrication were analyzed, but generally speaking companies have to rely on foreign imports of molds, which are crucial points of molding technology, or on contracting to the handful of superior mold manufacturers in Thailand. The problems here are the delivery times, responsibility for fine modifications, and mold maintenance. As measures to improve the situation, an approach which should be considered is, in the manner being done by some companies, to raise in-house knowledge and technical expertise for plastic processing to the point where one can exercise leadership in dealing with the mold manufacturers and thus seize the initiative in outside contracting and then in the end to move in the direction so as to make possibility for mold development jointly with mold fabricators.

#### **4B-2-3. Production Control**

##### **(1) Production Plans**

There are two types of production methods: production on order and anticipatory production. As shown by Table III-4B-1, five of the 13 companies surveyed engaged primarily in anticipatory production, with the majority adopting the production on order method. In both cases, the companies enjoy large amounts of production demand and are oriented strongly toward expansion of the volume of their production, thus do not sufficiently recognize the importance of detailed production plans.

The production plans of a company are made comprehensively and over the medium and long term for each product ordered or for each product scheduled to be sold in general consideration of the production capacity of the company, the state of procurement of materials, the manufacturing time, the cost calculations, the equipment plans, labor plans, etc. and are formulated by groups having a deep knowledge and experience in operation of the company and the factories. At that time, it should be decided whether to adopt the system of production on order or anticipatory production according to the product line and the types of customers, with each system having merits and demerits for the company's operations.

In the case of Thai plastic processing manufacturers which have adopted the production on order system, there is a tendency for the customers to be relatively limited in number, with production plans themselves ending up relying completely on the sales plans of the customers. Therefore, the production plans tend to be ad-lib and production volumes are sometimes adjusted along with changes in the working staff and sometimes losses of opportunities for orders. Drafting of such ad-lib production plans has a serious adverse effect on factors governing future growth of a company, such as renovation of facilities, augmentation or scrapping of facilities, and also personnel plans. Therefore, it is necessary to quickly establish the capability of researching product trends with customers and drafting production plans based on long term perspectives. Further, there are a considerable number of manufacturers which are negative about developing new customers, leading to worries about the ability to deal with changes in the industrial structure.

Among the processing manufacturers adopting the anticipatory production system was large sized companies which collected and analyzed market information together with overseas buyers and had specialized staff for drawing up production plans. Compared with manufacturers relying completely on production on order, these companies had staff for product planning, sales, and production planning and ensured the coordination among the same. Up until now, however, only a handful of large sized companies have actually used production plans based on such relationships and these were limited to firms which were relatively specialized as to their product lines. In all cases, regardless to the size of the company, there is a lack of administrative staff capable of undertaking production planning.

## **(2) Production Control**

In the West, Japan, and the other advanced industrialized nations, companies expend tremendous effort to ensure their production activities best meet the demands for quality and performance and demands for volume and proceed safely and rationally. Thorough production control is applied for this. This is also a measure for determining the maturity of an industry.

Thailand has been becoming aware of the importance of production control in recent years. Along with this, the number of companies establishing production control systems has been increasing.

During the current survey, the production control was judged by the quality of the control system, including quality control and environmental control in the factories, based on the impressions in the factory visits, the study of sample products, and interviews. The results of the judgement were as follows:

- Companies with relatively good control systems: 6
- Companies with some degree of control systems: 2
- Companies with problems in control: 5

In the first two of the above classifications, companies have control systems, that is, specifically, designate persons solely dealing with production control, but almost none of the companies prepare written work standards, process standards, quality standards, safety standards, etc., which are required for production control. The control is exercised by personal judgement. Note that while some companies were observed to have in-house control standards, these were in almost all cases Japanese standards used as is.

As control indicators, in general the companies statistically record the rates of material loss and defective products.

Quality control, as mentioned in 4B-2-2-(3), generally consists of inspections of the external appearance, dimensions, weight, etc., but some superior companies have established independent quality control sections which perform a wide range of tests and inspections on the products.

Whatever the case, there are no companies which have an effectively organized vertical control system covering everything from control of orders received to inventory

and delivery control. Each company was only doing part of this in accordance with its own actual needs.

For the time being, what should be first done is to take measures to raise the group of companies having problems in control, those of the last of the above classifications, to a good level.

### **(3) Materials Procurement**

The main materials used for plastic household goods in Thailand are the thermoplastic materials of LDPE, HDPE, PP, PS, and ABS and the thermosetting material melamine. The ratio of use of domestic materials has been increasing in all cases recently due to the development of the Thai petrochemical industry, but the ratio of use of imported materials is still high overall.

The plastics being used for household goods are so-called general use plastics and are produced by large numbers of manufacturers in large volumes internationally. Due to this background, with the exception of the fluctuation in purchasing prices, there are no major problems in procurement in terms of obtaining deliveries or quality both for domestic products or imports. In the future, the important questions will be if prices will stabilize and what level they will reach. This is the matter of most concern to the molding companies.

### **(4) Manufacturing Costs**

Manufacturing costs are crucial company secrets and therefore it was not possible to obtain absolute values, of course, or even ratios of composition in most cases. We were only able to obtain rough ratios of the costs of raw materials in the cost composition from seven, about half, of the companies. Ignoring differences in the types of products and differences in materials used, the ratio of materials is 40 to 75 percent, extremely large in all companies.

Therefore, the most important management objective should be to reduce the rate of material loss and improve the rate of passing products.

### **4B-3 Molding Technology**

The technical problems in plastic household goods may be roughly classified into those in molding technology, secondary processing technology, and materials control technology.

#### **(1) Molding Technology**

The technology of the injection molding, compression molding, and blow molding used most often for molding plastic household goods may be judged to have reached a suitable level in most processing manufacturers, but there is considerable room for improvement, such as in the setting of molding conditions according to the molding cycle and material characteristics.

In the case of injection molding, while also a problem of the mold technology, considerable flashes and traces of removed flashes were observed in the products, which would be problems in export products. Large flashes also occurred in and around the spool and gate portions, causing problems not only in maintenance of quality, but also a reduction in the efficiency of utilization of materials, so care will have to be taken in areas other than the products proper as well. Further, there were many products with too much spools and poor gate positions, causing uneven product thickness and having an effect on production efficiency as well. In other words, the processing technology for thin products has not yet been established.

In the compression molding of melamine tableware, there was a case of an approximately 5 percent material loss, somewhat higher than with injection molding. This results in the occurrence of large flashes and indicates problems in the technology for measuring out materials. Improvement is required in these respects. Also observed were uneven color of the products, black spots, whitening, and other problems resulting from poor molding technology. Efforts must be made to create molding conditions which are suited to the properties of the raw material resins and to improve in other respects as well.

