2-3-2 Ceramics Manufacturing Industry

(1) Overview

The Indonesian ceramics industry is now entering a phase of rapid growth. Supported by increased domestic demand and rising exports in recent years, investment for the establishment of new operations and the expansion of existing ones is on the rise, and production capacity has increased significantly. On the local market supply and demand are tight, and industry enthusiasm for investment remains healty. Production capacity is expected to increase significantly during the next two to three years.

Indonesia's ceramics industry is thought to have very good potential for development as an export industry, assuming efforts are made to improve quality and technical level and reinforce marketing strength in preparation for the expected increase in export capacity.

1) Demand and supply trends

The ceramic product manufacturing industry of Indonesia entered a high growth era through a rapid increases in investments in the latter half of the 1970s. After experiencing a period of stagnation during the recession in the early 1980s, it again recently displayed its remarkable ability for development.

Tableware manufacturering industry expanded the production capacity a great deal through successive new entries of domestic firms in the second half of the 1970s and kept growing steadily in the 1980s as well. The actual output also grew steadily, with the operation rate of factories rising considerably. The apparent rate of operation (the ratio of actual output to the authorized production capacity) at the end of the fourth five-year plan stood as low as 64 percent. But such a low figure was due to the existence of a considerable number of enterprises not yet in operation or unable to utilize their facilities because of a shortage of skilled hands. The operating firms generally are considerably busy.

Construction materials - ie, sanitary ware and tile manufacturing industry also entered a high growth era in the latter half of the 1970s and sustained rapid expansion almost continually in the 1980s as well.

Sanitary ware manufacturering industry rapidly expanded the production capacity in 1977 with the establishment of joint ventures with Japanese enterprises. A U.S. joint venture and a domestic firm with technology provided from a Japanese enterprise entered the industry in 1984. In recent years, plant and equipment investments have been carried out in fast succession contributing to a further expansion of capacity. Though it experienced sluggishness due to stagnation of domestic demand in the first half of the 1980s, production has risen at an increasingly rapid pace since the second half of the 1980s. The apparent rate of operation is still as low as 60 percent. However, like tableware manufacturing industry, this low rate is due to the large number of facilities still awaiting the start of operation and a shortage of skilled workers. Factories in operation are working at full capacity.

Since the beginning of the 1980s, domestic tile manufacturing industry have begun actively investing in new plants and equipment and the expansion of existing facilities. Along with a great increase in production capacity, actual output also continued rising rapidly. Despite the sharp increase in the production capacity, the apparent rate of factory operation has reached a high 71 percent.

Table 2-3-2: Trends in Annual Average Increase in Production Capacity and Actual Output, and Rate of Operation of Ceramic Manufacturing Industry in the Second-to-fourth Five-year Plan Periods

(Unit: %)

	Annual average rate of growth (in plan period)			Apparent rate of operation (at the end of period)		
	Second	Third	Fourth	Second	Third	Fourth
Tableware						
Production capacity	16.5	3.5	3.5	51.3	60.8	64.1
Actual output	14.5	5.1	4.6			
Sanitary ware						
Production capacity	23.0	5.1	13.9	60.1	62.8	60.0
Actual output	19.3	6.0	12.9			
Tiles						
Production capacity	7.1	31.4	6.9	72.9	70.0	70.9
Actual output	8.1	30.3	7.2			

Source: Table Based on Ministry of Industry data.

Domestic demand remained extremely firm. Its annual average rate of growth during the fourth plan period stood at 4.6 percent for tableware, 8.2 percent for sanitary ware and 7.5 percent for tiles.

Demand for construction materials has become increasingly brisk recently. As a result of active construction of office buildings, dwelling houses and hotels in the Metropolitan area centering around Jakarta and its suburbs as well as in tourist areas in Bali, demand for tiles and sanitary ware has kept increasing. There is a chronic shortage of stock in tiles, with some firms selling below-standards products at customers' request. Although the tightness of supply is expected to be resolved within two or three years with the start of operation of new and expanded facilities and the slowdown in the pace of growth in demand, the scarcity of supply is likely to continue until then. Domestic demand for sanitary ware, too, has remained so strong that the supply shortage continues.

Domestic demand for tableware also has grown a great deal due to a construction boom of hotels and dwelling houses and a rise of national income. The current market situation may be said to be so favorable that any products, ranging from high to low grade products, will sell.

Exports also began to rise in 1987, and this was followed by a rapid growth from 1988. Value of tile exports in 1989 amounted to $5.02 million, or a gain of 251 times over four years before. In the same period, sanitary ware gained 21 times to $7.36 million, tableware 1,443 times to $11.55 million and novelties 97 times to $3.3 million. However, in 1990, tile exports plummeted due to the tightness of domestic supply/demand and that for other items also leveled off or declined with excess production capacity for export approaching its limit. Thus, total ceramic product exports for the year increased a meager 4.8 percent over a year earlier.

Table 2-3-3: Exports of Ceramic Product, 1985-90

(Unit: thousands of dollars)

	1985	1986	1987	1988	1989	1990
Tiles	20	9	142	2,458	5,021	2,943
Sanitary ware	353	1,129	3,832	6,713	7,358	7,863
Tableware	8	14	343	3,902	11,546	14,639
Statuette, ornaments	34	-	12	720	3,302	3,088
Total	415	1,152	4,319	13,793	27,227	28,538

N.B.: Every item corresponds to the HS code as shown below.
Tiles (69.07 - 69.08) Sanitary ware (69.10)
Tableware (69.11 - 69.12) Statuettes and ornaments (69.13)
Source: Indonesia Foreign Trade Statistics

Imports, after falling drastically in 1987, have risen gradually but remain sluggish in comparison with the growth in local demand. In 1989, imports of the four items amounted to only $4.49 million. However, in 1990, tile imports sharply rose to 8.6 times that of the previous year due to a sudden increase in domestic demand. With other items also increasing, the four-item total soared to $18.85 million.

As a result, the balance of trade for ceramics products shifted in 1987 to a surplus which has been growing ever since. Although the surplus in trade shrank in 1990 owing to a sharp increase in tile imports, it is now seen as being a transitional phenomenon.

Table 2-3-4: Imports of Ceramic Products, 1985-90

(Unit: thousands of dollars)

	1985	1986	1987	1988	1989	1990
Tiles	1,611	1,828	922	1,677	1,718	14,813
Sanitary ware	461	412	229	71	629	713
Tableware	453	1,611	1,095	1,132	1,299	1,946
Statuettes and ornaments	744	1,481	1,134	864	840	1,379
Total	3,269	5,332	3,380	3,744	4,486	18,851

Source: Same as Table 2-3-3.

Changes in the trade specialization coefficient (N.B.) clearly show the growth of ceramic product exports progressing at a far quicker pace than that of imports.

The coefficient of tableware in 1985 was low at -0.97, with trade centering on imports. But in 1988, it turned to a positive figure and in 1989 rose to 0.80 and kept high ratio of 0.75 in 1990, achieving a switchover to an export-dominant trade structure in only five years.

The coefficient of novelties, also, was low at -0.91 in 1985. But in 1988, exports and imports became balanced and in 1989 the coefficient reached 0.59 in 1990, 0.38, indicating a transition to a trade structure of exports overwhelming imports.

The coefficient of sanitary ware, whose manufacturers led others in the exploitation of export markets due to a dullness in domestic demand, turned positive in 1986 and has continued to stay above 0.8 since 1987. The figure for 1989 stood at 0.84 and in 1990 at 0.83, slightly lower than two years earlier, due to a decline in scope for export expansion resulting from a rapidly rising domestic demand.

The coefficient of tiles in 1988 turned positive after rising each year from 1985, when this figure was -0.98 in. Due to brisk domestic demand and the resultant lag in exports, it stood at 0.49 in 1989, lower than that of other products. The coefficient of specialization of trade in 1990 fell to a negative -0.67 owing to a sharp increase in imports and a decrease in exports. But it is fully expected that the coefficient will return to a positive figure in the coming few years.

(N.B.) The trade specialization coefficient is calculated by the following formula, taking exports as Ei and imports as Mi:

$$\frac{Ei - Mi}{Ei + Mi}$$

The trade specialization coefficient ranges from -1 to +1, with -1 indicating zero exports, 0 balanced exports and imports, and +1 zero imports.

Table 2-3-5: Changes in Trade Specialization Coefficient (%)

	1985	1986	1987	1988	1989	1990
Tiles	-0.98	-0.99	-0.73	0.19	0.49	-0.67
Sanitary ware	-0.13	0.47	0.89	0.98	0.84	0.83
Tableware	-0.97	-0.98	-0.67	0.55	0.80	0.75
Novelties	-0.91	-1.00	0.98	-0.09	0.59	0.38
Total	-0.77	-0.64	0.12	0.57	0.72	0.20

Source: Calculated from Tables 2-3-3 and 2-3-4.

Table 2-3-6: Trends in Demand/supply Relations of Ceramic Products

	End of Repelita I (March 1974)	End of Repelita II (March 1979)	End of Repelita III (March 1984)	End of Repelita IV (March 1989)
Tableware				
Production capacity (tons)	11,900	25,567	30,327	36,037
Actual output (tons)	7,300	14,360	18,433	23,115
Demand (tons)	10,000	5,000*	15,930	20,000
Sanitary ware				
Production capacity (tons)	4,972	13,970	17,937	34,377
Actual output (tons)	3,476	8,400	11,235	20,625
Demand (tons)	6,000	9,000	11,250	16,650
Tiles				
Production capacity (m^2)	41,324	58,134	227,300	317,980
Actual output (m^2)	28,725	42,369	159,110	225,531
Demand (m^2)	36,000	50,000	154,708	222,540

* There is doubt about this figure.
Source: Ministry of Industry data

2) Recent Development

In recent years, numerous firms have newly entered the ceramics industry in Indonesia. Based on the figures for investment approval granted by the Investment Coordination Board (BKPM) and the Ministry of Industry, the number of firms in the tableware and novelty item sectors grew 76% to 30 in the three-and-a-half year period from the end of 1986 through June 1990; in the sanitary ware sector, 80% to nine firms; and in the tile sector, 39% to 25 firms. Together, the number of companies in the ceramics industry grew 60% to 64 firms. As of June 1990, a total of 52 firms (23 in tableware, eight in sanitary ware, and 21 in tiles) were in operation, while the remaining 12 were either under construction or preparing for operation. There is also active investment by existing firms for the expansion of operations, and the size of the industry is increasing rapidly. The number of (planned) employees in the above three sectors is 17,270 (up 104%), 2,180 (up 102%), and 13,770 (up 94%), resulting in a combined increase of 99% to 33,120 for the industry. Planned production capacity for the three sectors is 103,760 tons (up 143%), 42,180 tons (up 120%), and 909,330 tons (up 66%), representing a combined increase of 73% to 1,055,270 tons.

The above figures are limited to large and medium-size firms which had received government approval for investment (based on the Domestic and Foreign Investment Laws); a large number of small businesses and cottage industries are also in existence.

Table 2-3-7: Development in the Ceramics Industry (based on figures of government-approval of investment)

	End of 1986	June 1988	June 1990	
Tableware, novelties				(in operation)
Number of companies	17	25	30	(23)
Number of employees	8,473	12,022	17,271	
Production capacity (tons)	42,678	58,806	103,762	
Investment (million of rupiahs)	31,985	101,141	277,425	
Sanitary ware				
Number of companies	5	7	9	(8)
Number of employees	1,082	1,672	2,184	
Production capacity (tons)	19,155	34,528	42,177	
Investment (millions of rupiahs)	37,248	43,847	44,735	
Tiles				
Number of companies	18	24	25	(21)
Number of employees	7,112	8,211	13,765	
Production capacity (tons)	548,437	614,089	909,328	
Investment (millions of rupiahs)	87,617	119,453	310,497	
Total				
Number of companies	40	56	64	(52)
Number of employees	16,667	21,905	33,120	
Production capacity (tons)	610,270	707,423	1,055,267	
Investment (millions of rupiahs)	156,850	264,441	632,657	

Source: Investment Coordination Board and Ministry of Industry

3) The Ceramics Industry in Relation to Industry as a Whole

Although the ceramics industry is in a phase of rapid growth, it accounts for a very limited share of industry as a whole. According to Indonesian industrial statistics for large and medium-size companies, there were 53 ceramics-related firms extant as of 1988, accounting for only 0.4% of the industry-wide total. Production value amounted to 133.5 billion rupiahs, 0.3% of the total; gross added value, 53.4 billion rupiahs, or 0.4% of the total; and exports (of the above four items), 0.4%.

Productivity is also low overall. Based on industrial statistics, total production value per employee in the ceramics industry amounts to only 8.27 million rupiahs/year, 39% of the industry-wide average, while gross added value per employee is 3.34 million rupiahs, roughly 50% of the figure for industry as a whole.

However, the ceramics industry has made a significant contribution to the creation of employment. The number of employees per company averages 305, roughly 2.2 times the industry-wide average, while the total number of employees in the industry amounts to 16,190, representing 0.6% of industry as a whole.

For Indonesia, the ceramics industry is also worthy of promotion because it provides a place for the utilization of local labor and resources. It is therefore hoped that it can develop through improved productivity and thereby attract new investment.

Table 2-3-8: Position of Ceramic Product Manufacturing in Industrial Sector (sector of medium and large enterprises) (1988)

	Whole industry	Ceramic industry*
Number of business establishments	14,664	53
Number of employees	2,064,689	16,187
Labor cost (million rupiah)	2,836,068	18,899
Total production (million rupiah)	43,753,194	133,481
Gross added value (million rupiah)	13,873,758	53,991
Number of employees per business establishment	141	305
Production per business establishment (million rupiah)	2,964	2,519
Gross added value per business establishment (million rupiah)	946	1,019
Production per employee (million rupiah)	21.19	8.27
Gross added value per employee (million rupiah)	6.72	3.34

*Whole ceramic products including tiles, flowerpots, glass, ceramic glass, firebricks, marble tables and water jugs.
Source: Statistik Industri Besar Dan Sadang 1988

(2) Tableware, Novelties Manufacturing Industry

These sectors had their beginnings in the 1930s. At the time, they consisted of cottage industries producing cooking implements, pitchers, and flowerpots using traditional methods, but in the 1970s companies began to introduce modern technology from abroad, and significant development was achieved in the latter half of the 1980s.

At present, Indonesia has the capacity to produce a wide range of products, including plates, cups, teapots, tea and coffee serving sets, dinner sets, and novelty items.

Table 2-3-9: Production of Tableware and Novelties (1988)

	Unit	Quantity	Value (thousands of rupiahs)
Plates	1,000pc	34,902	5,988,744
Bowls	1,000pc	6,485	3,705,352
Cups	1,000pc	23,865	1,103,934
Gift sets	1,000set	178	932,385
Coffee serving sets	1,000set	95	686,032
Tea serving sets	1,000set	66	607,227
Saucers	1,000pc	1,436	223,833
Teapots	1,000pc	58	81,785
Teapot sets	set	1,036	3,625
Dinner sets	set	24	4,429
Ashtrays	1,000pc	4	35,192
Statuette	pc	1,064	15,740
Ornaments	pc	412	4,061

Source: Statistik Industri Besar Dan Sedang 1988

Most of the companies are concentrated in West Java, mainly in the area around Jakarta, where consumption is concentrated. As of June 1990 (based on figures for government-approved investment) there were 17 firms in West Java, six in Surabaya and surrounding areas in East Java, two each in Jakarta, Central Java, and West Kalimantan, and one in Bali for a total of 30 (23 of which are currently in operation).

The average number of employees per firm was 576, bigger than the figures of 243 for sanitary ware and 551 for tiles. On the contrary, investment per employee amounted to 16 million rupiahs, smaller than the figures of 20 million rupiahs and 23 million rupiahs for the latter two sectors. This suggests that the tableware industry is a highly labor-intensive field and that investment has a larger effect in creating new jobs.

Many of the companies in these sectors have introduced facilities and technology from Japan and Taiwan.

Companies can be divided into two groups: those dependent on domestic demand and those with a relatively high export orientation.

Export-oriented firms are enthusiastic about the improvement of technical levels, and raw materials are often imported.

The biggest foreign customer of tableware is the United States, accounting for 40.5 percent of total exports, followed by Japan (10.1 percent), Australia (8.0 percent), Singapore (6.6 percent), Netherlands (5.3 percent), the United Kingdom (5.3 percent) and former West Germany (2.4 percent) (1990). Out of these countries, the United States, Japan and Singapore alone have been big customers for three successive years, with the rest being new markets to which exports began in 1989.

Most of novelties are exported to the United States (78.3 percent). Exports to Canada, the United Kingdom and Singapore have also begun, but still only on a small scale.

Table 2-3-10: Exports of Tableware by Countries

(In US$)

	1985	1986	1987	1988	1989	1990
United States	-	138	20,825	1,133,291	4,432,324	5,932,703
Japan	120	-	289,168	1,597,468	3,294,999	1,483,549
Singapore	7,385	-	3,535	335,442	1,159,588	963,157
United Kingdom	-	-	-	-	944,106	519,905
Jordan	-	-	-	-	487,721	38,550
West Germany	-	-	-	-	342,584	356,244
Australia	-	-	-	-	312,189	1,168,381
Malaysia	-	13,950	-	-	296,126	310,651
Netherlands	-	-	29,891	-	235,909	782,474
Total	7,505	14,088	343,419	3,901,524	11,505,546	14,638,894

Source: Same as Table 2-3-3.
(N.B.) Do.

Table 2-3-11: Exports of Novelty by Countries

(In US$)

	1985	1986	1987	1988	1989	1990
United States	31,286	125	10,996	645,370	2,861,799	2,417,689
Canada	-	-	65	14,180	116,450	73,032
United Kingdom	-	-	-	24,890	98,687	111,440
Singapore	2,888	-	-	16,926	68,133	93,590
Malaysia	-	-	-	-	52,696	32,756
Netherlands	-	-	-	16,133	41,937	12,843
West Germany	-	-	499	2,389	25,593	39,013
Portugal	-	-	-	-	19,131	70,110
Hong Kong	-	100	-	-	18,034	391
Total	33,974	225	11,560	719,888	3,302,460	3,087,523

Source: Same as Table 2-3-3.
(N.B.) Do.

(3) Sanitary Ware Manufacturing Industry

Efforts at modernization have been more notable in the sanitary ware sector than in the tableware field, and the former has now established a foothold as a modern industry. This industry began its present course of development with the establishment of a Japanese-affiliated joint venture in 1977, and in 1984 a U.S.-affiliated joint venture and a local company which had introduced technology from a Japanese company were established, resulting in a dramatic increase in the size of the industry. There are currently eight firms in operation, with the above three firms maintaining a huge lead. The Japanese affiliate joint venture in particular stands above the rest. This firm maintains the biggest production capacity of any in Indonesia (600,000 units per year), and they are export base in their group. Quality control standards are equal to those at their headquarters in Japan, and they far surpasses the other companies in terms of both quantity and quality. The capital investment carried out by these leading firms is largely responsible for the rapid expansion of production capacity seen in the sanitary ware industry in recent years.

The main production items at present are toilet stools, washbasins, and bathtubs, with specifications being modified according to the intended buyer.

Production capacity for the industry is concentrated in West Java; in its early days, firms in the industry tended to locate in areas of local consumption. In advance of other ceramics sectors, however, this sector began full-scale exports starting in the mid-1980s, and performance has been improving steadily each year since. Growth in exports during the past two years has been limited in comparison with the tableware and tile sectors, but this is due to the fact that exports have already reached a certain level coupled with a dramatic increase in domestic demand. Export ratios at the three leading firms have already reached figures of 40-80%, and export growth is being restrained in order to satisfy demand from local buyers.

