4. Marketing

4-1. Product Development

As described above, the Thai textile industry is dominated by standard products, with most firms simply responding to color and pattern-related specifications from wholesalers. Until now, in-house development capabilities at most firms have been limited. In the export arena as well, the relative strength of the buyers has virtually eliminated the need for such capabilities. Only one of the firms visited in the survey maintained a product development section that was clearly designated as such. In addition, high import duties on thread and woven fabric have drained the competitive strength of foreign products on the domestic market, thus making it unnecessary for Thai textile manufacturers to promote development activities.

Today, apparel accounts for fully 73% of all textile exports, and the need for original textile exports is steadily increasing. The development and provision of products which meet the necessary standards (i.e., products which can compete with imported materials) will be needed in the future. This opinion was also expressed by some of the companies surveyed.

Although development capabilities at firms in the Thai textile industry are limited, they are not nonexistent. Some of the manufacturers of fiber or thread dyed fabrics have beat other firms to the punch in developing fabrics (special fabrics, curtain materials, material for women's suits, etc.) and have then ceased production when other firms began to manufacture the same type of product. In addition, woven fabrics such as jacquard and figured cloth which could not be manufactured profitably in Japan are currently being produced in Thailand, and there is believed to be room for development of special fabrics. The firm indicated above suggested that special products could better be produced in Thailand than in Japan.

Product development in the textile and apparel industries requires not only improvement of existing production facilities but also the accumulation of know-how in the dyeing and finishing processes such as "feel" and "touch" (at some Japanese companies these words have established themselves as technical terms for use on the factory floor). Some of the Japanese-affiliate firms pointed out that in the dyeing sector improvements in production management were more important than improvements in the production facilities themselves.

It is difficult to come to a definite conclusion concerning Thai product development capabilities. Some of the firms visited had achieved technological standards sufficient to pass in the Japanese market. With the exception of one firm, however, sales

routes of the companies visited all went through San Pen, and transaction routes are also fixed. None of the textile firms surveyed conducted direct transactions with garment manufacturers, and in virtually all cases of sales to garment companies the latter were capital affiliates of the textile firms.

Thus there exist serious problems in the market structure, namely, the facts that developed products are seldom sold through appropriate routes and that market-side demands do not reach the product development process.

4-2. Export Channels

4-2-1. Export Channels

Thai textile exports consist mainly of standard products and can be divided into ordinary foreign trade and border trade.

The majority of Japanese-affiliate and Thai firms conducting ordinary foreign trade export through trading companies. Some Thai firms, like Union Textile, export directly, but with the exception of the largest corporations there are few such firms.

It is difficult to obtain an accurate quantitative grasp of the border trade situation, but it is a presence which cannot be ignored when considering the Thai textile market. The main products are standard products of the same quality as those available on the domestic market, and it serves as one part of domestic distribution.

Ordinary overseas markets can be divided into quota and non-quota nations. A large percentage of Thai exports are destined for quota nations. In those markets featuring quantitative restrictions the export of high-priced products is desirable, but this kind of trend cannot be observed in the field of woven fabrics, which constitute the main textile export.

Exports to the Near and Middle East constitute a large portion of shipments to non-quota nations. Surprisingly, in many cases the unit price of artificial long-fiber woven fabrics, cotton fabrics, and artificial short-fiber woven fabrics for export to these nations are as high or higher than those for export to the U.S. and West Germany.

In the future, more attention will have to be paid to Japan, which constitutes the largest non-quota market. In 1987, 64% of Japanese thread imports (based on value) came from Pakistan, South Korea, and China, while Thailand provided only about 0.3%. Sixty-five percent of all imported woven fabrics came from China, Italy, and Korea, with Thai exports accounting for about 11%. Considering the above-mentioned foreign markets, there is a need to adopt marketing policies according to the character of the market, whether it be a market for standard products or discriminatory ones.

It was the opinion of nearly all of the woven fabric manufacturers visited that, in addition to the direct textile export channels described above, indirect export channels, in which Thai textiles are sold to garment manufacturers through San Pen and then exported, also play a significant role.

While increases in textile exports are naturally desirable, the effective use of domestic materials in the manufacture of garments for export is even more important. This is the problem of "linkage." Concerning this point, there is a need to examine textile distribution functions in Thailand (i.e., San Pen).

4-2-2. Domestic Distribution Market

The San Pen market forms the nucleus of the Thai textile industry. With the exception of direct exports of special spun and woven fabrics and direct garment linkage, the great majority of industry transactions are conducted at the San Pen market. Consequently, specific market prices have been formed for the products handled here.

The San Pen market.revolves around the textile agents referred to as primary, secondary, and tertiary wholesalers (the secondary and tertiary wholesalers often double as retailers). Virtually all Thai textile transactions pass through these firms (see Fig. I-4-1).

An organization called the Union Textile Merchant Association has been established in San Pen, and there are 301 participating firms on its list of members.

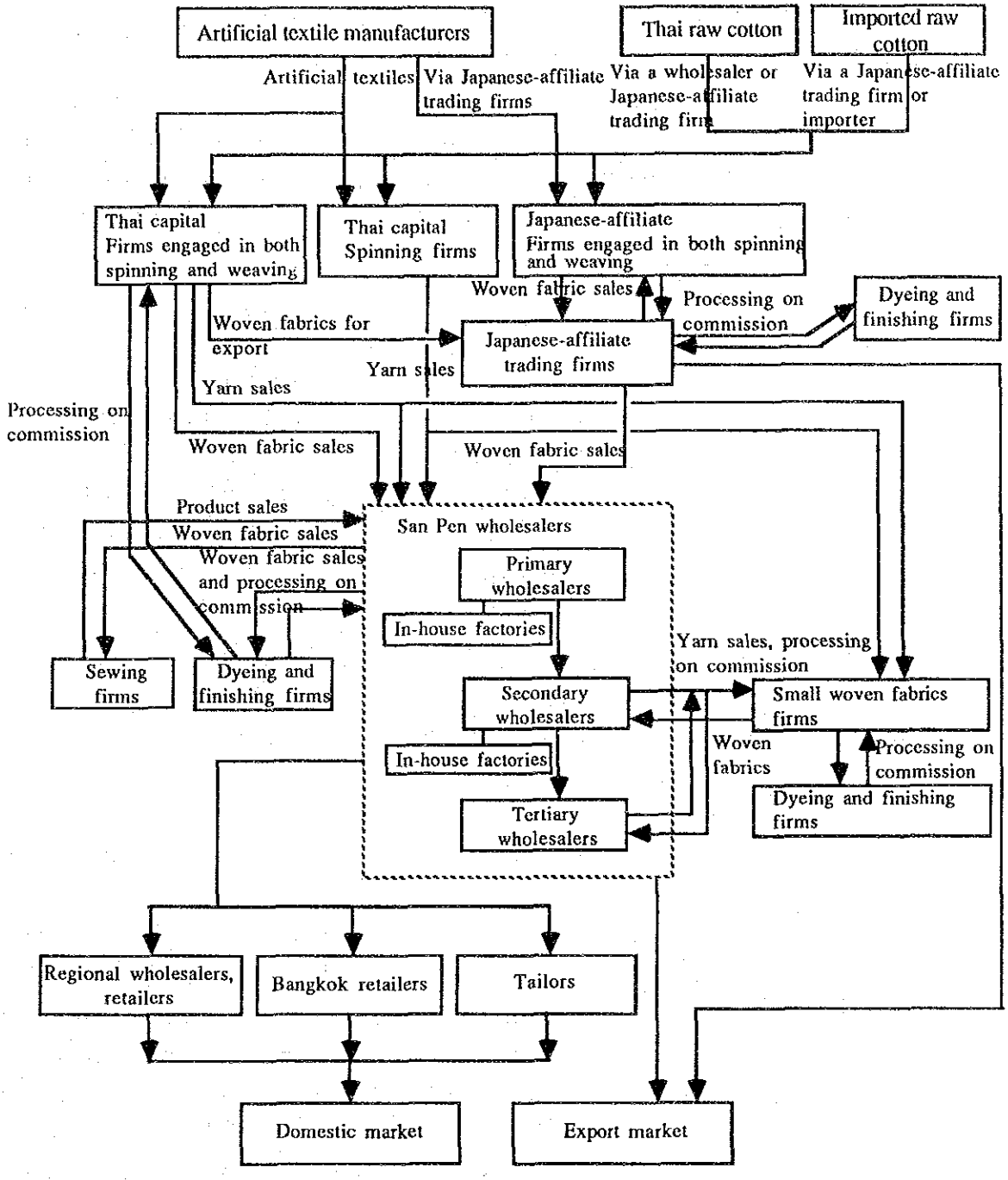
In the past, woven and other fabric sales formed the backbone of transactions in San Pen, but today 70% of the products sold there are supplied to garment manufacturers (this according to interviews with distributors). The market also serves as a supply base for imported fabrics required in garment manufacture (e.g., thick cloth woven fabrics not produced in Thailand).

Some woven fabric manufacturers mentioned that San Pen's secondary wholesalers have a lot to say concerning woven fabric design.

Those wholesalers whose name contains the word "Impex" are engaged in both imports and exports, and the number of such firms is on the rise. Some of the corporations visited pointed out that their functions as converters were growing stronger in contrast to their traditional functions as distributors.

This is indication of the fact that Thai textile distribution is changing, albeit gradually, through San Pen. However, some Japanese-affiliate corporations are skeptical as to how far these new functions will develop, and some companies are attempting to establish firms of their own having converter functions.

Fig. I-4-1. Thai Distribution Structure for Textile Products



Note: The following types of corporations are also present in addition to those shown above:

- Groups consisting of a number of firms, each responsible for artificial textiles, spinning, weaving, dyeing, finishing, or sewing
- Groups consisting of a number of firms, one each responsible for spinning, weaving, dyeing or
- finishing
- Large corporations specializing in weaving
  Knitting firms

4-3. Comparison of Price Competitiveness

4-3-1. Textile Prices

Yarn and fabric prices remained high in 1987. According to a Bank of Thailand report, this was due to rising exports and increased demand in the domestic garment manufacturing industry. As shown below, the market price of No. 20 and No. 40 cotton yarn rose dramatically.

(unit: baht/10 lbs)

Period		No. 20	No. 40
1986	1st quarter	225-240 (0.8555-0.9125)	300-360 (1.2552-1.3689)
	2nd quarter	240-260 (0.9126-0.9886)	320-350 (1.216-1.331)
	3rd quarter	270-310 (1.027-1.179)	360-380 (1.3689-1.449)
	4th quarter	320-350 (1.217-1.331)	400-440 (1.521-1.673)
1987	1st quarter	360-440 (1.399-1.710)	520-530 (2.022-2.060)
	2nd quarter	400-430 (1.555-1.673)	520-530 (2.022-2.060)
	3rd quarter	360-370 (1.399-1.438)	530 (2.060)
	4th quarter	360-380 (1.399-1.477)	500 (1.944)

(figures in parentheses indicate price in US$ per lb)

The high price of spun yarn has a significant impact on the woven fabric industry, and some company owners ranked Thai yarn and materials the most expensive in the world.

Let us compare the above prices with those for cotton yarn of the same count in Japan during the same period. In 1986, one pound of No. 20 cost ¥173, or $1.022, which is less than the highest price for the fourth quarter of the same year in Thailand. In 1987, the Japanese figure increased to $1.378/lb, which means that cotton yarn purchased at Osaka market prices was considerably cheaper than the same yarn purchased in Thailand.

In the case of No. 40 yarn, the Thai market price was $1.521-1.673 in the fourth quarter of 1986, again making it more expensive to buy in Thailand than in Japan. In 1987, the price for No. 40 rose to $1.9137/lb in Japan, but Thai prices for the first quarter still outran this figure by 10% (prices were to drop somewhat at year's end, however).

Since the above figures for Japan are yearly averages they may not provide an accurate comparison, but it is safe to say that cotton yarn bought on the Thai domestic

market is not cheap. Naturally, these high prices have a detrimental effect on export competitiveness.

Prices per 10 lbs of TC 45/1 were as follows in 1986: first quarter, 330-360 baht; second quarter, 360-450 baht; third quarter, 460-520 baht; fourth quarter, 520 baht. 1987 saw an end to the upward spiral, but the average price still rose 27.5% over the previous year: first quarter, 500-620 baht; second quarter, 560-580 baht; third quarter, 550-570 baht; fourth quarter, 540-560 baht.

Woven fabric prices began rising together with yarn costs in the second half of 1986, and high prices continued on into 1987. The price per bolt of calico, for example, while steady at 360 baht from the first through third quarters of 1986, rose to 360-475 baht in the fourth quarter, 475 baht in the first quarter of 1987, and 598.33 baht in the second quarter. Although prices subsided somewhat during the third and fourth quarters of 1987, an annual increase of 51.2% was still recorded.

The price per meter of cotton and synthetic fiber woven fabrics was steady at 19 baht from the first through third quarters of 1986 but rose to 19-22 baht in the fourth quarter and 22 baht in the first quarter of 1987. The final figure became the established price, resulting in an increase of 14.3% over the previous year.

4-3-2. Thai Product Prices Viewed Worldwide

As described in the section on general industry conditions, Thai textile trade is characterized by the import and export of the same types of products, and both are on the rise. In the survey, many companies indicated that the increase in textile imports is due to an increase in demand for garment materials, and, the concentration of imports from China, Korea, and Taiwan would seem to indicate that these products as well are being used in garment manufacture.

Tables I-4-1 through I-4-3 offer a comparison of export and import prices (i.e., import unit price/export unit price).

Thai textiles are priced higher than the competition in China and Pakistan. This is true of cotton products and woven fabrics, man-made long-fiber woven fabrics, and man-made short-fiber woven fabrics. However, Thai woven fabrics are less expensive than those produced in Korea or Taiwan, placing the nation midway between the NIEs and developing countries.

The industry's future task, and it will not be an easy one, is to overtake Korea and Taiwan while guarding against the advance of Chinese products.

There is also a need to examine whether Korean and Taiwanese products are special products or simply uppermarket versions of the same type of product. Whatever

the market, however, this competition is expected to continue, and it will be necessary to nurture a competitiveness taking into account the balance between price and product.

Table I-4-1. Comparison of Cotton Woven Fabric Prices (import unit price/export unit price)

5509	Country name	1983	1984	1985	1986	1987
	China	0.7961	1.1660	1.4458	1.0360	0.7389
	Hong Kong	3.2093	2.7431	2.8803	2.7445	2.5303
	India	0.2809	1.6808	2.1784	1.7865	0.9246
	Japan	1.8424	2.1241	2.9396	3.0261	2.6403
	South Korea	4.3673	3.3705	3.7370	3.4304	2.4376
	Pakistan	—	—	0.9191	1.3412	0.8972
	West Germany	4.5771	1.3664	1.2825	4.9029	3.8224
	Italy	7.6119	6.6390	5.1361	7.9743	6.6531
	U.K.	10.4421	2.2808	4.9977	5.9341	5.6213
	U.S.A.	6.0831	1.7106	8.6924	1.7775	2.8613
	Total	2.4458	2.2279	2.6154	2.560	1.5460

Source: Thai trade statistics

Table I-4-2. Comparison of Man-made Long-fiber Woven Fabric Prices (import unit price/export unit price)

5104	Country name	1983	1984	1985	1986	1987
	China	0.8676	1.2053	1.0321	0.7081	0.6338
	India	4.2416	6.8168	3.4860	3.0187	0.6169
	Japan	1.7572	1.8420	1.6897	1.2344	1.1526
	South Korea	1.6254	1.3416	1.3943	0.8418	0.8766
	Pakistan	—	—	—	0.4200	—
	Taiwan	1.2297	1.4179	1.1756	0.8179	0.7644
	West Germany	5.7639	2.55637	3.2964	2.3256	1.5017
	Italy	0.1119	0.7675	0.1526	0.1589	0.1582
	U.K.	1.6955	2.3519	3.5473	3.7091	3.5585
	U.S.A.	1.7812	2.1185	2.2415	1.4787	1.4524
	Total	1.410	1.4862	1.339	0.8748	0.8523

Table I-4-3. Comparison of Man-made Short-fiber Woven Fabric Prices (import unit price/export unit price)

5607	Country name	1983	1984	1985	1986	1987
	China	—	0.8542	0.9721	0.7749	0.7125
	Hong Kong	—	2.2381	2.5457	2.1997	1.8923
	India	—	—	0.8385	0.7965	0.8279
	Japan	—	3.5369	3.8419	2.3605	1.6868
	South Korea	—	2.4233	2.1334	2.2463	2.0801
	Pakistan	—	—	—	—	0.6822
	Taiwan	—	2.3363	2.0336	1.4652	1.5303
	West Germany	—	—	—	—	—
	Italy	—	3.9974	3.1441	3.6695	3.6203
	U.K.	—	3.1198	2.3278	2.3827	2.7435
	U.S.A.	—	4.0751	3.7615	4.5422	3.8888
	Total		1.8627	1.7956	1.1079	1.0146

4-4. Problems and Countermeasures

4-4-1. Problem of Linkage Between Textile and Garment Sectors

It has often been pointed out that there is insufficient linkage between fabric manufacturers and garment manufacturers. This comment was frequently heard at interviews held with companies visited during the survey. Many fabric manufacturers acknowledged this lack of linkage, indicating that while some of the fabrics sold to San Pen are used for making garments and are thus indirectly exported, they themselves have no direct contact with the garment manufacturers because their orders come from San Pen. Many blamed this on the transaction tax.

However, this weak linkage can also be ascribed to the traditional Thai practice in which the consumer purchases fabric and gives this to his tailor to sew into a garment, so that fabric itself was the end product. Consequently, fabrics are collected from fabric manufacturers in the trading center of San Pen, where those controlling the retail of fabrics are situated. Of course, many types of ready-made apparel have been sold in the past, and as shown in Table I-4-4 there have also been instances in which fabric manufacturers and garment makers have been linked by some form of capital affiliation. However, it is only during the past several years that the larger part (estimated to be 70% at present) of the fabrics which make their way to San Pen has been sold to garment manufacturers. At present, fabric and garment manufacturers are inevitably linked through San Pen.

Table I-4-4. Textile and Garment Manufacturers with Capital Affiliations

Textile Business Group	Garment Company (no. of sewing machines)	
Sukree Group	Thai Iryo Co., Ltd	(1,200)
Saha Pattana Group	Peoples' Garment Co., Ltd	(1,500)
	Thai Wacoal Co., Ltd	(1,400)
	Thanulux Co., Ltd	(300)
Saha Union Group	Union Garment Co., Ltd	(600)
Winner Group	Lian Thai Textile Industry Co Ltd	(550)
TTI Group	Thai Rung Textile Co., Ltd	(300)
Toray Group	Thai Garment Export Co., Ltd	(2,000)

Source: "Survey Report on Production Capacity of Textile Industries in Thailand," Japanese Chamber of Commerce, Bangkok

The problem of weak linkage between fabric and garment manufacture has been attributed to the following factors. (a) First of all, the amount of woven and knitted fabric imported into the country is growing together with the increase in garment exports, but there is no smooth flow of fabrics from the textile manufacturing sector. (b) Second, the textile manufacturing sector cannot provide the materials needed for some types of garments (especially autumn and winter wear). (c) Finally, smooth transactions and exchange of information between the two sectors are not being realized.

A closer look at each of these problems is provided below.

(a) Lack of Material Flow Between Textile and Garment Manufacturers

Table I-4-5 shows the flow of materials from textile manufacturers to garment manufacturers. Apparel exports have grown rapidly since 1984, but the production of textiles and sales to the garment sector have not kept pace. What is more, the percentage of fabric output passed on to the garment sector is gradually decreasing. As a result, imports of woven and knitted material have increased considerably in order to fill this gap, jumping 70% in 1987. While there is a steady flow in materials from textile manufacturers to garment manufacturers, the huge increase in demand resulting from increased garment exports has not had an impact on the textile manufacturing sector.

Table I-4-5. Trade Balance for Woven and Knitted Fabric & Garment Exports

(Unit: Fabric: 100,000 yd^2; garments: 1 million pieces)

	Garment export volume (1 million pieces)	Production			Flow to garment sector			Flow rate (%)	Exports total	Imports total
		Weaving	Knitting	Total	Woven	Knitted	Total			
1981	138	1,514	420	1,934	891	416	1,197	67.6	388	145
(growth rate)	(25.9)	(5.6)	(11.0)	*6.8)	(7.5)	(12.7)	(9.2)			
1982	145	1,647	424	2,071	941	417	1,358	65.6	480	112
(growth rate)	(5.2)	(8.8)	(0.9)	(7.1)	(5.6)	(0.2)	(3.9)			
1983	167	1,735	456	2,191	985	432	1,417	64.7		
(growth rate)	(15.3)	(5.3)	(7.4)	(5.8)	(4.7)	(3.6)	(4.3)			
1984	210	1,843	488	2,331	1,039	435	1,474	63.2		
(growth rate)	(25.5)	(6.2)	(7.1)	(6.4)	(5.5)	(0.7)	(4.0)			
1985	241	1,958	520	2,478	1,075	489	1,564	63.1		
(growth rate)	(15.0)	(6.3)	(6.6)	(6.3),	(3.5)	(12.4)	(6.1)			
1986	313	2,101	606	2,707	1,125	534	1,659	61.3	588	205
(growth rate)	(29.9)	(7.3)	(16.3)	(9.2)	(4.7)	(9.2)	(6.1)			
1987	459	2,210	640	2,850	1,198	570	1,768	62.0	592	349
(growth rate)	(46.6)	(5.2)	(5.7)	(5.3)	(6.5)	(6.7)	(6.6)		(6.8)	(70.2)

Source: Thai Textile Manufacturing Association & MOI

(b) Supply of Necessary Materials to Garment Sector

Table I-4-6 shows imports of woven fabric materials for 1983 ~ 87. All types of fabric recorded significant increases in 1986 and 1987, with the largest import items being cotton, T/C fabric, and T/R fabric rather than wool fabric for autumn and winter apparel. More detailed analysis is required in order to determine whether these cotton, T/C and T/R imports are standard fabrics or special types of fabric which cannot be obtained on the domestic market.