#### **(2) Secondary Processing Technology**

Overall, in the printing not enough care is taken in the silk screen, hot stamping, and other surface treatment technology, with there being much positional deviation, unevenness, and distortion of letters and patterns, ruining the appearance of the products.

Further, there are defects in the melamine tableware patterns arising from poor handling of the melamine paper.

In the surface treatment before the secondary processing, there were many cases of insufficient treatment of the foundation, e.g., removal of dust, moisture, oil, etc. from the surface of the products, in the surface treatment, causing fading of color, wear, peeling, etc. of the printed portions.

In factories handling tableware, there are cases where products are piled directly on the floor during secondary processing. Caution is required in this regard from the sanitary and aesthetic points of view.

In the future, the improvement of the surface treatment technology and improvement of work methods will be the keys to raising the quality of export oriented products.

If particularly fine care is not taken in secondary processing, the results are immediately apparent. Improvement is required from this viewpoint.

### **(3) Materials Control Technology**

In general, processing manufacturers do not well pay attention to material property and quality and do not perform their own inspections on incoming raw material resins they use. Some processing manufacturers obtain certificates of materials from the manufacturers supplying the materials and check against those, but even in those cases do not have the ability to check the materials in-house. This situation is a result of the lack of dissemination of the techniques for selecting or mixing optimum materials with consideration given to the product function and quality and the productivity and of the low recognition of the necessity of the same among the managers.

In addition, when using domestically produced raw material resins, the limitations in the grades of the materials and problems in control of the materials result in the problem, for example, that it is difficult to produce products requiring transparency. Further, it is difficult to say that strict control is being exercised in the mixing of dyes as well. There are cases of problems in differences in color in different molding lots.

#### **4B-4. Problems and Countermeasures**

##### **4B-4-1. Problems**

###### **(1) Lack of Product Planning and Development Capabilities**

Product planning and development for plastic household goods in most cases are handled by the customers placing the orders. There is a poor attitude taken toward positive investigation of overseas product trends or price trends and there is a notable lack of information.

Further, methods of product planning and development and means for improving existing products are not known.

###### **(2) Lack of Thorough Production Control and Quality Control**

There are no work standards, process standards, quality standards, and safety standards established for process control, with control being done by individual judgement. In some cases no specialized controllers are designated either.

Quality control has ended up incorporated in the manufacturing work as in-process inspection and is not being handled by an independent system in many cases.

###### **(3) Immaturity of Molding Technology**

It is good that the latest molding machines are being introduced and are installed, principally injection molding machines, but full use is not being made of their capabilities. The reasons are

[1] a lack of peripheral equipment (preheating of material hoppers, automatic control, etc.),

[2] a low level of mold performance,

[3] an insufficient grasp of the characteristics of the molding materials (chemical, physical, thermal, etc.), and



[4] insufficient knowledge of conditions and factors for setting molding conditions and the correlation with operability and quality.

**(4) Immaturity of Secondary Processing Technology**

The technology for printing, hot stamping, plating, and other surface decorative treatment, particularly the surface treatment technology for the same, is inferior. In many cases, the appearance is ruined at the final stage, making the products not good enough for the international market.

**(5) Immaturity of Knowledge and Technology Regarding Molding Materials**

Almost all of the materials used for plastic household goods are general use resins such as LDPE, HDPE, PP, and PS, but companies lack the ability to analyze and test even these general use resins and determine their physical properties and are poor in knowledge of the same. This is inhibiting product development and the improvement of molding technology.

#### **4B-4-2. Countermeasures**

##### **(1) Necessity for Positive Planning and Development**

To increase demand for plastic household goods, it is necessary to positively plan and develop new products.

Toward this end, it is necessary for industrial organizations etc. to work to collect overseas market information and to promote the sharing of information among companies. Further, it is important to obtain the cooperation of experts for each of the foreign markets and to study the methods of product planning and development.

##### **(2) Setting of Higher Targets for Product Quality and Thorough Controls**

Much greater improvement of technology is required in all fields of primary and second processing. Toward this end, it is necessary to set higher targets for product quality. The Thai market is not that severe when it comes to quality, so both the managers and engineers do not recognize that there is that great a problem with the current levels of quality. However the industry requires some framework enabling them to obtain a grasp of the level of quality and technology in the industrialized countries through products, processing equipment, and the actual state of production control overseas.

Further, some framework for guidance and training so as to strictly and efficiently ensure production control is required on either the industrial or public level.

##### **(3) Augmentation of Public Plastic Technology Centers**

At the present time, almost no measures are being taken in either the public or private sector regarding research and dissemination of technology regarding molding materials - which is of crucial importance in plastic processing. This is true even for general use plastics, the main materials used for household goods.

In practice, research, testing, and analysis of materials and determination of their physical properties would require sophisticated specialized knowhow and expensive facilities, so individual processing manufacturers would find it extremely difficult to secure their capabilities on their own. Therefore, as part of the country's industrial

policies, public organizations should be equipped with such functions and should offer education and guidance to processing manufacturers and assistance in product development. In implementation of this, close contact would have to be maintained with industrial organizations and education organizations.

## **Chapter 5. Corporate Management**

The quality of corporate management is largely dependent on the production capability of products and sales capabilities. The management environment of parts processors, however, is considerably affected by the management policies of the assembly manufacturers, so in this section we will partially report too on the state of management of assembly manufacturers.

### **5-1. Summary of Companies**

#### **5-1-1. Comprehensive Content in Business Characteristics**

Activity in the foreign and domestic markets for products leads directly to expansion in the volume of production and sales of plastic processors. In general, manufacturers of industrial parts are starting to feel there are problems in achieving the quality suitable for the markets, particularly export markets, and in methods of management. Further, manufacturers of household goods are starting to recognize the importance of collecting and having the ability to analyze data on export markets and the need for product planning capabilities corresponding to the same. However, from a viewpoint of the business profit, the corporate management seems to lay on a favorable condition.

As found from the current field survey, references, etc., there are the following general business characteristics of processors that may be noted:

[1] Most are family operated small and medium sized enterprises which concentrate in production for the domestic market

[2] The plastic processing industry as a whole is striving to expand the volume of production through construction of new factories and augmentation of facilities.

[3] Manufacturers using primarily injection molding constitute about 70 percent of all manufacturers and further are increasing in number.

[4] Product planning for industrial parts is left to the assembly manufacturers, including specifications of materials.

[5] There is a strong tendency to rely on the customers for planning of household goods as well, but production based on independent company planning is increasing. However, there are still few products making use of new ideas, that is, products are still copies of others by nature.

[6] Numerous factories are producing several types of products with different objects of use, such as industrial parts (for home electrical equipment and for automobiles), building materials, household goods, and sundry goods, using the same facilities and technology.

[7] Few manufacturers try to limit themselves to certain production lines and differentiate their production technology. The large companies and the small companies both tend strongly to produce the same type of products.