Italy is the largest customer nation, receiving 27.5 percent of exports, followed by the United States (16.8 percent), Taiwan (16.2 percent), R. Korea (8.7 percent), Hong Kong (8.7 percent) and Japan (5.8 percent). Although the destinations of the exports are varied centering around Europe and America, Japan and Asian NIEs, main markets greatly differ with individual firms. Exports are made through the use of brands of parent companies or OEM methods.

Currently, many firms are planning investments for expansion of facilities. Thus that the supplying capacity is expected to be boosted considerably within several years.

Table 2-3-12: Exports of Sanitary Ware by Countries

(In US$)

	1985	1986	1987	1988	1989	1990
Italy	-	836,113	2,490,788	3,236,289	3,889,485	2,165,624
Taiwan	31,238	90,397	371,418	1,218,168	1,211,265	1,278,102
France	-	1,423	373,189	737,935	502,239	86,970
United States	832	1,681	26,502	156,126	481,070	1,322,804
Japan	-	75	23,916	527,977	423,874	606,937
R. Korea	18,290	25,122	31,154	156,705	358,868	680,756
Hong Kong	1,362	16,130	181,723	412,943	230,591	686,307
Singapore	278,541	114,330	238,404	196,239	132,083	359,053
Malaysia	22,400	43,692	94,713	70,833	129,111	319,149
Total	352,663	1,128,963	3,831,807	6,713,215	7,358,586	7,867,581

Source: Same as Table 2-3-3.
(N.B.) Do.

(4) Tile Manufacturing Industry

The tile manufacturing industry received its start in the early 1970s. The industry was placed in difficult straits as a result of the recession stretching from the early to mid-1980s, but in recent years the boom in construction has brought about a rapid turnaround for the economic environment. Both new and expansion investment have been very active during the past two years, and production capacity is increasing at a rapid pace. Even today, however, supply has yet to keep pace with demand. Many firms in the industry have plans for expansion investment, and new companies continue to enter the field. As a result, production capacity is expected to increase even further.

Unlike the sanitary ware sector, this industry is led by local companies. Of the 21 registered firms currently in operation as of June 1990, only one was a joint venture with a foreign company (another joint venture with Japanese firm recalled its capital when the joint venture agreement expired in August 1990).

70% of production capacity is concentrated in Jakarta and West Java, although East Java, with capacity slightly less than 30%, is also an important producing area.

In the past, many firms introduced manufacturing equipment and technology from Taiwan and Japan, but in recent years Italian mass-production equipment has become the mainstream. Most of the raw materials are produced locally, and the majority of products are sold on the local market. In addition, exports to Singapore, Hong Kong, R. Korea, Australia, and Canada are increasing rapidly. Few firms are engaged in exports, however, and most companies simply do not have the excess production capacity required for exports. Export in 1990 decreased remarkably due to rapid increase of domestic demand.

In the tile industry, the recent investment surge has been greeted with a mixture of hope and uncertainty, with many firms being worried that, if the current situation continues, the local market will begin to suffer from oversupply in around 1992. In such a case, the development of export markets would be the only means of escape, but even then it would be impossible to simply reroute products destined for international market.

As a result, it is predicted that during the coming several years there will be a clear split between those firms producing high-grade and low-grade products.

Table 2-3-13: Exports of Tile by Countries

(In US$)

	1985	1986	1987	1988	1989	1990
Singapore	8,070	9,280	16,981	610,415	1,563,331	1,017,334
Australia	-	-	13,922	442,331	860,499	413,790
Hong Kong	-	-	65,266	684,212	763,886	227,811
R. Korea	-	-	-	31,921	560,727	494,799
United States	11,681	-	22,948	338,261	546,001	288,424
Canada	-	-	-	248,136	406,368	180,539
Taiwan	-	-	-	97,351	169,990	276,755
Brunei	-	-	23,084	5,873	124,866	-
Spain	-	-	-	-	25,484	-
Total	19,751	9,280	142,201	2,458,500	5,021,152	2,943,031

Source: Same as Table 2-3-3.
(N.B.) Do.

(5) Demand outlook

1) Domestic demand

This section provides a projection of domestic demand as a helpful means for forecasting the future size of the ceramic product manufacturing industry.

Population and standard of living greatly affect demand for tableware. Accordingly, future demand was calculated by using population, per capita private consumption spending and actual demand as coefficients (Table 2-3-14).

The result showed that demand for tableware will increase at an annual average rate of 4.2 - 5.3 percent and reach 30,145 - 33.574 tons in 1998, if the total private consumption spending rises at an annual average rate of 5 -7 percent.

A tendency is observed in developing countries is that when the standard of living surpasses a certain stage, demand for tableware changes from glass or plastic products to higher-grade ceramics. In Indonesia, accordingly, there is a good possibility that actual demand may get larger than the value predicted above.

Demand for sanitary ware and tiles are greatly affected by the scale of construction activities and changes in the quality of buildings. Accordingly, future demand was calculated using the total production value of the construction industry, the per capita production value of the construction industry and actual demand as coefficients (Table 2-3-15 -- 2-3-16).

The result shows that, if the total production value of the construction industry grows at an annual average rate of 5 - 7 percent, demand for sanitary ware will increase at an annual average rate of 3.5 - 5.4 percent and reach 31,509 - 37,544 tons in 1998 and demand for tiles at an annual average rate of 7.6 - 9.5 percent to 46,345 - 55,227 tons.

Because actual demand was unavailable, similar calculation about novelties could not be made. Roughly speaking, the market of modernistic products is expected to expand, though that of traditional ornaments may be limited to a modest growth.

2) Export

Exports are expected to continue stable expansion, though the rapid growth experienced over the past several years following the start of exports will not be able to be repeated.

Tableware exports will expand centering on products of medium or low grade for the three major markets of the United States, Japan and Singapore. The Asian NIEs, not yet exploited so far, seem as though they will be promising markets in the future. Issues arising out of attempts for further expansion of markets, however, are the establishment of assured quality, design and time of delivery as well as a guarantee of a rich assortment of products. Excessive dependence on low prices alone will face its limits sooner or later.

Exports of novelties will expand mainly to the United States. Exploitation of European and Japanese markets also can be expected. However, only two firms are exporting in earnest in the industry so that the production capacity is limited. It seems that exports in the future depend on entry of foreign enterprises through joint ventures or technological tie-ups.

Stable expansion of sanitary ware can be fully expected because three high-ranking firms have "taken off" as exporting enterprises. Great expectations may be held for the near future when facilities' expansion of the three firms will be completed. Exports to the NIEs are likely to be particularly promising.

Tile exports are also expected to increase to Singapore and other Asian NIEs in the long term, although decreased remarkably in 1990. An export drive is likely to take place in two or three years time when the currently tight domestic demand/supply situation is expected to be eased.

It is important, however, that efforts should be made to improve quality and the assortment of products, stability of supply and accurate observation of delivery time. It is also indispensable that marketing efforts should be strengthened to grasp overseas market trends in detail.

Table 2-3-14: Changes in Domestic Demand of Tableware and Forecast

	Population (1,000 men)	Per capita private consumption expenditure (rupiah, in 1973 prices)	Demand (tons)
1973 (actual)	128,800	36,390	10,000
1978 (actual)	136,631	49,360	5,000
1983 (actual)	152,679	71,180	18,433
1988 (actual)	175,589	73,970	20,000
1993 (forecast)	192,935	86,160~94,680	24,969~26,389
1998 (forecast)	210,936	100,580~121,460	30,145~33,574

(N.B.) Actual
[1] Population is taken from the data of Central Statistics Bureau
[2] Per capital private consumption spending is taken from 1991/92 version of Budget Paper.
[3] Demand is taken from the data of Indonesian Ministry of Industry data.

Forecast
[1] Population in 1993 is taken from fifth five-year plan. Population in 1998 is calculated on the assumption of an annual average growth rate of 1.8 percent.
[2] Per capita private consumption spending is calculated on the assumption of an annual average rate of total expenditure growth of 5 - 7 percent (predicted amount is calculated on 1973 prices by using as coefficients 1983 and 1973 prices as announced by the government) and population growth as stated above.
[3] Demand is forecast by the following formula obtained from actual results in the past on the basis of population and per capita private consumption expenditure.
$y = ax1 + bx1 + c$
y; demand, ax1; population bx1; per capita private consumption expenditure c; intercept (- 19.26992)

Table 2-3-15: Changes in Domestic Demand of Sanitary Ware and Forecast

	Total production value of construction industry (billion rupiah, in 1973 prices)	Per capita production value of construction industry (rupiah, in 1973 prices)	Demand (tons)
1973 (actual)	262.0	1,980	3,600
1978 (actual)	1,242.1	8,910	5,000
1983 (actual)	4,433.7	27,440	15,471
1988 (actual)	5,072.1	28,320	22,254
1993 (forecast)	6,473.4~7,113.9	32,980~36,250	26,646~27,398
1998 (forecast)	8,261.8~9,977.5	38,500~46,500	31,509~37,544

(N.B.) Actual
[1] Total production value of construction industry is taken from 1991/92 version of Budget Paper.
[2] Per capita production value is calculated from population.
[3] Demand is taken from Indonesian Ministry of Industry data.

Forecast [1] Production value of construction industry is calculated on an estimated annual average growth rate of 5 - 7 percent (predicted value is calculated in 1973 prices similarly to tableware).

[2] Demand is predicted by the following formula obtained from actual results in the past on the same basis as stated above).

$y = ax1 + bx2 + c$

y; demand, ax1; total production value of construction industry, bx2; per capita total production value of construction industry, c; intercept (2436.7390)

Table 2-3-16: Changes in Domestic Demand of Tile and Forecast

	Total production value of construction industry (billion rupiah, in 1973 prices)	Per capita production value of construction industry (rupiah, in 1973 prices)	Demand (1,000m^2)
1973 (actual)	262.0	1,980	3,600
1978 (actual)	1,242.1	8,910	5,000
1983 (actual)	4,433.7	27,440	15,471
1988 (actual)	5,072.1	28,320	22,264
1993 (forecast)	6,473.4~7,113.9	32,980~36,250	32,517~35,374
1998 (forecast)	8,261.8~9,977.5	38,500~46,500	46,345~55,227

(N.B.) Same as Table 2-3-13, except for c=3535.4176

2-3-3 Industrial Associations: Organization and Activities

The Indonesian Ceramic Association (ASAKI) is the only organization representing the entire ceramics industry (excluding the raw material sector).

(1) Capsule History of ASAKI

ASAKI was established under the leadership of the Ministry of Industry, public research institutes and other government agencies with the objective of promoting the development of the ceramics industry. The group's first chairman was Mr. Darubroto, who was then serving as the director of the Ministry of Industry's Institute for Research and Development of Ceramic Industry (IRDCRI). At the time, ceramic industry development lagged behind, and ASAKI activities were limited to a consultative role for the government. Notable activities during the 1970s included cooperation in the formulation of industrial standards by the Ministry of Industry and the provision of data to be used in establishing local industry protection policies.

Together with the growth of the ceramics industry in the 1980s, ASAKI gradually became more active. It dispatched representatives to the 1st ASEAN Ceramic Fair and Workshop, held in Bangkok in March 1980 and sponsored by the Ceramic Industry Club of ASEAN (CICA). In December of the same year ASAKI was accepted as an official member of CICA, and the organization's second general meeting was held in Jakarta. From this point through November 1990, ASAKI has participated in all of the CICA board meetings (11 times), executive committees (6), and general meetings (8) together with the trade fairs, survey missions, and training sessions participated in or sponsored by CICA in various ASEAN nations as well as Italy and Australia. In March 1991, ASAKI plans to participate in the 8th Fair and Workshop and ninth general meeting, scheduled to be held in the Philippines.

Other ASAKI independent activities have included the approximately bi-annual sponsoring of the Pameran Keramik Indonesia, a local ceramics fair first held in May 1984, joint implementation with the IRDCRI in 1988 of a two-stage training program involving quality control for ceramic tableware and novelties, and the joint sponsoring of a technical seminar in July 1990 with SACMI, an Italian manufacturer of ceramics equipment. A second technical seminar is scheduled for the end of 1990, and the organization has plans to exhibit at the Australian trade fair to be held in April 1991. ASAKI will also sponsor the 4th Pameran Keramik Indonesia in November 1991.

(2) Current Organization and Activities

The current chairman is Mr. Soejatno, director of PT Keramika Indonesia Associasi, who was appointed in April 1990. He succeeded Yudi Lesmana, president of PT Danto Indonesia Tile.

Members include the IRDCRI and 53 companies: 16 tile manufacturers, nine tableware manufacturers, three sanitary ware manufacturers, five novelty manufacturers, three manufacturers of various products, and 17 manufacturers and suppliers of other products and auxiliary materials. Judging from the fact that virtually all of the large companies in the industry and the industry's sole R&D institute, the IRDCRI, belong to ASAKI, its organization is thought to be sufficient.

The main objectives of ASAKI activities are the promotion of technology, the strengthening of marketing activities, and promotion of the local handicraft industries. Assistance for the handicraft industry, which is emphasized from the standpoint of improving income levels among the rural population, includes providing superior

samples, invitations to the Pameran Keramik Indonesia, and the arrangement of visits to and study tours in large companies.

However, ASAKI activities remain insufficient. Even many of the member firms view the organization merely as an informal social group, and few have great expectations of its activities.

This situation stems from the following factors:
(1) As the organization itself is glad to admit, ASAKI suffers from a serious lack of funding.
(2) The industry is extremely busy at present, and board members have little time or energy to commit to Association activities.
(3) The Association has only a short history, and it have little of the required know-how.
(4) Generally speaking, the member firms tend to prefer independent activities and are not particularly cooperative.
(5) The industry itself has only a short history, and the number of companies is limited; at present, therefore, the benefits to be gained from inter-company exchanges and division of labor are limited.

It should be pointed out, however, that ASAKI activities themselves are not being rejected. The technical seminar, for example, has attracted a great deal of attention locally due to the inadequacy of such opportunities in this country. In particular, there have been strong demands for the sponsoring of more practical seminars and training for plant foremen, etc. The Pameran Keramik Indonesia also provides small businesses with a valuable opportunity to learn about new markets, products, and technologies. It is expected that practical industrial promotion activities by ASAKI jointly with IRDCRI will become increasingly important in the future.

(3) ASAKI's Requests

With respect to assistance from the Indonesian government and Japan, the ASAKI office indicated the following requests:

[Requests to the Indonesian government]
(1) Promotion of peripheral industries
(2) Funding assistance for the industry and industrial associations
(3) Enhancement of the natural gas supply network

[Requests to Japan]
(1) Implementation of financial and technical assistance for the IRDCRI. Assistance similar to that provided for the Ceramic Research and Development Center (CRDC) in the Philippines is hoped for.
(2) Expansion of opportunities for training in Japan; simplification of related procedures.

2-3-4 Current Status of Corporate Management, Production and Technology

(1) Corporate Management

1) Corporate Classification

30 ceramics manufacturers were visited in the local survey, and a comprehensive evaluation of the 29 firms (excluding the one whose plant could not be observed) was conducted (Table 2-3-19).

Based on this survey, ceramics manufacturers were classified into five categories as shown in Tables 2-3-17 and 2-3-18.

The classifications were based on "Corporate Diagnoses by the Surveyors" obtained through company visits involving plant observation and direct interviews with management. Evaluation items included product quality, production and technology standards, technology and product development capabilities, production scale, management techniques, and labor management.

Table 2-3-17: Classification of Ceramics Manufacturers

Corporate classification	Overall evaluation	Corporate type
Type A	more than 70	Export-oriented firms with international level
Type B	60 - 69	Firms capable of exports
Type C	50 - 59	Local market-oriented firms conditionally capable of exports
Type D	40 - 49	Local market-oriented firms
Type E	less than 40	Local/cottage industries

Table 2-3-18: Overall Evaluations for Each Corporate Classification (out of a possible 10 points)

Corporate classification	Product	Production/Technology						Administration Management/ Labor Management		
	Quality	Raw material management	Quality control	Facility management	Operation management	Technology/ product	Production scale	Working environment, safety and hygiene	Administration management	Education and training
Type A (average for four firms) (three manufacturers of sanitary ware, one of novelties)	8.0	8.5	8.5	8.0	8.5	6.5	9.0	7.8	7.3	8.0
	Latest facilities. Full range of testing and research facilities. Excellent in-house training programs. Superior working environment.									
Overall evaluation	80.1 Excellent						(Export-oriented firms with international level)			
Type B (average for 12 firms) (nine manufacturers of files, two of table ware one of novelties)	6.9	7.1	7.0	6.6	6.6	4.5	7.3	6.3	6.3	4.0
	Modern facilities with testing and research facilities. In-house training programs. Good working environment.									
Overall evaluation	62.6 Good						(Firms capable of exports)			
Type C (average for three firms) (one manufacturer of tiles, two of table ware)	5.0	5.7	5.7	6.3	6.0	4.3	6.0	6.0	5.7	3.3
	Modern facilities but aging. Poor testing and research facilities. On-the-job training only. Ordinary working environment.									
Overall evaluation	54.0 Ordinary						(Local market-oriented firms conditionally capable of exports)			
Type D (average for three firms) (one manufacturer of tiles, two of tableware)	4.3	4.7	4.7	5.0	5.0	3.0	6.0	3.7	3.7	2.7
	Outdated facilities. Virtually no testing and research facilities. Virtually no training or instruction of employees. Inferior working environment.									
Overall evaluation	42.8 Inferior						(Local market-oriented firms)			
Type E (average for seven firms) (two manufacturers of tiles, one of tableware, four of novelties)	4.0	3.0	4.3	3.3	4.0	2.3	3.9	3.0	3.3	1.7
	Facilities are outdated and aging. No testing and research facilities. No employee training or guidance. Poor working environment.									
Overall evaluation	32.8 Poor						(Local/cottage industries)			

Table 2-3-19: Comprehensive Evaluations by Product and Company

Company abbreviation		Product	Production/Technology						Administration Management/Labor Management			Overall evaluation
		Quality	Raw material management	Quality control	Facility management	Operation management	Technology/ product	Production scale	Working environment Safety and hygiene	Administration management	Education and training	
Sanitary ware	AA	9	9	9	8	8	7	9	8	8	9	84
	AB	7	9	9	8	8	7	9	7	7	8	79
	AC	7	8	8	7	8	6	9	7	6	7	73
Average		7.7	8.7	8.7	7.7	8.0	6.7	9.0	7.3	7.0	8.0	78.7
Tiles	BA	8	7	8	7	6	4	10	6	7	4	67
	BB	6	8	7	7	7	4	9	6	7	3	64
	BC	7	7	7	8	6	4	8	7	6	3	63
	BD	6	7	7	7	6	4	9	6	7	4	63
	BE	6	7	7	7	7	4	7	7	6	5	63
	BF	6	7	7	7	6	4	6	7	7	5	62
	BG	8	8	8	6	7	5	7	5	5	3	62
	BH	8	6	5	6	7	4	7	7	5	5	60
	BI	8	7	7	6	7	4	6	6	6	3	60
	BJ	6	5	6	7	6	4	7	7	5	3	56
	BK	5	5	5	5	5	3	6	4	4	2	44
	BL	4	3	5	3	5	2	6	2	4	2	36
	BM	5	3	4	3	3	3	4	2	4	2	33
Average		6.4	6.2	6.4	6.1	6.0	3.8	7.1	5.5	5.6	3.4	56.4
Table ware	CA	7	7	7	7	7	6	9	7	6	5	68
	CB	6	7	7	6	7	6	7	6	7	4	63
	CC	5	7	6	6	6	6	4	6	6	4	56
	CD	4	5	5	6	6	3	7	5	6	3	50
	CE	4	5	4	5	5	3	8	3	4	3	44
	CF	4	4	5	5	5	3	4	4	3	3	40
	CG	3	3	5	3	4	3	3	3	3	2	32
Average		4.7	5.4	5.6	5.4	5.7	4.3	6.0	4.9	5.0	3.4	50.4
Novelties	DA	9	8	8	9	9	6	9	9	8	8	83
	DB	7	7	7	5	6	5	8	5	6	4	60
	DC	4	3	4	4	4	2	3	4	3	4	35
	DD	4	3	4	4	4	2	4	4	3	2	34
	DE	4	3	4	3	4	2	4	3	3	2	32
	DF	4	3	4	3	4	2	3	3	3	2	31
Average		4.7	4.5	5.2	4.7	5.2	3.2	5.2	4.7	4.3	3.7	45.8
Overall evaluation		5.9	5.9	6.2	5.8	5.9	4.1	6.6	5.4	5.4	4.0	55.1

2) Corporate Characteristics by Type

Generally speaking, those firms falling in Types A, B, and C have the potential for exports. Those in Type A are export-oriented corporations; virtually most of those in Type B, local market-oriented firms which have the potential for exports; and those in Type C, firms which have the potential for exports if certain conditions are satisfied (most of them are not exporting at present). Therefore, as its main object, the policy of export orientation for Indonesian ceramic industry should be applied especially to those firms falling in Type B and Type C which have the potential for exports. These firms amount to 52% of the companies surveyed this time.