It is also difficult to make a comparison on the basis of unit price. China is the leading exporter of cotton fabric (5509) to Thailand, followed by Hong Kong, South Korea and Pakistan. China is also the main exporter of T/C fabric (560720) and T/R fabric (560750). It is clear that imports of these inexpensive Chinese fabrics are rapidly increasing. The same also applies to knitted material. A large volume of cotton knitted fabric is imported and used for making shirts, underwear and many other kinds of garments, which are then exported (refer to Table I-4-7).

A substantial increase in the number of spinning, weaving and knitting machines is anticipated in the future. The task of filling this gap and meeting the demands of the garment manufacturing sector lies with the textile manufacturers.

Table I-4-6. Imports of Woven Fabric and Unit Price

(Unit: 100,000 yd^2, Unit price: baht/100 yd^2)

	1983	1984	1985	1986	1987
Filament Woven (5104) Fabric	878.5	862.2	709.1	893.3	984.0
Woolen & Worsted (5311) Fabric	1.3	4.5	15.0	9.6	11.1
Hemp Woven Fabric(54.5)	4.7	25.6	21.4	46.8	83.5
Cotton Woven (5509) Fabric	267.8 (2.49)	300.1 (2.67)	218.8 (3.47)	278.7 (3.05)	766.5 (2.36)
Synthetic Woven Fabric (T/C) (560720)	59.7 (1.48)	267.9 (2.24)	262.1 (2.19)	560.5 (1.55)	676.0 (1.63)
Synthetic Woven Fabric (T/R) (560750)	67.3 (1.04)	15.4 (2.59)	19.6 (1.78)	90.3 (1.02)	294.6 (1.01)

Table I-4-7. Knitted Fabric Imports and Knitted Product Exports

(Unit: 100 yd^2)

	Imports		Exports	
	1986	1987	1986	1987
Knitted fabric				
Cotton (600111)	62,694	83,760	969	7,873
Cotton mixed (600120)	84,905	103,243	7,338	7,446
Polyester (660121)	41,841	75,959	1,878	8,802
Nylon (600122)	12	19,542	557	352
Other synthetic (600129)	31,674	39,883	300	231
Wool (600141)	1,298	131	103	1
Total (6001)	119,930	205,609	12,151	25,748
Knitted shirts				
Cotton (600411)	8	5	10,221	11,159
Synthetic (600412)	4	1	11,039	18,946
Underwear				
Cotton (600421)	7	4	1,583	3,529
Synthetic (600423)	—	—	832	1,600
Other (600424)	13	4	743	2,330
Total (6004)	40	24	28,846	45,965

(c) Facilitation of Information Exchange and Transactions

In general, small companies maintain ties with only 4-10 customers and wholesalers for the selling and supplying of materials. Any more than this and it becomes necessary to keep a large staff of salesmen and buyers. Some companies, because of the existence of a power relationship, deal with just one company. This represents a narrow view within a large market. In Thailand there are no producer/trading companies in the field of textile manufacture. Therefore, garment manufacturers must either deal directly with manufacturing plants or go through San Pen for supplies of fabric. When appropriate information is not available, these firms turn to the San Pen market. In many countries, companies make use of trading companies with large information networks. But even here there is a limit to the information routes, and moreover, delays and inaccuracies in transmitting information are more difficult to avoid than when direct negotiations are held.

In order to find a way out of the present difficulties, a system allowing the mutual flow of information must be established. As a first step in such efforts, the concerned government institutions might publish magazines, etc. to provide specialized information.

In the future, the development and operation of a more effective system using computers should be considered. In Japan, for example, cases of regional public institutions and testing centers establishing information transmission systems using computers can often be seen.

4-4-2. The Problem of Price Fluctuations

A certain amount of fluctuation in material prices is inevitable due to market conditions, etc., but the dramatic increase in the price of yarn seen in 1986 and 1987 is abnormal. Concerning such abnormal price behavior, it is necessary for government policy makers to watch prices in the Thai textile market and ensure that they remain within reasonable limits. Also needed is discussion concerning a system which would be capable of preventing such dramatic fluctuations.

5. Corporate Operations

5-1. Process of Development of Companies

Large sized textile companies began to be established in Thailand in the 1960s. At that time, the government, as part of its program of industrialization to replace imports, raised the import duties on textile products and offer incentives for foreign investment in an effort to protect and promote domestic textile companies. Triggered by this, Japanese manmade fiber manufacturers and cotton yarn and cotton fabric manufacturers, which had been exporting to Thailand, established joint ventures with Japanese exporters and Thai importers and vendors and embarked on local production.

The first oil crisis of 1973, however, threw the world into a recession, as a result of which the Thai textile companies were confronted with a shrinking international trade in textile products. Further, the border trade, which had accounted for 30 percent of textile demand at the time, came to a sudden stop due to the end of the Vietnam war. The Thai textile companies were therefore forced to operate in a surplus supply situation. Some textile companies even closed down operations. For example, the largest Thai spinning company at the time, Thai Durable Textile, was driven to terminate operations during this period. Faced with this situation, many Japanese affiliated companies began to pull out of operations in Thailand. This appeared in the form of withdrawal from managerial dominance along with transfer of equity ownership to local businessmen or retreat from Thailand.

With the pullout of Japanese affiliated enterprises, large local corporate groups, such as the Sukree group and Saha Union group, began to expand their shares of the textile industry. At the present time, these groups wield great influence in the Thai textile industry.

During the recession brought about by the oil crisis, the Thai government, in consideration of the restoration of the balance of supply and demand in the textile market, banned in principle any further expansion of facilities in the manmade fiber, spinning, and weaving sectors. Subsequent to that, the balance in supply and demand began to be restored due to the absorption of the effects of the oil crisis and the resultant recovery of world business, the reopening of border trade, and expansion of domestic demand due to the growth of the domestic garment industry, and other changes in the business environment. In particular, starting in 1986, a state of undersupply of yarn and woven fabrics has been seen due to strong demand. One Japanese affiliated textile company visited indicated that business has been so good these past few years that it was able to wipe out its previous cumulative losses.

In view of this situation, in 1987, the Thai government authorized the new installation and expansion of facilities in view of the economic advantages with the current state of the textile industry, in accordance with its export promotion policy, and to contribute to its policy of dispersion of industry to the local regions. As a result, the total increase in production capacity, as applied for by the companies, as shown in Table I-2-8, was equal to 77 percent of the existing spinning machines owned as of 1987 and 11 percent of the looms. If all this new equipment is actually installed, the Thai textile companies will have a production capacity greater than that of Indonesia and close to those of South Korea and Taiwan.

Table I-5-1. Development of Thai Textile Industry by Period

Period	Summary	Main companies
Formation (1950-55)	• Primarily Thai capital • Mostly weaving and knitting	Bangkok Weaving Mills (1950) Thai Knitting Factory (1951) The Thai Weaving and Knitting Factory (1951) Thai Textiles (1954)
First expansion (1956-61)	• Primarily Thai capital • Mostly spinning and weaving of cotton	Thai Blanket Industry (1960) The Thai Durable Textile (1960) Luckytex (Thailand) (1961)*1
Second expansion (1962-66)	• Rapid establishment of companies due to 1962 Investment Promotion Act • Aggressive introduction of foreign capital, primarily Japanese-Thai joint ventures • Start of spinning and weaving of manmade fibers	Thai Yazaki- Mahaguna Textile (1963) Tokai Dyeing (1963)*1 Toray Nylon Thai (1963)*1 Thai Toray Textile Mills (1963)*1 Thai Teijin Textile (1965)*1 Nam Chai Industry (1965)
Third expansion (1967-73)	• Start of second increase due to Investment Promotion Act • Start of production of nylon and polyester fibers • Start of production of manmade filament fabrics	Teijin Polyester (Thailand) (1968)*1 Thai Filament Textiles (1969)*1 Siam Synthetic Textile Industry (1969)*1 Asia Fiber (1970) Erawan Textile (1971)*1
Recession (1974-77)	• Worldwide recession due to oil crisis (1973) and end of border trade due to end of Vietnam war, resulting in production surplus	Bankruptcy of Thai Durable Textile (largest integrated spinning and dyeing company in Thailand)

Source: "Textile Industries of Developing Countries", Institute of Developing Economies
Note: *1 mark indicates joint venture between Japan and Thailand.

Up until the early 1970s, textile companies in Thailand could be classified accurately into two types: One was that of a local enterprise engaged in spinning and weaving of mostly cotton products. The other was that of a member of a corporate group of a Japanese affiliation which formed, with other group members, a continuous flow of production from fiber production to spinning and weaving aimed at import substitution of standard products. With the withdrawal of Japanese affiliates from managerial predominance in the late 1970s and their physical retreat from Thailand, the ties between group companies maintained under the previous capital affiliation weakened and these firms began to act independently.

A look at the textile companies recently set up by Japanese, South Korean, and Taiwan firms shows most aiming at taking advantage of the high values of their own currencies and further most aiming at the low cost labor in Thailand. Therefore, there is a possibility of cost competition with the local manufacturers, Japanese-affiliated manufacturers, and third country manufacturers. Some of the textile manufacturers are seen as striving to set their products apart from others and thus avoid competition.

Reflecting this, today's Thai textile companies may be considered to fall under the following two general types from the nature of the products manufactured: One type is that of companies principally operating on the basis of mass production of standard products. The other is that of companies operating aiming at the production of higher grades of products such as specialized goods and discriminative goods.

5-2. State of Corporate Operations

5-2-1. Direction of Development of Products and Customers

(1) Manmade fibers

There are currently six companies operating in the field of production of manmade fibers in Thailand, as shown in Table I-2-10. If companies planning to start operations in the future are included, the figure rises to 10. The emphasis in Thai production of manmade fibers is on polyester staple fiber. The importance of this is expected to further rise with the implementation of plans for expansion of production capacities. Behind the expansion in the production capacity in this field are the current shortage of supply capacity, the increase of facilities in the midstream sector, and the expectations of a rise in demand in the border trade. therefore, it is expected that the future trend in business will be primarily a quantitative expansion in production of standard products.

The largest company in this field, Teijin Polyester, intends to develop future products through diversification of polyester products, as well as expansion of its previous Thai production of standard products, and aims at taking over the market of currently imported goods. For example, it is considering as items for diversification [1] raw material for sewing machine yarn use, [2] fiber filaments for stuffing, and [3] staple fibers for fine counts used for shirts etc.

Polyester staple fiber is currently being produced and supplied to domestic spinners by two companies: Teijin Polyester and Thai Melon Polyester. The following differences may be seen between the customers of these two vendors:

Table I-5-2. Summary of Customers for Polyester Staple Fiber

	Japanese affiliated manufacturers	Local Sukree group	Other local firms
Teijin Polyester	o	-	o
Thai Melon Polyester	-	o	o

According to one spinner, there is almost no difference in price between the polyester staple fibers of the two companies. The prices set by the two firms, however, tend to be higher than the prices at which such fiber can be procured domestically in competing countries. This is due to the 30% duty imposed on imports of the same

products. The price of procurement of imported fiber plus the duty serves as one of the guidelines in the setting of the prices of the domestic fiber.

Toray Nylon Thai also operates in the field of production of manmade fibers, but primarily engages in the production of filament yarn. It considers the domestic market as its customer. The increase in production enabled by the current expansion of its facilities, shown in Table I-2-10, is also intended for supplying the domestic market. The company is, however, considering international operations in the future and consideration is being given to exports from Thailand as well. The conceivable sales strategies in this case would be [1] taking over exports of products currently being supplied from Toray Japan to the U.S. and Europe or [2] taking over of supply of products currently being delivered from Toray Japan to Japanese users.

(2) Spinning and weaving

In the field of spinning and weaving, there are differences seen in the operating policies of local manufacturers and Japanese affiliated manufacturers in terms of product development. Both have as their basic policies the achievement of higher quality products. However, the Japanese affiliated manufacturers are seen as being faster than the local manufacturers in their move to increase the sales portions of discriminative products and higher class products. The reasons for this may be considered to be as follows:

[1] The Japanese affiliated manufacturers have faster access to information on new products. They receive information on the market and production technology from their parent Japanese firms, so can obtain information faster than local firms.

[2] The local manufacturers are more competitive than Japanese affiliated manufacturers in terms of labor costs and the rest of production costs. Therefore, Japanese affiliated manufacturers have found it essential to set their products apart and to make higher class products to maintain their competitiveness.

[3] Japanese affiliated manufacturers cannot compete with local companies in terms of quantitative production capacity. Therefore, they do not find competition with local manufacturers easy in mass production of standard products.

One Japanese affiliated manufacturer, in its plans for product development aimed at stabilization of future operations, has taken note of the fact that the main consumption regions of its products (including that exported as garments) are the advanced nations and the demands on quality in those nations have been rising. As opposed to this, the local manufacturers, as seen from the nature of their expansion of facilities etc., seem to intend to continue concentrating on standard products, for which there is a good market, for the time being.

5-2-2. Employment

Labor costs for Japanese affiliated companies in the textile industry are in general believed higher than those of local companies. The reasons for this, according to the Japanese affiliates, are as follows:

[1] Many of the local firms have introduced the concept of piece-work wages, but the Japanese affiliated firms mostly use fixed salaries and the retirement system.

[2] The Japanese affiliated firms have good work retention rates, so their workers have been with them for relatively more years. In one Japanese affiliate, the rate of loss of female workers is about 4 to 5% a year, better than in Japan.

[3] Further, most main Japanese affiliated manufacturers began operations in the 1960s and early 1970s and thus their workers have a longer average number of years of employment behind them.

In the main Japanese affiliated textile companies which have adopted the fixed salary and retirement system, the workers have either not yet reached the age of retirement or else are only now reaching it. Further, due in part to the good retention rate of workers, the average age of the workers has been rising, so the labor costs have been growing each year. As a result, the Japanese affiliated firms consider the local enterprises to be superior in terms of labor costs.

To make up for the lost competitiveness in labor costs, the Japanese affiliates are moving to rationalize equipment so as to keep down the percentage of labor costs in production costs. For example, one manufacturer has taken the policy of not replacing female workers who quit, but covering for their loss through improvement in productivity through renovation of its facilities. Further, in a few years, the first retirees will begin appearing and along with that it is considering introducing new machinery. In another manufacturer, the amount of labor required for the production of a unit product has been reduced each time machines have been replaced in recent years, and there is a slight surplus in workers.

Japanese affiliated manufacturers reportedly began renovation of facilities in the weaving sector by the "scrap-and-build" technique around 1987. A Japanese industry journal reported the developments shown in Table I-5-3.

Table I-5-3. State of Renovation of Facilities by Japanese Affiliated Manufacturers in Weaving Sector

Name of company	State of renovation of facilities
Thai Kurabo	Introduced 32 AJ looms in 1987. Introduced 32 AJ looms in 1988 as well.
Erawan Textile	Introduced 70 AJ looms in 1988. Scheduled to introduce 100 further AJ looms in 1989.
The Thai Textile	Introduced 20 AJ looms in 1988.
Luckytex	Scrapped 580 old looms and introduced 180 AJ looms in 1988. Plans to introduce 96 WJ looms in 1989. In denim sector, plans to move 24 looms from Penang factory and convert to AJ looms at that factory.
Thai Filament Textiles	Raised rate of automation 50% by conversion to rapier looms in 1988. Rate of conversion to rapier looms is expected to reach 90% in 1989. (Will scrap 135 units and introduce 128 rapier looms)
Siam Synthetic Textile Industry	Considering introduction of 100 WJ looms, including twisting and other secondary facilities, in two-year plan

Note: Prepared from Japanese industrial journal (dated January 1989)

The employment system of the Japanese affiliate manufacturers has brought about a rise in labor costs and is the cause behind the loss of competitiveness, but on the other hand it has led to an improvement of the technical level of the workers and is leading to improved quality of the products. In one manufacturer, reflecting the good retention rate of workers, highly skilled female workers with close to 10 years' continuous work experience form the mainstay on the production floor and are reportedly contributing to the improvement of the level of technical expertise. In another Japanese affiliated manufacturer, workers in their 40s and 50s have learned techniques of quality and management through their long work experience. Further, about 30 middle level managers in that manufacturer have learned almost enough to get along in the Japanese language, enabling relatively smooth communication with the Japanese management and

staff. This training of the personnel should become advantageous in improving productivity and promoting the diversification and higher quality of products in the future.

With the market being so good, most textile manufacturers are pushing forward with plans to increase or establish new facilities and improve quality. Along with this, there has been an increase in the amount of work for production control, such as control of the production lines, control of prime costs, and control of quality. At the present time, however, there is a shortage of supply of engineers knowledgeable about textile production and companies often find their engineers lured away to other textile manufacturers by higher salaries. This absolute shortage of the engineers necessary for the Thai textile industry is believed to be prompting this scouting of engineers.

5-2-3. Profit Margins of Spinners

The Thai textile manufacturers suffered from deteriorating profit margins for a long time since the recession caused by the first oil crisis of 1973, but the market has been good in these past two to three years and this has contributed much to the improvement of performance of textile manufacturers.

Table I-5-4 gives a rough grasp of the profit margins of spinners in these past few years based on their sales profit. The price conditions, the place where the raw cotton is purchased, the cost of the raw cotton, which differs depending on the mixture, the factory costs, which differ depending on the labor composition and productivity, and other various cost factors differ with each manufacturer, however, so the calculation here is only as an example designed for enabling one to obtain a grasp of the overall situation.

Table I-5-4. Estimation of Profit Margins in Cotton Production in Thailand

	Cotton yarn 20'S per lb (bahts)	Cotton yarn 40'S per lb (bahts)	Remarks
Sales	35	46.5	Jan-Mar. 89, commercial price
Prime cost of manufacture			
Raw cotton	19	22	
Factory costs	7	11	
Sales and management costs	3.5	4	Business tax etc.
Sales profit	5.5	9.5	
Sales profit ratio	(13.2%)	(20.4%)	

Source: Prepared from Japanese industrial journal (dated January 1989)

In the current survey, a Japanese affiliated spinning company gave a rough breakdown of costs of 60% for raw materials and 40% for other costs (broken down into labor costs, power, and other costs with a ratio of 30:30:40). This corresponds fairly much with the balance of expenses in the above estimation in Table I-5-4. .

5-2-4. Dyeing and Finishing

Dyeing and finishing work in Thailand are handled by dyeing and finishing divisions of spinning and weaving companies or other companies which handle the work for a fee. Companies which operate on the basis of fees for processing work tend by nature to depend much on their customers when it comes to the amount of work handled and the nature of the processing. The Thai spinning and weaving companies have previously poured effort into the production of TC, cotton, and other standard products. Therefore, businesses in Thailand performing dyeing and finishing work mostly set up with an emphasis on standard products. This situation may be said to continue today.

At the present time, looking at just dyeing and finishing of TC fabric and cotton fabric, there are six businesses engaged in operations with a capacity of over 5 million yards processing per month, as shown in Table I-5-5. In total, they have a capacity of about 35 million yards. There are reportedly another 10 or so companies with processing capacities of 2 to 3 million yards.

Table I-5-5. Dyeing and Finishing Companies with Monthly Processing Capacities of Over 5 Million Yards (TC fabric and cotton fabric)

Name of company	Processing amount (yards/month)	Destination
Union Textile	7 to 8 million	Export and domestic (domestic > export)
Luckytex	6 million	Export and domestic (export > domestic)
Thai Tricot	6 million	Domestic
Tokai Dyeing	5.5 million	Export and domestic (export > domestic)
Banchuei	5 million	Domestic
Sampran Weaving	5 million	Domestic
Total	34.5 to 35.5 million	

Note: From personal interview with large dyeing and finishing business during survey of companies.

At the present time, despite the good condition of the textile market, there are some dyeing and finishing businesses which cannot secure sufficient work for their above processing capacities. In particular, it is said to be more difficult to secure work the more a business concentrates on processing of standard products. This is due to the fact that there has been an increase in the amount of exports of products in the spinning and

weaving field as yarn and gray plain fabric. In particular, there has been an increase in exports of gray woven fabrics to Europe.

On the other hand, recently, weaving companies have begun moving to increase production of higher grade and specialized fabrics. The demand for dyeing and finishing work may be expected to increase correspondingly. However, the dyeing and finishing work performed in Thailand has been oriented since the past toward processing of standard products, so there is a worry as to if the existing processing system will be able to efficiently handle the dyeing and finishing needs of the future.

Still, in the dyeing and finishing field, the companies are operating with surplus processing capacities, so are not seen as very positive when it comes to new capital investment. Further, one large processor stated, the ratio of fluctuating costs to sales in the dyeing and finishing industry of Thailand is higher than in Japan or the U.S. and therefore there is little room for recovery of costs upon the purchase of new machinery. Even if a firm intended to introduce the most economical fluctuating cost elements, the ratio of the same would be about 68%. This is high compared with the about 50% for Japan and the about 30 percent for the U.S. according to the company's experience.