[8] Behind this there is a lack of the coordination among companies necessary for focusing the power of the industry and an overwhelming shortage of information on overseas markets, market prices, etc.

#### **5-1-2. Characteristics of Business as Seen from Sales Lines**

Overall there is no horizontal division of labor for products in the Thai plastic processing industry. There is a strong tendency for the sales lines of each company to spread over a wide range of products. Further, there are also examples of factories which simultaneously engage in injection, compression, inflation, and other molding. Processing of plastic involves different specifications and quality demands in the case of industrial parts and household goods and this tendency is one reason why it is difficult for the fundamental processing technology to be accumulated in the Thai plastic processing industry. In the field survey, we saw auto parts and home electric appliance parts being simultaneously produced and, further, household goods being produced using the same factories and equipment. There were some places which were simultaneously producing general containers, cosmetic containers, toys, camera parts, home electrical appliance parts, etc. and others which were producing kitchen containers, melamine tableware, plastic furniture, battery cases, and home electrical appliance parts.

This is due in part to the fact that the domestic market is small in size, so companies find it difficult to establish real mass production systems concentrating on a few products and thus are forced to broaden their sales lines in order to secure sufficient

operating volumes. Looking at industrial parts, due to the fact that foreign assembly manufacturers rapidly entered Thailand at a time when the Thai parts manufacturers were still not sufficiently developed in terms of management and technology, there is a tendency for orders from a wide range of product fields to concentrate in the companies having above a certain level of production capability. In the future, it is urgent to promote and increase the capacities of industrial parts manufacturers of a level able to deliver the required parts to the assembly manufacturers, along with the plans for expanded production of the assembly manufacturers and the increase in the rate of local procurement of parts. In particular, noticeable signs are beginning to appear of possible profitability of local production of high precision parts, large sized parts such as truck fenders, etc., for which depreciation of mold costs has been difficult due to the small volume of production of finished assembled products. It will also be important to strengthen the ability of manufacturers to deal with these processing fields. Simultaneously, improvement of the quality of materials and an increase in the types are also strongly desirable.

In the case of household goods, manufacturers having their own ability to collect market information and able to plan and develop their own products tend to limit their lines of manufacture to a certain extent, but the greater majority of the companies indiscriminately expand to lines where quality is not in that much demand in accordance with buyer requests. In the future, it will be important for companies to accurately judge the domestic and foreign market information and specialize in certain ranges of sales lines so as to improve production efficiency and raise production technology and to deal with quality and the shorter life cycles of products. The Japan Household Goods Import Association (JHI) projects a rapid rise in Asian products based on European designs. An accurate grasp of international market trends is essential for export oriented manufacturers to set their sales lines.

### **5-1-3. Size of Businesses**

There are no statistical materials available on the size of businesses in the Thai plastic processing industry and further the industry is a period of rapid growth, so it is difficult to obtain a quantitative grasp of the size of businesses of companies.

#### **(1) Characteristics of Business as Seen From Size of Capital**

Table III-5-1 shows the size of the capital of companies covered by the field survey. Compared with the manufacturers of industrial parts, the manufacturers of

household goods showed a wide distribution of from small to large capitals. This is believed to show the wide extent of companies in the industry due to the long history of processing of household goods in the Thai plastic processing industry, the large number of products made, and the relative ease, even now, of entry into the field compared with industrial parts. By nature, the larger the size of the capital, the stronger the tendency toward specialization of lines of products.

## **(2) Relationship Between Number of Employees and Size of Capital**

At the present time, the number of workers employed by plastic processors, said to number about 3000, is unknown, but judging from local publications and interviews, the majority of the companies are small sized manufacturers comprised of several dozen workers and are producing mostly products for the domestic market. Table III-5-2 shows the number of employees of processors covered by the field survey. In so far as the table shows, there is a high proportion of manufacturers having several hundred workers, with one manufacturer having 2000 workers. Taking a look at the composition of workers in Japan, industrial statistics show that there were 18,861 companies with four or more workers in 1988 (employing a total of 397,180 workers), of which 92.5 percent were manufacturers with less than 50 workers (55.2 percent less than 10) and only 3.1 percent were manufacturers with more than 100 workers. Further, there were no manufacturers engaged in processing of plastic with over 1000 workers. Further, in a 1989 survey of the Japan Plastics Industry Association, the ratio of manufacturers with over 500 workers was 15 percent in the U.S. and 3 percent in West Germany, but only 0.1 percent in Japan.

*Note that Fig. III-5-1 compares the size of capital and number of employees of the processors surveyed. The figure does not directly show the balance of business of manufacturers in the manufacturing industry, but in the case of parts manufacturers, there is a proportional relationship between the size of capital, the measure of the health of a company, and the number of workers, the measure of the production capacity and it is judged that production commensurate with the capacity of the companies is being performed, relatively speaking. However, some of the manufacturers of household goods have lost this relationship and there are fears of the poor efficiency of capital productivity and the instability of business standings.*

#### 5-1-4. Time of Establishment of Companies

Thailand's plastic processing industry has undergone rapid development since the early 1970s. There was another great turning point when, in 1978, a certain large sized company began production of plastic bags. Spurred on by this, many companies entered the field of plastic processing and increased the ratio of production of industrial parts gradually to that of household goods.

The state of establishment of the processors surveyed this time is shown in Table III-5-3. There was no particular trend seen in the times of establishment, and the survey findings therefore represent and embrace all ages of companies.

**Table III-5-1. Size of Capital**

(Unit: Million bahts)

Industry	Total	-10	11-50	51-100	101-200	201-500	501-
Assemblers of home electric appliances	3	-	-	1	1	-	1
Assemblers of automobiles	4	-	2	-	2	-	-
Companies mainly processing home electric appliance parts	7	3	2	1	1	-	-
Companies mainly processing auto parts	3	-	2	-	1	-	-
Companies mainly processing household goods	9	3	4	-	1	1	-
Total	26	6	10	2	6	1	1

Note: Two(2) companies unknown.