Overall, Type A firms have achieved international levels and have succeeded in establishing themselves as export corporations.

Type B firms are at slightly lower than international levels, and future expansion of exports will require greater efforts to improve quality of products. This in turn will require the improvement of production methods and the introduction of quality control systems.

Type C firms do not have the excess production capacity required for exports as a result of healthy domestic demand. In addition, poor international competitiveness in terms of quality makes these firms dependent on the local market. It is essential, however, that they take advantage of the current business climate to prepare for the future and make an all-out effort to improve quality. If no such effort is made, these firms will be downgraded to Type D and will lose the opportunity to develop into export corporations.

At present, the firms in Type D have virtually slight possibility of becoming export corporations, and their performance is vulnerable to the ups and downs of local demand. This is all the more true because these firms fall into the category of mechanized modern industry.

The tile and tableware manufacturers in Type E are local and cottage industries supplying inexpensive, low-quality products to low-income consumers in rural areas. They have little to do with exports, nor are they affected greatly by trends in the local business climate, and they will continue to serve as the bottom for Indonesia's ceramics industry. It is estimated that many of the small businesses which were not visited as part of the field survey fall into this type. The characteristics of novelties manufacturers are some what different, since these firms are manufacturers of the products referred to as "ceramic handicrafts." Products of these firms are sold to foreign tourists as souvenirs, thereby contributing to indirect exports, and some of the products also have artistic value, leaving open the possibility for direct exports. However, the study based its evaluation on the standard of the modern corporation, classifying these small producers of ceramic handicrafts into Type E.

3) Current Status of Corporate Management -- Areas of Interest Expressed by Corporate Managers

Areas in which interest was expressed by the managers of ceramics manufacturers in the questionnaire survey are shown in Table 2-3-20 and Fig. 2-3-2.

These Table and Figure show the results of survey presenting managers with a list of 20 objectives for corporate management and asking them to select the five areas in which they were most interested or had the most concern. Since several companies selected more than five areas, so that the average number of responses per firm is slightly more than five.

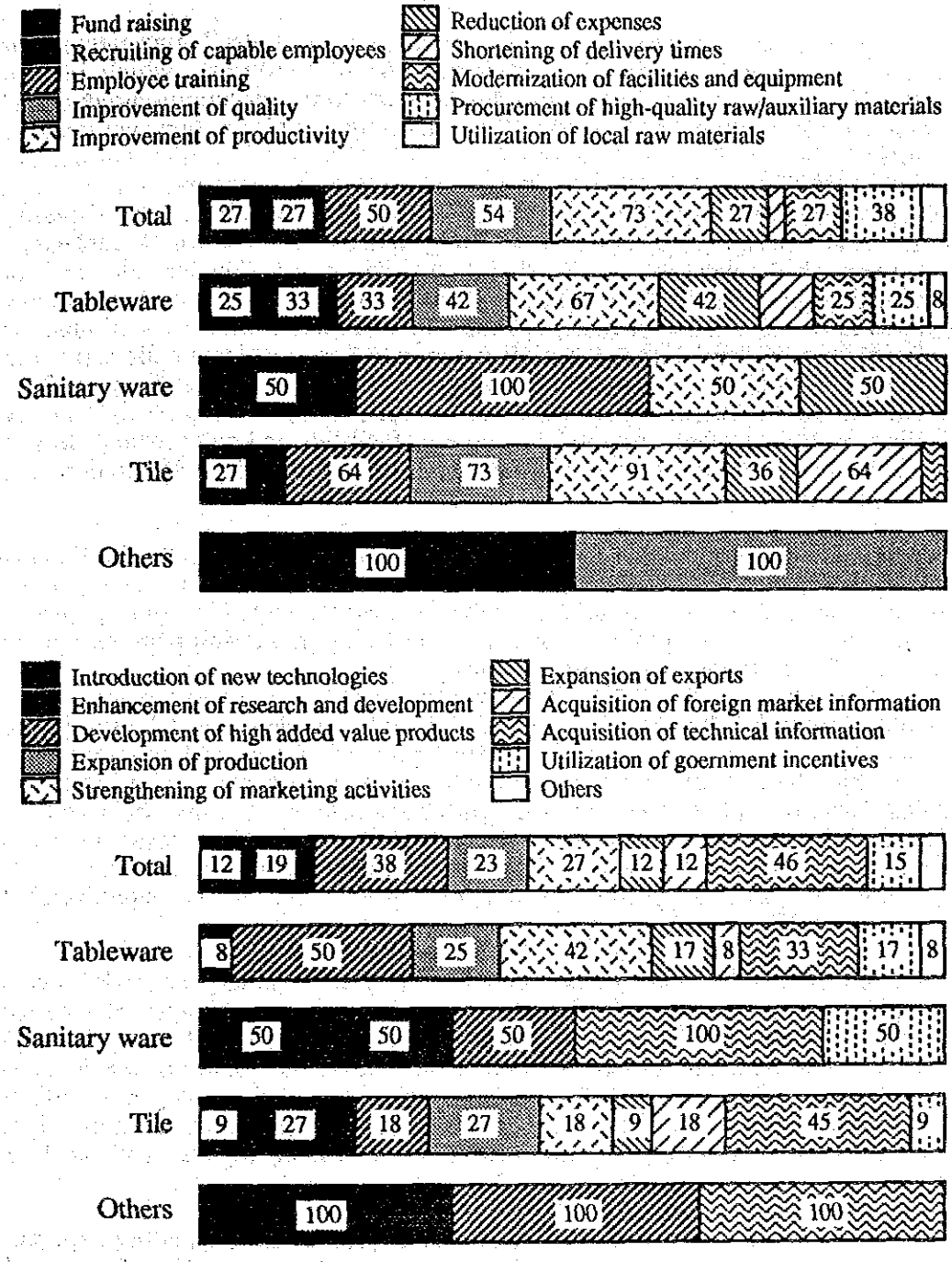
Respondents included 22 of the firms covered by the survey plus a manufacturer of bricks products falling outside the scope of the survey and a firm with plans for the manufacture of tiles, for a total of 24 companies. (The numbers in the Table and the Figure are based on responses from these 24 firms.)

Table 2-3-20: Management-related Concerns of Managers

Item	Number of firms responding	Number of firms responding/total number of firms surveyed(%)
Improvement of productivity	19	73.1
Improvement of quality	14	53.8
Employee training	13	50.0
Acquisition of technical information	12	46.2
Procurement of high-quality raw/auxiliary materials	10	38.5
Development of high added value products	10	38.5
Modernization of facilities and equipment	7	26.9
Recruiting of capable employees	7	26.9
Reduction of expenses	7	26.9
Fund raising	7	26.9
Strengthening of marketing activities	7	26.9
Expansion of production	6	23.1
Enhancement of research and development	5	19.2
Utilization of government incentives	4	15.4
Expansion of exports	3	11.5
Acquisition of foreign market information	3	11.5
Shortening of delivery times	2	7.7
Utilization of local raw materials	2	7.7
Introduction of new technologies	2	7.7
Other	1	3.8

Source: Questionnaire survey for the study

Fig. 2-3-2: Management-related Concerns of Managers (by product)



Source: Same as Table 2-3-20

The characteristics indicated in Table 2-3-20 will be summarized below, taking into account the results of the interviews.

(1) The greatest area of concern for managers at present is the "improvement of productivity." This will require the "modernization of facilities", which in turn necessitates fund raising. Furthermore, the firms appear to be "expanding production" while making efforts to "reduce costs" and thereby "achieve improvement of productivity."

(2) The second concern voiced by the managers was the "improvement of quality standards." This focus on quality at a time of healthy domestic demand can be applauded. There are fears that the local market, which during good times will support demand for even low-quality products, might be hit by oversupply in two to three years, and in any case competition is expected to intensify. Firms should prepare for this by working now to improve their competitiveness and make the preparations needed to allow them to survive as export corporations. Improvements in product quality will be essential. This in turn will require the "recruiting of capable personnel", "the procuring of high-quality raw/auxiliary materials", and "the modernization of facilities and equipment." In this framework, the high concern expressed for "the acquisition of technical information" can also be understood.

(3) Of notable interest was the fact that "employee training" was ranked third following "improvement of quality." This is suggestive of the attention managers are paying to the "training of employees" and which stems from the present difficulty of "recruiting capable personnel." In any case, the problems of manpower hiring and training are extremely important ones for the Indonesian ceramics industry.

(4) It is noteworthy that "the development of high added value products" was ranked higher than "the enhancement of research and development." This probably stems from a climate in which basic R&D is left to the public research institutes while individual companies focus on applied research that will lead directly to commercialization. However, the "enhancement of research and development" at the public research institutes and the feedback of the results of such work to related corporations have great significance in the sense of supporting "the development of high added value products" at individual companies.

(5) The interest expressed in "procurement of high-quality raw/auxiliary materials" was as expected given the great concern indicated by virtually all of the managers during the interviews. Fluctuations in the quality of raw/auxiliary materials, be they locally-produced or imported, naturally have an adverse impact on the quality of the finished product. For the present, Indonesian raw materials suffer from basic mining and grading-related problems. The extent of the need for screening and selection to separate high-quality portions and impurities/low-quality portions during mining together with stocking and management by grades was also indicated in the survey results.

(6) Also of note was the unexpectedly low interest expressed in "expanding exports." There was also little concern indicated for "the acquisition of foreign market information." One of the things made clear during the company visits was that only four firms -- three large manufacturers of sanitary ware and one novelty manufacturer -- falling into Type A are export oriented companies, and that virtually most of the firms in Types B and below are local market-oriented companies, as described above. In a sense, then, the results are reflective of actual market conditions.

4) Operating Cost Analysis -- Manufacturing Cost Breakdown

In the questionnaire survey, breakdowns of manufacturing costs were obtained from 22 firms. (Table 2-3-21~22)

(1) Raw Material Costs

Based on this data, raw material costs account for an average of approximately 34% of total costs at ceramics manufacturers. When broken down by product sector, the figures were slightly less than 40% for sanitary ware, 35% for tiles, and 31% for tableware and novelties. Average corporate evaluations were 78.7 for the sanitary ware sector, 56.4 for tiles, 50.4 for tableware and 45.8 for novelties. Thus it can be seen that, given the difficulty of obtaining high-quality raw materials locally, the higher the ranking of the company the greater the ratio of total costs that is going to be spent on high-quality raw materials including imports, which have a major impact on the quality of the final product. The same result can be found when companies are broken down by type, with the figures for raw material costs at Type A firms being nearly twice as high as at Type E firms. Type B/C shows the highest figures. However, this is considered to be due to the existence some materials control problems in this group. It also seems to be due to the large proportion of fuel costs in total manufacturing costs in the tile and tableware product sectors. Type E firms tend to rely upon inexpensive low-quality materials.

(2) Labor Costs

Labor costs are responsible for slightly less than 18% of total costs on the average. This level is not particularly high, and in fact is thought to be favorable from the standpoint of corporate management.

When broken down by product sector, the figures for sanitary ware (13%) and tiles (14%) were far below the average, while the figures for tableware and novelties (21%) were slightly higher.

This is due to the progress of mechanization in the sanitary ware and tile sectors, which are equipment-oriented fields less dependent on manual labor than the tableware and novelty sectors. When broken down by corporate classification, the percentage of labor costs was extremely low for firms in Type D (8.0%) and extremely high for those in Type E (30%). Although this is only an hypothesis, it may be that firms in Type D have passed on cost reductions to the relatively easy-to-manipulate area of labor costs. It has already been noted that production facilities at Type D companies are outdated and aging considerably, and unless labor costs are reduced no improvements in reduction of expense can be expected. However, such a measure may sacrifices in the area of productivity. The Type E firms, on the other hand, are thought to consist of household industries with few employees and family-like management, and the fact that labor costs account for 30% of manufacturing costs is not thought to be especially problematic. In other words, management at these operations is directed more towards maintaining the family livelihood than towards pursuing company profits.

Table 2-3-21: Manufacturing Cost Breakdown by Product (%)

Product	Sanitary ware		Average of 2	Tile								Average of 8	Tableware/Novelties											Average of 12	Total average of
Company	AA	AC	firms	BA	BB	BD	BG	BH	BJ	BK	BM	firms	CA	CB	CD	CE	CF	CG	DA	DB	DC	DD	DE	DF	firms	22 firms
Factor (Total 100%)																										
Materials costs	23	54	39	37	39	40	37	44	30	34	31	36	51	15	50	17	56	16	40	40	20	10	35	25	31	34
Labor costs	17	9	13	9	17	6	17	10	20	6	26	14	12	17	10	10	8	32	18	25	15	30	25	50	21	18
Electric/fuel/water	18	14	16	22	29	31	19	30	30	48	23	29	16	34	19	23	4	41	7	13	7	40	28	15	20	23
Others	42	23	32	32	15	23	25	16	20	12	20	21	11	34	21	50	32	11	35	22	58	20	12	10	28	25

Source: Questionnaire survey for the study

Table 2-3-22: Manufacturing Cost Breakdown by Type of Company (%)

Product	Type A			Average of 3	Type B/C										Average of 10	Type D			Average of 3	Type E						Average of 6	Total average of
Company	AA	DA	AC	firms	CA	BA	BB	BD	CB	CD	BG	BH	DB	BJ	firms	BK	CK	CF	firms	CG	DC	DD	BM	DE	DF	firms	22 firms
Factor (Total 100%)																											
Materials costs	23	40	54	39	51	37	39	40	15	50	37	44	40	30	42	34	17	56	36	16	20	10	31	35	25	23	34
Labor costs	17	18	9	15	12	9	17	6	17	10	17	10	25	20	16	6	10	8	8	32	15	30	26	25	50	30	18
Electric/fuel/water	18	7	16	14	16	22	29	31	34	19	19	30	13	30	23	48	23	4	25	41	7	40	23	28	15	30	23
Others	42	35	21	32	11	32	15	23	34	21	27	16	22	20	19	12	50	32	31	11	58	20	20	12	10	17	25

Source: Questionnaire survey for the study

(3)Utility Costs (Electric, Fuel, Water)

Electricity, fuel and water utility costs account for 23% of total costs on average.

When broken down by product sector, those figures were 16% for sanitary ware, 29% for tile and 20% for tableware. The figures for tile were thus particularly high.

For manufacturers of ceramics such as in sanitary ware or tile, which are considered as kinds of equipment intensive industries, utilities costs necessarily increase a certain degree when mechanization has progressed.

However, the figure for tiles (29%) shows, when compared with that of sanitary ware (16%), that there are inefficiencies in the use of utilities.

When companies are broken down by types, a clear result can be found with the figures for utility costs for Type A firms (14%) are,the lowest, followed by Type B/C (23%), Type D (25%) and Type E (30%), the highest. The result clearly shows that figures for the better types are lower. This also means that better types utilize higher quality and higher cost materials leading to the higher figures of raw materials cost share in total manufacturing costs. This also means that efficient utilization of utility has a considerable effect on the reduction of cost.

(4) Cost Reduction Measures

Points upon which particular interest was expressed concerning cost reduction by the managers of ceramics manufacturers in the questionnaire survey were "Improvement of productivity" and "Technological improvement".

The need to import expensive raw materials and high utility costs are pointed out as the problems in cost reduction. However, to secure a supply of good quality materials in Indonesia, it is to a certain degree necessary to import. Even in the Japanese ceramics industry, good quality materials are mostly imported. As a result, such costs in the total manufacturing costs are naturally responsible for higher percentage figures on the average.

Table 2-3-23: Cost Reduction Measures

Item	No. of firms that responded	No. of firms that responded /Total no. of firms that participated in survey (%)
Improvement of productivity	21	91
Technological improvement	12	52
Acquisition of low priced materials	10	43
In-house production of materials	9	39
Direct purchase of materials	8	35
Others	2	10

Source: Questionnaire survey for the study

Table 2-3-24: Problems with Cost Reduction

Item	No. of firms that responded	No. of firms that responded /Total no. of firms that participated in survey (%)
Expensive raw materials to be imported	11	61
High costs of fuel	6	33
Low productivity	5	28
High costs of electricity	3	17
Other	2	11

Source: Questionnaire survey for the study

(5) Comparison of manufacturing costs of the ceramics industry in Indonesia and Japan.

Table 2-3-25 shows the comparison of manufacturing cost structures of the ceramics industry in Indonesia and Japan.

Table 2-3-25: Comparison of Manufacturing Costs (Indonesia and Japan)

	Indonesian firms (Average of 22 firms)	Japanese firms (Average)
Raw materials	34%	35%
Labor costs	18%	29%
Utilities (Electric, fuel, water)	23%	5%
Others	25%	31%
Total	100%	100%
	*1	*2

Source: *1-Questionnaire survey
*2-"Cost index of Japanese intermediate and small enterprises" issued by the Agency of Medium and Small Scaled industries

Based on this data, raw material costs account for an average of 34% to 35% in both countries. Thus in this respect there is little difference.

Labor costs are far lower for Indonesia. This result reflects the abundance of the labor force and lower personnel costs in Indonesia, and the high personnel costs and the shortage in the labour force in Japan.

As to utilities, figures for Indonesia are extremely high at 23% compared to 5%, the Japanese figure. As seen in the preceding section of this report, Indonesian managers of the ceramics industry pointed to the high costs of fuels and electricity as problems in coping with the reduction of expenses. This means the cost reduction of utilities is an essential point for total manufacturing cost reduction and a very important problem for the Indonesian ceramic manufacturers.

In order for the Indonesian ceramics industry to take advantage of Indonesia's abundant oil resources, further consideration is desirable in such areas as expanding LNG supply networks as well as the systematic supply of electricity and water.

These political measures related to the industrial infrastructure would be welcomed by the ceramics industry which is considered as one of the big fuel consuming industries.

5) Sales and Overseas Marketing

As was seen above, most of the companies in the Indonesian ceramics industry, with the exception of those in Type A, are heavily dependent on the healthy domestic market, and attitudes and philosophies at these firms strongly reflect the feeling that "if we make it, they'll buy it."

As a result, little effort is devoted to marketing, and virtually no promotional materials such as brochures and pamphlets have been prepared. Overseas marketing activities are particularly inadequate, and there are virtually no organized activities at the corporate level. Nor is there great enthusiasm for exports; only three of the responding firms indicated "the expansion of exports" as a matter of top concern to managers. The same there were also the only three firms to indicate interest in "the acquisition of foreign market information."

Penetration of overseas markets is thought to be essential for the development of this industry, but this will require a revolution in industry structure and awareness.