In view of this situation, the dyeing and finishing businesses in Thailand are watching what happens with the plans of the spinning and weaving companies for expansion of facilities and intend to take a careful approach to their operations through a close watch on the nature of dyeing and finishing work and demand for the same in the future.

5-3. Problems and Countermeasures

5-3-1. Apprehensions of Small and Medium Size Weaving Manufacturers Over Competitiveness

The local small and medium sized manufacturers in the woven fabric field are expanding their production capacities through the use of used shuttle looms. These manufacturers are concerning themselves with the recovery of their capital investment while the market is good and so at the present time are increasing their capacities by used looms.Of course, there are also aspects which make introduction of the latest performance looms difficult, such as the high tariffs on imported machinery and problems in machine maintenance. These manufacturers, however, are seemingly strongly leaning toward selection of short term business in standard products, which represents a large market, rather than long term business aimed at discriminating products and high grade products.

The market for standard products will continue to stay at a certain size,though there will be both good times and bad times. Among the many manufacturers, it will be the large corporations which have set up mass production systems that will be able to take the lead in the standard products market, which features very fierce international competition. In the field of mass production goods, the large corporations have an easier time in securing competitiveness compared with the small and medium sized companies due to the reduction of procurement costs by securing of materials and massive purchases, contacts with large demanders, the ability to handle large orders, and the reduction of costs through mass production. Further, if the export market ever becomes depressed, the large corporations will divert their masses of products to the domestic market. As a result, the small and medium sized companies producing the same types of products may be shut out of the domestic market.

Under this situation, the survival of the small and medium sized weaving companies will require the participation in the production of standard products under the control of the large corporations or the raising of the percentage of relatively competition-free discriminating products. The promotion of the environment for this will be necessary for the promotion of small and medium sized manufacturers.

5-3-2. Shortage of Staff and Engineers

If production capacities are expanded through the implementation of the expansion plans of the textile manufacturers, there will naturally be a corresponding increase in the amount of work for production control, quality control, order control, etc. The presently

approved increase in spinning machines corresponds to about 50% of the number of machines owned as of 1987 (Table I-2-8) and will require a considerable number of staff and engineers. Further, should expansion of the Thai domestic capacity for weaving, dyeing, and finishing become necessary to meet this increase in spinning capacity, even more engineers will become necessary.

There is already an imbalance in the supply and demand of engineers, with there being considerable scouting of skilled engineers among companies using high salaries. With continued industrialization and corporate investment from abroad, it will be only natural to see frequent shifting of staff and engineers from company to company. Should such shifting become too fierce, however, it will hinder stable corporate operations.

Fundamentally, it is important to speed up the training of staff and engineers so as to eliminate this absolute shortage in personnel. Such effort is underway now. However, it is difficult to train personnel in a short time and the state of shortage of personnel will continue for a long time at the same time as the scale of production grows.

Therefore as a means for making up for the absolute shortage of staff and engineers, consideration should be given to promotion of computer processing for some portions of the work of staff and engineers so as to raise the productivity of that work. The scheduling of input of production resources such as labor, materials, and equipment, the scheduling of product mixes, the control of inventory and semifinished goods, order entry, shipment procedures, and other forms of management of orders, etc. are considered fields of work amenable to computerization.

Further, the computer processing of work would require as a prerequisite the establishment of standard formats of processing of work, which would serve as an effective means for continued, stable management of factories despite the high turnover of personnel in companies in the future employment environment.

6. Industrial Water Supplies and Industrial Effluent in the Textile Industry

6-1. Industrial Water Supplies

The textile manufacturing industry, which includes spinning, weaving, and knitting, makes use of a large amount of water in the various production processes - a large amount even compared with other manufacturing industries. In particular, the rate of use is very high in dyeing processes, including bleaching and resin treatment.

In the textile manufacturing industry, the insect prevention, fluorescent whitening, flame retardant, softening, and sanitation treatment and dyeing process are performed with combinations of chemicals, pastes, dyes, colors, and other chemical substances and industrial water supplies, so the quality of the industrial water used (constitution and temperature) has a direct effect on the quality of the textile product.

In addition, the use of good quality industrial water in the rinsing which is often performed before and after these processes is necessary to ensure good product quality .

Furthermore, the quality of the industrial water used by individual companies has had a great relevance to their maintenance operations and production efficiencies in terms of the prevention of corrosion of the water treatment facilities, dyeing treatment facility piping, and treatment containers in factories, adhesion of scale (both of which can be the cause of malfunctions and accidents), and reduction of equipment efficiency. In particular, the quality of the raw water is a major problem when it comes to the supply of water to the boilers.

6-1-1. Amount of Industrial Water Used

According to a report by the Metropolitan Water Works Authority (MWWA), the demand for industrial water per textile company in the Samut Prakan industrial belt outside of Bangkok ranges anywhere from 350 to 3,000 m^3/day. Specialized dyeing companies consume about 15 m^3/day of industrial water.

In the current field survey too, it was estimated that there were five or six specialized companies in Bangkok or its environs which had dyeing capacities of 5 million yards/month or more and that each consumed at least 5,000 m^3/day of industrial water.

The following companies were active in Bangkok and its environs:

Textile manufacturers	737 companies
Textile product, garment, and garment material manufacturers	1,664 companies
Paint manufacturers	107 companies

(Companies registered at the Department of Industrial Works (DIW) as of April 1986)

Further, according to a joint survey and report by the Japan External Trade Organization (JETRO) and the Engineering Consulting Firms Association (ECFA) dated March 1988, the ratio of specialized and in-house factories for dyeing and printing having seven or more employees is as shown in Table I-6-1.

Table I-6-1. Distribution of Quantities and Sizes of Dyeing/Printing Factories

Factory operations		Quantity	Size			Remarks
			Small	Medium	Large	
1.	Printing	89	71	16	-	Not available = 2
2.	Dyeing	93	68	16	3	Not available = 6
3.	Printing and Dyeing	28	11	10	6	Not available = 1
4.	Printing and Knitting	2	-	1	-	Not available = 1
5.	Dyeing and Knitting	6	-	2	4	
6.	Weaving and Printing	3	3	-	-	
7.	Weaving and Dyeing	124	66	28	12	Not available = 18
8.	Spinning and Dyeing	3	-	1	2	
9.	Spinning, Weaving	6	-	-	3	Not available = 3
10.	Weaving, Printing and Dyeing	6	4	1	1	
11.	Spinning, Weaving, Knitting and Dyeing	1	-	-	1	
12.	Knitting, Weaving, and Dyeing	1	-	-	1	
	Total	362	223	75	33	31

NB: Employees 49 and below = Small factories
50 - 199 = Medium-size factories
200 and above = Large factories

Ref. Saeng Samoonrueng Dr.

Note that according to this report, Thailand consumes an annual 1500 to 2000 tons of dye, of which 200 to 300 tons is domestically produced.

In Thailand, there are many unregistered companies. There are no statistics on the amount of consumption of industrial water by individual companies and, further, there are reports of a considerable number of companies pumping up ground water without permission. For these reasons, it is difficult to obtain an accurate grasp of the overall consumption of industrial water by the textile industry as a whole, but we have made the following rough estimates of the amount of water consumed:

• Dyeing and printing processes consume 400,000 m^3/day of industrial water, of which almost all is consumed in Bangkok and nearby provinces.

• Companies classified as textile manufacturers in Bangkok and nearby provinces consume as much as 700,000 to 1,000,000 m^3/day of industrial water.

6-1-2. Water Sources

The industrial water supplies in the metropolitan area and its nearby provinces, where manufacturing industries are concentrated, are drawn primarily from rivers and ground reserves.

(1) River Water

The central part of Thailand, where the majority of the factories are located, is supplied with water primarily from the Chao Phraya river and the Meaklong river. This region is located in the southern part of a vast alluvial plain and is comprised of flat flood plains or lowlands, and there has been notable ground subsidence around the coastal areas in recent years. Due to these factors, there has been considerable mixture of seawater with river water recently.

According to the "Thailand National Resources Profile, 1987" issued by the Thailand Development Research Institute, the salt content of the Chao Phraya river has been detected as 10 mg per liter at the river mouth at low water level during dry seasons, with intermixture of seawater as far upstream as 40 km from the river mouth.

At the present time, the MWWA is taking about 2.1 million m^3/day of surface water about 100 km upstream of the river mouth and supplying it, after treatment, to Bangkok and surrounding regions. The raw water, however, is very dirty and considerable treatment is required. In addition, according to various surveys and Thai newspaper reports, about 40% of the water is lost on the way to the end users.

There are plans to draw industrial water for supply to the eastern seaboard industrial belt around Laem Chabang and Map Ta Phut, where industrial development is

proceeding at a rapid pace, from the two large reservoirs of Dok Krai and Nonburlai and from Nong Kho Dam. It is expected that better quality raw water will be secured than is possible in the central region around the metropolitan area.

(2) Ground Water

According to the Thai "Ramnarong Report" (Japan Industrial Water Association Journal, April 1988), the amount of water pumped up by the MWWA and companies or individuals under the 1977 Ground Water Act in the Bangkok metropolitan area and nearby provinces has been reduced yearly due to recent government restrictions. After peaking in 1982 at about 1.4 million m^3/day, it now stands at about 1.3 million m^3/day. When water pumped up illegally is added, however, the amount is reported to reach an estimated 2.05 million m^3/day.

A breakdown of the water being pumped up shows that the amount taken by the MWWA has fallen from the 32% of the total amount pumped in 1982 to about 20% in recent years, while the amount pumped up by the private sector is on the rise.

According to Thai documents, a suitable amount of water to be pumped up in the region around the metropolitan area would be 800,000 m^3/day. The present figure is about 1.75 to 2.6 times that amount. This excess pumping is resulting in a rapid decline in the water level, inviting the intrusion of salt water into the ground water, causing ground subsidence, and simultaneously assisting flooding.

Already, these phenomena are beginning to become real social problems, as is clear from numerous reports. This situation will not only become a problem for industries such as dyeing, where the quality of the water supplies has a direct impact on the product quality, but will also become a factor causing tangible and intangible damage to general commercial and industrial activities.

The ministries and agencies of the Thai government have been moving forward aggressively in recent years in the face of this situation with special measures and plans for individual regions, such as stopping the issuance of new permits for ground water wells, stopping the renewal of well permits, expanding surface water treatment facilities, and developing new reservoirs.

Therefore, it is judged that use of ground water for industrial water supplies will come under harsh restrictions in the very near future.

6-1-3. Water Quality

The majority of the territory of Thailand consists of a limestone rock foundation covered with a layer of laterite containing large amounts of iron, a kind of red sandstone. The central region of Thailand is comprised of a vast alluvial plain rich in organic matter as a result of the alluvial action of the Chao Phraya river.

Standards for the water quality of naturally-occurring inland water are given by the Office of the National Environment Board (ONEB) in environmental standards of quality of surface water, established in 1985 (Table I-6-2), and the Ministry of Industry in standards of water quality for potable ground water announced in 1978 (Table I-6-3). Further, standards for bottled drinking water were established by the Ministry of Public Health in standards announced in 1981 (Table I-6-4).

The NWWA treats river water or ground water according to these standards by filtration, sterilization, and other chemical processes, then supplies it to users through water pipes. This treated water can be used as is for various processes in the fields of textiles and dyeing, but to achieve a certain level of higher product quality and to minimize the variation in quality, further removal of dissolved metal salts and metal ions is required.

Ground water, due to the geological characteristics of Thailand, is hard water containing large amounts of iron and calcium and has a high pH. It cannot be used as is for production processes if one considers the product quality and maintenance of facilities. Further, there is intermixture of salt into the ground water around the coastal regions.

The temperature of the ground water is 30°C to 32°C, which is relatively high for textile processing and dyeing processes.

Table I-6-2. Environmental Standards for Surface Water Quality

Item	Unit	Type				
		1	2	3	4	5
Water temperature	℃	n	n'	n'	n'	
pH	-	n	5 - 9	<---	<---	
DO	mg/l	n	6	4	2	
BOD 5 (20 °c)	mg/l	n	1.5	2.0	4.0	
Total E. coli	MPN/100ml	-	5,000	20,000	-	
Fecal E. coli	MPN/100ml	-	1,000	4,000	-	
NO3-N	mg/l	n	5.0	<---	<---	
NH3-N	mg/l	n	0.5	<---	<---	
Phenols	mg/l	n	0.005	<---	<---	
Cu	mg/l	n	0.1	<---	<---	
Ni	mg/l	n	0.1	<---	<---	
Mn	mg/l	n	1.0	<---	<---	
Zn	mg/l	n	1.0	<---	<---	
Cd	mg/l	n	0.005*	0.05**	<---	
Cr (6)	mg/l	n	0.05	<---	<---	
Pb	mg/l	n	0.05	<---	<---	
T-Hg	mg/l	n	0.002	<---	<---	
As	mg/l	n	0.01	<---	<---	
Cyanides	mg/l	n	0.005	<---	<---	
Radiation (alpha rays)	Becquerel/l	n	0.1	<---	<---	
Radiation (beta rays)	Becquerel/l	n	1.0	<---	<---	
Total agricultural chemicals	mg/l	n	0.05	<---	<---	
DDT	µg/l	n	1.0	<---	<---	
alpha BHC	µg/l	n	0.02	<---	<---	
Dieldrin	µg/l	n	0.1	<---	<---	
Aldrin	µg/l	n	0.1	<---	<---	
Heptachloro	µg/l	n	0.1	<---	<---	
Endrin	µg/l	n	ND	<---	<---	

Note: 1. n: Natural state

2. n': Not more than 3 degrees change from natural state

3. *: Hardness less than 100 mg/l (Ca CO_3)

4. **: Hardness 100 mg/l (Ca CO_3) or more

Table I-6-3. Standards for Potable Ground Water

Item	Unit	Standard	
		Suitable tolerance	Maximum tolerance
Chromaticity	Pt-Co	5	50
Turbidity	JTU	5	20
pH	-	7.0 - 8.5	6.5 - 9.2
Iron	mg/l	0.5	1.0
Manganese	"	0.3	0.5
Copper	"	1.0	1.5
Zinc	"	5.0	15.0
Sulfuric acid ions	"	200	250
Chlorine ions	"	200	600
Fluorine ions	"	1.0	1.5
Nitric acid ions	"	45	45
Total hardness	"	300	500
Noncarbonic hardness	"	200	250
Evaporated residue	"	750	1,500
Arsenic	"	none	0.05
Cyanides	"	none	0.2
Lead	"	none	0.05
Mercury	"	none	0.001
Cadmium	"	none	0.01
Selenium	"	none	0.01
General bacteria	colonies/ml	500	-
E. coli	MPN/100 ml	2.2	-
Pathogenic E. coli	"	none	-

Table 1-6-4. Standards for Potable Water

Item	Unit	Standard
Chromaticity	Pt-Co	20
Odor	-	none
Turbidity	Silica turbidity	5.0
pH	-	6.5 - 8.5
Evaporated residue	mg/l	500
Total hardness	"	100
Arsenic	"	0.05
Barium	"	1.0
Cadmium	"	0.01
Chlorine ions	"	250
Chromium	"	0.05
Copper	"	1.0
Iron	"	0.5
Lead	"	0.1
Manganese	"	0.05
Mercury	"	0.002
Nitric acid nitrogen	"	4.0
Phenols	"	0.001
Selenium	"	0.01
Silver	"	0.05
Sulfuric acid ions	"	250
Zinc	"	5.0
Fluorine	"	1.5
E. coli	MPN/100 ml	2.2
Pathogenic E. coli	"	none
Pathogenic bacteria	"	none

6-1-4. Price

At the present time, the MWWA is supplying industrial water (business water) at prices ranging from 8 to 8.5 baht/m^3, including basic charges, though prices differ depending on the amount used.

The Samut Prakan industrial estate recently signed a contract with Bangkok Water Resources for the supply of 5,475 m^3/day of water, and the Bangboo industrial estate has constructed a 100-rai reservoir and has plans for the supply of 3,000 m^3/day of water. The price in both cases has been left at 4.75 baht/m^3 for the first eight years.

As opposed to this, the cost of pumping up ground water is estimated to be 2 to 2.5 baht/m^3. This cost includes a water fee of 1 baht/m^3 for pumping in an area supplied by the MWWA and 0.75 baht/m^3 for pumping up in an area where supply is scheduled.

In the textile industry, dyeing and scouring require large amounts of water. Looking at an example of cotton fabric processing plants in Japan, a vertical dyeing and scouring plant uses 0.06 m^3/m^2, a specialized scouring and bleaching plant 0.036 m^3/m^2, and a specialized dyeing plant 0.027 m^3/m^2. 90% - 95% of this water is discharged from the plants as effluent, so the impact on the price of water for dyeing-related firms is great.

6-1-5. Water Treatment Facilities

Needless to say, the water used in the various processes of spinning, weaving, knitting, bleaching, dyeing, and resin treatment should, with the exception of some special treatment processes, be soft, neutral, and as pure as possible.

Dyes do not dissolve easily when Ca is present, so the use of hard water in the dyeing process is not desirable. When Ca is present, part of the dye will precipitate or cause discoloration and spotting. Furthermore, Ca not only increases the amount of detergent required in the rinsing and bleaching processes but also forms insoluble substances which can cause changes in the color and damage the natural luster.

Fe contained in the water causes brownish stains and changes the color depth in the bleaching and rinsing processes. It also makes dyeing white impossible. Hydrogen sulfide, even in small amounts, reacts with metallic catalysts to notably reduce the coloring power. Similarly, sodium salts reduce the coloring power and cause spotting or loss of color.

In this way, only slight differences in the composition of the water used throughout the manufacturing processes can have various effects on product quality.

Control over the water is therefore a basic requirement in the textile manufacturing industry.

During the field survey, companies equipped with filters and water softeners were seen here and there, primarily among the large companies, but many companies still did not have any water treatment facilities other than storage tanks. One large specialized dyeing company, in fact, was using ground water as is without treatment and, despite this, was receiving numerous orders for work.

6-2. Industrial Effluent

Along with progress in industrialization, serious problems always arise which require that measures be taken to protect the environment and prevent pollution. The textile industry is one of the manufacturing industries which must pay particularly great attention to environmental protection and pollution prevention. In particular, it must take full measures to prevent the contamination of water.

6-2-1. Measures to Prevent Water Contamination

Thailand has the following acts considered relevant to measures for prevention of water contamination on the land:

* Public Health Act, 1941
* Act for the Cleanliness and Tidiness of the Country, 1960
* Building Control Act, 1979
* Factory Act, 1969

Of these, the Factory Act makes it obligatory for factories to treat their effluent before releasing it so that the chemicals, organic matter, heavy metals, and other components fall below prescribed levels. In the case of violations, the Factory Act provides for several types of punishment, including cancellation of factory permits.

Efforts to prevent water contamination are administered by the Department of Industrial Works (DIW) of the Ministry of Industry (MOI) for biological wastewater and factory effluent. This includes monitoring of the water quality standards, supervision, and guidance. In the case of violations, it decides on administrative action, such as the cancellation of factory permits.

At the present time, there are about 90,000 factories nationwide which fall under the jurisdiction of the DIW and over 20,000 in Bangkok alone. These factories are classified into 99 groups according to type. Of these, the food, agriculture produce processing, and textile industries are considered to be characterized by frequent contamination of water.

Aside from this, the Office of the National Environment Board (ONEB) of the Ministry of Science, Technology, and Energy (MSTE) formulates policies for overall environmental protection for Thailand and checks to ensure that the standards set by relevant ministries and agencies are working well.

6-2-2. Regulations on Effluent

The DIW is in charge of measures regarding industrial effluent under the Factory Act. The standards for industrial effluent set by the Ministry of Industry in 1970 are shown in Table I-6-5 and are applied to all factories as defined under the Factory Act. Further, the ministry announced the start of a system of managers for pollution prevention in 1982, primarily for large factories, wherein factories meeting certain conditions set by the law were obliged to designate pollution prevention managers and persons for handling treatment facilities. At the present time, there are about 400 factories in Thailand with such pollution prevention managers.

The DIW has inspectors which make spot checks on specific factories to examine the factory effluent, but there are only about 70 such inspectors in all and only 10 analysis technicians, which cannot be said to be sufficient considering the number of factories in the country. In the current field survey too, there were several factories which indicated that they had never undergone any official examination.

The DIW, in the ministry announcement of 1985, made it obligatory for factories to appoint pollution prevention managers to analyze for toxic substances and prepare reports every three months. This analysis is supposed to be conducted by a public testing organization or a private analysis organization approved by the DIW, thereby eliminating the need for on-site factory checks by DIW inspectors.

6-2-3. Effluent from Textile Processing (Spinning, Weaving, and Knitting) and the Dyeing Process

The Thai textile manufacturing industry primarily uses as domestic materials 100% cotton, mix spun polyester and cotton, and mix spun polyester and rayon.

The effluent from the processes from the spinning of these fibers to their weaving and dyeing is very diverse due to the types of the materials used, manufacturing methods, and products. The physical and chemical properties of the discharged effluent also differ tremendously along with slight differences in the treatment conditions, even with the same manufacturing process. The effluent can be roughly divided into the process effluent from the materials to production of the fabric and dyeing effluent.