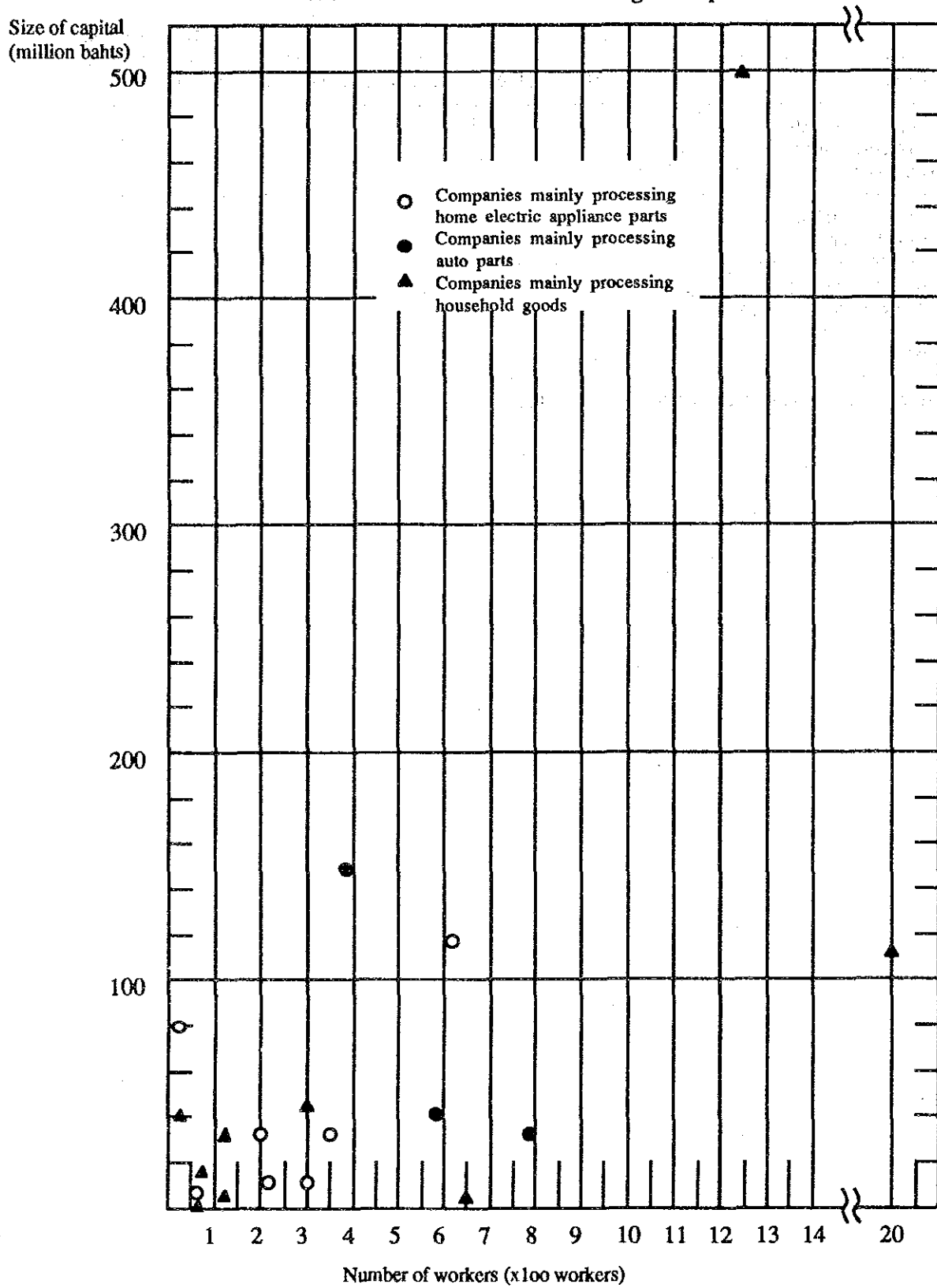
**Table III-5-2. Number of Workers in Plastic Processing Companies**

(Unit: workers)

Industry	Total	-49	50-99	100-199	200-499	500-999	1000-
Companies mainly processing home electric appliance parts	7	1	1	-	4	1	-
Companies mainly processing auto parts	4	-	-	1	1	2	-
Companies mainly processing household goods	10	2	2	2	1	1	2
<b>Total</b>	<b>21</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>4</b>	<b>2</b>

Note: Number of workers includes temporary workers

**Fig. III-5-1. Relationship Between Size of Capital and Number of Workers of Plastic Processing Companies**



**Table III-5-3. Times of Establishment of Companies Surveyed**

Times of establishment	- 1970	- 1980	- 1989
Companies mainly processing home electric appliance parts	4	1	2
Companies mainly processing auto parts	1	2	1
Companies mainly processing household goods	4	4	2

Recently, manufacturers have had a strong urge to increase production and there has been a trend toward expansion of facilities or establishment of separate, independent production items and the construction of new factories. Adding to this the new entries to the industry, there are growing signs of rapid growth in the volume of production of finished products.

#### **5-1-5. State of Introduction of Foreign Capital**

Table III-5-4 shows the equity structure of the 28 companies covered by the field survey. According to this, the assembly industries of home electric appliances and automobiles are striving mightily to maintain production and obtain transfers of technology through joint ventures with foreign capital. The processing manufacturers tend more strongly to include foreign capital the higher the rate of production of industrial parts. Manufacturers converting from processing of household goods to industrial parts or producing both product lines even today do not have any ties with foreign capital with the exception of a few cases. Even when having ties with foreign capital, the suppliers of the foreign capital are mostly manufacturers of household goods.

Behind the strong feature of inclusion of foreign capital in the parts manufacturers is believed to be the guidance or demands of the assembly manufacturers to which the parts manufacturers ship their products. During the term of the survey, the following main opinions were voiced by the assembly manufacturers regarding the parts industry:

\* The industrial parts of processors with no joint venture, technical tieup, technical cooperation, or other relations are being used, though still remaining unsatisfactory, but full-scale use is not possible under current conditions.

\* For metal pressed parts, local procurement is becoming less of a problem

technically speaking, but the backwardness of processing technology in plastic processed parts is a major problem.

\* Plastic processed parts present an obstacle to the achievement of high local content (in auto parts). At the present time, it is possible to procure only the following in Thailand: Battery trays, wheel caps, side moles, door handle caps, steering corner covers, timing belt covers, center consoles, scuff plates, trims, glove compartments, etc. The purchasing price of parts for passenger cars is about 40 percent higher than in Japan.

\* Production of parts for export purposes is difficult for the time being.

Therefore, it is judged that establishment of joint ventures and technical guidance under the guidance or demands of the assembly manufacturers will become even greater in the future.

**Table III-5-4. State of Introduction of Foreign Capital**

Industry	Total	Local capital companies	Foreign capital joint venture companies	Foreign capital companies	Remarks
Companies assembling finished products	7	*1	5	1	*Shifting from joint ventures with foreign capital to technical tieups
Plastic processing companies					
Industrial parts	8	3	5	-	
Household goods	8	8	-	-	
Industrial parts + household goods	5	4	1	-	
<b>Total</b>	<b>28</b>	<b>16</b>	<b>11</b>	<b>1</b>	

#### 5-1-6. State of Utilization of Sub-contractors

Of the 28 companies surveyed, there were 20 which were making use of sub-contractors in one way or another for plastic processing work, four which were not using sub-contractors at all, and four for which the situation was not known.