(2) Current Situation of Production and Technology

1) Overview

The production methods for tableware, novelty, sanitary ware, and tiles vary greatly.

The manufacture of tableware, novelty and sanitary ware, for example, requires advanced technologies, while tile production requires specialized technology and know-how in the handling and maintenance of facilities and equipment in order to make full use of the automated facilities.

Tableware (including kitchen ware) can be broken down into porcelain ware and stoneware. The former requires imported raw materials of the highest quality coupled with fine technology and skills. In Indonesia, however, the use of imported raw materials has been cut drastically in order to reduce manufacturing costs. As a result, the whiteness and transparency of the body suffers, tarnishing the high-quality image of the products and forcing them into the medium-grade category. The latter are produced widely across Indonesia using mainly local raw materials. Glazing and body finish (especially, molding) processes of both items lack precision, bringing about serious problems in quality.

Employees in this sector are characterized by high separation rates. There are insufficient foremen and other intermediate managerial staffs which impedes the improvement of quality and productivity.

There were only two novelty manufacturers, both of which were foreign affiliates, specializing in exports. While one of them has achieved an international level both in technology and quality, the other is faced with the abovementioned problems in quality as of tableware. There are small-scale operations producing flower vases, bottles, pots, and other souvenirs and handicrafts for sale on the local market, but quality standards are poor in general. These household and cottage industries are a far below the level of export corporations.

In the sanitary ware industry, two foreign capital-affiliated joint ventures and a domestic firm in a technological tie-up with a foreign enterprise were studied. These three firms have achieved international levels in technology and quality and seem to face little problems with exports. Unlike other ceramics products, sanitary ware is typically large in size and structurally complex. Casting is used to mold these products. High-viscosity plastic clay is needed to provide strength for the body after it is removed from the mold. Such clay is not found in Indonesia and imported from Japan or the United Kingdom.

Tiles are generally characterized by a lower selling price than other ceramics products. Hence the greater the capital investment, the greater the production capacity necessary to recover the investment. As a result, automated facilities are common. Firms have raced to introduce high-productivity fully-automated lines from Europe especially Italy and Germany. The modernization of facilities and equipment which has taken place since 1985 is remarkable. On the other hand, the unstable quality of raw materials has led to irregularities in product shape among companies. In the future, therefore, industry standards for dimensional precision should be established and precision improved.

Moreover, problems of forming such as bending and torsion and defects of body including high water absorbability should be overcome. It may be said that 70 percent of the firms visited are faced with such problems of quality. Products of the remaining 30 percent firms are judged to be accepted in the international market as the medium-grade products.

Shortage of intermediate managerial staff is serious in this industry as well. Securement and nurturing of talented people may be said to be of urgent necessity to achieve improvement in productivity.

Below is an overview of product sectors focussing on firms belonging to Type A, Type B and Type C .

2) Tableware (Including Kitchenware)

Of the seven companies visited during the field survey, the top three firms had achieved a combined share of approximately 60% of the local tableware market.

Products manufactured by these three firms dominate the market, and each company produces items with both overglaze and underglaze decorations. The former are mainly porcelain ware; the latter, stoneware.

a) Production Methods

The manufacturing process is the same for both porcelain ware and stoneware, but there are differences in the grades and mixing of raw materials used as well as in the firing and decorating conditions.

The main facilities at all three firms have been imported from Japan and Taiwan. As a result of the plentiful labor supply, however, high-productivity facilities designed to conserve labor have not been adopted. All steps continue to rely heavily on manual labor, and a high degree of skill is required.

Production processes and methods do not differ significantly from those at small and medium-sized companies in Japan, but level of factory management and quality control as well as the raw and auxiliary materials being used are characterized by inferior quality.

b) Technical Standards

Overall, technical standards are low. This is due to a shortage of ceramics engineers, which prevents the development of original technologies. The top-ranked companies have taken advantage of technical tie-ups with foreign firms to bring management to bear on all facets of the production process, including the selection and mixing of raw materials, the establishment of molding conditions, and the maintenance of firing temperature and atmosphere, and have also hired foreign experts in these areas.

When introducing foreign technology, the quality of the finished product varies greatly depending on the technical standards of the partner company. Those firms which have teamed up with leading Japanese corporations have achieved considerable improvements in technical standards but other firms are suffering from various problems in the area of technology. Tableware production requires both careful management and a high level of skills during manual operations, and the success of quality improvement efforts depends on efforts to develop these skills. Thus the training of technical staff is an important area for improvement.

c) Management of Production and Technology

Many companies suffer from insufficient raw material management, especially in the acceptance of raw material shipments and the management thereof. Another serious problem already mentioned is that Indonesian raw materials are plagued by quality fluctuations, with significant variations from lot to lot.

Inexpensive materials are sometimes used in order to reduce manufacturing costs, but these contain numerous impurities and are susceptible to discoloration and deformation and can result in poor yield. Consequently, standards should be established for the acceptance of raw material shipments, with products not meeting these standards to be returned to the producer.

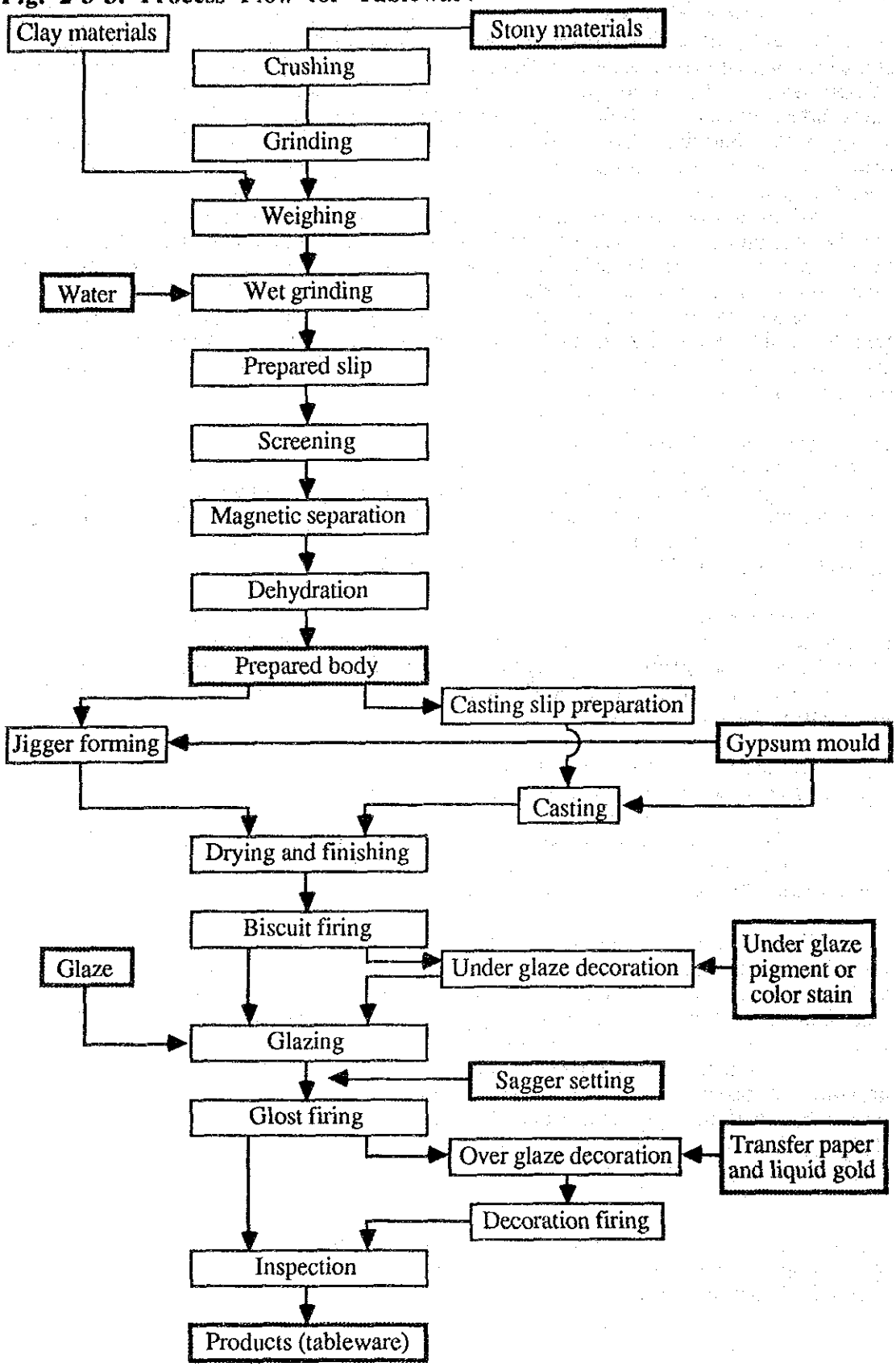
At the firms with Japanese technicians, there has been thorough instruction in this type of management, but room remains for further improvement.

In the field of work management, stringent controls over raw material mixing, added water, grinding time, clay moisture content, body finishing, and prevention of the introduction of impurities are needed.

Concerning facilities, it is recommended that companies introduce magnetic ferrofilters to increase the whiteness of ceramic bodies. Natural materials contain oxides such as iron and titanium in addition to mica. The problem of how to minimize or remove completely such substances has a large impact on the whiteness of the finished product.

More precise management of production and technology is required than in other ceramics industries. Unless staff can be enhanced and management strengthened, therefore, overall improvements cannot be expected.

Fig. 2-3-3: Process Flow for Tableware



d) Development of Technology and Product

Overall technical standards are low, but those firms receiving technological assistance from Japan are thought to be making steady improvements.

Of the firms visited during the field survey, only one was engaged in research and development of new products. Even at this firm, the work was the result of Japanese technical collaboration and not original development. At other firms, a shortage of technicians prevents satisfactory research and development.

e) Working Environment; Safety and Hygiene

Generally speaking, work areas suffer from inadequate lighting. As a result, dirt, strain, scratch, and other small defects are often overlooked during the intermediate inspections at each process. When this is repeated, the operation itself becomes slipshod.

The improvement of lighting in the work place is also critical to improving work efficiency.

The floor should be cleaned after the completion of operations each day (thoroughgoing management).

Although only a few work areas are vulnerable to the generation of dust, dust collection facilities should be installed as necessary.

At clay refining plants, ball mills are in constant operation. Accident prevention measures, such as the use of protective rails or ropes to prevent the entry of personnel during operation, are needed.

f) Education and Training of Employees

The rate of work separation is extremely high, especially among female employees. Although the improvement of employee benefits would be optimal, the ease of securing replacement workers makes managers reluctant to adopt such measures. However, it is impossible to produce quality products in an environment which does not foster skilled workers. Therefore ways must be considered to reduce the separation rate.

All companies are strongly aware of the need for training of mid-level management, but at present only a handful of firms are providing such training, this in the form of dispatching candidates to Japan for training of a specified period based on cooperation from Japanese manufacturers or technical assistance contracts. Even here, time has been lost in immigration-related problems, and there are strong voices for improvements in this area.

There are not sufficient training facilities within Indonesia, and this is a problem which will have to be dealt with in the future.

3) Novelties

The production of novelty items requires even more delicate manual operations than tableware, resulting in the need for advanced skills.

A manufacturer specializing in exports had adopted Japanese-style management standards and had achieved an extremely good plant layout in addition to thoroughgoing management.

Apart from the two leading firms, companies in this sector suffer from insufficient production scale, inferior quality, and other management-related problems. It will not be easy for them to develop into export corporations.

a) Production Methods

The leading two export-oriented firms import processed clay from Japan and Taiwan. Other companies use local clay and process it in-house. The leading two firms use casting, while manual molding methods (including turn table) are used at the other companies.

Due to the use of casting and manual molding techniques, complex facilities and equipment are not required. In addition, casting slurry and glaze adjustment facilities, firing kilns, gypsum mold fabrication facilities, and finishing facilities are all simple.

Novelties can be broken down into porcelain, earthenware, or dolomiteware depending on the properties of the body.

b) Technical Standards

The leading two firms, which are export corporations, have been steadily developing their foundations based on foreign technology, but the two firms differ greatly in terms of management methods and the technical expertise of instructors.

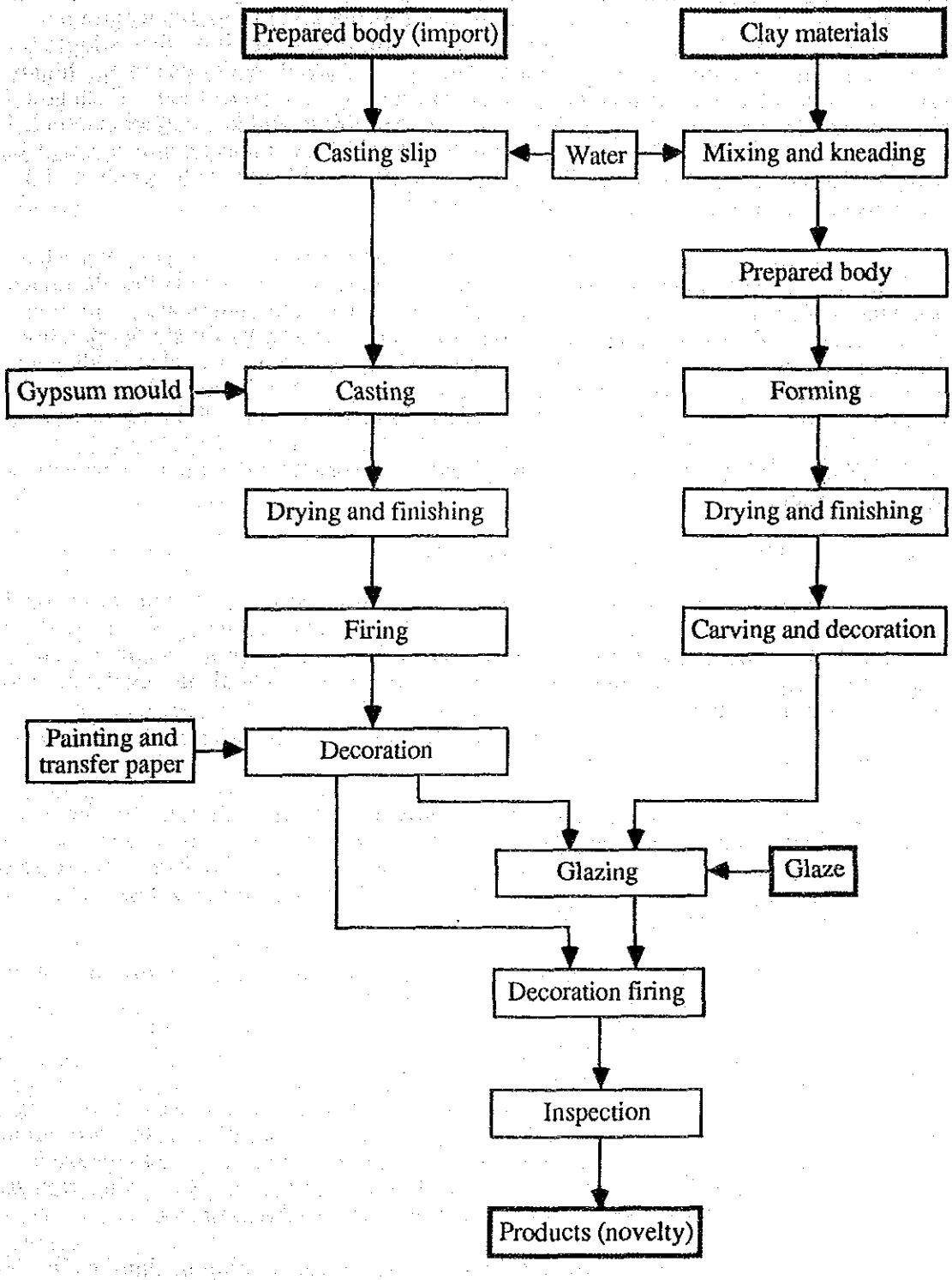
Both firms have introduced facilities and technology from Taiwan. The firm at which Japanese personnel are supervising plant operations and management has higher overall standards of production technology than the other firm, which employs foreign technicians of other nationalities. Just as in the tableware sector, the manufacture of high-quality products with high added value in this labor-intensive industry will require efforts to strengthen work management and achieve overall improvements in technical standards.

Companies other than these two also have well-trained skilled craftsmen, but their number is limited, and significant development by these firms is deemed not to be easy.

c) Management of Production and Technology

The firing conditions for novelties depend greatly on the composition of the body. Given raw materials of unstable quality, it is impossible to consistently produce bodies with a uniform composition. Consequently, those firms targeting the export market import prepared body from Japan and Taiwan; in-house processes begin with the adjustment of casting of body.

Fig. 2-3-4: Process Flow for Novelties



Products at the firm adopting Japanese-style management techniques include dolls, animals, ornaments, and other knick-knacks, being decorated, unglazed ceramic. This company has prescribed standards for controlling firing conditions (concentration of casting body, casting time, and gypsum mold lifetime). It has also adopted a thoroughgoing production management system, as evidenced by the use of the highly efficient group allotment method for the finishing and decorating operations. Each group has a leader who clarifies the group's scope of responsibility and is engaged in detailed checks and instruction. However, the number of mid-level management is small in comparison with the total number of employees (1:100), and further enhancement of the same management staff is needed.

The firm under technical management of other foreign experts uses porcelain, earthenware, and dolomiteware to produce dolls, animals, ornaments and other decorated ornaments of medium to large size depending on the material. There are no thorough standards for work management, and instruction and checks at the finishing operations for the intermediate processes are insufficient. Mold management is also inadequate. Mid-level management suffers from an inadequacy of specialized knowledge, and in the future the training of technicians capable of production management will be necessary.

Firms other than the two discussed above have yet to establish management systems as such.

d) Development of Technology and Product

Few products produced by the novelty manufacturers are based on original designs; instead, virtually all products are based on models or designs specified by customers based on market needs or else are adapted from foreign products. It is strongly hoped that original models and patterns unique to Indonesia will be developed and established in the market.

e) Working Environment; Safety and Hygiene

The firm under Japanese management provides sufficient lighting for the work place and good organization at all points, and offers an excellent working environment in terms of safety and hygiene. The firm under other foreign technical management suffers from a poorly-lit plant floor and a poor product flow. Thorough organization and better lighting of the work place are needed.

Many of the other plants also require improvements in the area of work place illumination.

f) Education and Training of Employees

Just as in the tableware sector, the novelty industry is characterized by a high percentage of female workers, and in general work separation rates are high. Improvements in employee benefits are needed. Management must come to realize that, since skilled manual labor forms the basis of most operations, the resignation or replacement of experienced workers represents a great loss to the company.

Companies in this sector are unable to rely on outside training institutions for the education and training of employees, forcing them to conduct in-house training. As a result, the training of experienced managers capable of carrying out both instruction and management is needed. To this end, leading firms have invited foreign instructors to supervise their guidance and training programs.

4) Sanitary Ware

Of the three firms visited during the field survey, two were joint ventures or domestic company having technical tie-ups with Japanese corporations, while the third was a joint venture with a U.S. firm.

Production methods were the same at all of the companies. Combined annual production volume at the three firms was 27,600 tons, and when scheduled increases in production are added the figure comes to 38,700 tons. Put together, the three corporations are responsible for more than 90% of all Indonesian production capacity.

a) Production Methods

Sanitary ware is characterized by its large size and the use of casting. As a result, adjustment of the casting of body requires advanced technology and know-how.

Each of the companies is engaged in the streamlining of facilities from the standpoint of quality control. Molding divisions have adopted pressure molding, while tunnel kilns and the latest shuttle kilns have been introduced in the baking operation to provide a flexible mass-production system. A growing number of products are colored pieces which are glazed.

b) Technical Standards

Each of the three firms has achieved high technical standards through the technical cooperation of leading foreign corporations. In the area of raw materials, high-quality ball clay is imported from the United Kingdom, and stable casting of body is adjusted.