Process effluent is primarily of the direct reaction chemical effluents such as organic solvents and coagulants and the effluent from the stripping, deoxidation, desulfurization, bleaching, and other neutralization and washing processes and includes

Table I-6-5. Effluent Standards in Effect, 1970

(1)	PH		Between 5.0 and 9.0
(2)	Permanganate Value (COD)		60 mg/l
(3)	Dissolved Solids:		
	Discharge into water way:		2,000 mg/l or more but not exceeding 5,000 mg/l, depending upon discharge point
	Discharge into sea or estuaries (Salinity higher than 2,000 mg/l)		5,000 mg/l higher than dissolved solids content in sea or estuary waters
(4)	Sulfide as H_2S		1.0 mg/l
(5)	Cyanide as HCN		0.2 mg/l
(6)	Heavy metals		
	Zinc	(Zn)	5.0 mg/l
	Chromium	(Cr:6)	0.5 mg/l
	Arsenic	(As)	0.25 mg/l
	Copper	(Cu)	1.0 mg/l
	Mercury	(T-Hg)	0.005 mg/l
	Cadmium	(Cd)	0.03 mg/l
	Barium	(Ba)	1.0 mg/l
	Selenium	(Se)	0.02 mg/l
	Lead	(Pb)	0.2 mg/l
	Nickel	(Ni)	0.2 mg/l
	Manganese	(Mn)	5.0 mg/l
(7)	Tar		Nil
(8)	Oil & Grease		5.0 mg/l (Except for crude oil refinery and lubricant blending plant; less than 15 mg/l)
(9)	Formaldehyde		1.0 mg/l
(10)	Phenols & Cresols		1.0 mg/l
(11)	Free Chlorine		1.0 mg/l
(12)	Insecticides and radioactive substances		Nil
(13)	Suspended solids (SS)		30 mg/l or more depending on dilution ratio as shown below

Dilution Ratio	Allowable Suspended Solids
8 - 150	30 mg/l
151 - 300	60 mg/l
301 - 500	150 mg/l

(14)	BOD, 5 days, 20°c	20 mg/l or more but not exceeding 60 mg/l depending upon discharge point
(15)	Temperature	Less than 40 °c
(16)	Color and Odor	Not objectionable when mixed in receiving water

Source: Office of Industrial Services and Water Treatment
Industrial Works Department

some effluent from the insecticide, sanitation, flame retardation, softening, and other processes. Of these, the chemical effluents are often reprocessed for recycling and there are relatively few cases of direct discharge of large amounts. For reference, an analysis of the factory effluent in Japanese rayon factories and an example of the relationship between production and effluent are given in Tables I-6-6 and I-6-7.

Treatment of the dyeing effluent, which includes effluent from the fiber scouring, bleaching, dyeing, finishing, and other processes, is more difficult than treatment of the effluent from processing up to the manufacture of the raw fabric since the processes involve many changes and the treatment methods tend to differ from factory to factory. Furthermore, the majority of processes are performed by immersion in solutions, so large amounts of water are required, and most of this is discharged as effluent. In general, this effluent seriously impairs the appearance of water, contains considerable amounts of dyes and chemicals, colors river water, has a foul odor, destroys the order in the biosystem, and has a direct effect on the human body.

As an example, the properties of effluent from scouring through finishing processes in the dyeing factory of company T, a standard spinning company in Japan, will be shown below:

(Company T)

No. of employees:	430 (two shifts)
Materials:	Cotton and man-made fiber
Chemicals used:	Dyes, sulfuric acid, hydrogen peroxide, caustic soda, chlorine
Dyed amount:	100,000 m/day
Effluent:	3,333 m^3/day
Properties of effluent	
Temperature:	25.5°C
pH:	12.0
BOD:	121.0 mg/l
COD:	125.0 mg/l
Suspended solids:	132.0 mg/l
Oils:	44.0 mg/l
Iodine consumption:	315.0 mg/l

The general properties of the effluent in the processes of scouring and dyeing are as given below:

Table I-6-6. Example of Analysis of Effluent from Rayon Factories

(Unit: mg/l)

Item \ Factory	A	B	C
Appearance	Turbid gray	Turbid gray	Turbid gray
pH	2.5	3.0	3.2
Total dissolved solids	1,380	3,800	4,400
Residue on ignition	1,280	3,700	—
Suspended solids	80	140	190
Sulfuric acid ions (as SO_4)	500	2,000	450
COD (high temperature method)	66	90	200
BOD (5 days)	110	100	180
Zinc (Zn)	13.0	76	28
Dissolved oxygen	3.0	4.0	0.5
Total sulfides (as S)	12.4	16.2	12.0
Oils and fats	10	26	5

Table 1-6-7. Relationship of Rayon Production and Various Effluents

Type of effluent \ Production	20 tons/day	100 tons/day
Alkali effluent	3,000 m^3/day	5,000 m3/day
Sulfide effluent	3,000 m^3/day	6,000 m^3/day
Acidic effluent	10,000 m^3/day	30,000 m^3/day
Coolant water and other waste water	20,000 m^3/day	50,000 m^3/day

(1) Cleaning Process

1) Desizing Process

Starch, glue, and other natural organic substances and CMC, PVA, and other synthetic organic compounds are used as sizing agents. In the case of natural substances, acid etc. is used to hydrolyze the agent and make it soluble in water. In the case of synthetic organic compounds, the agent can be rinsed and removed as is. The effluent from this process contains a large amount of organic substances and is highly contaminative but is relatively small in volume.

2) Scouring Process

This process removes the impurities in the fiber (oils and fats, waxes, pectin, nitrogen-containing compounds, etc.), surface oil, sizing agents, etc., so it produces effluent containing natural animal and vegetable oils and fats, waxes, pectin, caustic soda, soda ash, and silicates and displaying a strong or weak alkalinity. The amount of discharge is large and the degree of contamination high.

3) Bleaching Process

The effluent from this process is primarily comprised of chlorine-type oxides and includes large amounts of impurities removed from the fiber. The effluent is neutral when bleaching powder is used, acidic when sodium chlorite is used, and weakly alkaline when hydrogen peroxide is used.

4) Mercerization Process

This involves treatment in a solution of caustic soda, so the effluent becomes strongly alkaline.

(2) Dyeing Process

Use is made of large amounts of a wide range of dyes and dyeing assistants, so the effluent from this process in general is large in volume and strongly colored by residual dyes. Assistants are also contained, and sometimes they are toxic. The dyeing effluent naturally differs in composition depending on the type of dyes. For reference, examples are shown in Table I-6-8.

In the dyeing of cotton, an alkaline effluent is frequently discharged; in the dyeing of man-made fibers, an acidic one. When sulfide dyes are used or when hydrosulfite, sodium bichromate, or dispersion dye carriers are used as dyeing assistants, effluent which gives off a foul odor and can be deadly to plant, animal, and human life is discharged, so particular care is required in treatment.

Table I-6-8. Composition of Effluent by Type of Dye

Dye	Composition of effluent
Direct dye	Dye, active agent, Glauber's salt, dye fixer
Basic dye	Dye, tannin, tartar emetic, acetic acid
Naphthol dye	Dye, active agent, caustic soda, hydrochloric acid, sodium, acetate, sodium, nitrite
Sulfide dye	Dye, sodium, sulfide, Glauber's salt, soda ash
Vat dye	Dye, caustic soda, hydrosulfite, hydrogen peroxide, paste
Acid (metal alloy) dye	Dye, Glauber's salt, acetic acid
Acid catalytic dye	Dye, acetic acid, sodium, bichromate
Disperse dye	Dye, active agent, carrier, hydrosulfite

(3) Finishing Process

There are various finishing processes for insect prevention, sanitation, flame retardance, softness, fluorescent whiteness, wrinkle prevention, shrink prevention, waterproofing, etc., but in general the water discharged from these processes does not contain large amounts of contamination except when used for cleaning vessels and machinery or disposing of solvents themselves. When resins and surface active agents are mixed in the effluent, however, the BOD rises and the amount of floating substances and suspended substances increases.

Further, of the textile products destined for Japan, those which are designed for infants of under 24 months' age and those for socks, bed clothes, gloves, etc., even when not for infants, are subject to a ban on use of formalin. Therefore, just before switching to a finishing process for products for Japan, cleaning water containing formalin from processes for previous products may be discharged.

6-2-4. Effluent Treatment Facilities

There are various methods for treating effluent depending on the product and the process. Further, there are large differences in the method of treatment applied even in the same process. The basic pattern of effluent treatment in the Thai textile industry is, through the processes of manufacture and dyeing of textile products, in the case of natural fiber, screening or sedimentation pond -> aeration -> neutralization -> precipitation -> discharge. This pattern of treatment is built on the minimum necessary treatment units and

combinations thereof. There is almost no instance of the pattern generally used in countries like Japan with strict environmental restrictions, such as secondary treatment by biological filtration, coagulation and dissolved air flotation, submerged combustion method, and biochemical treatment. It is also believed that the practices of removal of toxic substances by the ion-exchange method and the recycling of effective ingredients of chemicals etc. have not spread widely. Further, it is deduced from references and the current field survey that with the exception of a few of the large companies, there are very few factories equipped with even the above-mentioned basic treatment facilities. The small and medium-sized companies often either omit portions of the basic treatment processes or else combine several of them into one.

In particular, dyeing companies are relatively small in size. With the exception of one company which had adopted aerobic digestion treatment using activated sludge to adjust pH, BOD, and SS, use was being made of simply dug artificial ponds or lagoons to store effluent and unify the components and effluent temperature, with only neutralization, coagulation, and precipitation carried out. Note that even the former factory is planning to use the natural aeration method in future expansion.

Thus the situation has remained virtually unchanged since the report of the 1979 JICA survey mission, in which it was indicated that only 4% (one) of the dyeing factories had neutralization and aeration type effluent treatment facilities and only 11% (three) had storage ponds for dye effluent.

6-3. *Problems and Countermeasures*

6-3-1. Industrial Water Supplies

To raise the quality of the fiber produced in Thailand to levels current on the international market, one of the most important of the basic conditions is to secure large quantities of good quality water. This is true not only for the textile industry, but for the entire Thai manufacturing industry, including dye manufacture, metal plating and heat treatment for molds and dies, and other sectors covered by this survey.

Here, problems concerning industrial water supplies for the textile industry will be discussed.

(1) Lack of Knowledge Regarding Quality Demanded for Industrial Water Supplies

The physical and chemical properties of the process water used in various production processes are largely affected by the inherent functions of chemicals, dyes, and assistants. When the properties required for individual processes are not present, the quality of the product is adversely affected. Even when using water for direct cleaning, the presence of unneeded components will inevitably have a detrimental influence on the fabric.

As shown by past surveys, and in the current survey, small and medium-sized companies sometimes use untreated ground water for production. Further, even while companies may possess softening units or other equipment, rare are those firms that constantly strive to analyze the water after treatment in an attempt to control water quality.

(2) Fears Over Securing Stable Industrial Water Supplies

According to 1984 statistics of the Ministry of Industry, 94.7% of the country's spinning and garment companies were concentrated in Bangkok and the central region surrounding it. In this region, considerable treatment is required for river water before it can be used for production processes due to contamination and the intermixture of salt. This is one reason why factories prefer not to use river water. On the other hand, the cost of pumping ground water is far lower than the price of industrial water supplied by the MWWA, and ground water is less contaminated than river water. As a result, the majority of factories have ended up relying on ground water. Excess pumping of ground water beyond allowable limits, however, is causing ground subsidence around the metropolitan region and, along with the lowering of the underground water level, the entry of salt into the ground water and thus salt damage to farmland. This is creating serious social problems.

Therefore, supervision of and restrictions on the pumping of ground water will inevitably become stronger in the future.

As a result, the development of new, abundant supplies of high-quality, inexpensive water commensurate with the suppression of pumping of ground water and the strides being made in industrialization will be a decisive key in expanding the volume of Thai industrial products and improving their quality.

(3) Installation and Spread of Effect Water Treatment Facilities

Due to the geological and topographical characteristics of Thailand, the water in regions where the textile industry concentrates is hard water containing large amounts of iron and organic substances. Further, it often contains strong salts. Therefore, in order to ensure a certain level of product quality, individual companies require primary or secondary treatment facilities such as water softening apparatus and desalination units, regardless of whether the water is natural or treated.

The capital investment and the operating costs required by this kind of equipment, however, would have a major impact on the manufacturing costs, so in most cases the small and medium-sized companies either do not have such facilities or else have facilities with only low treatment capacities. This has begun to limit the degree of quality demanded.

Note that as the final properties of water for the textile and dyeing industries, the following properties should be treated for at a minimum:

	Boiler water	Process water
Water temperature	15 ~ 25°C	15 ~ 25°C
Turbidity	2 mg/l <	10 mg/l <
pH	6.5 ~ 7.5	6.5 ~ 7.5
Total hardness (as CaCo3)	2 mg/l <	30 mg/l <
Total iron (as Fe)	0.1 ppm <	0.1 ppm <
Total chloride	20 ppm <	20 ppm <

6-3-2. Industrial Effluent

The speed of industrialization in recent years and the concentration of population and factories around Bangkok have been causing rapid changes in the awareness of the people about their living environment. As a result, social and legal restrictions on companies designed to protect the environment can only become stronger.

In particular, the textile industry is viewed as one of the main industries generating effluent detrimental to the environment. Already, several problems have arisen in Thailand because of it.

(1) Awareness of Discharge of Industrial Effluent

As indicated by some of the companies surveyed, there is in general low awareness of the need for dealing with discharged effluent. For example, some companies have never been inspected on site by a public organization or have been inspected but have never had action taken against them. This lack of awaress is in part a management problem; namely, effluent from the factory never contributes to production, and in order to comply with effluent standards large capital investment and operating expenses would be involved, reducing the cost competitiveness of the company's products.

(2) Knowledge of Properties and Treatment of Factory Effluent

The properties of water discharged from textile and dyeing processes differ greatly due to the very many types of chemicals, dyes, and assistants used, their composition and combination, temperature, and concentration. They also vary over time. In addition, around the dyeing process, there are severe fluctuations in the amount of effluent discharged along with time, making treatment especially difficult.

For the treatment and management of effluent, suitable sampling before and after treatment and the ability to perform accurate chemical and physical analyses are also required.

However, it was observed in the field survey that while the textile and dyeing companies understood the need for such technicians, most, with the exception of a few of the largest firms, took a negative attitude with regard to the matter. This is believed to be due to the facts that there are few technicians with advanced education in chemical treatment and that such technicians tend to shun work in the textile industry.

(3) Public Monitoring of Water Quality and Ability of Supervising Organizations

Thailand is on the road to greater contamination of its waters. The most pressing matter for Thailand in preventative measures is to give far greater guidance to the factories than in the past.

The organization for this is in substance the DIW, but when one thinks of the number of factories today and the increase in their number in the future, it is hard to say that there are sufficient DIW inspectors and analysis technicians.

For reference, analysis of factory effluent belongs to one of the more technically difficult areas of analysis, so it is important not only to boost the number of staff, but also to improve analytical techniques and obtain more and better inspection and analysis equipment.

(4) Capital Investment for Effluent Treatment Facilities and Operating, Maintenance, and Management Costs

Effluent treatment facilities require large initial capital investment and involve significant operation, maintenance, and management costs. Private companies, which stress profit margins, are therefore not especially cooperative in the acquisition of facilities having sufficient treatment capacity for meeting factory effluent standards.

The initial investment involved in setting up effluent treatment facilities in private Thai companies has not been determined, but the recent initial investment in joint dyeing effluent treatment facilities in a Japanese industrial estate, which adopted the coagulation and pressurized floating system, according to records of Company N, was 125,000 to 200,000 yen per cubic meter of effluent per day for the facilities and the construction costs, not including the land (for a treatment capacity in the 4000 m^3/day class) - a fairly high figure.

Furthermore, according to survey materials of the Kanagawa Prefectural Industrial Testing Institute, the cost of aeration and precipitation treatment by activated sludge (purchase of coagulants, disposal of sludge, power, etc.) is about 10 million yen a year for a discharge of 250 m^3/day.

Further, according to the same survey materials, expenses for treatment of effluent of a factory engaged in scouring to dyeing can be broken down as follows:

Chemical costs	23.4%
Utilities	11.0%
Disposal of industrial waste	4.8%
Repair of facilities	1.9%
Commissioned analysis of effluent	2.4%
Personnel	5.8%
Depreciation	50.7%

(Discharge: 500 m^3/day, coagulation and dissolved air flotation, centrifugal drying, air drying and incineration method)

[Reference] Case of Effluent Treatment at Factory Engaged in Printing and Rinsing

Chemical costs	29.6%
Utilities	9.3%
Disposal of industrial waste	2.1%
Repair of facilities	6.4%
Commissioned analysis of effluent	1.3%
Personnel	19.3%
Depreciation	32.9%

(Discharge: 700 m^3/day, coagulation and dissolved air flotation, vacuum filtration, kiln incineration method)

In both cases, the depreciation costs are high and the capital investment burden is large. Further, chemicals required for treatment are costly.

6-3-3. Countermeasures

(1) Dissemination of Practical Knowledge on Quality Control of Industrial Water

Practical knowledge regarding the effects of the quality of industrial water on product quality, the methods of treatment and control of industrial water to make it suitable for product manufacturing processes, methods of inspection and analysis, and methods of treatment for recycling of water must be disseminated among company managers and senior engineers through seminars or moving guidance at factories. At the same time, it is necessary to better organize public research institutes so as to arrange seminars, train supervisors, and secure the necessary staff.

(2) Promotion of Development of Inexpensive Industrial Water and Reinforcement of Supply System Through Treatment of Surface Water

It will become necessary to quickly move in the direction of widespread restrictions or bans on pumping of ground water in regions of central Thailand, where population and factories are concentrated, and in regions with underground water veins linked with those regions. Therefore, it would be desirable to see the budgeting and execution of development and expansion plans for large scale, principally river water, treatment facilities, pipelines, and reservoirs for dry seasons. Quantitatively, it is necessary to restrict pumped up water to the optimum established level of 800,000 m^3/day and in consideration of the increase in demand of both which will result from further

industrialization, establish a plan to newly supplement approximately 1 million m^3/day of water with surface water.

In promoting the utilization of river water, it will be necessary to incorporate strong measures such as major repairs in existing pipelines, reduction of the price of water for industrial use or provision of government subsidies to certain industries, and step-by-step increases in the tax on pumping of ground water in certain regions.

(3) Government Assistance to Companies for Installation of Water Treatment Facilities

It appears that it will take a long period of time and major fiscal measures before development of surface water reaches the point where it can cover the overall needs of industry. Furthermore, the industrial water in Thailand is basically hard water containing metal ions. For the time being, therefore, it would be practical if preferential tax measures could be devised for primarily industries with a high ratio of use of industrial water or industries with very high demands on the quality of the water, e.g., the extension of special low interest financing for the purchase and installation of filtration apparatuses, water softening apparatuses, desalination apparatuses, iron ion removal apparatuses, and other treatment facilities and large reductions could be made in the import taxes on imported equipment, so as to improve the quality of products while minimizing the impact on production costs. Further, it would be desirable if refunds of import duties on the chemicals and ion-exchange resins used in treatment processes could be studied.

(4) Promotion and Reinforcement of Activities for Raising Social Awareness of Responsibility for Water Contamination

In the prevention of water contamination by industrial effluents, a first step might be to raise the awareness of the businessmen themselves of the problem and obtain their cooperation in observing the legal restrictions. As a means for publicizing this, it would be desirable to hold numerous seminars covering the many instances of pollultion due to water contamination in the advanced industrialized nations, examples of countermeasures, compensation problems, and administrative action. Participants in the seminars should preferably be top management responsible for company operations. Participation itself might be made a condition for acquiring or renewing a factory permit. For the time being, such compulsory measures will be necessary.

(5) Dissemination of Technical Knowledge Regarding Treatment of Factory Effluent

Treatment of textile and dyeing effluent involves diverse things and requires advanced technical skill and know-how, so general seminars and similar activities could not well be expected to have concrete results. For this purpose, direct guidance at

factories by public organizations would be practical. This could be conducted in parallel with the on-site inspections of effluent by the Ministry of Industry.

In the long term, it will be important to establish specialized courses on industrial pollution, including water contamination, and other general pollution (for example, an environmental engineering course) at vocational schools or junior colleges so as to try to ensure sufficient human resources for the increasing number of environmental mesaures to be taken in the future.

(6) Reinforcement of Monitoring of Water Quality and of Supervision System of Ministry of Industry, Department of Industrial Works (DIW)

It is difficult to obtain the cooperation of private companies in measures against effluent because of the status of corporate production activities. Therefore, measures are more effective from the administrative standpoint when compulsory. For this reason, it will be important to expand the staff at the DIW and modernize inspection and analysis equipment so as to strengthen the monitoring and guidance system.

It will also be necessary to make compulsory for the textile and dyeing industries the submission of Environmental Impact Assessment (EIA) reports, for which submission is already compulsory for some industries under the Factory Act upon renewal of factory operating permits.

(7) Government Assistance in Taxes and Funding

The capital investment and maintenance and operating costs for effluent treatment facilities pose a large burden on companies. In particular, the impact on the dyeing industry would be great. To deal with this, there is a need to formulate the same type of policy as with the "government assistance for water treatment facilties" of the afore-mentioned section on industrial water supplies while maintaining linkage with environmental policies.