**(1) Assembly Manufacturers of Home Electric Appliances (3 companies)**

All of the manufacturers surveyed sub-contracted out all or the majority of the plastic processed parts. In sub-contracting, they supplied all or the majority of the molds and also supplied all of the plastic materials (imported materials). One company was also contracting out plating work. The reliance on sub-contractors for plastic parts is high, but the companies lean to contracting of only the molding work.

**(2) Assembly Manufacturers of Automobiles (4 companies)**

All the companies were contracting out all of their plastic parts. Two of the companies, further, were relying on sub-contractors for part or about half of their fabrication of molds.

**(3) Processors of Home Electric Appliance Parts (7 companies, including one unknown)**

Aside from two manufacturers which were not using sub-contractors, the companies were contracting out part of their parts processing work or part of the mold fabrication work. "Parts processing" includes cases of fabrication of molds as well.

**(4) Processors of Auto Parts (4 companies, including two unknown)**

One company was not using sub-contractors, while the other was contracting out about 30 percent of the parts processing work, supplying the sub-contractor with molds and materials.

**(5) Processors of Household Goods (10 companies, including one unknown)**

There was one company not using sub-contractors. The process most often contracted out was the fabrication of molds, for which five companies contracted out partially or completely. There were only two manufacturers which contracted out part of the plastic processing work, of which one contracted out the overflow of the orders it received itself. In addition, there were two manufacturers which contracted out the printing work for their products.

### **5-1-7. Business Expansion Plans**

Seen overall, the companies covered by the field survey were extremely aggressive about expanding the volume of their businesses through increased production or expansion of their product lines. At the present time, 19 of the 28 companies surveyed had some sort of plans for business expansion or were in the middle of such expansions.

#### **(1) Assembly Manufacturers of Home Electric Appliances (3 companies)**

None of the manufacturers surveyed had plans for business expansion. As reasons for this, two out of the three companies had begun operations in 1987 and thus had relatively newly entered the field.

#### **(2) Assembly Manufacturers of Automobiles (4 companies)**

Three out of the four companies were implementing plans for expansion. The plans specifically called for [1] increase of production through establishment of new factories and [2] increase of production through increase of personnel or use of alternating work shifts. The one foreign capital affiliated company had plans for constructing a new factory and tripling the volume of production of finished cars, giving consideration to the rate of local procurement of parts, and will be directly exporting some of the finished cars as "cars made in Thailand" to Japan, the U.S., the West, Indochina, etc. Further, it aims at increasing production of engines four to six fold and directly exporting some of that production as well.

#### **(3) Processors of Home Electric Appliance Parts (7 companies)**

Six companies had plans for expansion of their businesses. Five of the companies planned to strengthen their facilities through expansion of their factories and one planned to establish a new company.

#### **(4) Processors of Auto Parts (4 companies)**

Three companies had plans for business expansion, with each intending to increase production two to four fold. Two of the companies intended to increase production through the establishment of a new factory and one through an increase in personnel. It should be noted that the business expansion plans of the assembly

manufacturers of finished cars and those of the parts manufacturers are the same in both intent and scale of plans, suggesting that the two sides sufficiently coordinate their production plans with each other in advance. Note that according to domestic Japanese newspaper reports etc., manufacturers which used to process intermediate products of auto parts made in Thailand into finished parts in Japan and then export them are planning to shift their entire processing lines to local Thai manufacturers and to arrange for direct exports from Thailand to, principally, the U.S. in an OEM arrangement. Therefore, they are already moving concretely to build new factories. Use of this scheme of export of parts from Thailand should increase in the future.

#### **(5) Processors of Household Goods (10 companies)**

There are two companies which have not yet formulated detailed plans, but have strong intentions of expanding their businesses. Also, there are seven companies with business expansion plans. Two are already in the process of implementation. Five companies are building new factories, including the construction of new factories along with relocation of joint venture plants or their own plants, and strengthening their facilities, all of the plans call for increasing production capacities of products two to three times over the past levels, but there was also a manufacturer which intended to convert to production of higher value added products.

### **5-2. Sales**

#### **5-2-1. Features of Sales Methods and Background of Same**

Table III-5-5 shows a comparison of the methods of sales of products by the manufacturers surveyed. In the case of the products of the assembly manufacturers (finished products), the method adopted was indirect sales through the manufacturers' affiliated sales organizations. One company, however, was selling directly all of its products to the overseas parent company. In the case of the manufacturers of industrial parts, the basic setup was for direct wholesaling to specific assembly manufacturers, but some products are being sold domestically through wholesaler organizations as replacement parts (spare parts) for end users. In the case of household goods, the ratio of indirect sales to unspecified markets through wholesalers or trading companies is rising, but even in such cases, there are many instances of direct sales by the manufacturers' directly run stores. Further, looking at exports, there are many cases of direct transactions with overseas buyers.

A characteristic of the parts manufacturers of Thailand is the lack of any tendency to sell to only specific manufacturers affiliated with a single assembly manufacturer, except in a very few cases, unlike the organization in the advanced industrialized countries where a company is completely incorporated in the affiliated network of companies of one assembly manufacturer. Rather, the manufacturers sell their products to a number of assembly manufacturers. The reasons are [1] there are only a limited number of parts where processing manufacturers are able to meet the demands of the assembly manufacturers, [2] those assembly manufacturers which have primarily sold to the domestic market have not been able to put together orders for parts large enough for them to feel the need to bring parts manufacturers under their sway and strengthen ties with the same, due to the small size of the domestic market, etc.

#### **5-2-2. Thinking in Setting of Sales Targets**

Table III-5-6 shows the state of product planning in the companies covered by the field survey. In the case of industrial parts, manufacturers in principle rely on the assembly manufacturers for the planning of parts for production, though there was a motorcycle part manufacturer which was pushing forward with its own planning, in cooperation with assembly manufacturers, to ensure that its plastic body parts and some of its lighting covers met with the preferences of the market in Thailand and in Malaysia.

In general, in the processing of industrial parts, the molds are supplied or the mold drawings are supplied by the assembly manufacturers, including the majority of the foreign capital joint ventures. Also, technical guidance is provided for mold fabrication by the engineers of the assembly manufacturers. Further, due to the large use of compound materials, the materials are either supplied from the assembly manufacturers (almost all of it being imported materials) or the type or grade of the materials is specified.

In this way, Thai's parts processors currently substantially rely on instructions from the assembly manufacturers for their product planning, including design, materials, molds, and other technical areas. Therefore, manufacturers remain ignorant of the mutual technical relationship of product design, processing methods, materials, and quality. This is a reason for their inability to show planning capabilities to the assembly manufacturers. Further, even among the management related people, there are very few right now who consider it important to be autonomous in planning of products to be sold.