Standards have been established for the selection and blending of raw materials and other conditions, and there are no problems of note.

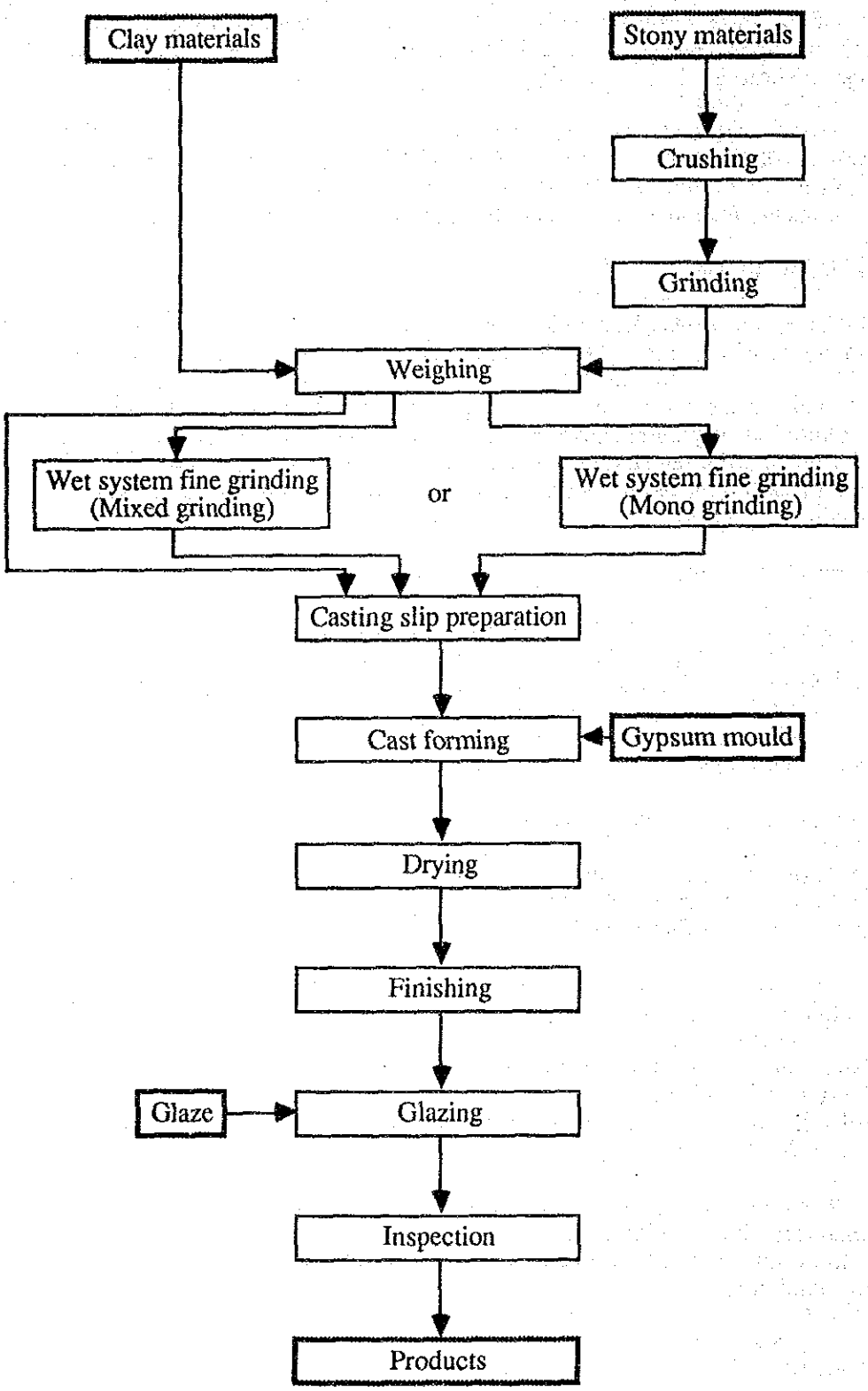
c) Management of Production and Technology

Thoroughgoing management has been established in all areas, including raw material management, and has progressed to an extent unseen at manufacturers of other ceramics products in Indonesia.

In particular, the Japanese-affiliated joint venture carries out testing and examination of all important steps, including raw material selection and blending and quality inspections, in Japan, splitting responsibilities with the plant floor to ensure consistent quality. This policy has probably been adopted because the local plant is not yet ready to take full responsibility for all quality checks. This system of total quality control utilizing the allotment of operations is thought to be a necessary measure for companies in developing stage.

The other two firms are also engaged in inspection and testing of each shipment of raw materials, basic colored glaze tests, and quality inspection inside and outside the plant; thoroughgoing management is carried out to ensure the maintenance of specified quality standards.

Fig. 2-3-5: Process Flow for Sanitary Ware



d) Development of Technology and Product

In general, technical standards are high, and both the technical assistance of the foreign partners and the attitudes of local management are very positive. Concerning product development, the firms are engaged in the development of products incorporating features such as shape, coloring, and ease of use in accordance with changing lifestyles and housing trends based on foreign market information obtained from their marketing divisions.

e) Working Environment; Safety and Hygiene

Plants are well-organized, from the storage of raw materials to final finishing. Although the work areas were thought to be somewhat small, they were well organized. Companies suffering from limited land and building space had built two-story plants and adopted other measures to ensure a smooth flow of intermediate products.

Generally speaking, better lighting is needed in the inspection rooms.

No specific problems were noted in the areas of safety and hygiene.

f) Education and Training of Employees

Training of management and foremen at the Japanese affiliate is conducted either at the plant under the supervision of Japanese technicians or in Japan, via periodic three- to six-month training programs. The firms are extremely enthusiastic about training and the improvement of technical know-how.

The company receiving technical cooperation from a U.S. firm provided in-house training to its employees, but this was insufficient, and there were strong demands for the establishment of a manpower supply system by government agencies.

5) Tiles

Unlike tableware and sanitary ware, the main raw material used in the manufacture of tiles are clay materials, with few stone materials. Continuous molding is used, and most firms have adopted high-productivity facilities. Those firms without such facilities are making full use of outdated and aging facilities, but productivity is low and the time for renovation is fast coming.

Wall and floor tiles account for the overwhelming majority of products currently being manufactured, with few mosaic and split tiles being produced.

a) Production Methods

(1) Wall Tiles

After press molding, the tiles are biscuit-fired. This is followed by glazing, decoration, and then glost-firing. In other words, the pieces are fired twice.

(2) Floor Tiles

After press molding, the tiles are glazed and decorated before firing. Firing only once requires strength and a very dense body. Recently, an increasing number of products are large in size.

(3) Mosaic Tiles

These are small tiles, with 30-mm square and other sizes available. There are porcelain which are molded and glazed before firing.

(4) Split Tiles

These tiles are fired after molding in a vacuum extruder. The final product is a floor tile utilizing the coloring of the raw materials being used.

The shape and size of the piece to be molded are subject to limitations.

b) Technical Standards

At the firms adopting streamlined mass-production systems, production methods are virtually identical, as are the types of facilities in use. Consequently, product quality and design trends are also similar.

Technical standards at the companies do not differ greatly. Generally speaking, the standards for basic technology are rather low. Since production facilities have been automated and mass-production systems adopted, research on fine techniques and application of basic technologies remains insufficient. However, a great deal of research has been conducted on decorative patterns, and firms are approaching the stage where they will be able to create their own original designs.

Design is the most important element for tiles. Most of the companies have adopted the designs of European firms, but it is suggested that designs unique to Indonesia also be developed.

c) Management of Production and Technology

Inexpensive clay is the main raw material used. Since quality fluctuations in raw materials have a great impact on product quality, it is important to maintain a large number of raw material grades and lots and use these to mutually complement deficiencies. Some of the large corporations have adopted this method, but in general firms are heavily dependent on single grades. A variety of grades should be used whenever possible, and measures should also be taken to limit quality-related problems when changing raw materials.

Since facilities have been automated, there is a need for basic know-how and skills concerning handling and maintenance coupled with management capable of maintaining stable operating conditions.

Viewed overall, the top-ranked companies received good marks for the operation and maintenance of equipment, but more work on these areas is needed at the lower-ranked firms.

d) Development of Technology and Product

Tile shapes are limited at present, and more efforts are needed to match shapes and patterns to customer needs. Also needed is the development of original patterns and the development of new markets. Altogether, there are numerous areas requiring improvement.

Concerning the development of new products, virtually all of the current products have been adapted from European designs, and there were few items based on creative new ideas.

e) Working Environment; Safety and Hygiene

At the large corporations plants were relatively large; many provided favorable working environments. There were significant variations from company to company,

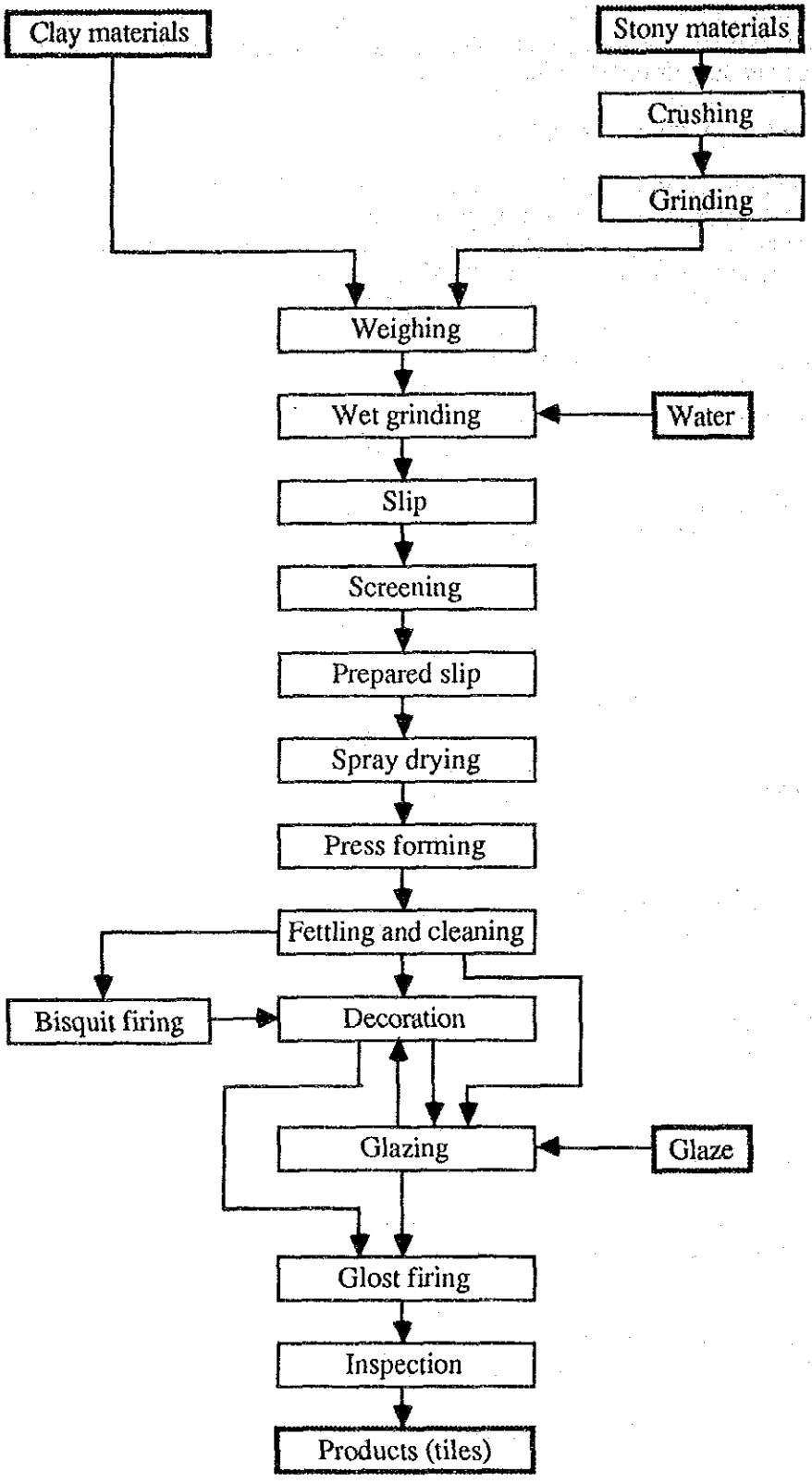
however, and at some plants management was terrible, with raw materials being scattered about the plant floor.

Overall there was insufficient illumination of the work place, and better lighting is another area needing improvement.

f) Education and Training of Employees

Although some large firms have had the experience of training employees in Europe, most enterprises conduct only in-house education and training of employees. Some firms are educating employees about quality control through meetings. All of the enterprises recognize the need to nurture skilled employees.

Fig. 2-3-6: Process Flow for Wall Tiles and Floor Tiles



(3) Case Study

1) Sanitary ware plants

a) AA Company

A sanitary ware company established in 1977 as a joint venture with a Japanese sanitary ware manufacturer.

Its present annual production is 800,000 pieces. Expansion of the new factory is scheduled to increase the additional annual production capacity of 800,000 pieces to allow the company to respond to the extremely strong domestic demand. The accessory metal attachment department is also scheduled to be expanded. This company is said to be the best ceramic manufacturer in Indonesia in all aspects including factory atmosphere, machinery and equipment, the quality of its products, and corporate management. In particular, its products boast excellent quality and stability of this maintained through the quality control method directly introduced from its Japanese partner, and the strict observation of the method. The product yield rate is about 60%, which reflects the strict inspection carried out here.

About 60% of production is for domestic sales and 40% for export. As domestic demand is very strong, a maximum of 50% of production is available for export according to company policy. 70% of the raw materials used such as Kaolin Feldspar, and clay are domestically produced materials. However, plastic clays and To-seki are imported.

In the case of adoption of new types of raw materials, only the raw materials which have passed the physical, chemical and mixing tests conducted in the factory of the Japanese partners in Japan, are selected to be used. Such analyzing tests of raw materials are not conducted in the Indonesian factory. Product tests, however, are conducted in the Indonesian factory. Product tests are conducted in the laboratory then despatched to the Japanese company two times a year for quality evaluation by Japanese testing methods.

The factory workers have two paid holidays a week. In this respect, labor working conditions are the same as in the Japanese factory and are satisfactory for the workers.

Factory expansion is scheduled but there is no available space within the present factory site. Therefore, a new factory is planned to be built in another place. Problems to be solved are the product yield rate which is lower than that of the Japanese factory as well as increasing the production capacity.

This company is said to be typical of successful firms in Indonesia that have entered joint ventures with Japanese firms.

b) AB company

This company was established in 1984 under a joint venture agreement with an American sanitary ware manufacturer. Its company group also includes tile and roof tile manufacturers. This company once had a factory on Belitung Island but because of problems of product quality and limitations of production capacity, the factory was transferred to Chibinon with capital investment from the American company, establishing a new company. Annual production capacity is 500,000 pieces, and 50% of the total products are destined for export to such countries as Australia, New Zealand, Italy and France.

Manufacturing equipment presently used comes form the U.S., Germany, England and Japan. As to raw materials used, kaolin, feldspar and part of the plastic clay are those domestically produced. Imports are relied upon for ball clay, plaster of Paris and pigment.

This company has wide factory space especially in the casting and forming sector which is evaluated as being in good working condition. It is desirable to have somewhat greater space for the firing sector.

Testing of both raw materials and final products is conducted within the company laboratory. This company produces a large proportion of color glazed products which require repeated color glazing tests in the laboratory. Workers at the operation sites have very good attitudes and sufficient care is given in the finishing stage process. In general, the operating conditions are good. However, the quality of the final products seems to be a little inferior compared to that of AA company. The reason is not clear but it is assumed to be due to the selection of inferior materials for body and glazing. It may also be partially due to problems in firing techniques. Improvement in the quality of body and glazing is considered to be the solution to the problems.

2) Tile plants

a) BA company

Established in 1975, it is the largest tile manufacturer in Indonesia. Production is 25,000 m2 a day including floor tiles, wall tiles and granite tiles. The firm is operating at full capacity due to an increase in domestic demand. About 25 percent of its output is exported to various European countries through agents in Singapore. This company has a large plant building area of 35,000 m^2 out of its total area of 45,000m^2. It has more than 20 firing kilns.

The quality of the product is generally evaluated as good. The major products are large size tiles, 30 x 30 cm and 43 x 43 cm in size. They are produced with one-time firing and have few defects such as bending, torsion, etc. This factory puts it at a relatively high level among the many Indonesian tile manufacturers. The inspection of the final products is conducted according to the European standard, CEN, and product tests are executed in their own laboratory every day to check the bending rate of the body, autoclave (weather resistance), and other quality control related elements.

This company has a large number of employees in the sections of design and testing, in order to develop new products particularly from the design point of view. Training of employees is conducted within the company as OJT. The quality control method and new information on attained know-how can be disseminated to the workers through frequent seminars within the company. A problem to be addressed in this company is the fact that the very large size of the factory may cause some difficulty in operation control covering all of the operation sectors. This is partially due to the insufficiency of managerial staff.

b) BI company

This company was established in 1979 and two years later in 1981 production of unglazed floor tiles began with a production capacity of 400 - 500 m^2. The raw material used is the unique Sukabumi clay which gives a brown color to this simple color tile product. The production technology and equipment are supplied by a Taiwanese maker, but productivity is very low and most of the equipment is becoming obsolete, reaching the stage where replacement parts can not be obtained.

The prepared body making process is conducted using two types of crushing methods. One is dry crushing with roller mills. The other is wet crushing by spray dryers. The prepared body made using the former method is formed by a friction press and in the the latter, the body is formed using a hydraulic press. At the stage of roller mill crushing, this company does not pay careful attention to the adequate mixing rate of clay and scraps, leading to a lack of mixing control. The inspection of raw material at delivery has not been conducted for many years. An unfavorable change in the characteristics of the raw material would present problems difficult to be solved in the later processing stages.

There are also many other problems to be solved or improved in this company's operations. Above all, the working conditions in the operation sites are extremely poor. Whenever workers walk around in the work place large amounts of dust from the raw materials and prepared clay powder is scattered around the floor. It is necessary to install some kind of dust absorber machines in addition to the regular sweeping and clearing of the floor for the sake of hygiene control. As to the problem of the equipment, it seems that the initial investment in production equipment is obstructing production effectiveness. The production speed of the machines is also 4 to 5 times slower than other ordinary modern equipment.

The factory layout should be reconsidered and the bad working conditions such as the lack of lighting within the work place should be improved.

3) Tableware plant

a) CA company

This company was established in 1977 and began production in 1978 under a technical assistance agreement with a Japanese maker. At present this company is one of the best tableware manufacturers in Indonesia and plays a leading role in the industry. Production capacity which at the beginning was 30,000 pieces per day of porcelain ware, has now reached 90,000 pieces per day including stoneware products. This capacity is the largest in the Indonesian tableware industry and about 60% of its production is exported to the U.S., Europe and Australia. Regarding domestic sales, it has a 90% share of sales to the Indonesian hotel industry, and 40% share of sales of the restaurant industry. The technical agreement with the Japanese manufacturer has already expired. However, its manufacturing technology and administration capability are still kept stable and healthy. This company has made efforts to improve working conditions to secure employees from the relatively scarce skilled workers among the abundant Indonesian labor force through its advantageous welfare and fringe benefit policy which is superior to that of any other tableware company in Indonesia. As for raw materials, imported materials are used to make products mainly for export, and for domestic sales, domestic materials are used. Thus, the use of raw materials depends on the purpose and the kinds of product. Its porcelain ware has relatively low levels of whiteness and transparency, partially due to the quantity of the raw materials. However, this problem would be easily resolved if somewhat higher quality materials were used.