(8) Industrial Estates for Dyeing Centered Around Joint Effluent Treatment Facilities

Dyeing companies in particular are mostly small and medium-sized firms and in many cases would find it difficult in practice to equip themselves with facilities for treatment of effluent to levels meeting the standards for discharge into the rivers. Furthermore, there are some dyeing factories which cannot install effective effluent treatment facilities because they are situated in urban areas and lack sufficient area in their factory sites.

The properties of effluent from dyeing factories, as mentioned before, differ widely. Moreover, the effluent is discharged intermittently, so at the very least at the

primary treatment stage, treatment is necessary for each company according to the actual conditions of those companies. However, the standards of discharge of factories to existing or planned central effluent treatment facilities of industrial estates are as shown in Table I-6-9 or Table I-6-10. These are lax when compared with the treatment standards in the case of direct discharge into public rivers (see Table I-5-5).

Therefore, each factory need only have simple, primary effluent treatment facilities meeting these standards. As a result, capital investment can be significantly reduced. Secondary effluent treatment facilities would be necessary for receiving the primary treated effluent from the factories and treating it to a level able to be discharged into the rivers, but these secondary treatment facilities and the formation of the surrounding industrial land are desirably the province of public funds. The cost of moving the factories and the operation of the treatment facilities should be split among the user companies.

In addition to treating dyeing effluent, installation of effluent treatment facilities for cyanides, chromium, acidity and alkalinity would enable centralized, common processing in the same estate for plating and surface treatment industries, which are always a problem when it comes to stable, high-purity industrial water supplies and reliable treatment of effluent.

Table I-6-9. Standards for Regulation of Effluent from Factories in Laem Chabang Industrial Estate

BOD	500 mg/l
SS	250 mg/l
VSS	170 mg/l
TKN	40 mg/l
P	8 mg/l

Table I-6-10. Standards for Regulation of Effluent from Factories in Ladkrabang Industrial Estate

	State of effluent		Standard
1.	BOD:	Average daily value	900 ppm
		Maximum daily value	1,000 ppm
2.	Suspended solids: average value		500 ppm
3.	pH		4.0 - 11.0
4.	Temperature		45 °C >
5.	Sulfides (as H2S)		1 ppm
6.	Cyanides (as HCN)		0.2 ppm
7.	Oils and grease		0
8.	Tar		0
9.	Formaldehyde		1 ppm
10.	Phenol and cresol		1 ppm
11.	Free chlorine		1 ppm
12.	Pesticides		0
13.	Radioactive substances		0
14.	Fluorine		15 ppm
15.	Mercury and mercury compounds		0.005 ppm
16.	Dissolved iron and dissolved manganese		10 ppm
17.	Zinc, chromium, arsenic, silver, selenium, lead, nickel, and copper - concentration of total or single components		1 ppm

7. State of Industries of Competing Countries

7-1. Textile Industry of Hong Kong

7-1-1. Structure

The features of Hong Kong's textile industry (textiles and apparel) are due in large part to the government's complete "hands off" policy, making that region one of the world's leading exporters of textile products and at the same time one of the leading textile importers. This "hands off" policy means that companies can freely procure materials and that the downstream sectors which use the same are very well developed. These are the major features and makes Hong Kong different from South Korea and Taiwan, whose upstream sectors are more developed.

The textiles produced in Hong Kong are primarily cotton yarn, cotton fabrics, and mixed cotton fabrics. Hong Kong does not manufacture man-made fibers. A feature of the textiles is the large weight of dyeing and knitting businesses - primarily small and medium companies. Hong Kong primarily dyes Chinese made fabrics and then re-exports them.

About 10% of the work force in Hong Kong is engaged in the textile industry, not including the apparel industry. 1987 figures show that there were 7023 workers employed in spinning, 851 in spinning of wool, 15,508 in cotton fabrics, 30,263 in dyeing and processing, and 47,307 in knitting.

In terms of products, the cotton fabric sector specializes considerably in denim and corduroy, while the spinning sector specializes considerably in thick count open end yarns.

7-1-2. Facilities

(1) Spinning

A look at the number of spindles shows there were 900,000 spindles in 1970 and 280,000 in 1987 - a considerable decline. However, a feature of spinning in Hong Kong is the large number of OE spindles, of which there were 62,500 installed in 1987. (See Table I-7-1.)

This converts to a production capacity of about 900,000 spindles. These facilities are used for production of thick count yarn and is used locally in numerous instances.

Table I-7-1. Spinning Facilities of Various Countries

(Unit: 1000 spindles)

	Thailand	S. Korea	Hong Kong	Taiwan	China	Indonesia	Japan
1983	1,786	3,243	402	3,661	21,406	2,560	
1984	1,802	3,251	358	3,921	22,197	n.a.	9,273
1985	1,937	3,298	259	3,937	23,238	n.a.	9,087
1986	1,955	3,300	278	3,932	24,000	2,482	8,686
1987	2,068	3,505	281	4,077	25,000	2,645	8,518

Source: Prepared from statistical bureaus of respective countries.

Note: 1. Figures for South Korea are only for cotton spinners. If one addes the number of worsted spinning frames and woolen spinning frames, the figures would be as follows:

1983 4,270 (thousand spindles)
1984 4,245 (thousand spindles)
1985 4,259 (thousand spindles)
1986 4,331 (thousand spindles)
1987 4,562 (thousand spindles)

2. Figures for Hong Kong in parentheses are OE spinners. If one OE rotor is converted to 10 ring spindles, the figures would be as follows:

1983 905 (thousand spindles)
1984 849 (thousand spindles)
1985 708 (thousand spindles)
1986 825 (thousand spindles)
1987 906 (thousand spindles)

3. Figures for Taiwan, like those for South Korea, are only for cotton spinners. If woolen spinners are added, the figures would be as follows:

1983 4,071 (thousand spindles)
1984 4,348 (thousand spindles)
1985 4,364 (thousand spindles)
1986 4,369 (thousand spindles)
1987 4,484 (thousand spindles)

(2) Looms

The same rationalization of production seen with spindles can be seen in looms as well. The feature of this sector is the high proportion of shuttleless looms. In 1986, these accounted for 32.2% of the looms. (See Table I-7-2.)

Table I-7-2. State of Looms in Hong Kong

	Shuttle (A)	Shuttleless (B)	Total (C)	B/C
1983	18,100	4,000	22,100	18.1
1984	14,400	4,600	19,000	24.2
1985	13,160	4,800	17,960	26.7
1986	12,250	5,940	18,460	32.2

Source: Equipment statistics of ITMF

7-1-3. Production

Hong Kong's production of spun yarn, as mentioned earlier, is characterized by specialization in denim, corduroy, sailcloth, and other thick count cotton yarn for local consumption. In 1979, 185,000 tons were produced. This fell to just under 70% in 1981 and 1982, but recovered after 1985. In 1987, 215,000 tons were produced - exceeding the 1979 peak.

Production of mixed cotton yarn has been declining since 1980.

Production of cotton fabrics fell in 1981 and 1982 when the world economy was in recession, but has since been recovering. (See Table I-7-3.)

Table I-7-3. Trends in Spinning and Weaving Production in Hong Kong

	Spun yarn (1000 tons)				Staple fiber fabrics (million m2)		
	Cotton	Cotton/ Manmade	Manmade	Total	Cotton	Cotton/ Manmade	Total
1983	140.6	21.6	5.0	167.2	642.7	65.0	707.7
1984	136.5	16.8	3.5	156.8	659.2	58.0	717.2
1985	142.5	11.6	3.2	157.3	638.9	39.3	678.2
1986	180.1	10.5	2.8	193.4	759.2	40.6	799.8
1987	215.1	9.8	3.1	228.0	851.2	32.3	883.5

Source: Hong Kong government

7-1-4. Trends in Trade

When looking at Hong Kong 's trade, it is necessary to pay attention to local exports and indirect exports.

(Exports)

Exports of textiles and apparel accounted for a large 33.3% of all Hong Kong 's exports of manufactured goods in 1987 and of this apparel exports accounted for 80% and textile exports for about 20%. Of the latter, yarn accounted for 8% and woven fabrics for 60% (of which, over 80% was cotton fabrics). The main export destinations were China, the U.S., the U.K., and the ASEAN nations.

In recent years, the trend has been for straight, steady growth, with the exception of 1985 when there was minus growth. (See Table I-7-4.)

Table I-7-4. State of Exports of Textile Products of Hong Kong

(Unit: HK$ million)

	1983	1984	1985	1986	1987
Local exports					
Apparel	34,365	46,714	44,912	52,162	65,321
Textiles	8,083	10,952	10,145	15,772	23,027
Subtotal	42,448	57,666	55,057	67,934	88,348
Reexports					
Apparel	4,495	6,184	7,652	13,365	18,275
Textiles	7,820	12,708	15,999	15,728	19,247
Subtotal	12,317	18,892	23,651	28,643	37,552
Total	54,765	76,558	78,708	96,577	125,870
Apparel	38,860	52,898	52,564	65,527	83,596
Textiles	15,905	23,660	26,144	31,050	42,274
Textile&apparel exports	34.1	34.6	33.5	34.9	33.3
/Total exports (%)	(9.9)	(10.7)	(11.1)	(11.2)	(11.2)

Source: Hong Kong government

Note: Figures in parentheses indicate percents of textile exports.

(Imports)

Hong Kong is the world's third largest importer of textile materials. It imports the majority of its apparel materials. The main countries imported from are Japan, Taiwan, South Korea, and China.

Hong Kong imports more materials than it exports, but has an overall surplus in trade due to its apparel exports.

The main items imported are polyester and polyester/cotton fabrics. These are followed by cotton fabrics. The former are supplied from Taiwan, Japan, China, and South Korea, while the latter are supplied from China (55%), Japan (24%), Taiwan, and South Korea.

The biggest import item out of silk, linen, ramie, and wool is silk, almost all of which is imported from China.

Hong Kong imports about 1% of its polyester/cotton fabrics from Thailand. (See Table I-7-5.)

Table I-7-5. Hong Kong's Imports of Textiles

(Unit: HK$ million)

	1984	1985	1986	1987
Yarn	10,125	10,021	12,108	15,720
Cotton fabrics	6,647	5,853	7,632	10,678
Manmade fiber fabrics	8,190	9,048	11,684	15,107
Natural fibers	2,823	3,284	3,896	5,063
Knitted fabrics	1,163	1,406	2,376	3,943
Total	28,948	29,611	37,697	50,511

Source: Hong Kong statistical bureau

7-1-5. Problems and Countermeasures

The Hong Kong textile industry has developed smoothly but now faces the following problems:

Rising wages: Wages are low compared with the advanced nations, but are rising fast. Aside from this, Hong Kong is trying to retrain female workers in an effort to secure a good quality labor force.

Market development: Most of the export markets have quota systems, so no future increase in the volume of exports can be expected. Therefore, it is necessary to raise the added value of the products. As a means for this, companies are investing overseas so as to move their production bases to regions with looser quota restrictions. Hong Kong companies are selecting Macao, Singapore, Taiwan, Malaysia, Mauritius, and also Sri Lanka, the Philippines, and Indonesia as investment areas.

Upgrading of technology: The textile industry has organized the Textile Council of Hong Kong with the aim of improving the level of trade and technology. This

comprises 11 industries and several related members. The affiliated training organizations are as follows:

The Vocational Training Council
The Clothing Training Board
The Clothing Industry Training Authority
The Hong Kong Polytechnic
The Hong Kong Productivity Council

Hong Kong 's textile industry will find it difficult to grow as smoothly as it did in the past and has to move toward production of items with greater added value. The past functions of Hong Kong as a center of information and as a relay station for trade will become even more important in the future.

7-2. Textile Industry of Taiwan

7-2-1. Structure

The Taiwanese textile and apparel industry underwent great growth in the 1950s to become by the 1960s the main industry of Taiwan. It has the position of one of the strategic industries in the economy.

Along with the growth of the economy, official policies shifted in emphasis to the capital intensive industries based on advanced technology. As a result, electronic components took over as the main export products.

A look at 1987 figures shows that total production in the textile industry was NT$544.6 billion, corresponding to 16.8% of total production in the region (2.3% for man-made fibers and 12.2% for spinning). In the past five years, the share has remained almost constant . (See Table I-7-6.)

Table I-7-6. Share of Textile Industry in Manufacturing Industries

(Unit: %)

	1983	1984	1985	1986	1987
Manufacturing industries	100	100	100	100	100
Textile industry as a whole	16.1	17.1	16.8	17.5	16.8
Manmade fibers	1.9	2.2	2.2	2.3	2.3
Spinning	11.5	12.2	12.1	12.7	12.2
	13.4	14.4	14.3	15.0	14.5

Source: Taiwan Spinning Industry Sales Promotion Association

The biggest feature of the Taiwanese textile industry is that, in contrast to Hong Kong , the textile sector is larger than the apparel sector. Man-made fibers and spinning account for 88.7% of the textile industry.

As to the number of workers employed in the industry, 1987 figures show 452,000 workers in the field, of which 180,000 worked in man-made fibers and 290,000 in spinning. This corresponds to 19.5% of the total number of workers in the manufacturing industries and shows that the industry plays a central role in the manufacturing industries of Taiwan.

7-2-2. Trends in Facilities

A look at the trends in facilities in the textile industry shows a notable augmentation of man-made fiber producing facilities. Taiwan has increased production from a daily 2.835 tons in 1983 to 4.685 tons in 1987.

The man-made fibers produced in Taiwan include polyester, nylon, acrylic, and rayon fibers, but the main type among them is polyester, which accounts for about two-thirds of the production.

As of 1987, Taiwan's man-made fiber producing facilities had a capacity greater than those of South Korea, making Taiwan the third largest producer in the world after the U.S. and Japan.

A look at the spinning facilities shows that while there was a partial drop in the number of spindles in 1986, the number of spindles passed the 4 million mark in 1987. In Taiwan's case, these cotton spindles are augmented by 400,000 woolen spindles. The number of woolen spindles has remained constant in these past few years. However, the emphasis in cotton spinners is now shifting from expansion to replacement. (See Table I-7-1.)

A look at the number of looms shows that the peak was 61,000 units in 1984, after which a gradual decline was shown. In 1987, Taiwan had 54,000 looms. In the process of this decline, however, there was an increase in shuttleless looms, so the decline does not signify a drop in the production capacity itself. By way of reference, a look at the percentage of looms shows that shuttleless looms accounted for 11.4% of all looms in 1987, but 29.9%, almost three times as much, in 1987.

In 1987, there were 16,000 shuttleless looms.

The number of woolen looms has also been gradually falling.

Filament looms are gradually increasing in number, rising from 14,000 looms in 1983 to 15,000 looms in 1987. There has been a noticeable increase in the number of

water jet types. In 1987, about two-thirds of all such looms were of the water jet type. (See Table I-7-7.)

Table I-7-7. Loom Facilities

(Unit: looms)

	1983	1984	1985	1986	1987
Cotton looms	59,902	60,916	58,630	54,017	53,942
Of which, shuttleless	6,802	9,155	10,652	12,938	16,126
	(11.4%)	(15.1)	(18.7)	(24.0)	(29.9)
Woolen looms	1,332	1,356	1,344	1,272	1,124
Filament looms	13,292	13,975	14,796	14,177	14,972
Of which, shuttleless	6,534	6,909	8,207	9,032	10,177
	(49.2%)	(49.4)	(55.5)	(63.7)	(68.0)

Source: Taiwan Spinning Industry Sales Promotion Association

7-2-3. Production Trends

Man-made fibers: Production increased tremendously due to an expansion of the man-made fiber production facilities. Production of polyester filament rose from 218.9 thousand tons in 1983 to 525.0 thousand tons in 1987. Production of staple fiber of the same rose from 289.5 thousand tons in 1983 to 555.7 thousand tons in 1987. In both cases, production almost doubled.

The same was true for nylon filaments, production of which increased from 105.2 thousand tons to 177.2 thousand tons. Acrylic and rayon increased in production too, though not to the same extent as polyester and nylon. Production of man-made fibers grew the most compared with other textiles. The stabilization of oil prices has resulted in stable prices of man-made fibers as well, working advantageously for mix-spun products and other textiles. (For production of man-made fibers, see Table I-7-9.)

Table I-7-8. Production of Key Textiles

(Unit: yarn and filament, 1000 tons; fabrics, 1,000 m)

	1983	1984	1985	1986	1987
Polyester F	218.9	274.5	339.3	437.8	525.0
Polyester S	289.5	317.1	378.8	509.6	555.7
Nylon F	105.2	122.9	136.9	142.5	177.2
Acrylic S	124.5	129.0	134.9	150.0	152.3
Rayon S	98.5	124.5	119.6	116.4	116.5
Cotton yarn	164.8	181.3	191.8	223.9	246.4
Mix-spun cottonyarn	249.2	324.5	351.9	283.6	396.6
Woolen yarn	10.0	10.9	9.7	9.7	10.1
Rayon staple filament yarn	49.2	54.6	61.0	66.3	64.0
Cotton fabrics	661,495	606.,954	618,464	755,661	729,419
Mix-spun cotton fabrics	627,442	681,650	676,039	682,794	667,351
Mix-spun woolen fabrics	10,2801	10,798	10,941	10,913	11,019
Staple fiber fabrics	8,405	5,751	3,264	3,548	3,394
Polyester fabrics	136,445	196,646	199,147	242,477	298,174
Nylon fabrics	251,376	290,573	305,165	323,136	380,216

Source: "Industry of Free China"

Spun yarn: Aside from woolen yarn, production of yarn has been increasing steadily. Cotton yarn production rose from 164.8 thousand tons in 1983 to 246.4 thousand tons in 1987, a 49.5% increase. It is noteworthy here that the growth rate of production was far higher than the rate of increase in facilities themselves. (See Table I-7-9.)

Table I-7-9. Indicators of State of Textile Industry

(1983=100)

	1984	1985	1986	1987
Spinning facilities	107	108	107	111
Cotton yarn	110	116	135	150
Mix-spun cotton yarn	130	141	153	159
Woolen yarn	109	97	97	101
Rayon staple fiber	111	123	135	130
Manmade fiber yarn	117	137	151	147
Cotton fabrics	92	93	114	110
Mix-spun cotton fabrics	108	107	108	106
Mix-spun woolen fabrics	105	106	106	107
Staple fiber fabrics	68	39	42	40
Polyester fabrics	144	146	178	219
Nylon fabrics	116	121	129	151
Polyester F	125	155	200	239
Polyester S	110	131	176	192
Nylon F	117	130	135	168
Acrylic S	104	108	120	122
Rayon S	126	121	118	118
Cotton looms	102	98	90	90
Shuttleless	134	157	190	237
Woolen looms	102	101	95	84
Filament looms	105	111	107	112
Shuttleless	106	126	138	156

Mix-spun cotton yarn, rayon staple fiber, and man-made fiber yarn all have been increasing in production. (For output of respective textiles, see Table I-7-9.)

Woven fabrics: There have been extreme differences in the rates of growth of production of cotton fabrics and man-made fiber fabrics. Cotton fabrics and mixed cotton fabrics have tended to stagnate in growth, while large growth has been shown by polyester and nylon fabrics. In particular, production of polyester fabrics rose to about double the level of 1983 in 1987, reaching 380 million meters. This was due to the expansion in man-made fiber production facilities and the doubling in the number of looms (filament looms).

7-2-4. Labor Situation

The number of employees in the textile industry peaked at 485,000 workers in 1985 and has been gradually declining since.

A breakdown by sector of the textile industry shows that up until 1985 the number of employees in the spinning sector rose by about 10,000 each year, but subsequently fell by about 10,000 a year and has now stopped at 290,000 workers in 1987, the same level as in 1983.

In the spinning sector, the number of workers in cotton spinning fell from the 69,000 workers in 1984 to 58,000 workers, a striking decline of 11,000 workers or 19.6%. However, production of cotton yarn rose 10% a year during that period, so there must have been consideration mechanization and other forms of rationalization at that time.

The number of workers in the man-made fiber sector rose from 74,000 workers in 1983 to 84,000 in 1987 - the only steady yearly increase shown in all the spinning sectors. This is believed to be a result of the expansion of man-made fiber producing facilities and the increase in the number of looms.

A look at the wage levels shows that, with respect to average wages in the manufacturing industries of 100, the man-made fiber sector paid 142, the spinning sector 104, and the apparel sector 80, showing a large difference in wages among the sectors of the textile industry. The man-made fiber sector has continued to offer high wages since 1985, paying over a monthly NT$20,000.

Regarding the growth in the productivity of the spinning sector, if 1981 is considered 100, productivity in the spinning sector grew to 107, 108.8, 120.4, and 132.7 in 1984, 1985, 1986, and 1987, compared to 118, 121, 134.1, and 148.0 in the manufacturing industries as a whole. In other words, productivity did not grow as much as wages.

7-2-5. Trends in Trade

Domestic consumption of textile products is expected to increase in the future, due in part to the effects of economic growth, but the domestic market is a small one and thus most companies rely on the overseas markets.

(Exports)

The ratio of Taiwan's textile exports (including textiles and apparel) in all exports, looking at the 1980s, peaked at 22.2% in 1981 and then gradually fell, reaching 17.7% in 1987. By value, exports increased, but the increase was far less than that of electronic and electrical equipment. (See Table I-7-10.)