**Table III-5-5. Method of Sales of Products**

Industry	Total	Direct sales	Indirect sales	Combination of direct/indirect sales	Remarks
Assembly companies of finished products	7	1*	6	-	*To overseas parent
Companies mainly processing home electric appliance parts	7	6	-	1*	*All parts sold direct
Companies mainly processing auto parts	4	2	-	2	
Companies mainly processing household goods	10	3	1	6	

**Table III-5-6. State of Product Planning**

Industry	Total	Own planning	Combination of own/customer planning	Customer planning
Assembly companies of finished products	7	7	-	-
Companies mainly processing home electric appliance parts	7	-	2	5
Companies mainly processing auto parts	4	-	2	2
Companies mainly processing household goods	10	3	1	6

Note: Copies of products are included in customer planning.

In the general case in Japan, manufacturers of materials and processors listen to the demands, opinions, and intentions of the assembly manufacturers, but in most cases make materials or develop processing methods independently or jointly. In this respect, the processing manufacturers are independent technology-wise, which makes possible direct participation by the processing manufacturers in the product planning of the

assembly manufacturers. In the case of the processing manufacturers, this technological independence enables the maintenance of planning capabilities and facilitates development of new lines to meet with diversifying product needs.

In the case of household goods, most of the production by independent company planning is in the field of sundry goods. Tableware, kitchenware, cosmetic containers, etc. are mostly based on buyer plans. Further, the higher the export product ratio of a manufacturer, the greater the tendency for reliance on buyer plans. As a general trend, the production lines are determined in accordance with samples brought in by the buyers in the majority of cases. Some of the manufacturers with their own brand products have internal marketing organizations and are beginning to plan products in cooperation with overseas sales organizations. This is a good sign. The impression gained from the comments of the surveyed companies was that there was a larger proportion of manufacturers which recognized the need for marketing and in-house planning of products compared with manufacturers of industrial parts. On the other hand, a relatively larger number of the manufacturers of household goods use domestic materials and due to the quality of the materials, it is difficult to make products for which transparency is required. In particular, in the case of injection molding, due to the underdevelopment of mold-making technology and plastic processing technology, processing of thin items is not fully possible. These have been pointed out as technical reasons why there has not been much progress in in-house planning of products for export.

### **5-2-3. State of Exports of Products**

#### **(1) Export Ratio**

Exports of plastic processed products may be divided into direct exports where the products themselves are exported as single finished items and indirect exports where the products are delivered to assembly manufacturers or processors of oils and fats, cosmetics, food, etc. which make finished goods and then are exported by those manufacturers or processors.

Table III-5-7 shows the state of exports of the 17 of the 21 plastic processors which were surveyed and were exporting in some way or another. This shows that the Thai plastic processing industry is deeply involved in exports. Due to the nature of the products, the method of indirect exports is used for industrial parts and direct export for household goods in most cases, but there have also been some direct exports of

motorcycle batteries and lighting equipment and other auto parts, primarily to countries nearby Thailand. Further, there have been reports of moves by foreign capital companies to use Thailand as a base for processing of export parts and plans for promoting a horizontal division of labor of parts among the ASEAN countries. However, these moves are limited right now to the group of foreign capital firms etc.. The managers of Thai capital companies do not seem to be interested much at all in the market for direct export of parts or to understand the need for sales promotion activities for foreign markets due to already increasing volume of sales of parts accompanying the expansion of the production of the assembly manufacturers.

Table III-5-7. Export Ratios of Plastic Processors

Co.	Equity mode	Ratio of exports to sales (5)	Breakdown (%)				Remarks
			Direct exports		Indirect exports		
			Industrial parts	Household goods	Industrial parts	Household goods	
A	Foreign joint venture	20	10	--	10	--	Auto lighting equipment
B	Local capital	>30	30	--	Yes	--	Motorcycle batteries
C	Foreign joint venture	>20	--	20*	Yes**	--	*Mainly sanitary equipment **Auto/home electric appliances
D	Same	100	--	--		100	
E	Same	95	--	--	95	--	Auto/home electric appliances
F	Same	100	20	-	80	-	Home electric appliances
G	Local capital	10	--	--	10	--	Auto/home electric appliances
H	Same	>5-7	--	5-7*	Yes	--	*Sanitary equipment
I	Same	22	--	7*	15	--	Sanitary equipment
J	Same	50	--	50	--	--	Melamine tableware
K	Same	50	--	50	--	--	Mostly melamine tableware
L	Same	30	--	30	--	--	Stationery
M	Same	40	--	40	--	--	Sundry goods
N	Same	Unknown	--	Yes	--	--	
O	Same	Unknown	--	---	--	Yes	Manufacture of containers
P	Same	10-20	--	10-20	--	--	
Q	Same	>40	--	30-40	--	Yes	Manufacture of cosmetic containers

Note: State of 17 of the 21 plastic processors which are exporting.

In the case of household goods, manufacturers having their own brands of products often engage in direct transactions with overseas buyers and are aggressively developing markets, including overseas ones, and promoting sales. The vast majority of

companies, however, export through wholesaler organizations, though this is also considered direct export, so lack information and knowledge about the export markets. Among these, there are quite a few manufacturers which produce on order but do not have a firm grasp of the export destinations of their products.

## **(2) Export Destinations**

Plastic processed products are exported all over the world - even when seen from just the manufacturers surveyed. The results of the survey were generally as follows:

### Destinations in case of direct exports

Motorcycle parts	ASEAN region and Middle and Near East
Automobile lighting equipment	U.S., Japan, ASEAN region
Tableware and kitchenware	Mostly Europe, but world as a whole
General household goods	ASEAN region and Australia
Cosmetic containers	Japan, ASEAN region, U.K.
Sanitary equipment	Japan and U.S.
Stationery	World as a whole
Sundry goods	East Asia and ASEAN primarily, but world as a whole

### Destinations in case of indirect exports (parts)

Motorcycles	ASEAN region
Microwave ovens	U.S. and Europe
Refrigerators	ASEAN region and Middle and Near East
Audio equipment and radios	U.S. and ASEAN region
Facsimiles	U.S.
Fans	ASEAN region

There does not seem to be any particularly outstanding regional characteristics, but it may be seen that Thai plastic processed products or products including Thai parts are being exported throughout the world, particularly to East Asia. Household goods of a relatively medium or low level of quality, mostly sundry goods, have been exported from the ASEAN region to the Middle East for a long time now, while melamine tableware enjoys deeprooted popularity in Europe.

#### **5-2-4. Features of Sales Channels**

As mentioned earlier, industrial parts are almost all directly delivered to the orderers, the assembly manufacturers. Production of parts is increasing at present in response to the expanded production of the assembly industries, so producers of parts do not seem to feel the need for positive development of sales channels.

Household goods are delivered directly to specialty stores, department stores, supermarkets, and other mass merchandisers without going through trading companies and wholesalers and further are directly sold in transactions with overseas sales outlets. In this case, there is a strong tendency to fix the wholesalers of the products and the production on order system is adopted.