According to their corporate policy, stress in laid on expansion. Accordingly, a new plant which is to specialize in export oriented high class porcelain ware is at present under construction aiming at an annual production capacity of 30,000 pieces.

(2) CE company

This company manufactures four kinds of products including tea and coffee sets, bowls and plates under Taiwanese technical guidance with production machines imported

from Taiwan. The production capacity is 40,000 pieces per day and all the products are oriented toward the domestic market. The quality of the products is not very good because the raw materials used are of second grade quality, though the main raw materials are imported from China and Japan. The problems to be solved are as follows.

— Insufficient operation control in each operation sector although looks like active due to too many workers.
— Rough finishing process of product bodies. Thorough working is needed
— Insufficient lighting in the work place. Better lighting is needed.
— Insufficient inspection of the intermediate products. Strict inspection is needed.
— The maintenance and control of gypsum moulds is not adequate. Limitations on the frequency of use of gypsum molds should be strictly observed.
— Strict selection of raw materials is needed. Delivery inspection should be conducted based on definite standards.
— Lack of specialized technicians. Employing new technician or testering stuffs is necessary.
— In order to promote exports of the products it is necessary to improve quality control, even at the expense of production volumes.

4) Novelties plant

a) DA company

This is a joint venture company with foreign capital which was established in 1987. It is manufacturing mainly small novelties such as dolls, figurines, ashtrays, vases, etc. The products are exported to the U.S., Canada, England and Germany through the marketing channels of the joint venture partner in Hong Kong.

The manufacturing techniques and equipment were introduced from Taiwan. Production management is being conducted by three Japanese technical managers in a typically Japanese style. Therefore, in every stage of the production process, a well balanced arrangement of workers under divided operation control is found. This is especially noticeable in the decoration department. There is general supervision and several foremen responsible for the various sections conduct frequent checks on detailed operation procedures and the regulations to be observed.

At the operation sites, the working conditions are excellent. In general, the lighting systems are complete.

At this company, the prepared bodies are all imported and thus there are no body preparation facilities. The manufacturing process begins at the stage of mixing of casting slip and continues through casting, drying, finishing, firing, decoration and finally decoration firing.

Most of the materials and auxiliary materials, such as prepared bodies, pigments, operation tools, decoration utensils, gypsum molds and kilns, are all brought in from the joint venture partner in Hong Kong. This company seems to be taking advantage of the abundant labor in Indonesia very effectively.

The production capacity is 200,000 pieces per month, mainly unglazed porcelain products.

Factory management is well established. However, it seems that an increase in the number of intermediate foremen would be desirable. (At present, there are only about 10 foremen for 1,150 workers.)

The problem of fostering intermediate managers is common to all firms in the ceramic industry in Indonesia.

b) DB company

This company was established in 1988 and presently produces a wide range of middle to large size novelties ranging from dolls, flower vases and animal figurines to lamp stands. The technology and equipment are imported from Taiwan, as are the prepared bodies and glaze. Therefore, the manufacturing process begins from the stage of mixing and casting slip, just as in the case of DA company. Factory management and production control are conducted very carelessly. There is no control of slip density, gypsum molds or finishing procedures. There is also no specialized technical staff. The only specialist is a technician from Taiwan who comes to give guidance from time to time. Of the company's total production, 70 percent is porcelain, 10 percent is semi-porcelain and 30 percent is Hakuun Toki. All products are of under glaze decoration.

Demand for this company's products is said to be rather stable since they are not directly related to seasonal events such as Christmas or Easter. The quality is fairly good, partially due to good design which covers inferior finishing or colors.

The working conditions at this factory are far behind those of DA company. The general lighting system is very bad. One problem which the company faces is frequent work separation among its female workers. Working conditions including salary and fringe benefits for workers should be improved to solve this problem.

The noticeable insufficiency of process control in this company should be dealt with by fostering more technical managers through training or by hiring such people as soon as possible.

(4) Expectations of the government by ceramic product manufacturers.

In order to grasp ceramic product manufacturers' expectations of the government, a questionnaire survey was conducted.

The items most commonly chosen during the questionnaire were "Provision of various information" followed by "Guidance on quality control", "Technological guidance by foreign experts (supported by the government)", "Technical assistance", etc., indicating that expectations lie mainly in the field of technology.

They also request various other types of support such as "Export promotion activities" and "Promotion of joint venture investment and technical tie-ups with foreign companies".

These requests differ according to the product field.

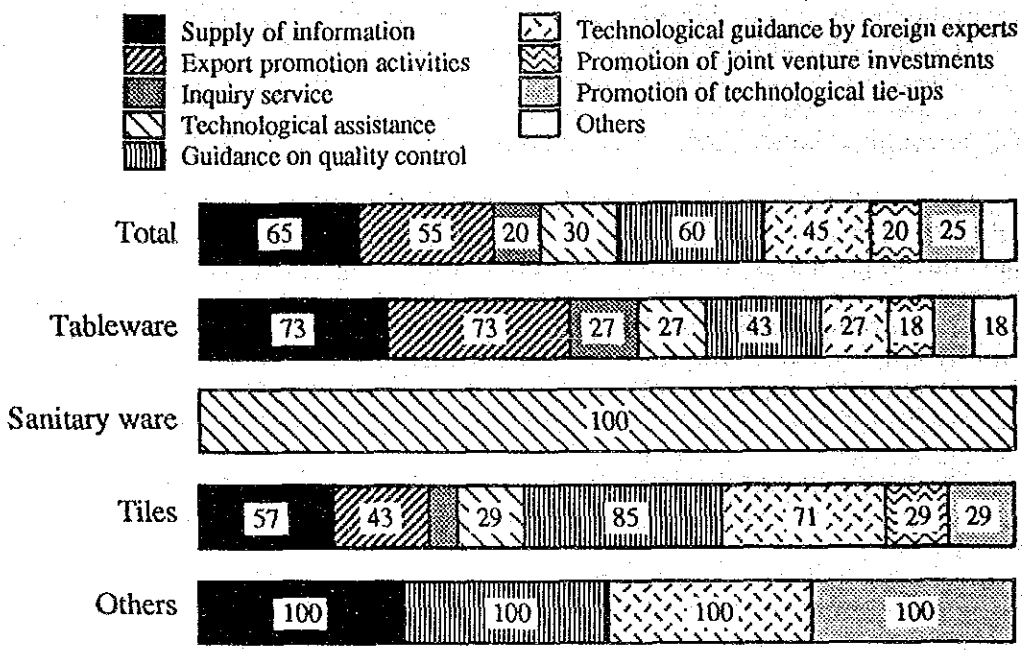
Tableware manufacturers show high interest in "Provision of various information", "Guidance on quality control", and "Export promotion activities".

This indicates that there are many firms which intend to cultivate new overseas markets through practical marketing activities supported by the improvement of technical levels.

Sanitary ware manufacturers are interested mainly in "Technical assistance". All of the companies which responded are excellent firms which have high technical levels. However, they feel relatively weak in terms of basic research, product and technology development capability so that in these areas they seek government support.

Tile manufacturers show strong interest in "Guidance on quality control" and "Technical guidance by foreign experts." In general, this industry is in the process of modernizing machinery and equipment. However, the interests of manufacturers revealed in the questionnaire indicate that they have fallen behind in the accumulation of know how in soft technology such as quality control, efficient utilization of equipment, and etc.

Fig. 2-3-7: Ceramic Manufacturers' Expectations of the Government



Source: Questionnaire survey
N.B.: Multiple response survey. Numerical value indicates the percentage of firms choosing each item in total firms surveyed.

2-3-5 Current Situation of Joint Venture Investment and Technological Tie-ups with Foreign Companies and Attitude of Indonesian Firms

(1) Current situation

Introduction of foreign capital or technological tie-ups with foreign enterprises can be utilized as a very effective means to promote the ceramic industry of Indonesia.

Investment through joint ventures with foreign enterprises are the most effective method of introducing capital, technology, management know-how and overseas market channels in single packages. Technological tie-ups also have a wide range of benefits in that it introduces not only technology but also management and overseas marketing know-how.

In fact, joint ventures affiliated with foreign capital, and domestic companies in technological tie-ups with foreign enterprises play a considerable role in the ceramic industry of Indonesia as well.

In the sanitary ware manufacturing industry, among others, two joint ventures affiliated with foreign capital, one with a Japanese and the other with a U.S. enterprise, and a domestic firm in a technological tie-up with a foreign company play a leading role in exports. As stated earlier, all those three are excellent firms which have achieved international-level products and technology. Their overall corporate ability is very high, and their development of products and technology, quality control and marketing is conducted through international cooperation within their respective group of firms. All the three can be said to have made a "take-off" as exporting companies.

Domestic firms are dominant in the tile industry. There is only one joint venture affiliated with a Singaporean company with a small share of the market (there had been another joint venture company but the foreign capital side withdrew with the expiration of the contract). Technology and quality control of the two firms are of so high a standard that they rank high in the industry. Besides this, there are four firms in technological tie-ups with Japanese and Asian NIEs companies. Their strong willingness to improve product quality makes them promising as future exporting enterprises.

There are no operating joint ventures in the tableware industry. But a Japanese affiliate is in the course of construction, displaying confidence in its potential to export to the United States. It plans exports to Japan as well in an international division of labor with the parent firm in the future. Furthermore, five firms are in technological tie-ups with Japanese and NIEs companies. All of them have relatively high levels of technology and quality, already having succeeded in securing export markets. Among others, the industry's leading firm , currently operating independently after accumulating technology through a tie-up with a Japanese enterprise, has secured stable sales channels of its own in Europe, America and Australia.

In the novelties industry, the leading manufacturer prides itself on its outstanding technology and quality. It is a unique Hong Kong affiliate under technological control by Taiwanese and Japanese engineers. It is a typical export-oriented enterprise with all the products exported to Europe and America through its Hong Kong investors' sales routes. In addition, a firm in a technological tie-up with a Taiwanese company is exporting more than 70 percent of its products to Europe, America and Singapore.

(2) Attitude of firms

Ceramic product manufacturers' interest in joint ventures and technological tie-ups seems to have become increasingly stronger in recent years.

In the latest questionnaire survey, 10 out of the 26 respondent firms answered that they want joint ventures with foreign enterprises and 15 firms replied they desire technological tie-ups.

1) Joint ventures

The 10 respondent firms favoring joint ventures included six tableware manufacturers, one sanitary ware manufacturers two tile manufacturers and another (brick producer). This means that tableware manufacturers are the most strongly interested in joint ventures. The responding rate of novelty manufacturers was so low that their actual situation could not be grasped.

Most of the firms prefer Japanese enterprises as partners to ventures as shown in Table 2-3-26 below.

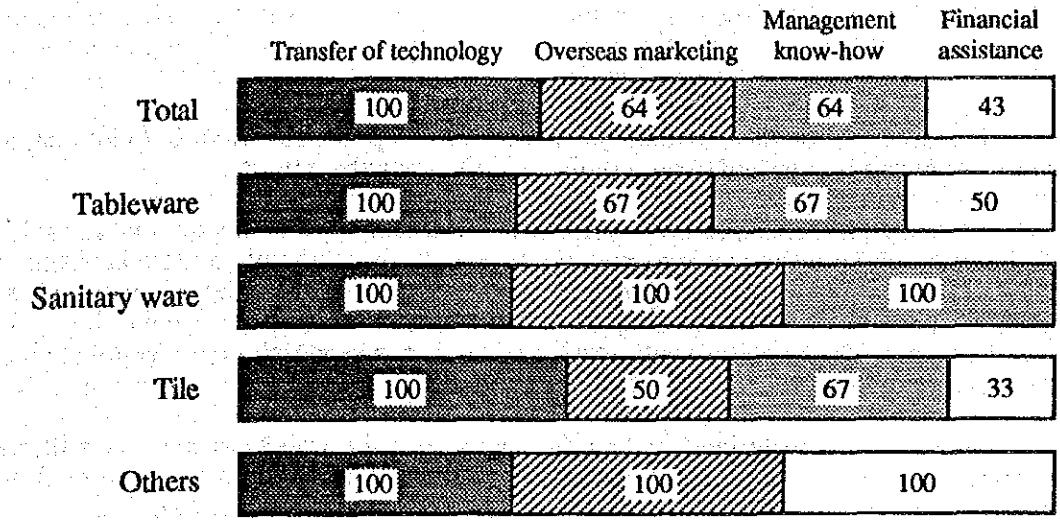
Table 2-3-26: Breakdown of Countries or Territories of Companies Preferred as Partners for Joint Ventures (multiple response)

	Japan	United States	EC nations	Asian NIEs	ASEAN
Tableware	5	1	1	1	1
Sanitary ware	1				
Tile	1		1	1	
Others				1	
Total	7	1	2	3	1

(Source) Questionnaire survey. Same hereafter.

Most of the firms cite "transfer of technology" as the benefits they hope to achieve from joint ventures investment, followed by "overseas marketing" and "transfer of management know-how". Expectations on financial effects are slightly smaller in number.

Fig. 2-3-8: Expected Benefits of Joint Ventures (multiple response)



(NB) Figures show the percentage of number of respondents who selected each item in whole respondents

2) Technological tie-ups

The 15 firms favoring technological tie-ups include eight tableware manufacturers, one sanitary ware producer and six tile makers. It is natural that tableware and tile manufacturers, which are still weak in tie-up relations with foreign firms, are the most interested.

Most of the firms prefer Japanese companies as partners to the tie-ups as is the case with joint ventures.

Table 2-3-27: Breakdown of Countries and Territories of Companies Preferred as Partners for Technological Tie-ups (multiple response)

	Japan	United States	EC nations	Asian NIEs	ASEAN
Tableware	7	1	2	3	1
Sanitary ware	1				
Tile	3		2	1	
Others	1				
Total	12	1	4	4	1

2-3-6 Promising Ceramics Products and Potential Markets

(1) Conventional products sectors

1) Tableware

Tableware is roughly divided into stoneware and porcelain ware. In Indonesia, the field of stoneware is expected to be promising in the immediate future.

From the viewpoints of raw materials and technology, it is thought that the ability of Indonesian ceramics industry to manufacture high-grade porcelain ware is limited at present. The manufacture of such products will be possible if the chief raw materials are imported, but this will inevitably boost the cost resulting in weakening price competitiveness. The level of manufacturing technology is generally low to apply to such products.

Domestic raw materials can be used for most of the stoneware and this will give the product an advantage in terms of cost. Some glaze materials must be imported, but expenses for these are small and will not affect the products' cost advantages.

However, Improvement of quality and technology is indispensable for the expansion of exports. Improvement of molding and firing techniques and development of designs are required. For tableware exports, it will be necessary to recognize the importance of consistency in quality, shape and patterns and to establish a high-grade image.

The most promising markets for stoneware will be Europe and America centering on the United States and Canada. A practical marketing method for the products will be to establish sales routes in tie-up with dealers who have sales networks in these markets.

2) Novelties

Novelties of the type suitable for Europe and America will continue to be promising.

Although only two firms produce novelties for export at present, the possibilities of development in the future are considered to be good. There will be no question of marketability because a considerably large demand for novelties exists, mainly in the European and American markets. Entry into this field is relatively easy because the scale of required plant and equipment investments is small. No advanced technology is necessary and workers can be easily secured. Even though raw materials will have to be imported, novelties may be one of the most cost-advantageous industries in that, being labor intensive, it can utilize the abundant and cheap labor available in Indonesia.

Of course, improvement of quality and design are essential prerequisites for exports of novelties as well. It is desirable that design, pattern and finishing technologies be improved while maintaining an up-to-date understanding of overseas market needs and expanding production capacity.

3) Sanitary ware

Two joint ventures affiliated with foreign capital and a domestic firm in a technological tie-up with a foreign enterprise account for most of the exports in this field. The products of these firms are developed, manufactured and subjected to quality control within the international networks of the respective firms so as to meet the needs of target market. Because the three firms have no significant problems with manufacturing and

sales, the future expansion of their business is viewed as certain and exports, mainly to the U.S., the Middle East and Japan, are expected to maintain steady growth. With the exception of the three firms mentioned above, sanitary ware firms are oriented toward the domestic market. Their entry into the export market will not be easy without tie-ups with foreign enterprises.

4) Tiles

Because they can be manufactured using mainly domestic raw materials, tiles are products which can be very cost competitive. The outlook for their exports may be said to be excellent.

Measures necessary for the expansion of tile exports will be improvement of design and color tone and establishment of a system for stable supply. The improvement of design is particularly important. It is desirable that a system for developing products to suit individual markets be quickly established while maintaining an up-to-date understanding of design trends in the main markets.

The most promising markets for tiles will be Europe and America, Asian NIEs and ASEAN member countries.

(2) New products sectors

1)Bone China

Bone china, which is made from bone ashes and is characterized by a soft texture, is used in the manufacture of high-quality tableware and ornaments. It has a milky white or ivory color and is characterized by a look of quality in addition to being very strong. As living standards improve, the use of bone china is increasing at ordinary households in the form of tableware for daily use in addition to hotels and restaurants.

The bone ash used to produce bone china is obtained by burning specific types of cattle bones. Recently, however, a variety made from artificially synthesized calcium phosphate has been well-received in the Japanese, European and U.S. markets.

Bone china is more expensive to produce because it uses man-made materials. Thus great demand cannot be expected from the Indonesian market. However it is thought to be well-suited for export to Europe, the United States, and Japan.

2)Reinforced Porcelain

Porcelain tableware suffers from strength-related problems; improper handling can easily result in breakage. Particularly at institutions handling large quantities of tableware at once, such as hotels, restaurants, corporate cafeterias, hospitals and schools, a great deal of tableware is lost to breakage.

Porcelain tableware generally has a bending strength of about 500-700 km/cm^2, but a high-quality, reinforced porcelain tableware with superior whiteness has been developed. In Japan, the production of this variety is increasingly replacing the conventional variety for both the domestic market and export markets. Reinforced porcelain is characterized not only by its high strength but also by an extremely white body, which brings out underglaze or overglaze decorations and presents a high-quality image. The new variety also has excellent heat resistance, making it extremely well-suited for instantaneous heating in microwave ranges and ovens. Growing demand can be expected in a wide range of fields of use in Japan, America and European nations.

3)Oversized Tiles

The size of the tiles which can be manufactured is limited by facilities and raw materials. At present, the typical large tile has dimensions of 40 x 40 cm, with larger sizes requiring the use of oversized molding machines. Increasing the size of the tiles results in a greater sense of beauty for the interior in which they are used. Changing lifestyles have resulted in increased demand for large tiles. Originally 20 x 20 cm was the largest size which could be manufactured, but this grew to 30 x 30 cm and then to the current 40 x 40 cm. In the future, demand is expected for 60 x 60 cm and 80 x 80 cm sized tiles.Therefore manufacturing-related research should be embarked upon at once.

4)Refractories (High-quality Refractory Brick)

Refractory brick is one of the basic materials for heavy industry, and it is indispensable to the industrial furnaces used in key industries such as iron and steel, nonferrous metal refining, electric insulators, and cement. Indonesia relies entirely upon imports for the supply of basic refractory brick and high alumina refractory brick, which are used under the harshest conditions of any high-quality refractory brick. For the time being, production of this type of high-quality refractory brick will probably be destined for use in local heavy industry furnaces, but in the future exports to neighboring countries should also be possible.

5)Electric Insulators

In general, Indonesia suffers from a poor supply of electrical power. Further expansion of the power supply system will require the use of medium- and low-voltage electric insulators. Even if domestic production of insulators for high-voltage power transmission networks are not easy, that of medium- and low-voltage electric insulators for use in small plants and households should be promoted in due course.