Table I-7-10. Textile Trade of Taiwan (Exports)

(Unit: US$ million)

	Total exports A	Textiles B			
		Total	Fiber	Yarn/Fabric	Secondary products
1980	19,811	4,326.8	109.5	1,790.7	2,426.6
		21.8	0.6	9.0	12.2
1981	27,611	5,021.2	134.1	2,038.4	2,848.7
		22.2	0.6	9.2	12.6
1982	22,204	4,818.5	159.9	1,767.8	2,890.8
		21.7	0.7	8.0	13.0
1983	25,123	4,987.2	175.7	1,828.2	2,783.3
		19.9	0.7	7.2	11.9
1984	30,456	6,145.4	191.5	2,192.9	3,761.0
		20.1	0.6	7.2	12.3
1985	30,723	6,260.2	229.2	2,518.5	2,512.5
		20.3	0.7	8.2	11.4
1986	39,789	7,634.6	277.6	3,098.0	4,259.0
		19.2	0.7	7.8	10.7
1987	53,538	9,477.5	329.5	4,152.1	4,995.9
		17.7	0.6	7.8	9.3

Source: Trade Statistics of Taiwan

A look by export destinations shows that for textile materials, Japan was in the lead (36.1%), followed by Hong Kong (11.9%), India (11.0%), and the Philippines (8.9%).

For yarn and fabric, the leaders were Hong Kong (34.0%), the U.S. (10.0%), Singapore (7.6%), and Japan (7.5%).

Seen overall, the main destinations for exports of textiles were the U.S., Hong Kong , and Japan, accounting for over 50% of exports in total, followed by West Germany, Saudi Arabia, etc. This trend has remained constant. (See Table I-7-11.)

Seen by item, the main exports were, in materials, man-made staple fiber and filaments, in yarn and fabrics, man-made spun yarn and man-made long fiber fabrics, and in secondary products, sweaters, knitted outerwear, and fabric products.

Textile materials are exported to Japan and Hong Kong, most of this being man-made fibers. The main destination for exports of yarn and fabric is Hong Kong .

Table I-7-11. Export Ratio of Textiles

Textile materials		Yarn/Fabric	
Japan	36.1	Hong Kong	34.0
Hong Kong	11.9	U.S.	10.0
India	11.0	Singapore	7.6
Philippines	8.9	Japan	7.5
South Korea	6.9	Philippines	4.2
Others	25.2	Others	36.7
	100.0		100.0

Source: Trade Statistics of Taiwan

(Imports)

Imports have not up until now been of that great importance. There is no question, however, that Taiwanese textile products face severe competition. One woven fabric manufacturer stated that, for its materials, it imported 20 to 30 count fabrics from Pakistan and India due to their price, obtained 40S and T/C 45 S domestically since Taiwan was competitive there, and 50 S to 80 S from Japan due to their quality. In this way, it is possible that companies will no longer purchase all their materials domestically.

Table I-7-12. Textile Trade of Taiwan (Imports)

(Unit: US$ million)

	Total imports A	Textiles B			
		Total	Fiber	Yarn/Fabric	Secondary products
1980	19,733	888.9	585.2	297.8	5.8
		(4.5%)	(3.0)	(1.5)	(-)
1981	21,200	888.6	539.2	343.7	5.7
		(4.2)	(2.5)	(1.6)	(-)
1982	18,888	901.1	571.3	324.2	5.5
		(4.8)	(3.0)	(1.7)	(-)
1983	20,287	905.4	535.3	364.4	5.6
		(4.5)	(2.6)	(1.8)	
1984	21,959	1,129.5	674.2	448.0	7.3
		(5.1)	(3.0)	(2.0)	
1985	21,102	993.6	590.7	394.2	8.7
		(4.9)	(2.9)	(1.9)	
1986	24,165	1,207.4	613.9	582.4	11.1
		(5.0)	(2.5)	(2.4)	
1987	34,506	1,709.0	899.6	767.9	41.6
		(5.0)	(2.6)	(2.2)	(0.1)

Source: Taiwan Spinning Industry Sales Promotion Association
Note: Figure in () indicates the percentage sharing in the total imports

7-2-6. Problems and Countermeasures

Dispersion of markets: As mentioned previously, most of Taiwan's textile exports are to the U.S., Hong Kong, and Japan. It is necessary to quickly disperse exports to other markets as well.

In particular, exports to the U.S. market are limited in the extent of their growth due to the quotas under the textile agreement, so it is necessary to develop products with higher added value.

New markets: It is considered necessary to develop the Southeast Asian market and Middle and Near Eastern markets and further to positively tackle the markets of Eastern Europe and China.

Rising wages and shortages of labor: The rise in personnel costs is causing prices to rise. Further, the industry is faced with a shortage of labor due to the growth of the electronics industry, tertiary industries, etc. The enforcement of the Labor Standards Law has also been a cost factor and is working to the detriment of the industry.

Balance with upstream sector: Even today, further construction of spinning facilities is scheduled. It is believed that capacity will increase to 4.5 million spindles. Man-made fiber producing facilities are also continuing to be built, resulting in an overload on the upstream sector. The excess production will probably end up being exported. If this is not possible, then it would have to be consumed domestically, which could result in discount price competition.

High value of NT$: The NT$ should continue to remain high in value on the exchange market. Some measures will have to be taken against this.

In addition, it will be necessary for Taiwan to create new export products in view of the pace at which the ASEAN nations and China are catching up with it and also the need to differentiate its products from those of the other NIEs.

7-3. Textile Industry of South Korea

7-3-1. Structure

The textile industry was a key factor in the economic growth of South Korea and accounted for 12.3% of the total production and 17.7% of the workers of the manufacturing industries in 1987. Further, it accounted for 24.5% of the country's exports. Projections for 1988, however, indicate that the industry has lost its superior position to the electronics industry.

The textile industry accounted for 22.5% of the workers in the manufacturing industries in 1983, but this subsequently fell with each year to 21.5%, 20.7%, 20% and 17.7%, in 1984, 1985, 1986 and 1987 respectively. This reflects the decline in position of the textile industry.

In addition to this, problems have arisen due to the appreciation of the value of the Korean won and rising wages.

One of the structural features of the textile industry is the large number of vertical production type companies. When South Korean companies become large in size, they tend to adopt a vertical production system. Finally, they end up with an integrated system covering everything including the raw materials (man-made fiber production facilities or spinning) and woven fabrics (or knits and dyeing)., so there are many large-sized mass production type companies.

Further, a look at distribution shows that production is linked directly with sales. This is an advantage and at the same time makes companies very susceptible to recessions.

7-3-2. Facilities

Spinning: South Korea's cotton spinning facilities were comprised of about 3.12 million spindles up until 1987, with over 96% of these being owned by 23 companies. The large scale of facilities per company or per factory is a characteristics of the industry.

In addition, there were 886,000 spindles of worsted spinning frames and 171,000 spindles of woolen spinning frames (in both cases, figures are as of 1987). The number of spindles has been gradually increasing in these past five years. (See Table I-7-1.)

Man-made fibers: All of the man-made fibers are produced by the 13 member companies of the Korean Man-made Fiber Association.

The capacity of the man-made fiber producing facilities increased 16.2% in 1986 and 12.5% in 1987 to reach a total of 990,000 tons.

More specifically, they can produce 12,000 tons of viscose, 9,000 tons of acetate, 179,000 tons of acrylic, 157,000 tons of nylon, 328,000 tons of polyester F, and 306,000 tons of polyester SF.

Production of man-made fiber has been continuing to rise by over 8% a year. (See Table I-7-14.) Of this, production of polyester exceeds 60%.

Looms: There were 45,448 cotton looms in 1983 and this rose to 53,506 by 1987. The weaving sector includes numerous small and medium sized companies, 70% of which are cottage sized firms with less than 50 looms. Of the looms, about 9.2% are shuttleless.

There were about 74,000 cotton looms in 1983 and this rose to 98,000 by 1987, displaying rapid growth. (See Table I-7-13.)

Regarding woolen looms, there were 3,890 in 1983 and the number has remained fixed at that level since.

The industry uses many Korean-made looms. According to a survey run by the Korean Textile Industry Federation, the ratio of domestic machines was 64.8% for looms and 3.8% for spinning frames.

Table I-7-13. Number of Looms and Other Facilities in South Korea

	1983	1984	1985	1986	1987
Cotton looms	45,448	49,489	47,493	53,792	53,506
Silk looms	74,387	65,118	63,648	96,806	97,878
Woolen looms	3,890	3,154	3,775	3,934	3,806
	Percent of shuttleless types believed to be about 9.2%				
Twisting frames	134,000	125,000	123,000	124,000	124,500

Source: Korean Textile Industry Federation

7-3-3. Production

Yarn: The main yarns in production are cotton yarn and mix-spun cotton yarn, which together account for about 90% of South Korea's yarn production. Since 1983, production has been increasing as a general trend. In 1987, production reached 499,000 tons. (See Table I-7-14.)

As to the count of cotton yarn produced, 30 to 39 count accounts for 29.8%, 20 to 29 count for 26.2%, and 10 to 19 count for 21.1%. The fine 40 to 49 count accounts for 16.2% and the 50 or over count for just 2.2% (according to articles in the July 1988 issue

of Spinning Monthly and March and April issues of the journal of the Korean Spinning Association).

The average of these counts is 32.22, 30.98 for fine cotton yarn. The comber ratio is also about 25%.

In 1987, there was a shortage of cotton on the domestic market and due in part to this, imports of thick count yarn from Pakistan, China, etc. increased, with imports of cotton yarn exceeding exports.

Worsted yarn: In 1987, production is estimated to have been 35,000 tons. Since 1983, production has been gradually rising.

Woolen yarn: In 1987, production is estimated to have been 27,000 tons. This represents an increase from the 1983 level of 23,000 tons, but the growth has been limping. (See Table I-7-14.)

Woven fabrics: South Korea produces cotton fabrics, worsted fabrics, silk fabrics, rayon fabrics, and man-made fiber fabrics. Among these, cotton fabrics (including mix-spun cotton) account for 52.5% of the production, over half, and man-made fiber fabrics for 43.7%. In 1987, 1.737 million meters of silk fabric was produced, representing a 70% increase over 1983.

Regarding man-made fiber fabrics, 1,477 million meters were produced in 1987, a 27.6% increase over the 1983 production. Cotton fabrics have experienced sustained growth, but production of man-made fabrics fell in 1984 and 1985 and began to recover and grow again in 1986 and 1987.

As for worsted fabrics, silk fabrics, and rayon fabrics, these are not important items and their production fluctuates. (See Table I-7-14.)

Eighty percent of both the cotton and man-made fabrics is exported. The growth of the South Korean textile industry has been promoted with these in mind.

Dyeing industry: The percentage of subcontractors who handle dyeing on consignment is high. A look at production by sector shows there were 3,399.8 million yards of piece dyeing performed, 326.13 million yards of printing, and 182,851 tons of yarn dyeing.

Table I-7-14. Production of Key Textile Products

(Unit: 1,000 tons)

	1983	1984	1985	1986	1987
Cotton yarn and mix-spun cotton yarn	420.1	437.8	439.0	471.1	498.7
Worsted yarn	25.8	28.0	28.7	31.5	34.8
Woolen yarn	22.6	22.9	21.4	23.0	27.1

(Unit: 1,000 m)

Cotton fabrics	1,1016,046	1,315,139	1,246,405	1,424,292	1,737,170
Worsted fabrics	36,490	40,175	37,096	36,118	42,924
Silk fabrics	44,327	41,007	40,063	60,934	58,067
Rayon fabrics	17,341	18,371	17,948	27,298	26,013
Manmade fiber fabrics	1,133,396	959,046	936,988	1,425,120	1,447,175
	2,247,600	2,373,738	2,278,500	2,975,762	3,311,409

(Unit: 1,000 tons)

Acrylic	152.3	162.7	163.8	165.0	178.9
Nylon	123.9	133.3	138.4	139.8	157.0
Polyester	387.6	451.1	509.9	557.2	634.2
Viscose	10.7	10.6	17.6	11.8	12.0
Acetate	8.2	8.1	8.1	7.1	8.7
Polypropylene	0.6	1.0	0.4	-	-
	683.3	766.8	832.2	880.9	990.8

Source: Korean Textile Industry Federation

7-3-4. Labor Situation

The South Korean textile industry employed 375,000 workers in 1983, 367,000 in 1984, 398,000 in 1985, and 418,000 in 1987. A look at the wages shows companies paying 195,558 won/month in 1984, 213,235 won/month in 1985, 235,669 won/month in 1986, and 272,756 won/month in 1987, meaning a high rate of wage hikes of 9% from 1984 to 1985, 10% from 1985 to 1986, and 15.7% from 1986 to 1987.

At the same time, a problem is beginning to appear of shortages of labor due to the relationship of the industry with other industries.

7-3-5. Trends in Trade

The South Korean textile industry has been developed led by its exports, so the promotion of the growth of the domestic textile market has been left for later, but the market has been steadily growing in the 1980s despite the inattention.

In 1987, domestic consumption reached 525,174 tons, corresponding to about one-half of the exports of that year.

(Exports)

South Korea's textile exports were valued at US$6.05 billion in 1983, US$7.08 billion in 1984, US$7.00 billion in 1985, US$8.73 billion in 1986, and US$11.7 billion in 1987, falling in 1985, but otherwise increasing steadily.

Exports of textiles account for about one-fourth of all exports in value between 1983 and 1987. Of this, apparel accounts for about 70% and textiles about 30%. The percent of textile exports in all exports has been falling as a general trend, though not regularly.

The main export item among textile exports is woven fabrics, which account for 30% of all textile exports. The main export items are man-made fabrics, cotton fabrics, variegation fabric, silk fabrics, and woolen fabrics, with man-made fabrics accounting for 61.4% and cotton fabrics for 19%. (See Table I-7-15.)

As for yarns, the main export items are man-made yarns, cotton yarn, and woolen yarn. The respective ratios of these are 46.3%, 32.1%, and 18.1%. (See Table I-7-15.)

Table I-7-15. Textile Trade of South Korea (Exports)

(Unit: US$ million)

	1983	1984	1985	1986	1987
Total value of textile ;es	6,051	7,079	7,004	8,734	11,718
Yarn	595	702	694	698	809
Cotton yarn	229	271	224	215	260
Woolen yarn	77	74	95	93	147
Manmade fiber yarn	250	313	355	360	375
Silk yarn	39	43	20	31	28
Fabrics	1,788	1,939	1,889	2,549	3,078
Cotton fabrics	341	398	341	476	587
Woolen fabrics	104	103	84	95	122
Manmade fiber fabrics	1,015	1,053	1,093	1,448	1,889
Rayon fabrics	16	17	30	81	101
Silk fabrics	95	100	101	127	178
Embroidered fabrics	100	103	83	89	107
Tie products	88	115	116	145	207
Knitted fabrics	11	12	9	29	79
Others	18	38	32	59	100
Finished products	3,668	4,438	4,421	5,487	7,537
Textile products/ Total exports (%)	24.8	24.2	23.1	25.2	23.5
Textiles	9.7	9.0	8.5	9.3	7.2
Apparel	15.1	15.2	4.6	15.9	16.3

Source: Korean Ministry of Commerce and Industry

The main regions exported to are the U.S., Japan, Hong Kong, and West Germany. (See Table I-7-16.)

A look at the exports in 1987 shows that exports to the U.S. rose 20% from the previous year and those to Japan rose 64%, both large growth rates.

Table I-7-16. Destinations of Textiles by Country

	1985	1986	1987
Japan	13.8	15.3	18.8
Hong Kong	6.0	5.9	6.3
Saudi Arabia	4.0	5.2	3.9
West Germany	5.4	6.7	7.3
U.K.	2.8	3.2	3.4
Canada	4.2	4.2	3.9
U.S.	37.1	33.9	30.5
Others	26.7	25.6	25.9
	100.0	100.0	100.0

Source: Prepared from Korean trade statistics.

(Imports)

Imports of textile products, with the exception of imports of materials (raw cotton, wool, etc.), have been increasing in value as a general trend, but account for only 6.2% of total imports (as of 1987). (See Table I-7-17.)

However, in volume, imports of thick count cotton yarn increased in 1987, making South Korea a net importer. The reason for this was the sharp rise in imports from Pakistan and China. (See Table I-7-19.)

Due to this situation, it cannot be said that South Korean products have absolute superiority in competitiveness compared with imports.

Further, the current 20% duty on imports of cotton yarn and cotton fabrics is scheduled to be reduced to 13% for cotton yarn and 15% for cotton fabrics in 1989, so the environment surrounding the spinning sector may be expected to become more severe.

Looking at fabrics, the price of a cotton fabric of 20x20/60x60 x 47" is 520 won/yard for Korean makes and 420 won/yard for Chinese makes (market price, including 20% duty, 2.5% defense tax, and 10% added value tax), which indicates that even if the current stance is maintained, there will be fierce competition from the later developing countries.

Table I-7-17. Textile Trade of South Korea (Imports)

(Unit: US$ million)

	1983	1984	1985	1986	1987
Total value of textile imports	1,334	1,550	1,512	1,759	2,526
Textile materials	802	926	847	798	1,071
Raw wool	167	175	184	207	322
Raw cotton	534	616	531	403	514
Manmade fibers	73	77	85	133	180
Yarn	186	215	226	355	633
Manmade filament	88	84	76	103	204
Flax yarn	5	18	48	52	73
Cotton yarn	13	20	18	57	134
Manmade fiber yarn	26	32	32	71	123
Fabrics	329	390	419	574	781
Manmade long fiber fabrics	65	75	84	88	110
Cotton fabrics	45	57	57	80	129
Manmade staple fiber fabrics	86	108	119	175	220
Special fabrics, etc.	56	63	64	98	135
Secondary textile products	16	20	20	32	40
Textile products/Total imports (%)	5.1	5.1	4.9	5.6	6.2
Textiles					
Materials	3.1	3.0	2.7	2.5	2.6
Yarn	0.7	0.7	0.7	1.1	1.5
Fabrics	1.2	1.2	1.3	1.8	1.9
Secondary products	0.1	0.1	0.3	0.2	0.2

Source: Korean Ministry of Commerce and Industry

Table I-7-18. Ratio of Imports/Exports

	1983	1984	1985	1986	1987
Yarn	31.3	30.6	32.6	50.8	78.2
Fabrics	18.4	20.1	22.2	22.5	25.3

Source: Prepared from Table I-7-15 and Table I-7-17.

Table I-7-19. State of Imports of Cotton Yarn by South Korea

(Unit: tons for volume and US$1000 for value)

	1983	1984	1985	1986	1987
Imports					
Volume	4,238	6,973	8,466	28,709	55,559
Value	12,530	19,724	17,514	57,158	134,078
Exports					
Volume	67,837	66,968	59,105	47,226	51,718
Value	147,208	201,041	163,180	134,111	199,507

Source: South Korean Trade Statistics

7-3-6. Problems and Countermeasures

South Korea faces problems similar to those mentioned in the section on Taiwan. However, there is a great difference here in that South Korea instituted a textile policy which promoted accelerated growth of the industry through strong government protection. The textile industry of South Korea began rapid growth with a law on temporary measures for textile industry facilitiesin 1968. In 1980, a law on the promotion of modernization of the textile industry was enforced. Various policies have been set with the basic objectives of upgrading the structure of the textile industry, upgrading and diversifying products, diversification of export markets, etc. In 1985, a textile white paper was released giving a long term vision of the textile industry. The 1980 promotion law served its function, and the textile industry was dealt with comprehensively under an industrial development law starting in July 1986.

Considering all this, it may be said that the South Korean textile industry is in transition from a period of growth to one of adjustment.

The problems facing it include [1] the rising value of the won, [2] rising wages, [3] the need for diversification of export markets, and [4] the need for higher added value of its products.

In particular, the need for diversification of export markets is severe. The existence of quotas in the U.S. market alone makes the increase of the added value of products essential. At the same time, entry into areas with no quotas is considered necessary, but as seen in the knit trade with Japan, problems will arise when exports are expanded without limit and there too long term measures are considered necessary.

7-4. Textile Industry of Indonesia

7-4-1. Structure

In the economy of Indonesia, half of the total domestic production is accounted for by agricultural and mining. The textile industry (including the manufacture of garments) is the most important industry, accounting for 28% of the production of the manufacturing sector in 1985, and has continued to grow under the government's program of promotion of non-petroleum and gas exports.

Almost all of the textile industry is located on Java. There are 2042 factories in the Indonesian textile industry, which break down into 88 spinning factories, 1,341 weaving and knitting factors, 291 dyeing factories, and 322 sewing factories at the end of 1986.

7-4-2. Facilities

As of the end of 1987, Indonesia had 2.65 million spindles worth of spinners and 125,000 loom. The number of spinners is the largest in the ASEAN nations (2.068 million spindles in the case of Thailand). (See Table I-7-1.)

The spinning companies are mostly vertical, general types which handle everything from weaving to dyeing and processing as well. Therefore, some shortages of yarn have occurred among the weaving companies and prices of yarn are high.

Indonesia has an abundant labor force, so investment is more in increasing production and improving quality than in saving labor. By way of note, there are about 23,060 OE spindles, accounting for less than 1% of the total number of spindles.

A look at the looms shows almost all to be of the shuttle type.

Further, Indonesia relies on imports for these spinners and looms.

7-4-3. State of Production

Regarding textile materials, some cotton is produced domestically, but covers less than 10% of domestic demand. The majority of it is imported, mostly from China (32%), the U.S. (24%), and Pakistan (21%).

Production of spun yarn has been increasing with each year, reaching 295,000 tons in 1986. (In Thailand's case, production of cotton yarn and manmade fiber yarn reached 302,000 tons at the same point of time).