In general, however, products are mostly sold wholesale to nonspecific locations domestically and overseas sales outlets through specialized wholesalers or brokers and there is a tendency not to be particular about these intermediaries.

In Japan's case, there are about 16,500 wholesalers handling plastic household goods (statistics of Ministry of International Trade and Industry), which may be roughly divided into general wholesalers, specialized department store wholesalers, and specialized retailer wholesalers. According to the 1989 "survey of wholesaling" of the Japan Plastics Industry Association, 98.7 percent of the manufacturers of household goods went through wholesalers (73.9 percent through primary wholesalers and 24.8 percent through primary and secondary wholesalers) while only 1.3 percent engage in direct transactions with retailers - a different ratio compared with the distribution channels of Thailand. Further, while Japanese processors cooperate with these wholesalers in the positive development of products and markets, Thai processors tend strongly to engage in production in accordance with instructions from the wholesalers and take a very passive stance toward development of markets and sales channels. In particular, they in many cases do not have a firm grip on to which countries their export products are sold (export destinations).

### **5-3. Labor Management**

#### **5-3-1. Labor Situation**

The plastic processing industry depends to a relatively small degree on the abilities and skills of the workers and is an industry easier to enter compared with other processing and assembly industries, but on the other hand is largely influenced in the development of business by the managers' knowledge of the markets and management capabilities and judgement in introduction of technology, renewal of facilities, labor management, etc. Further, there is a strong tendency for a company's entire capabilities in the working environment, planning, production, quality, and sales to be determined by the state of the administrative and technical management staff in charge of practical day to day matters.

In this regard, the field survey revealed the following situation:

\* In the large sized manufacturers and the foreign capital affiliated medium sized manufacturers, the companies were effectively organized and the roles of the staff of different organizations were relatively clearly delineated, so the managers could easily collect abundant information on business operations and could make correct judgements on management with support from related industries and their own management staff. However, while the managers recognize the need to join together, take leadership, and establish an industrial strategy as an industry, they are not making any progress in concrete, substantial activities for the same.

\* In the small and medium sized manufacturers, family management was often seen, where there was a strong tendency to give managerial roles only to family members or very close friends and where even if personnel suitable as candidates for staff or foremen positions were trained, they would never be given an opportunity for advancement and therefore it would be difficult to establish a productive work organization for planning or managing production, sales, etc. internally. With the management span limited to the manager and his close associates, there is a great possibility of difficulties accompanying any appropriate measures taken to deal with the rapidly diversifying product trends.

\* Whatever the case, there are deep problems in the industry of shortages of factory control class staff having proper abilities and fiber.

\* Regardless of the size of companies, there is a problem of an overwhelming shortage of engineers and researchers with specialized knowledge in plastic processing. In particular, there is a noticeable shortage of expert engineers having the proper knowledge and experience in molds, molding, and materials. Among the manufacturers, there are some managers who are overly confident of their own experiences and do not believe in the need for expert engineers.

\* Further, there are relatively large numbers of manufacturers which complain of the shortage of technicians for taking charge of the maintenance of the processing facilities. In this industry, the processing quality of the products and the efficiency of processing are largely determined by the state of the facilities and for this reason alone, at this time when modernization of facilities is predicted, the shortage of technicians will probably become a major problem.

\* The processing is handled to a large extent by a female labor force, including the operation of processing equipment.

### 5-3-2. State of Work

On the average, the administrative staff serve in single shifts, while the workers in the production divisions work in three alternating shifts, but as shown in Table III-5-8, there are some differences according to the fields of the surveyed companies.

**Table III-5-8. State of Work of Surveyed Companies (Production Divisions)**

Industry	One shift	Two shifts	Three shifts	Three shifts only in molding division
<b>Assembly manufacturers</b>				
Home electrical appliances	1	-	-	1
Automobiles	1	2	-	-
<b>Plastic processing manufacturers</b>				
Home electrical appliances	1	-	4	2
Automobiles	2	-	1	1
Household goods	1	-	7	2

By content, there were fewer assembly manufacturers which were using alternating shifts compared with the parts processors. Further, auto related manufacturers used alternating shifts less than manufacturers of home electrical appliances and household goods. In any case, the molding divisions were operating 24 hours so as to maintain heat efficiency and prevent loss of materials during hold up cycles. Further, almost all of the manufacturers made two to three hours of overtime work obligatory, on the average, for their workers. Note that among the auto related manufacturers was one which made wide use of part time workers.

### **5-3-3. Wages**

The wage situation may be roughly classified into daily wages for workers in the production division and monthly wages for administrative staff, but the wage system and amounts paid differ depending on the industry.

In general, workers in the production divisions earn a daily 70 to 100 bahts in Bangkok and its environs, with some even receiving less than the legal minimum wage for the region. However, two automobile assembly manufacturers and one auto parts processor were using the monthly wage system for their general workers and, further, one automobile assembly manufacturer was using the monthly wage system for even the machine operators among its workers. The wage income in this case is a monthly 3000 to 6000 bahts, with workers earning an average of around 5000 bahts including overtime. While all of the key staff are paid monthly, there are considerable differences among the companies. For example, university graduates with technical backgrounds earn anywhere from a monthly 4000 to 12,000 bahts.

In addition to the monthly wages, there are manufacturers which pay a bonus of three months' worth of wages each year and manufacturers which pay out bonuses for 100 percent attendance and bonuses for encouraging efficiency.



#### 5-3-4. State of Employment and Retention of Workers

Table III-5-9 shows the state of employment and retention of workers in the manufacturers surveyed from which responses could be obtained.

**Table III-5-9. State of Employment and Retention of Workers**

	No. of responses	No problem	Difficult
Employment of general workers	14	12	2
Employment of university graduates with technical backgrounds	11	-	11
Retention of workers	20	16	4

Almost all manufacturers felt there was no problem with the employment of general workers. Almost all manufacturers also considered the state of retention of their workers to be good and that there was no great problem with it. Among the handful of manufacturers which had problems with the employment and retention of workers were also a large manufacturer and a manufacturer with good wage levels, so it is difficult to believe that the treatment of workers was the cause. These manufacturers, however, were located inside Bangkok, so this probably had something to do with the fact that workers could easily obtain various jobs in the area. Note that we heard from some of the manufacturers of workers being scouted by other firms. On the other hand, all the manufacturers responding, without relation to the size of their businesses or remuneration, indicated it was difficult to secure personnel with college or other higher specialized technical education. Further, manufacturers also mentioned the job mobility of staff with higher education or higher level technicians. This situation will be a major obstacle to the spread of management knowhow and broad ranged basic engineering technology in the industry and further to the polishing and transmission of application and development capabilities, which are accumulated through experience by engineers.