2-4 Policy Review for the Promotion of the Ceramics Industry

2-4-1 The Organization and Activities of Adminstrative Organizations, Technology Promotion Organizations, and Testing, Research and Development Institutes

(1) Administrative organizations

The ceramics indsutry is under the jurisdiction of the Ministry of Mining and Energy, Ministry of Industry, and the Ministry of Trade.

The Directorate General of General Mining at the Ministry of Mining and Energy is in charge of development, promotion, supervision, and techncial guidance for the mining raw materials sector. Ceramic raw materials are treated as one of the "industrial minerals". The regional offices of this Ministry is in charge of administration in individual regions.

The Directorate General of Multivarious Industries within the Ministry of Industry is in charge of promotion, supervision, and guidance for the ceramic products manufacturing sector. The directorate general consists of a planning promotion division, and five other divisions covering different types of products (foodstuffs, textiles, chemical products, electrical machinery and metal products, and building and various industries). The Director of the Building and Various Materials Division is in charge of ceramic products. The regional offices around the country are responsible for administration in their regions.

The Ministry of Trade is made up of two directorates general, one for domestic trade and one for imports and exports, and three agencies. The Directorate General of Foreign Trade is in charge of export and import controls, export promotion, and improvements to the standards and quality control of trade commodities. The National Agency for Export Development (NAFED) is in charge of activities related to the promotion of exports. Ceramic products are treated as belonging to the category of "other industrial products".

Each Ministry has its own testing and inspection organization.

There is also the Investment Coordination Board (BKPM) which is in charge of the control of internal and external investment, and the formulation and implementation of promotion policies, jointly with Ministry of Industry, Ministry of Mines and Energy and other related ministries and agencies.

However, there is no organization whose function is to be in charge of the whole ceramics industry.

(2) Technology Promotion Organizations and Testing, Research and Development Organizations

In the raw materials sector, the Ministry of Mining and Energy's Directorate General of General Mining has the Mineral Technology Development Centre (MTDC), and in the product manufacturing sector the Ministry of Industry's Industrial Research and Development Agency has the Institute for Research and Development of Ceramic Industry (IRDCRI). Both of these institutes are situated in Bandung. There is also the Superintending Company of Indonesia PT (SUCOFINDO) which carries out testing in 17 head and branch offices around the country. The company's testing service is relatively prompt, and it is used by some companies belonging to the ceramics industry. However, because its testing fees are high and the reports it issues contain only the results of tests

and inspection it is not rated that highly and it is difficult to utilize the results of its test. As a result, its use is restricted to urgent cases. Although the company's membership is made up of the various industry organizations, ASAKI is not included in its membership.

1) Institute for Research and Development of Ceramic Industry (IRDCRI)

The Institute is one of the 9 sectoral research and development institutes run by the Ministry of Industry, and its status is that of the central research center for the ceramics sector. The IRDCRI was established in 1922 under the name Ceramic Laboratory, and began by offering inspection, training and information services. Its functions were gradually expanded, and it was given its present name in 1980. The IRDCRI has a record of conducting joint research with the Government Industrial Research Institute, Nagoya, Japan.

a) Main objectives of IRDCRI

[1] Research and development related to raw materials, manufacturing processes, machinery and equipment, prototype and product technology, and processing-industrial standards, quality control and research into manufacturing technology-

[2] Dissemination of the results of research through services such as holding seminars, and providing technical assistance, guidance and training to the industry;

[3] Promotion of specialist skills and the application of technology;

[4] Providing information helpful for the formulation of industrial development policies by the government;

b) Organization and activities

[1] Organization: General Affairs Department,
Heavy Ceramics
Research Department and Development Department,
Fine Ceramics
Research Department and Development Department;

[2] Personnel: 31 university graduates, 20 graduates from technical high schools, 223 staff with qualifications under high school graduate; total personnel: 274;

[3] Scale: site area 13,000sq meters, building, 8,538 sq meters.

The IRDCRI has a line-up of the usual equipment. As well as carrying out research and development, analyzing and testing the physical properties of raw materials and products, it trains employees from medium and small-sized companies and staff members from the Ministry of Industry. It also accepts students from developing countries under the Colombo Plan.

However, it must be said that all of its activities are not so active. Its rating among private companies is also not very high. It rates as "the only specialist organization in the ceramics industry, and though the industry therefore has to rely upon it, its services are not satisfactory". Some of the reasons why it has yet attained high level activities are listed below:

[1] Shortage of research and inspection personnel

[2] Because of insufficiency of funding (its budget for fiscal 1991 is 130.0 million rupiah), it is slow to renew or supplement equipment and that it does not have sufficient chemicals, pharmaceuticals and associated materials required for inspection and analysis. The majority of the chemicals it uses are imports, and there are problems related to supply as a result of the poor stock levels of domestic distributors.

[3] Under such conditions researchers are not encouraged to seek high goals, and they make little effort to raise their own technical skills;

[4] Consequently, companies do not use the Institute very often, thus creating a vicious cycle whereby this in turn hinders the vitalization of activities.

In order to step up the activities of the IRDCRI it is necessary to increase its fixed and operational funding, increase its personnel, equipment, and materials, and to have companies use it more often.

The IRDCRI expectations in regard to assistance from the central government and Japan are listed below:

[1] Increase in its budget (ordinary budget);
[2] Expanding equipment and buildings;
[3] Assistance for staff training;
[4] Provision of know-how for instituting the analysis and testing of raw materials, research and development, and a training curriculum.

The expectations of private companies for the IRDCRI are:

[1] Speeding up of provision of inspection and test results (takes 1~2 months at the present time);
[2] Advice and comments made on the basis of the inspection results;
[3] Implementation of a rovering system for providing guidance, and the dispatch of staff to collect samples for use in tests;
[4] Reduction in training service fees (they currently stand at 17,000 Rp. per person per day. There are no accommodation facilities).

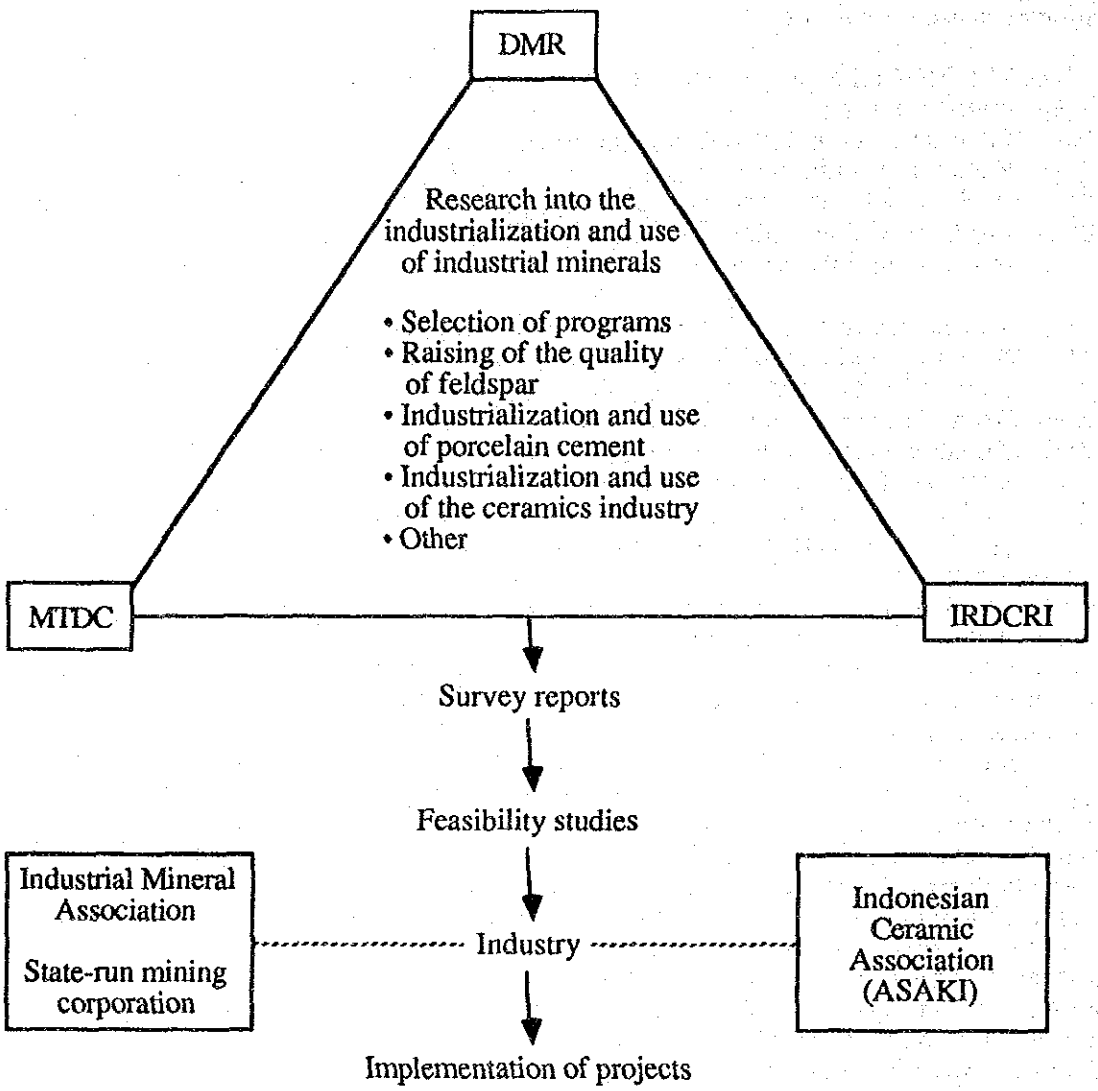
2) Mineral Technology Development Centre (MTDC)

The MTDC is the only institute run by the Ministry of Mining and Energy which undertakes research and development related to mining (metal, industrial minerals, coal) technology. Its services include research, analysis and testing, the handling of data, education and training, and a library. Its research mainly consists of mining technology, treatment and refining technology, preservation of the environment, mineral products, regional mining development and feasibility study. Its activities related to the ceramics industry include ore deposit surveys, development, refining, and analysis for zeolite, bentonite, kaolin, silica sand and feldspar. It has modern facilities and equipment, and its many highly qualified personnel (223 university graduates, 203 high school and higher technical school graduates) are engaged in numerous activities. Its education and training function is especially good, and it takes in 1,000 students each year. Its equipment and the contents of its projects are a cut above those of the IRDCRI. It is actively engaged in joint research projects with research organizations in Japan and other advanced countries, and it has a cooperative relationship with the Government Industrial Research Institute, Tohoku, Japan for work on zeolite.

3) Links between research and development institute

Up to today the IRDCRI and the MTDC have carried out their activities independent of one another, and there is an absence of mutual links which one would normally expect to find. However, there is the strong recognition of the importance of forming links between the industry's sectors from the upstream sector right down to the downstream sector for the development of the industry, and there is a high level of interest in mutual links. As part of this interest in December 1990 a working group was set up between the Ministry of Mining and Energy's Directorate of Mineral Resources (DMR), the MTDC, and the IRDCRI, and plans have been made for initiating joint research. In the future it plans to include industrial organizations and to supply information and the findings of its research. The plan is as shown in the figure below.

Fig. 2-4-1: Flow Chart (Plan) for a Joint Research and Development Activity for the Ceramics Industry



2-4-2 Position Among Industrialization Policies

The 5th five-year development plan (Repelita V) refers to ceramic products in its section on non-metal mineral processing industries. It makes the development of ceramic products a top priority. The production and export of ceramic products carried out during the period of Repelita IV and the production and export targets for Repelita V are shown in the Table below.

Table 2-4-1: Projection on Production & Export of Ceramic Products in Fifth Five-Year Development Plan

	Repelita IV	Repelita V
Production (1,000 tons)	138,090	200,000
Exports (US$1,000)	13,240	51,788

Source: Repelita V, Industry Sector

Calculations based on the above show that the annual average growth rate during the period of Repelita V for ceramic products is 7.68% for production. The expected annual average growth rate for exports is even greater at 31.36%.

2-4-3 Trade and Investment Policy Related to the Ceramic Industry

Negative list of investment of Indonesia in which investments are banned does not include the ceramic industry. This industry is opened to both foreign and domestic investments. According to BKPM, eight PMDN (domestic investment) projects were approved in the ceramic industry between 1985 and October 1990. In addition, there are many expansion projects.

There are no specific trade policies related to ceramic products alone.

For detail, please refer to Part I. "Review of Policies Related to Industrial Sub-Sector Development" of this survey report.

2-4-4 Financial Programs

The results of the local survey of Indonesian firms indicated that most of the firms are in need of capital investment and investment for safety, hygiene, and pollution-prevention measures. Although the government is making efforts to develop the local financial sector and long-term capital market, demand for long-term capital is also increasing rapidly. Thus, the shortage of capital and high interest rates present major obstacles to the promotion of industrial subsectors.

Taking this into account, Section I of this report ("Review of Policies Related to Industrial Sub-Sector Development") recommends the utilization of foreign two-step loans in the subsectors covered by the present survey (for export-oriented corporations and small and medium-sized businesses in particular) and the enhancement of incentives for capital investment. For details, please refer to Section I.

2-4-5 Infrastructure

Indonesia's ceramic plants are situated far away from the country's main raw material producing regions, and are concentrated in Surabaya in East Java, Semarang in Central Java, and the Bekasi, Tamgerang and Cibinon regions surrounding Jakarta in West Java. However, the level of concentration is not as high as that in producing regions in Japan, and the various plants are spread over a wide area. With the exception of some industrial complexes, the infrastructure which supports the operations of these plants is not very well established.

The following are problems related to the infrastructure.

[1] Supply system for natural gas for use as a fuel

Because natural gas is cheap and easy to handle and control, it is considered to be the best fuel for the ceramics industry under present conditions. The supply of natural gas is limited to certain areas, and systems for facilitating the stable supply of natural gas to areas around the country are expected to be established.

[2] Electricity supply

There is a shortage in the supply of electricity, and supply is still extremely unstable. Given that each company must rely upon its own generation of electricity, it is strongly hoped that a stable network for the supply of electricity will be put in place.

[3] Transportation facilities of raw materials

Trucks are relied upon for the transportation of raw materials. There is a short supply of rolling stock for transportation use, and it is to be hoped that such transportation facilities will be secured.

[4] Water for industrial use

The quality of water is generally not good in all regions. Water which is used in the ceramics industry must not contain properties which weaken color fastness. It is necessary to have a stable supply of water which may also be used as drinking water and water for everyday use.

2-5 Issues for the Promotion of the Ceramics Industry

2-5-1 Selection and Improvement of Quality and Stabilization of Supply of Raw Materials

The quality of ceramic products greatly depends on the quality of raw materials. As the domestically produced raw materials in Indonesia are inferior in terms of quality consistancy, comprehensive improvement, including the supply system is necessary.

(1)Strengthening the development of raw materials

It has been confirmed that there is an abundance of ceramic raw materials in all regions in Indonesia. The IRDCRI has been in charge of carrying out tests and analyses on the quality of these raw materials and in examining the value of their use. It has done this with the cooperation of the Government Industrial Research Institute, Nagoya, Japan. However, this has not been followed up on a continuing basis owing to insufficient staff numbers and funds on the part of the IRDCRI and other institutes.

The development of raw materials is, as a matter of course, under the jurisdiction of the Ministry of Mining and Energy. But it is desirable that IRDCRI and the Ministry of Industry be more active in the fields of quality inspection, analysis and application study. The results of such activities and data should be offered to private industries and enterprises also should offer samples and information to IRDCRI. Thus, government and industry would work together to develop and utilize new raw materials.

It is important to take into account in the development of raw materials that the materials used for ceramic products basically have to satisfy the following conditions.

a) Stability of quality
b) Stability of supply
c) Economical prices and easy availability

As a reference regarding the development and effective utilization of raw materials, major materials by product and their desirable quality are shown hereunder.

[Main Raw Materials]

Main raw materials by products are shown in Table 2-5-1, 2-5-2, 2-5-3, and 2-5-4.

Table 2-5-1: Representative Raw Materials for Tableware

Chemical Composition/ Raw Materials	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	Ig.loss
Kaolin	<47	>34	<0.5	<0.2	<0.3	<0.3	<1.0	<1.0	Abt.13
Plastic Clay	<46	>32	<0.8	<0.5	<0.3	<0.3	<1.5	<0.5	Abt.12
Plastic Clay	<50	>30	<1.0	<0.3	<0.5	<0.3	<1.5	<0.5	Abt.13
Feldspar	<68	>18	<0.3	-	<0.3	<0.2	6~10	<4.0	<1.0
Feldspar	<75	>15	<0.1	-	<0.1	<0.2	>4	>4	<1.0
Silica	>98	>1.0	Tr	-	Tr	Tr	<1.0	<1.0	-

Table 2-5-2: Representative Raw Materials for Novelties

Chemical Composition/ Raw Materials	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	Ig.loss
Pottery Stone	Abt.78	>1.2	<0.7	<0.5	<0.4	<0.5	1~3	<2	Abt.3
Feldspar	Abt.76	Abt.15	<0.3	<0.1	<0.1	<0.2	Abt.4	Abt.4	<0.5
Silica	>98	<0.5	<0.1	-	<0.2	<0.8	-	-	<0.2
Dolomite	<1.0	<0.2	<0.4	-	>30	<22	-	-	Abt.45
Plastic Clay	<52	>32	<1.0	<0.3	<0.5	<0.3	<1.0	<1.0	Abt.12
Plastic Clay	<50	>32	<1.0	<0.5	<0.5	<0.2	<2.0	<0.5	Abt.13
Kaolin	<50	>34	<0.2	<0.2	<0.8	Tr	1~1.5		Abt.13

Table 2-5-3: Representative Raw Materials for Sanitaryware

Chemical Composition/ Raw Materials	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	Ig.loss
Pottery Stone	Abt.80	Abt.12	<0.5	<0.05	<0.6	<0.2	2~4	<0.5	Abt.3
Plastic Clay	Abt.52	>34	<1.0	<0.8	<0.3	<0.3	<2.0	<0.5	Abt.12
Plastic Clay	Abt.50	>32	<1.5	<0.5	<0.5	<0.2	<1.0	<1.0	Abt.13
Kaolin	<53	>30	<1.0	<0.2	<1.0	<0.2	<0.5	<0.5	Abt.13
Calcium Carbonate	<0.3	<0.2	<0.05	-	>52	<2.0	-	-	Abt.45
Dolomite	<0.5	<0.5	<0.2	-	>33	>18	-	-	Abt.47
Feldspar	<70	>16	<1.0	<0.2	<0.5	<0.5	4~6	4~6	<1.0

Table 2-5-4: Representative Raw Materials for Tiles

Chemical Composition/ Raw Materials	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	K_2O	Na_2O	Ig.loss
Plastic Clay	<50	>33	<1.5	<0.8	<0.5	<0.3	<1.5	<0.3	Abt.12
Plastic Clay	<58	>28	<1.8	<1.0	<0.5	<0.5	<1.5	<0.5	Abt.8
Kaolin	<50	>34	<1.0	<1.0	<0.5	<0.3	<1.5	<0.3	Abt.12
Feldspar	<75	>14	<0.5	-	<0.5	<0.2	4~6	4~6	-
Pottery Stone	<75	>15	<0.5	<0.6	<0.5	<1.0	3~5	<1.0	Abt.3
Silica	>99	<0.5	<0.2	-	-	-	-	-	-
Calcium Carbonate	<0.5	<0.5	<0.2	-	>54	<1.0	-	-	Abt.44
Ro-seki	<65	>28	<0.5	<0.3	<0.3	<0.2	<0.2		Abt.6

[Auxiliary Materials]

As to auxiliary materials, glazes, gypsum mold, sagger and slab support, etc.are used.