Fabric production has also been increasing with each year and has reached 2,350 million meters. (See Table I-7-20.)

Production of manmade fiber began in 1974. Import substitution was fairly much completed from 1980 to 1984. In 1986, Indonesia produced 80,000 tons of polyester S, 77,000 tons of polyester F, 12,000 tons of nylon F, and 39,000 tons of rayon. The ratio of polyester staple fiber and filament was about 1:1.

Table I-7-20. Production of Key Textile Products by Indonesia

(Unit: 1000 tons)

	1983	1984	1985	1986
Polyester S	55.0	73.3	75.0	79.6
Polyester F	50.5	62.8	70.0	76.7
Nylon F	9.5	10.2	11.7	11.7
Rayon S	34.0	39.8	39.8	39.0
Spun yarn (1000 bales)		(1,448	1,465	1,620)
Spun yarn (1000 tons)		263.3	266.4	294.5
Woven fabrics (million meters)	NA	2,039	2,124	2,347
Woven fabrics (million meters)	NA	362	375	414
Apparel (million dozens)	NA	25.7	27.1	28.9

Source: June 1987 announcements of Indonesian Ministry of Industry and "Overseas Textile Industry Survey and Study" by Japan Cotton Yarn and Cotton Fabric Institute

7-4-4. Labor Situation

The labor force is plentiful and the wage levels are about 60,000 rupia for the weaver class and from 100,000 to 120,000 rupia as the average wage of workers (including various allowances). These wage levels are lower than in China and wages in Thailand, of course, are lower than in China as well.

The wage levels are rising with each year, but the rupia has been devaluating at a faster rate and thus the wages, seen on a dollar basis, have been falling.

7-4-5. Trends in Trade

The domestic Indonesia market is extremely sluggish due to the low purchasing power.

Demand grew steadily throughout the 1970's due to the spread of manmade fiber products, but the growth rate slowed down considerably in the 1980's.

The government estimates domestic demand in 1983/84 to have been 2,260 million meters in terms of woven fabric and is targeting for demand of 2,750 million meters for 1988/89.

(Exports)

Indonesia achieved import substitution of textile products from the late 1970's to the 1980's. In the 1980's, the Indonesian government designated exports of textile products to be an important goal in its trade policies due to its policy of steering the economy away from oil.

The 1978 devaluation of the rupia and the 1979 introduction of an export incentive system resulted in an expansion of exports. By 1987, textile exports had surpassed 1 billion dollars, corresponding to 6% of total exports (of which, exports of textiles, not including garments, accounted for 2.5%). (See Table I-7-21.)

Table I-7-21. Exports of Textile Products

(Unit: US$ million)

	Textiles	Apparel	Total	Percentage of all exports (%)	
1983	112.2	157.2	269.4		
1984	188.0	295.9	483.9		
1985	239.6	339.1	578.7	3.1	(1.3)
1986	322.6	508.3	830.9	5.6	(2.2)
1987	432	598	1,030	6.0	(2.5)

Source: Indonesia Spinning and Weaving Association (API)

In Indonesia's exports of textile products (1987), the ratio of textiles and apparel was 2:3, with the proportion of textiles being higher. This reflects the fact that due to the slump in domestic demand in the early 1980's, the local spinning and weaving companies were forced to push exports and thereby raised the export competitiveness.

The mainstays of the textile exports are pure cotton and mixed polyester and cotton fabrics.

The main destinations of exports are the U.S. at 40%, the EC at 34%, and ASEAN at 19%, with the quota imposing regions accounting for 70% of exports. Exports to the U.S. grew largely because the U.S. had not imposed any restrictions on export quantities until 1985.

(Imports)

Imports of textile products account for about 1.7% of all imports of Indonesia. Even including imports of materials, the trade balance in textile products has been in a surplus since 1983 and the surplus continues to grow.

7-4-6. Problems and Countermeasures

Indonesia is in the best position among countries in the region in terms of overall conditions.

In particular, it is more competitive in wages than even China. Further, while other countries are confronted with rising exchange rates for their currencies, the rupia is devaluating. In that sense too, much can be expected in terms of growth in the export markets.

The question will be less that of the competitiveness in price and more one of to what extent Indonesia will be able to deal with product and nonprice competitiveness.

7-5. Textile Industry of China

7-5-1. Structure

The total industrial and agricultural output of China broke down, as of 1986, into 35.3% agricultural output, 36.2% light industrial output, and 34.6% heavy industrial output.

Production in the textile industry accounted for 11. 2% of total industrial output, making that industry number two in importance after machine building.

The textile industry is estimated to employ some 6.807 million workers. (See Table I-7-22.)

Table I-7-22. Number of Workers in Main Sectors of Textile Industry

(Unit: 1000 workers)

	1981	1982	1983	1984	1985	1986
Total for textile industry	4,381.4	4,633.0	4,313.8	4,260.5	6,429.2 (4,506.0)	6,807.7
Chemical fibers	178.0	184.5	199.6	153.8	211.1 (260.0)	243.8
Cotton spinning, weaving, and dyeing	2,439.9	2,569.6	2,629.6	2,606.8	3,073.0	3,254.3
Of which, dyeing	197.6	206.4	217.7	218.9	266.9	260.7
Knitting	508.0	531.4	524.9	527.5	606.6	632.6
Wool spinning and weaving	262.9	297.1	325.6	342.2	450.4	507.9
Hemp and flax spinning and weaving	122.8	126.6	142.4	152.7	216.2	252.3
Silk spinning and weaving	409.4	434.2	-	-	646.2	656.3

Note: Figures from 1985 on include workers in companies not covered by state budget and plans. Figures in parentheses indicate previous fiscal year.
Source: China Textile Industry Yearly

7-5-2. Trends in Facilities

A look at the number of spindles shows that China had 15.6 million spindles as of 1978 and had about 22 million as of 1984 and 25 million as of 1987. (See Table I-7-1.) This is about 10 times the number of Thailand.

China further had 700,000 or so cotton looms as of 1986. (See Table I-7-23.)

In addition, it had 1.7 million worsted spindles and 26,000 woolen looms. It is estimated to have about 98,000 silk spinners.

The production capacity of chemical fibers was 1.25 million tons as of 1986 and is scheduled to be raised to 1.95 million tons by 1990. A breakdown of the capacity as of

1986 shows a capacity of 200,000 tons of cellulostic fiber and1.05 million tons of synthetic fiber, broken down further into 75,000 tons of nylon, 660,000 tons of polyester, 550,000 tons of staple fiber, 75,000 tons of acrylic, and 70,000 tons of vinylon, it is believed (World Textile Trends and Production Trends, the Economic Intelligence Unit).

Table I-7-23. Trends in Textile Facilities

	1982	1983	1984	1985	1986	1987
Cotton spinning frames (1000 spindles)	20,189.9	21,405.6	22,196.5	23,237.9	24,025.5	25,000
Cotton looms (1000 units)	595	624.7	633.5	667.7	700.1	
Woolen spinners (1000 spindles)	888.8	1,005.3	1,205.2	1,394.9	1,685.3	1,750
Woolen looms (units)	12,446	14,650	17,121	21,676	25,704	
Hemp and flax spinners (units)	7,476	8,256	9,317	9,892	10,494	
Yarn makers (1000 sets)	1,091	1,164	1,238	1,279	1,433	
Silk looms (1000 units)	73.4	79.6	98.4	143	149	
Chemical fiber production capacity (1000 tons)	682.4	769.9	820.3	1,038.8	1,291.4	1,400
Of which, recycled fiber (1000 tons)	151.1	156.8	157.7	170.8	19.0.1	
Of which, synthetic fiber (1000 tons)	531.3	613.1	662.6	868.0	1,101.4	
Dyeing capacity (Million meters)	8,817	9,120	9,393	9,900	10,303	10,000

Source: China Textile Industry Yearly and newspaper reports

7-5-3. Production Trends

A characteristic feature of the textile industry in China is the ability to supply the domestic market with almost all key materials.

China is one of the leading world exporters of cotton and at the same time is a key exporter of wool (the fourth largest exporter in the world), silk, and flax. In addition, it is rapidly expanding its production of chemical fibers and has reached the number two level in the world in terms of production of polyester staple fiber.

Regarding cotton, China began adjusting its production starting in 1984 and in 1987 managed to produce 3815,000 tons. It also produce 187,000 tons of wool and 372,000 tons of silk.

A look at textile products shows production of cotton yarn and staple fiber spun yarn has been increasing in recent years and reached 4,324,000 tons in 1987.

Table I-7-24. Production of Key Items in Textile Industry

		1981	1982	1983	1984	1985	1986	1987	1988 Jan-June
Chemical fibers	(1000 tons)	527.3	517.0	540.7	734.9	947.8	1,017.3	1,1156.9	643.9
Recycled fiber	(1000 tons)	142.6	141.6	138.7	159.1	177.3	186.6		940
Synthetic fiber	(1000 tons)	384.7	375.3	402.0	575.8	770.6	830.7	930.3	552.6
Staple fiber spun yarn	(million bales)	17.63	18.68	18.20	17.91	19.67	22.137	23.832	12.561
	((million tons))	(3.17)	(3.35)	(3.271)	(3.219)	(3.535)	(3.978)	(4.324)	(2.2786)
Pure cotton yarn	(million bales)	12.251	14.02	12.64	11.56				
	((million tons))	(2.203)	(2.52)	(2.292)	(2.098)				
Staple fiber fabrics	(billion meters)	14.27	15.35	14.88	13.69	14.67	16.47	17.30	8.27
Pure cotton fabrics	(billion meters)	8.52	10.12	9.04	7.01	8.21	9.91		5.26
Processed fabric	(billion meters)	8.29	8.08	7.33	6.81	7.53	7.95		4.24
Cotton knitted fabric	(1000 tons)	554.3	635.3	614.2	591.0	685.3	766.9		
Woolen yarn	(1000 tons)	76.5	92.5	102.1	110.0	125.9	149.1	179.1	97.2
Pure wool yarn	(1000 tons)	18.6	17.7	20.4					
Woolen fabrics	(million meters)	113.08	126.69	142.91	180.49	218.16	251.86	259.50	130.60
Pure woolen fabrics	(million meters)	32.56	46.67	54.96	64.49				
Blankets	(million pieces)	10.670	13.788	16.216	17.454	20.154	24.218		
Hemp bags	(million pieces)	429	500	551	548	627	760		
Flax fabrics	(million meters)	20.52	21.10	18.81	20.56	22.62	26.57		
Ramie fabrics	(million meters)	29.63	44.91	28.58	42.04	39.36	46.97		
Silk yarn	1000 tons)	37.4	37.1	36.9	37.6	42.2	47.2	50.8	23
Silk fabrics	(million meters)	835	914	1,003	1,178	1,449	1,501	1,506	754
Pure silk fabrics	(million meters)	1.25	1.56	-	-				
Textile machines	(1000 tons)	279.8	328.1	337.9	301.8	355.9	397.7		

Source: China Textile Industry Yearly for 1981 to 1986 and China Statistics Monthly of China State Statistics Bureau etc. for 1988.

Production of woven and knitted fabrics has also been increasing as a general trend, with production in 1987 reaching 17.3 billion meters (a 5% increase over the previous year).

These figures are over the 3.90 million tons of cotton yarn and 16.2 billion meters of cotton fabric targeted for production in 1990.

The rate of growth in production in the 10 years from 1978 to 1987 was an average annual 7% for production of cotton yarn and 5% for cotton fabrics.

China produced 206 million meters of woolen fabrics and 1.5 billion meters of silk fabrics in 1987. Production of both fabrics has been rising steadily in recent years. (See Table I-7-24.) In particular, the growth of silk production has been due to the increase in exports to the U.S. Mix-spun silk products come under quota restrictions, but pure silk is not restricted under the MFA. (Exports to the Japanese market, however, are restricted.)

7-5-4. Labor Situation

China's textile industry employed a total of 6.8 million workers in 1986. This is about 36 times the number of workers in the textile industry of Thailand. In 1983, there was a decline in the number of employed workers, but in all other years it has increased. (See Table I-7-22.) (Note that the number of workers seems to increase sharply from 1985 on due to the incorporation of workers not covered under the state budget and plans.)

The wages of China's textile workers, according to a survey by Werner International Managing Consultants, stand at 48th place in the world or 23 cents per hour (February 1989 issue of Textile Monthly).

If one compares just wage levels, China has great competitiveness.

7-5-5. Trends in Markets and Trade

The growth in China's textile industry since the late 1970's has been due to exports. Further, in 1982 and 1987, there were 50% devaluations of the currency with respect to the US$, which also proved to be large factors behind the export growth. At the same time, the industry was bolstered by powerful growth of domestic demand.

The domestic Chinese market is considerably affected by the growth of personal income. In 1986, the per capita consumption of textiles was 4.6 kg - twice that of 1975.

The majority of this is in the form of cotton yarn, but the percentage of cotton yarn has been falling, reaching 69% in 1986 (compared with 76% in 1976), while the

percentage of manmade fiber has rise to 25%. In 1990, it is expected that per capita textile consumption will reach 5.8 kg. Assuming the population rises to 1.1 billion, the overall amount of textiles consumed in China will reach 6.3 million tons, of which 1.9 million tons is expected to be manmade fiber.

At the present stage, the market for fabric is strong, while the market for readymade clothes is just now growing.

(Exports)

China's textile products account for 28% of all exports in value in 1987. Of this, textiles account for 52% of exports, textile materials 13%, and apparel 33%.

A look at the state of exports of yarn and fabric shows that while there was minus growth in 1984 and 1985, exports rose 30% in 1985/.1986 and 35% from 1986 to 1987 - large growth rates.

In 1987, China exported a total of US$11,068 million worth of textile products, of which exports of textiles accounted for US$5,799 million. (See Table I-7-25.)

Table I-7-25. Weight and Balance of Textile Trade

(Unit: US$ million)

	1983	(%)	1984	(%)	1985	(%)	1986	(%)	1987	(%)
Exports										
All commodities (A)	22,171		25,022		27,559		31,335		39,547	
Textiles (B)	5,625	(100)	6,943	(100)	6,520	(100)	8,408	(100)	11,068	(100)
B/A (%)	(25.4)		(27.7)		(23.6)		(26.8)		(28.0)	
Of which, textile materials	671	(12)	879	(13)	1,158	(17)	1,164	(13)	1,513	(13)
Yarn, fabrics, etc.	2,899	(52)	3,523	(51)	3,281	(50)	4,278	(50)	5,799	(52)
Apparel	2,056	(36)	2,541	(37)	2,081	(31)	2,966	(35)	3,756	(33)
Imports										
All commodities (C)	21,336		26,742		42,832		43,400		43,399	
Textiles (D)	1,396	(100)	1,603	(100)	2,742	(100)	2,721	(100)	2,998	(100)
D/C (%)	(6.5)		(6.0)		(6.4)		(6.3)		(6.9)	
Of which, textile materials	830	(59)	665	(42)	1,110	(40)	1,068	(39)	1,131	(37)
Yarn, fabrics, etc.	563	(40)	932	(58)	1,617	(58)	1,639	(60)	1,850	(61)
Apparel	3	(-)	6	(-)	15	(-)	14	(-)	17	(-)
Trade balance										
All commodities (A-C)	(+) 835		(-) 1,720		(-)15,273		(-)12,065		(-) 3,852	
Textiles (B-D)	(+) 4,229		(+) 5,340		(+) 3,778		(+) 5,687		(+) 8,070	

Note: Statistics denominated in rmb in "Customs Statistics" of China Customs Office converted using average RMB-US$ rate of each year according to IMF statistics.

Table I-7-26. Volume of Exports of Main Items

Item		1982	1983	1984	1985	1986	1987
Natural fibers and their products							
Cotton yarn	(tons)	41,687	102,229	123,959	154,728	228,293	242,957
Cotton fabrics	(million m)	1,124	1,325	1,551	1,673	2,056	2,342
Silk and rayon yarn	(tons)	10,340	9,330	8,098	10,893	14,987	15,029
Silk and rayon fabrics	(million m)	115	150	142	115	133	310
Cashmere*	(tons)	1,735	1,131	1,795	2,069	1,503	2,560
Angora rabbit hair	(tons)	3,407	7,642	7,744	4,450	3,556	4,908
Wool fabrics	(million m)	12	14	11	80	100	10
Blankets	(1000 pieces)	410.0	490.0	490.0	190	400	410
Carpets	(million m^2)	4.91	5.60	5.16	5.09	5.26	6.75
Hemp bags	(million pieces)	175	141	113	177	228	144
Apparel *	(US$ million)	2,491	1,826 (a)	1,675 (a)	1,715 (a)	2,966 (a)	3,756 (a)
Chemical fibers and their products							
Chemical fiber spun yarn *	(tons)	10,251	15,198	14,274	15,257	14,987	18,308
Staple fiber fabrics	(million m)	126	117	132	142	158	168
Polyester-cotton mixed fabrics	(million m)	491	622	608	736	971	1,147
Chemical filament fabrics *	(million m)	29	27	24	20.1	28	31

Note: Rmb converted using IMF rate.
Source: Statistics of Ministry of Foreign Trade in "China Statistics Yearly", published by State Statistics Bureau, for 1981 to 1986. However, "Customs Statistics" of *China Customs Office for each year of items marked with asterisk and for 1987* for other items.

The main destinations of these exports are Hong Kong, the U.S., and Japan. (See Table I-7-27 and I-7-28.)

A look from the standpoint of volume shows that the main export items were cotton yarn, chemical fiber spun yarn, and silk and rayon yarn. In addition, angora rabbit hair, cashmere, etc. are being exported.

In fabrics, cotton fabrics are the main items exported. Most of this is exported in the grey state.

Table I-7-27. Exports by Destination and Main Textile Products (1986)

	Total exports (US$ million)	Cotton yarn (Bales)	Cotton fabric (million m)	Woolen (1000 m)	Silk yarn (tons)
Hong Kong	1,999.77	71.74	618.10	6,112	1,095
Macao	97.72	6.92	39.51	75	70
Japan	849.81	11.85	262.33	176	1,597
Singapore	89.46	1.31	80.15	49	15
West Germany	191.50	0.43	37.38	23	268
France	88.96	0.01	36.08	399	266
Italy	117.34	0.02	14.63	171	1,364
U.K.	78.86	0.18	54.82	32	48
Switzerland	119.11	0.69	30.29	0.9	1,980
Canada	171.30	0.05	24.11	380	-
U.S.	1094.18	0.86	187.99	932	100
Australia	89.03	0.2	39.53	517	-
Rumania	45.33	-	6.68	127	-
U.S.S.R.	400.74	-	95.72	20	1,018
India	30.53	-	1.82	-	1,101
East Germany	95.35	-	28.69	39	-

Source: "China Textile Industry Yearly"

Table I-7-28. Imports of Cotton Yarn and Fabric from China by Main Countries

	(A) Cotton yarn (tons)				(B) Cotton fabric*(million m^2)			
	1982	1983	1984	1985	1982	1983	1984	1985
Japan	1,068	7,327	33,800	26,825	233.5	229.7	390.0	387.4
Hong Kong	40,431	99,752	135,468	138,220	419.8	554.1	501.8	521.4
Singapore	766	1,338	1,158	746	47.3	63.8	31.5	41.9
U.K.	58	71	54	85	55.7	54.0	48.7	62.9
Netherlands	..	..	..	18	52.5	54.8	33.5	41.4
France	441	823	506	304	45.8	41.8	38.9	49.2
West Germany	1,087	1,672	1,477	668	33.1	34.3	36.0	41.1
Italy	96	69	72	126	14.1	13.7	11.6	20.5
Canada	38	27	31	42	1.7	20.4	28.7	38.6
U.S.	..	..	38	1,100	127.0	164.0	215.0	205.2
Australia	n.a.	n.a.	n.a.	n.a.	26.0	-	-	253.2
Total	41,687	102,229	123,959	154,728	1,124.0	1,325.0	1,551.0	1,673.4

Note: Statistics are total exports from China as announced by State Statistics Bureau of China. Two periods indicate slight imports. Asterisks refer to conversion from weight indication of raw materials to area using area per unit weight in customs clearance figures for imports by Japan from China for each of the years for countries other than Japan, Hong Kong, and Singapore.

Source: U.N. commodity trade statistics

Table I-7-29. Textile Exports by Main Destination Countries (1986)

(Unit: million yuan)

	Textile materials			Textile products			Apparel		
1	Japan	1,063.55	(27.1)	Hong Kong	6,529.87	(46.3)	U.S.	2,996.99	(15.4)
2	Hong Kong	803.54	(20.4)	Japan	1,435.12	(10.2)	Hong Kong	1,589.30	(8.1)
3	U.S.S.R.	284.06	(7.2)	U.S.	1,314.12	(9.3)	Japan	1,392.29	(7.1)
4	Italy	253.12	(6.4)	U.S.S.R.	796.77	(5.7)	West Germany	653.03	(3.3)
5	West Germany	223.88	(5.7)	Singapore	623.65	(4.4)	U.S.S.R	434.49	(2.2)
6	Switzerland	190.39	(4.8)	West Germany	393.42	(2.8)	Canada	416.06	(2.1)
7	Indonesia	144.91	(3.7)	U.K	241.36	(1.7)	Poland	319.92	(1.6)
8	U.K.	127.20	(3.2)	Macao	240.07	(1.7)	Italy	221.31	(1.1)
9	Czechoslovakia	109.53	(2.8)	Australia	203.70	(1.4)	France	208.96	(1.1)
10	Canada	106.78	(2.7)	Canada	198.56	(1.4)	East Germany	200.59	(1.0)
	Total of above	3,306.96	(84.1)	Total of above	11,976.64	(85.0)	Total of above	8,432.94	(43.2)
	Others	623.73	(15.9)	Others	2,113.74	(15.0)	Others	11,090.92	(56.8)
	Total	3,930.69	(100.0)	Total	14,090.38	(100.0)	Total	19,523.86	(100.0)

Note: Figures in parentheses indicate share in %.
Source: Customs statistics

(Imports)

Imports of textile products accounted for 6.9% of all of China's commodity imports in 1987. This trend has remained constant for the past several years. The main items are yarn and fabric, followed by textile materials. China only imports slight amounts of apparel. (See Table I-7-25.)