## **5-4. Problems and Countermeasures**

### **5-4-1. Problems**

#### **(1) Large Dependence on Assembly Manufacturers by Parts Processing Manufacturers**

Some manufacturers are beginning to appear which work to develop products and improve their processing technology while maintaining ties with assembly manufacturers, but the majority rely on the assembly manufacturers for technical aspects of product design, mold, processing and also materials etc. Therefore, they do not understand product design, processing methods, materials, quality, and other individual aspects of technology nor the mutual relationship among the same. The parts processing manufacturers are not able to display autonomy or independence in technology to the assembly manufacturers. This further means it is difficult to establish product strategies or management plans.

#### **(2) Insufficient Market Information in Processing Manufacturers of Household Goods**

There are some manufacturers which make some products planned on their own, but almost all of these are in the area of similar design to other products. Product planning is largely through designs or samples brought in by buyers. The buyers are also relied on for production volumes and final sales destinations. This is because there is no system in the industry for organized collection of market information, including overseas market information, suitable judgement of market trends, and creation of products enabling companies to open up markets on their own.

#### **(3) Evil of Tendency of Expansion of Production Volumes**

The manufacturers all strongly want to expand the volume of their production. To expand the volume of production, they tend to go about expanding their lines of sales ignoring the fact that there are differences in technology required for the manufacture in individual product fields. As a result, all manufacturers are producing similar products. In other words, they are producing products with different purposes of use (required quality) using the same knowhow, facilities, and technology. This makes the industry one in which accumulation of technology and knowhow and specialization in certain

processing technologies are difficult.

#### **(4) Limits to Family Managed Companies**

In the plastic processing industry, business development is by nature governed more by the managerial capabilities and judgement of the management rather than the quality and capabilities of the employees. There are large numbers of family managements seen, especially in the small and medium sized manufacturers, but with the increasing diversification of product directions and the shortening of product lives worldwide, there is a strong possibility that management limited to close relatives will prove a major hindrance to company operations. It is important to train personnel in-house and make effective use of that personnel and at the same time to transform into modern management.

#### **(5) Difficulties in Securing Human Resources**

The industry as a whole faces the problems of an overwhelming shortage of engineers with specialized plastic processing knowhow and the job mobility of engineers. These problems are obstacles to the spread of basic technology in the industrial field and further to the polishing and transmission of application and development capabilities, which are accumulated by engineers through long experience.

Further, the shortage of administrative staff capable in factory management is also becoming an important problem for manufacturers of parts and manufacturers of household goods desiring to convert to modern processing industries.

#### **(6) Lack of Coordination Among Companies**

While considering that it is necessary for the power of the industry to be focused for the formulation and implementation of strategies on products, processing technology, markets, etc. in the plastic processing industry, including mold makers and producers of materials, there is little of a stance taken by the management ranks of the various manufacturers for implementing or promoting this.

Therefore, manufacturers are not able to specialize in production lines making use of their individual strengths or to differentiate their production technologies from others'. Further, the industry cannot deal with the development of mold technology or the

development of materials suited for products and it is difficult for the industry to make clear, unified demands to the government regarding institutions and policies.

#### **5-4-2. Countermeasures**

##### **(1) The Role of Private Organizations in the Improvement of Technology and its Dissemination and Support from the Government**

The plastic industry is one in which technical innovation comes relatively quickly in all areas, including materials, mold making and product processing. Some industrial organizations already have established their own training facilities and are working to disseminate and upgrade processing technology, but as overall activities, these are still small in size compared with the size of the industry.

In the future, it will be necessary for the industry to join together and augment these processing training facilities both in quality and quantity and to increase the number of experienced workers in the factories. On the other hand, urgent necessities include the increasing of the ratio of local parts procurement through quality improvement in the parts industry and the establishment of markets by increasing the value added in the household goods industry. Therefore, it is essential for the industry to increase the number of medium and high level engineers and it is necessary to establish a new facility for education and training which can provide education based on practical theories of plastic processing and, based on that, practice in processing, testing, analysis, and other areas. However, it is impossible for the private sector to undertake the above-mentioned activities alone because of the lack of funds and technology.

It is hoped that the Ministry of Industry would play a guiding role in this area by making it part of its industrial promotion policies, maintaining close ties with public research organizations, including universities and industrial organizations, and implementing plans in the form of support to the private sector. Furthermore, it is recommended that the Ministry of Industry and the industrial organizations promote, individually or in joint activities, the subdivision of product fields, the invitation of overseas experts in the same, and the dissemination of technology through seminars and factory visits to provide guidance.

## **(2) Collection of Overseas Technical and Market Information and Its Dissemination**

There are tremendously fast changes in processing technology and technology regarding plastic materials, and the diversification of products is leading to rapid changes in market trends as well. It would be of great significance for not only industries which have a target mentioned in above (1), but also public organizations to analyze knowledge and information obtained from overseas information related to the same. The acquisition of overseas information regarding commercial production is something which companies inherently should do on their own, but there are innate limitations in this regard in the majority of the companies, which do not have extensive overseas networks. It would be practical to establish a system enabling one to seek support from overseas agencies of the government and to promote sharing of collected materials and information in the public and private sectors and, further, in dissemination of the same to a broad range of general users, to make use of the organizations and funds of the industrial organizations for arrangement of the information, translation, etc.

Further, dispatch of an observer to the industrial conference of Asian NIEs sponsored by the Japan Plastic Industry Association should be effective in terms of collection of information both for the public and private sectors.

## **(3) Strengthening of Guidance for Improvement of Management and Management Capabilities**

Due to the nature of plastic processed products, the development of companies and the industry is largely dependent on the managerial capabilities of the managers and the managerial capabilities of factory managers over production at the production sites, even more so that on technology. Therefore, it is judged important for the industry as a whole to spread the concepts of modern management, particularly in family run companies. It is desirable that through such activities, the technical knowhow in which individual companies are skilled be pinpointed and the companies gradually move to specialize in their lines of production and in their production technology.

Therefore, it would be good to switch the content of seminars, which previously strongly tended to lay emphasis on improvement of technology, so as to gradually touch more concretely on business management. Government and industrial organizations must give full consideration to this point in their organization of seminars, direct guidance to

companies, etc.

In the long term, it will be necessary to give consideration to establishment of courses concerning modern managerial engineering and production engineering in the universities.

#### **(4) Supply and Ensurement of Human Resources**

In the long term it will be essential to increase as much as possible the number of staff with technical backgrounds in the higher educational facilities, both by augmenting current educational ranks and increasing the allowed number of the same. The formulation of practical plans for this by the Ministry of Industry and the educational authorities based on long term industrial policies is desired.

In the short term, scholarship systems could effectively be established by individual companies or industrial organizations in accordance with the situations in the same so as to give capable students an opportunity for study, with an obligation of employment being made a condition.

Besides the above, individual companies should make efforts to arrange welfare programs and improve working conditions to prevent job hopping by staff and skilled laborers.