[1] Auxiliary materials used as glazing

• Alumina (Al_2O_3)	;	Industrial use with high purity in powder form (300 mesh pass)
• Zinc Oxide (ZnO)	;	Industrial use with high purity in powder form (300 mesh pass)
• Barium Carbonate ($BaCO_3$)	;	Industrial use with high purity in powder form (300 mesh pass)
• Frit	;	To be used for tile and novelty products. Varieties of grades of quality used according to uses and purposes. High reactivity to other raw materials.
• Feldspar, Silica, Clay, Dolomite, Calcium Carbonate	;	These materials are raw materials themselves but used also as auxiliary raw materials in tableware and sanitary ware products to enhance the quality of the respective original raw materials. Therefore, the quality of these auxiliary raw materials should be same or superior to the original raw materials.
[2] Gypsum mold	;	Used for tableware products. Mixed gypsum composed of ∂-plaster (20 - 40%) and ß-plaster (60 - 80%)
[3] Sagger, Support	;	High durability Mullite - cordierite characteristics

Recently, use of synthetic raw materials in some areas has been accompanied by the improvement in grades of ceramic products. One example is calcium phosphate which is used for bone china. Other viable alternatives include high quality mixed kaolin, mixed feldspar, synthetic mullite, and synthetic cordierite. As well as developing these kinds of man-made raw materials, efforts should be made with regard to research and the use of a wide range of new raw materials.

(2) Provision of standards and guidance for selection and grading

When raw materials are mined there are various kinds of methods which can be used, such as bench cutting and tunnel mining, depending on the topography and existing conditions. It can be said of all raw materials that, being natural raw materials, quality differs from one layer to another. In many cases this is assessed from external appearance. A distribution survey should be carried out for raw materials which are buried underground, and thickness of layer of the top soil and of useable raw materials are grasped. The top soil is then discarded, after which it becomes necessary to excavate the different layers.

As for stone raw materials, foreign substances and dirty sections removed by manual selection, and in the case of clay raw materials, they are divided and stored for each excavation separately depending on the layers and extent of the mixing of impurities.

All raw materials should be classified, depending boundary samples prepared, and it is desirable that the excavator would be instructed to makes an assessment based on

visual inspection for dividing the raw materials. It is important to take great care that there is no mixing of good quality sections with poor quality sections, and that excavation and selective mining take place as each section is classified according to grade.

A general standard for grading is shown here under.

[1] Kaolin	;	- High content of Al_2O_3 (over 34%) - Low content of Fe_2O_3 and TiO_2 (Fe_2O_3 plus TiO_2; less than 0.7%) - The lower the content of TiO_2, the better - High plasticity
[2] Plastic Clay	;	- High plasticity - Low content of Fe_2O_3 and TiO_2 (To void the impurity causing undesirable coloring) - High refractoriness
[3] Feldspar	;	- High content of K_2O and Na_2O (over 10%) - Low content of Fe_2O_3 and TiO_2 - Low content of CaO and MgO (Max 1%)
[4] Silica	;	- Extremely high content of SiO_2 (over 99%) - No content of MnO and Fe_2O_3
[5] Dolomite	;	Extremely high content of MgO and CaO without any other impurity.
[6] Calcium	;	Extremely high content of CaO without any other impurity.

(3) Improvement of the processing and treatment processes

1) Stoney raw materials

Depending on the deposits, dynamite is used to smash and excavate, and selective mining is carried out while the primary and secondary grinding processes are being undertaken.

When primary grinding is finished selection takes place by manual selection using a conveyor belt, whereupon secondary grinding is carried out. The materials are divided into different grades for the different sizes of the particles depending on their intended use, and once magnetic ferrofilter has been used for extracting iron contents which were mixed in during grinding, it is divided and stored according to particle size and quality.

2) Clay raw materials

Clay is divided into primary clay and secondary clay, and the impurities they contain vary according to their origin. Fine organic matter, and ground particles contained are removed by washing with water and sieving with water. It is necessary to use a powerful magnetic ferrofilter in order to remove magnetic substances with color fasting properties. Most of the clay which is seen in existing plants is not refined. Kaolin is the only type which is refined, but the degree of magnetic separation is not high. It is necessary to incorporate a process for increasing the effect of magnetic separation at a water sieving factory.

Fig. 2-5-1: General Treatment Processes and Processing for Stoney Raw Materials

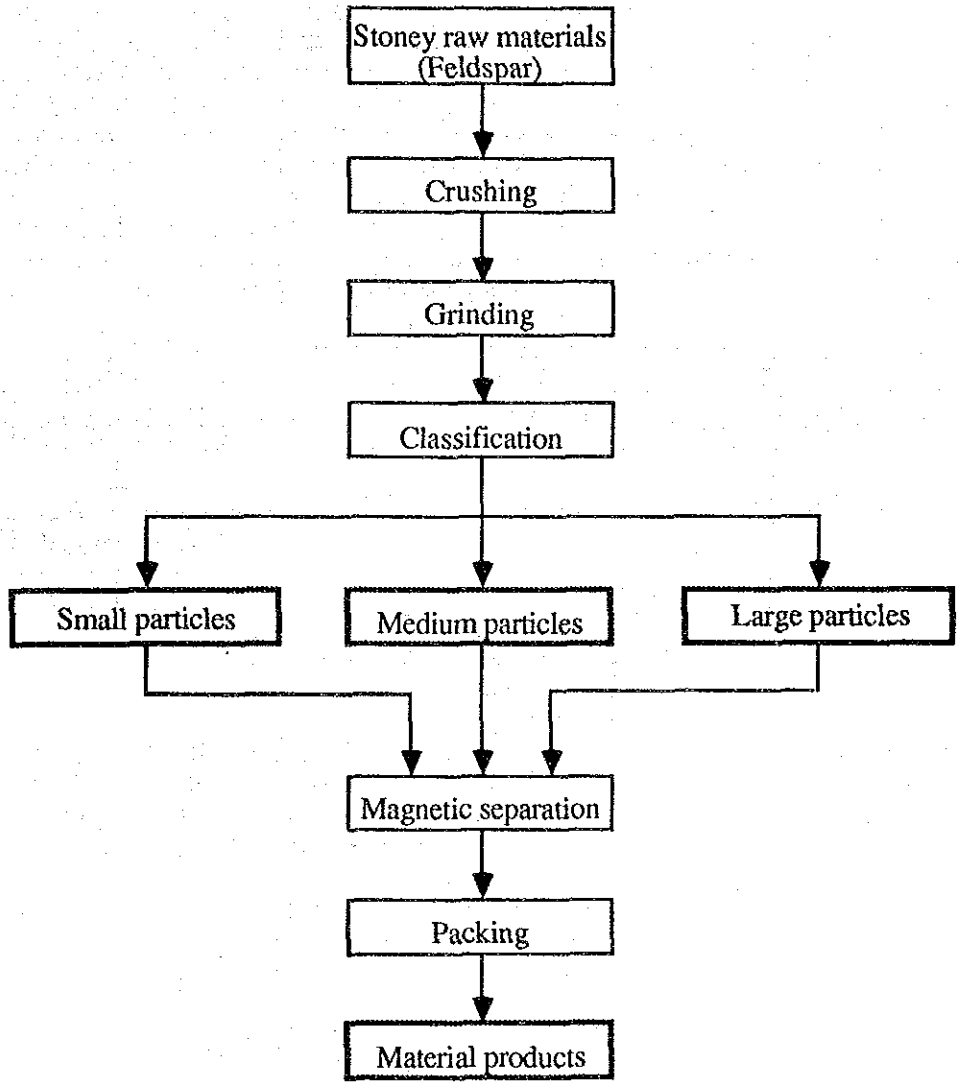
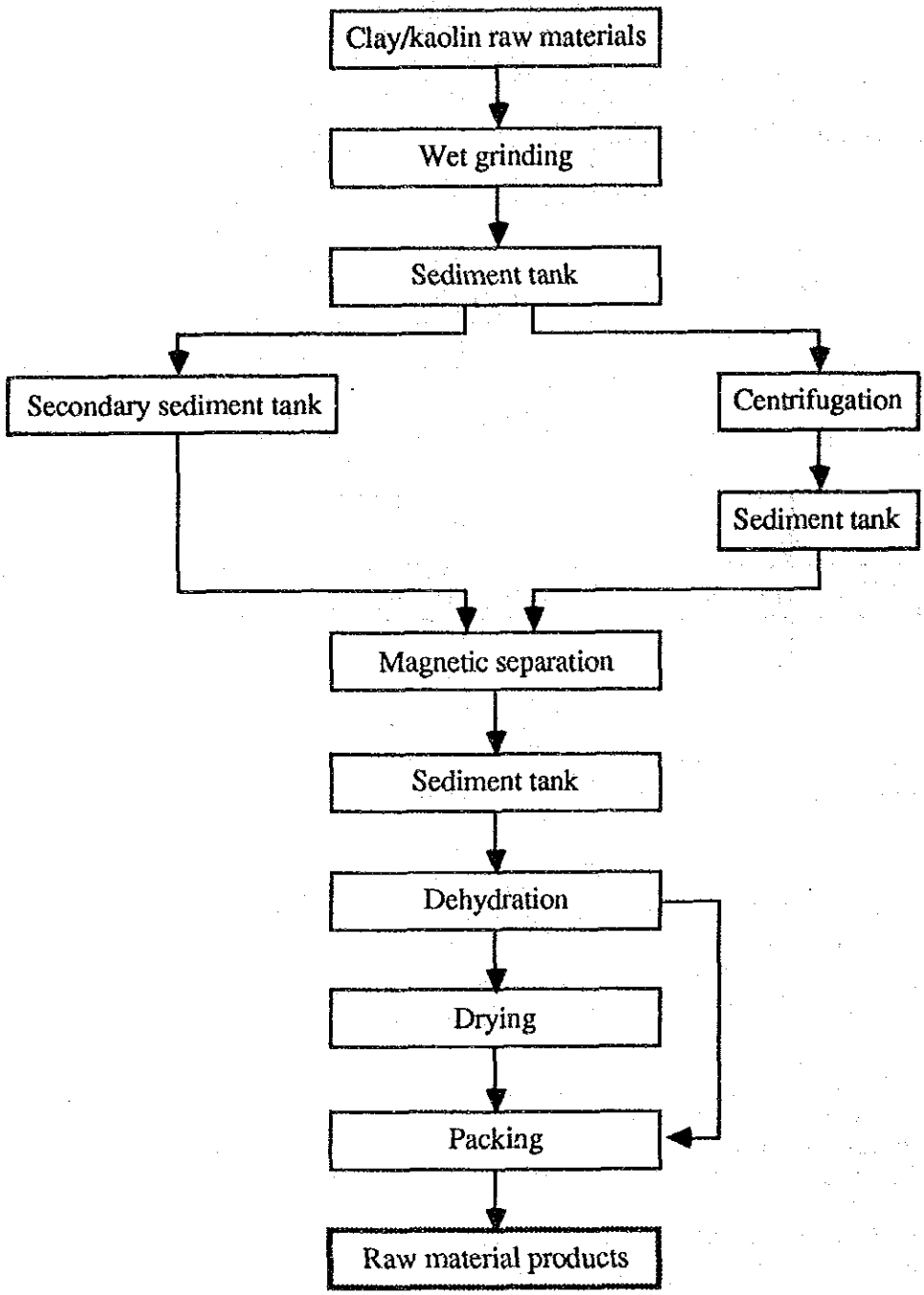


Fig. 2-5-2: General Treatment Processes and Processing of Clay/Kaolin Raw Materials



(4) Promotion of mixing technology

Mixing ratios and conditions vary according to the properties of the raw materials which are used for table ware, sanitary ware, novelty items, and tiles. In Japan each company possesses its own know-how for this and regards it as being top secret. The basics for mixing are to achieve optimum molding conditions and a strong green body, and it is important that this is done so as to obtain a standard quality for products. It is not possible to control the quality of product efficiently if the character of body would change depending on the mixing of materials. Once quality tests, mixing tests, and trial tests have been carried out and the optimum conditions have been found, it is necessary for those conditions to be strictly maintained. As for adopting these conditions, it is necessary to undertake advanced tests for the entire volume and repeat them as the properties of the raw materials adopted change.

One issue that must be tackled is the establishment of a comprehensive supply system of prepared materials as well as accumulation of technology for treatment and mixing of materials. For example, it is recommendable to create a raw material supply complex where prepared body is provided according to the condition of standards.

A general sample of mixing ratios according to product categories is shown as follows.

[1] Tableware	Feldspar:	25 - 30%
	Silica:	20 - 25%
	Kaolin:	35 - 20%
	Clay:	20 - 25%

In case the silica content included in feldspar and clay is larger, the quantity of silica should be reduced accordingly and feldspar and clay should be increased in quantity, proportionally. However, to avoid the loss of trasparency of the body, the increase of clay content should be limited.

[2] Sanitary ware	Feldspar:	20 - 15%
	Silica:	20 - 30%
	Pottery Stone/Ro-seki:	35 - 25%
	Calcium:	3 - 5%
	Clay: (incl. Kaolin)	20 - 25%

In order to adjust the shrinkage at the forming stage, clay with desirably high plasticity should be used but in as low a quantity as possible. If the silica content included in the Feldspar is large, the quality of the silica to be utilized should be reduced.

[3] Novelties		
a)Haku un Toki	Dolomite:	35 - 25%
	Ro-seki:	40 - 55%
	Clay:	25 - 20%
b)Porcelain Type	Feldspar:	12 - 8%
	Silica:	8 - 12%
	Kaolin:	5 - 10%
	Clay:	20 - 30%
	Pottery Stone:	55 - 40%

- Haku un Toki is unstable in regard to body strength.
- Porcelain type novelties are recommendable to develop.

[4] Tiles

a)Wall Tiles	Feldspar:	17 - 5%
	Silica:	10 - 20%
	Pottery Stone:	15 - 20%
	Ro-seki:	15 - 25%
	Calcium:	3 - 5%
	Clay:	40 - 25%
b)Floor Tiles	Clay:	35 - 45%
	Pottery Stone/Ro-seki:	35 - 30%
	Feldspar:	20 - 10%
	Silica:	10 - 15%

In order to adjust the shrinkage of body, the quantity of clay should be reduced and the use of the other stone materials should be increased in quantity.

(5) Improving the import environment

It is not possible to manufacture top quality table ware, novelty items, and sanitary ware using only raw materials produced in Indonesia. It is necessary to reply on imports for some raw materials and auxiliary materials (pigments, plaster of Paris, and kiln furniture, etc.).

Although tariffs preferential measures have been put in place in the case of raw materials which are imported for use in products which are to be exported, this is not so in the case of products for the domestic market. They are subject to prescribed tariffs, and this raises their costs. It is very desirable to either abolish or lower tariffs applied to imported raw materials and value added tax as a means of raising the quality of products made for the domestic market.

For reference, materials for ceramic products which are considered necessary or desirable to be imported at present are shown by product as follows.

[1] Tableware	Feldspar (For Glazing use) Alumina (Al_2O_3) Zinc Oxide (ZnO) Barium Carbonated ($BaCo_3$) Transfer paper Plaster of Paris Plastic clay Sagger Pigment
[2] Sanitary ware	Plastic clay Zinc Oxide (ZnO) Barium Carbonated ($BaCo_3$) Zircon Plaster of Paris Slab and support Pigment
[3] Novelties	Frit Pigment Zinc Oxide (ZnO) Barium Carbonated ($BaCo_3$) Feldspar (Glazing use) Alumina (Al_2O_3)

	Calcium (Glazing use)
	Dolomite (Glazing use)
	Plastic clay
	Slab and support
[4] Tiles	Pigment
	Zinc Oxide (ZnO)
	Feldspar (Glazing use)
	Frit

(6) Implementation of a full-scale survey on resources

Though fragmentary surveys have been carried out on ceramic raw materials, an organized survey is yet to be undertaken. The inadequate linkage between the Ministry of Mining and Energy and the Ministry of Industry has resulted in the failure to undertake a joint survey on resources.

Though a survey will require considerable time and expenditure, but it is possible to obtain considerable data by some simple method such as continuous collecting and analyzing of samples. It is necessary to undertake a systematic survey in the major regions on aspects such as distribution, amount of deposits, and quality.

Promising raw materials to be included in the survey include kaolin, plasticity clay, feldspar, pottery stone, Roseki, pagodite, silica, gypsum, magnesite, and dolomite, etc.

2-5-2 Promotion of Production and Supply Systems for Auxiliary Materials, and Provision of the Infrastructure

One of prerequisites for the manufacture of good quality ceramic products is the establishment of production and supply systems for auxiliary materials. It is not possible to obtain good quality products if these systems are unstable. The establishment and expansion of such systems is an important element when aiming at comprehensive development.

Following are main auxiliary materials by product to be elaborated in this section.

Table 2-5-5: Main Auxiliary Materials by Product

Table ware	Sagger Slab and Support Plaster of Paris Transfer Paper Feldspar Zinc Oxide Alumina Barium Carbonate Pigment
Sanitary ware	Slab and Support Plaster of Paris Pigment Zircon Barium Carbonate Zinc Oxide Feldspar
Novelty	Frit Pigment Slab and Support Zinc Oxide Barium Carbonate Feldspar Alumina Calcium Carbonate Dolomite
Tile	Frit Pigment Zinc Oxide Barium Carbonate

The required quality of auxiliary materials are as follows.

[1] Sagger, Slab and Support

It is desirable to use Mullite-cordierite material which has durability, heat resistance and spall resistance. A representative composition is as follows.

Cordierite:	35 - 40%
Mullite:	40 - 35%
Other:	20 - 30%

[2] Plaster of Paris

The mixing rate of ∂-plaster and ß-plaster differs according to forming styles, i.e., jigger forming and casting forming. Jigger forming used mainly for tableware requires the use of ∂-plaster dominant mixture. On the other hand, casting forming used for table ware and sanitary ware requires the use of a ß-plaster dominant mixture which has good water absorption but inferior strength. Therefore, a ß-plaster dominant mixture should contain about 20% of ∂-plaster to enforce body strength.

[3] Feldspar

A representative kind of feldspar is Indian feldspar which is recommendable to use because of its higher content of K_2O. In general, the feldspar actually used in Indonesia contains a higher content of Na_2O rather than K_2O. The best composition rate of K_2O plus Na_2O is said to be about 10%. Feldspar with the lowest possible content of Fe_2O_3 would be desirable.

Table 2-5-6: A Sample of Composition of Indian Feldspar

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Ig.Loss
616.04	18.73	0.11	0.20	-	11.64	2.95	0.22

[4] Transfer paper

High grade products require adequate transfer papers with excellent design and multicolored printing.

[5] Zinc Oxide, Barium Carbonate, Alumina, Zircon

These auxiliary materials are all to be of industrial standard quality and extremely small in size, 300 mesh pass.

[6] Dolomite, Calcium Carbonate

A lower content of Fe_2O_3 in these materials would be desirable.

[7] Pigment

There are many kinds of pigments including pigments with a main content of cobalt, chrome or iron. These are used for separate purposes as mixed pigment. It is important to designate clearly the purpose of use at the time of procurement of the pigment.

(1) Intensive development of priority fields

Two associated areas which are important to foster are manufacture of kiln furniture and gypsum molds.

The kiln furniture utilized vary according to the product sectors. Table ware industry uses a large quantity of sagger. Slabs and supports are required for novelty items. Imports are relied upon for all of these at present. They are made of highly durable materials using synthetic mullite and cordierite. Silicon carbide is also used in some cases. Even though silicon carbide may be excluded from examination of development due to the small amounts in which it is consumed, in the case of mullite and cordierite, it is necessary to produce these domestically using imported-synthetic raw materials. Domestic production of auxiliary materials is important not only from the point of view of lowering costs but also from the standpoint of the technological development of new areas.