7-5-6. Problems and Countermeasures

From the viewpoint of raw materials and the viewpoint of labor costs, China is one of the most promising future suppliers of textiles. China cannot be said to be making full use of its production capacity at the present time, with productivity estimated at from 10 to 15% that of the U.S. (World Textile Trade and Production Trends, the Economic Intelligence Unit).

Labor productivity rose only 3.5% from 1980 to 1985, despite productivity having risen 20% in other industries.

The outdatedness of facilities was once the largest problem facing the Chinese textile industry, but from 1982 to 1987, China increased its spinning facilities by about 4.9 million spindles.

However, one-third of the spinners and half of the looms are said to be antiquidated. Further, the OE rate is about 1%. Very few shuttleless looms are to be seen.

In the seventh five-year plan, the emphasis is on remodeling and replacement of antiquidated facilities in the midstream sector. Further, China is planning to introduce air spinning frames, shuttleless looms, and large-sized high speed knitting machines.

The plan sets as targets for the year 2000 the production of 3,510,500 tons of yarn (2,930,000 tons in 1980), 14,275 million meters of fabric (13,500 million meters), and 945,000 tons of chemical fibers (450,000 tons) (long term strategic targets of the seventh five-year plan).

Further, China intends to raise the rate of production of readymade apparel from the 1985 level of 20% to 50% by 1990. In relation with this, it is exerting effort into the improvement of the quality of the apparel, through modernization of design, differentiation, diversification of products, and creation of sets.

China has further decided to stress the diversification of demand applications, i.e., expansion of textile demand for interior decor, the home, and industry.

In January 1987, the production division of the Yarn and Fabric Corporation was transferred from the jurisdiction of the State Council to the jurisdiction of the Ministry of Textile Industry. The Garment Industry Service Corporation was also transferred from

the Ministry of Light Industry to the Ministry of Textile Industry. By these and other actions, the Chinese established a system aimed at integrated textile processing.

China's textile industry is designated as a key industry for development in the seventh five-year plan. In particular, China will probably establish strong measures to change it over to an export orientation.

Therefore, it is urgent for the industry to change over from its separated processing type system. The augmentation of the dyeing stage, which links the spinning and weaving stage with the sewing stage, to be emphasized in the future, is one of the tasks for the future.

[Note: Regarding the state of industries of competing countries. Some parts refer to the report "Overseas Textile Industry Survey and Study" by Japan Yarn and Cotton Fabric Institute.]

8. Trends in Key Markets

8-1. The Japanese Textile Market

8-1-1. Market Structure

The importance of the Japanese textile industry has continued throughout the post-war years, from the period of economic reconstruction after World War II to the high economic growth of the 1960s. With the changes in the industrial structure that have accompanied growth, however, this importance is waning.

In 1955, the textile manufacturing industry accounted for approximately 19% of all shipments (in value terms) by manufacturing industries in Japan. By 1965, however, this figure had dropped to roughly 12%, and as of 1985 had fallen to a mere 5%. Textiles' share of manufactured goods exports showed an even steeper decline during the same period, from 37% in 1955 to approximately 4% in 1985.

Regardless of this decline, however, the Japanese textile industry remains a huge one, employing approximately 2.83 million workers (1.33 million in manufacturing and another 1.5 million in distribution) and boasting annual shipments of roughly 13 trillion yen.

The industry has the following four characteristics:

(1) Small business

Compared with other major industries, the textile industry contains a high proportion of small and medium-sized firms. This trend is particularly evident in the mid-stream sector, and there is a strong element of excessive competition.

(2) Producing regions

Compared with other industries, the textile sector boasts a large ratio of so-called "producing regions" in which numerous manufacturers are concentrated in local areas. The industry therefore has a relatively large impact on local economies.

(3) Cyclicity

The cyclical character of the textile industry is pronounced: natural textile materials are a cyclical product, most finished products are seasonal, the sector is dominated by small business, competition is excessive, old-fashioned management methods and structures prevail, and responses to new information are limited.

(4) Processing on commission

Particularly in the mid-stream sector and below, there is a fine division of labor in each production process, with divided work being contracted out to small and medium-sized businesses. These firms are generally connected by processing on commission or subcontracting relationship, with distributors such as trading firms and wholesalers intermediating in a variety of forms.

(5) Complexity of the production and distribution structure

At Japanese textile manufacturers, a fine division of labor has taken root in all of the processes from yarn manufacture to final consumption. Mediation by the distributors which tie all of these processes together is complex, resulting in roundabout distribution routes and contributing overall to increased prices. Distributors also hinder the flow upstream of information on market demand, thereby leading to the development of a supply structure that is dependent on speculative demand.

The following problems also become visible when the industry situation is viewed from an international perspective.

(1) Reduced international competitiveness

Remarkable growth by the textile industries in semi-industrialized nations like Korea and Taiwan and developing countries such as China and Pakistan has meant not only the cessation of Japanese exports to third-country markets but also the establishment of imports from these nations in the Japanese market itself. Japanese firms are attempting to respond by concentrating on high quality and differentiated products, but the steeply appreciated yen presents an obstacle to exports.

(2) Changing supply and demand trends

In Japan, increased incomes and changing lifestyles have brought about more diverse, individualized, and high-quality consumer demands. In the textile market as well, the demand structure has become characterized by high added value and high-variety, low-volume, short-cycle production.

Despite this, the fact that Japan's is the only major market in the industrialized nations which does not apply MFA is a major attraction to all textile exporting nations.

8-1-2. Supply and Demand Trends

Tables of supply and demand trends prepared by the Ministry of International Trade and Industry are useful in examining supply and demand in the Japanese textile market. A quantitative view of supply and demand based on these tables is provided below. (Note: Statistics have been converted into yarn-based figures in the tables.)

On the supply side, production has gradually declined since peaking at 2.05 million tons in 1979, amounting to 1.86 million tons in 1987. Imports showed a general decline in 1980 after recording a figure of 340,000 tons in 1979. Since 1981, however, they have continued to increase, posting a figure of 640,000 tons in 1987 and currently accounting for more than 30% of domestic demand. A breakdown of 1987 imports shows approximately 260,000 tons (39.9%) of yarn, 120,000 tons (18.7%) of woven fabric, and 270,000 tons (41.3%) of textile products.

On the demand side, regular movements of the type seen on the supply side could not be observed. The demand in 1987 totaled 2.51 million tons, of which exports accounted for 549,000 tons and domestic demand for 1.96 million tons. Exports, after peaking at 650,000 tons in 1983, have been on the decline. Woven fabric constitutes the main export product, followed by yarn. There are relatively few exports of textile products themselves.

Domestic demand was also characterized by a lack of any regular movements. The 1987 figure of 1.96 million tons was the highest in the last ten years. Virtually all of this was used in clothing, although roughly 10% went for industrial applications.

The export ratio, which indicates the ratio of exports to production, peaked at 36% and has trod an irregular path since. At present it is on the decline, amounting to 29.5% in 1987. The import ratio, indicating the ratio of imports to domestic demand, continues to rise, reaching 33% in 1987 and providing quantitative indication of the tendency toward increased imports (see Table I-8-1).

Table I-8-1. Textile Import and Export Ratios (%)

	Export ratio (%) Exports/production	Import ratio (%) Imports/domestic demand
1975	36.0	10.0
1980	29.3	16.3
1981	34.0	18.4
1982	31.1	19.9
1983	34.2	19.6
1984	32.6	25.1
1985	31.8	26.1
1986	33.0	27.8
1987	29.5	32.7

Source: Ministry of International Trade and Industry (MITI)

8-1-3. Consumption Trends

Clothing is responsible for the majority of textile consumption in Japan.

According to an FAO survey, 1985 per-capita textile consumption in Japan was 17.7 kg, roughly six times the average figure for developing nations and higher than the average for industrialized nations but still lower than the figures for the U.S. and West Germany. Japanese consumption remains virtually constant and is concentrated in cotton and synthetic-fiber textiles (see Table I-8-2). The average amount spent on clothing per household is virtually constant at roughly 7% of total consumption outlays.

8-1-4. Trade Trends

One major characteristic of Japanese textile trade in recent years has been the outstripping of exports by imports (when textile raw materials are included). This state of affairs was first seen in 1984 and has continued since 1986. Even when raw materials are excluded and the focus is limited to textile products (yarn, woven fabrics, garments, and other secondary products), Japan is seen to have become a net importer in 1987.

Japanese exports of textile products (including garments) totaled 6,100 million dollars in 1987, this in contrast to imports of 6,700 million dollars, resulting in a net deficit of 600 million dollars. Although Japan remains a net exporter of yarn and woven fabric, clothing imports are increasingly contributing to this deficit.

Table I-8-2. Per-capita Textile Consumption in Major Countries and Regions (1982-85)

(unit: kg)

	1982	1983	1984	1985	1982	1983	1984	1985
	Industrialized nations				Developing nations			
Yarn	6.0	6.2	6.6	6.8	2.1	2.1	2.0	
Wool	1.1	1.1	1.1	1.2	0.1	0.1	0.1	
Linen	0.5	0.5	0.6	0.6	0.0	0.0	0.0	
Cellulose fiber	1.9	1.9	1.9	2.0	0.2	0.2	0.2	
Synthetic fiber	6.0	6.5	6.8	6.7	0.8	0.8	0.9	
Total	15.4	16.2	17.0	17.2	3.4	3.4	3.3	
	EC				U.S.			
Yarn	5.5	5.8	6.1	6.3	6.2	7.3	7.9	8.3
Wool	1.4	1.5	1.5	1.6	0.4	0.5	0.7	0.7
Linen	0.2	0.2	0.2	0.1	0.3	0.3	0.6	0.6
Cellulose fiber	1.6	1.5	1.4	1.8	1.1	1.3	1.3	1.2
Synthetic fiber	5.8	5.5	6.1	6.0	10.9	13.4	13.2	13.0
Total	14.4	14.4	15.3	15.8	18.9	22.9	23.7	23.8
	West Germany				Japan			
Yarn	7.1	8.1	8.6	8.4	7.6	6.7	7.7	7.8
Wool	1.7	1.8	1.8	1.7	1.1	1.0	1.1	1.3
Linen	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.1
Cellulose fiber	2.0	2.1	1.4	3.1	1.6	1.5	1.6	1.5
Synthetic fiber	8.3	7.3	7.8	6.0	6.8	6.6	7.1	7.1
Total	19.3	19.4	19.8	19.4	17.1	15.8	17.7	17.7
	East and Southeast Asia				Near East			
Yarn	1.4	1.5	1.4		3.5	3.3	3.1	
Wool	0.0	0.0	0.0		0.7	0.7	0.6	
Linen	0.0	0.0	0.0		0.1	0.1	0.1	
Cellulose fiber	0.4	0.4	0.4		0.5	0.8	0.8	
Synthetic fiber	1.6	1.3	1.3		2.3	2.3	2.3	
Total	3.4	3.2	3.1		7.1	7.08	7.2	

Source: FAO

[Exports]

As of 1986, Japan was responsible for 4.8% of all world textile product exports (including garments). When broken down, Japan's shares of textile and garment exports are roughly 8% and 1.2%, respectively. Japan is the world's third largest exporter of textiles after West Germany and Italy. The main destinations for Japanese textile product exports are the U.S., Hong Kong, Korea, China, and Taiwan. When broken down by geographical region, Southeast Asia, at 49.2%, provides the largest market, followed by the U.S.

When broken down by product, it can be seen that woven fabrics account for more than half of all textile exports, with garments responsible for 10% and yarn for 16% (all figures as of 1987). The main products in the yarn sector are synthetic yarn, chemical yarn, wool yarn, and cotton yarn. Most synthetic yarn is of the long-fiber variety. Korea is the leading exporter. In the spun yarn sector, competition with products from Southeast Asia is growing more intense every year, and the strength of the yen has helped to place exports on a downward curve. The leading Japanese exports are acrylic and polyester, with cotton products accounting for only about 4% of all yarn shipments.

The woven fabric sector is dominated by synthetic and cotton woven fabric, of which Japan exported 455 million m^2 in 1987. Despite the continued rise of the yen, the adjustment of domestic prices, and the tightening of the supply-and-demand relationship in Japan, Japanese exports were supported by the continuing worldwide preference for natural fiber and favorable market conditions in Europe and the U.S.

Exports of synthetic-fiber woven fabric in 1987 totaled 1,602 million m^2 and were valued at 2,020 million dollars. Nylon long-fiber woven fabric has been selling well. This is because countries like Korea and Hong Kong are turning to Japan for taffeta and other materials for the production of clothing which will eventually be re-exported to markets in Europe and the U.S.

Exports of polyester are down due to factors such as the advances made by Korea and other East Asian nations, the preference for natural fibers in the industrialized nations, and the appreciation of the yen. Exports to North America have been hit not only by the strong yen but also by restrictions laid out in the Japan-U.S. Textile Agreement. The same is true for the EC. In Southeast Asian markets as well, the strong yen has meant intensified competition with Korean products.

Among short-fiber woven fabrics, polyester is on the decline, and the largest export, mixed polyester-cotton woven fabrics, has taken a particularly steep fall due to intensified competition with Southeast Asian products and the appreciation of the yen.

[Imports]

Japan is responsible for 3.3% of total world textile imports, ranking it ninth among importing nations. If garments are included, this ratio rises to 3.9%. When the discussion is limited to textiles, however, Japanese can be seen to import fewer textiles than Hong Kong.

1987 textile product imports jumped 48.4% over the previous year to 9,459 million dollars, the highest figure ever. When broken down by product, the figures were 2,699 million dollars for textile materials, 976 million dollars for yarn, and 1,083 million dollars for woven fabrics. In 1988 imports of yarn totaled 1,242 million dollars and those of woven fabrics 1,791 million dollars, with significant growth shown by textile products overall.

Imports of yarn amounted to 265,000 tons in 1987 and 300,000 tons in 1988 (an increase of 15%). The main imports were cotton yarn, man-made long-fiber yarn, and man-made short-fiber yarn. In terms of volume, cotton yarn accounted for 60% of all imports (in terms of value, the ratio was 55%).

Import statistics for the various types of yarn are provided below.

(Cotton yarn)

Japanese imports of cotton yarn amounted to 187,000 tons in 1987 and 200,000 tons in 1988. The leading supplier was Pakistan, whose products centered around No. 20 yarn. This nation has succeeded in increasing its exports based on stable quality and excellent price competitiveness. China and Korea were next on the list of leading suppliers. China has been expanding its exports evenly over all thread counts. Pakistan, Korea, and China together are responsible for 95% of all cotton yarn exports by volume (in value terms, the figure is 89%).

In synthetic-fiber yarn sector, imports of long-fiber polyester varieties from Taiwan and Korea for use in woven fabric and knits are on the rise. Regarding nylon yarn, Taiwan, the U.S., and West Germany are responsible for 91% of all supplies (in value terms). In the field of short-fiber yarn, acrylic is the main product, and Korea and Taiwan are the leading suppliers. Exports failed to increase in 1987 due to increased domestic demand in the exporting nations, but recovered in 1988.

Silk yarn and spun silk yarn are among the other types of yarn available. These are currently being imported from China, Korea, the U.S., and Italy. Finally, Korea, Italy, China, and Peru are the leading producers of wool yarn.

In the field of woven fabrics, cotton and synthetic woven fabrics are the largest imports in terms of volume. When viewed in value terns, however, wool and silk woven fabrics are also important.

1987 imports of cotton woven fabrics amounted to 560 million m^2 and were valued at 360 million dollars. In 1988, the respective figures were 689 million m^2 and 496 million dollars. China is by far and away the largest supplier of cotton woven fabrics, accounting for 80% of all imports by volume and 63% in dollar terms. Korea and India are next on the list in terms of volume. In 1987, approximately 3 million m^2 of cotton woven fabric was imported from Thaliand. In dollar terms, China was number one, followed by Korea, Italy, Switzerland, and Indonesia, indicating an aspect of product differentiation.

Korea, Italy, and China were the leading suppliers of silk woven fabrics. It should be noted that Japan maintains bilateral agreements concerning silk woven fabric imports with China, Korea, and Taiwan.

8-2. The U.S. Textile Market

8-2-1. Overview

The U.S. is the world's largest importer of textiles and garments and is also a leading producer of a wide variety of textile materials. It is the world's largest producer of man-made fiber and second-largest producer of cotton. Overall, however, little attention is paid to exports, and as a result textile exports amount to only about 3% of total production.

58% of textile consumption is destined for general industrial and household applications. This is one reason for America's heavy consumption of synthetic fiber. A breakdown of textile consumption shows man-made fiber by far and away the leader, with 64.5% of total consumption, followed by cotton, with 29.3%, other cellulose fiber, with 4.8%, and wool, with 1.4%.

Based on 1984 U.S. textile consumption of 5.44 million tons, the FAO predicts demand of 5.88 million tons in 1990 and 6.37 million tons in 1995. As of 1985, America's self-sufficiency ratio for textiles exceeded 70%, but as lower-priced products continue to establish themselves in the market this figure is expected to fall to approximately 60% by 1995. Per-capita consumption of textiles in the U.S. was calculated based on 1985 figures to be 23.2 kg. This is a full 5 kg higher than the average for industrialized nations.

8-2-2. Trade Trends

Textile trade in West Germany and Japan is characterized by a small gap between exports and imports. The U.S., on the other hand, imports far greater quantities of textiles and garments than it exports. In 1986, the U.S. imported 102.8 dollars worth of textiles per citizen. A breakdown of the regions from which these products are imported shows that 40% came from developing nations and 50% from industrialized nations. Imports from Thailand accounted for 1.4% of the total. When broken down by country, China, Hong Kong, Korea, and Taiwan were the largest suppliers.

As of 1986, the U.S. was the world's second-largest importer of textiles after West Germany. Despite the numerous bilateral agreements maintained with other nations for the restriction of further increases in imports, textile imports continue to rise. The 1985 figure of 4,800 million dollars rose to 5,600 million dollars in 1986 and 6,400 million dollars in 1987, with net trade deficits of 2,600 million dollars, 3,100 million dollars, and 3,700 million dollars, respectively, for these three years.

Imports of spun products totaled 4,800 million dollars in 1987 and 4,700 million dollars in 1988. In terms of volume as well, imports have remained steady. In value terms, Japan is the largest supplier of spun products to the U.S. market, followed by Italy, Korea, and China. When analyzed by volume, however, China is the largest supplier, followed by Taiwan, Japan, and Korea. Imports of spun thread totaled 280 million dollars in 1987 and are on the rise. Mexico, Italy, Japan, Egypt, and Turkey are the leading suppliers.

Regarding double-width woven fabric, imports of cotton woven fabric amounted to 1,280 million dollars in 1987 and 1,050 million dollars in 1988. Imports of woven fabric produced from man-made fiber totaled 1,220 million dollars in 1988. Imports of cotton woven fabric from Japan and China declined, but shipments from Hong Kong and Taiwan were on the rise. Imports of man-made fiber amounted to 340 million dollars in 1987 and 370 million dollars in 1988, indicating a slight increasing trend.

1988 U.S. shipments of spun goods totaled 5,980 million dollars (as compared with 5,770 million dollars in 1987); double-width cotton woven fabric, 4,300 million dollars (4,400 million dollars); man-made fiber woven fabric, 10,100 million dollars (9,300 million dollars); and man-made fiber, 12,200 million dollars (11,700 million dollars). There was some variation in each sector, but overall shipments showed a tendency to rise.

Let us now examine the relationship between shipments and imports. The ratio of shipments to imports was 7% - 8% for spun goods, 3% - 4% for spun yarn, 20% - 29% for double-width cotton woven fabric, 11.6% - 14% for man-made fiber woven fabric, and 2.5% - 3% for man-made fiber.

Although the ratio of imported woven fabric is relatively high and imports are currently on the rise, overall these imports do not appear to have a significant impact on the domestic market. The fact that there are no drastic increases in imports is believed to be the result of the various textile agreements in effect.

8-2-3. Trends by Industry Sector

The U.S. textile industry is characterized by rationalization. Fields which are not cost-competitive are abandoned in order to streamline operations. As of 1985, 22 of the world's 50 largest textile firms were American corporations.

One notable trend is the spread of the belief that cost-competitiveness is not everything. Attempts are also being made to effectively link the upstream and downstream sectors of the industry. Specifically, this work aims at minimizing the period of time required to respond to consumer needs. The project has been christened "Quick

Response" (QR) and is being promoted as a joint effort by the Textile Apparel Linkage Council (TALC) and the Suppliers Linkage Council (FASLINC).

This project is still in the testing stage, but its ultimate objective is to achieve the smooth transfer of information between suppliers, manufacturers, and retailers and thereby bring them in contact with actual demand.