Japanese Chemical Companies in Asia
—The Challenge of Achieving Growth—

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To gauge the impact of Asia's currency crisis on the production sites of Japanese chemical makers in Asia, and to consider their strategy in the medium to long term, we conducted an interview survey of Japanese production sites in four ASEAN nations (Indonesia, Malaysia, Thailand, and Singapore) this February. Based on the findings, we examine the present status and future prospects of their Asian strategy.

1. Singapore's Growing Competitive Advantage

(1) Impact of the Currency Crisis by Country

After the currency crisis hit East Asian nations in the summer of 1997, massive outflows of foreign capital threatened to collapse their economies.

The ASEAN nations most crippled by collapsing financial systems were Indonesia and Thailand. They are still trapped in a vicious circle where capital shortages have dampened domestic demand, hurt the cash flows of operating companies, delayed recovery of investment in existing projects, and discouraged investment in new projects.

Plant location is crucial in the petrochemical industry, and in Indonesia, where derivatives plants were built in industrial areas before upstream ethylene facilities, redundant infrastructure and investment costs have become excessive.

Compared to Indonesia, Singapore is recovering more quickly. Already an attractive investment destination, Singapore is exploiting new opportunities created by the currency crisis to further enhance its superiority in the following respects.

(2) High Labor Productivity

In the petrochemical industry, cost competitiveness is determined not only by unit input costs of production such as labor and electricity, but by more general considerations such as the stability of factor inputs. For example, fewer personnel are needed to operate ethylene plants in Singapore compared to Indonesia because of Singapore's higher quality of labor (Table 1). In addition, Singapore's lower crime rate also contributes to the higher labor productivity because fewer security personnel are needed to guard plants.

Table 1 Comparison of Labor Productivity and Electricity Supply

	Singapore	Indonesia	Thailand
Plant worker's monthly salary	US$ 2,070	US$ 130	US.$ 370
Ethylene plant	PCS No. 2	Chandra Asri	TOC
No. of plant personnel	72	94	116
Annual capacity	515,000 tons	510,000 tons	385,000 tons
Labor productivity per worker	7,153 tons	5,426 tons	3,319 tons
Annual labor cost per ton	US$ 3.5	US$ 1.9	US$ 1.3
Electric rate per MWh	US$ 47	US$ 25	US$ 32
Electrical outages per year	0	Several	Several

Notes: 1. Salaries and electric rates are estimates in petrochemical producing areas.
2. For Chandra Asri, number of personnel includes four Japanese workers costing ￥25 million /year including living expenses.
3. Currency conversion rates are as of March 25: US$1 = S$1.72 = 8,095.24 rupiah = 36.96 baht.
Source: Interviews

(3) Stability of Electric Power Supply

As important as electricity costs are, the stability of electricity supply is even more critical. Since petrochemical plants operate around the clock, power outages can be costly, while independent power generation would increase investment costs significantly. It is estimated that a single power outage at an ethylene plant produces a loss one million dollars. Singapore excels here because it has zero power outages (Table 1).

(4) Supportive Government Policies

Because the petrochemical industry uses massive physical plants which cannot be easily dismantled, in addition to the input of high quality factors of production, the industry strongly needs a guarantee of stable operation in the form of political stability.

The Singapore government's consistent stance toward foreign capital has been a source of confidence. This confidence was reinforced recently when the government signaled its intention to reduce business costs through competitiveness-enhancing measures and cut labor costs including pensions, electric rates, land rents, and taxes.

(5) Favorable Location

Petrochemical projects do not necessarily need a large domestic local market and expansive lots. Despite its small domestic market, because Singapore boasts a low country risk and strong government support, projects that export to the regional market can be profitable if shipping costs are contained.

2. Impact of Currency Crisis on Demand

For the petrochemical industry, the currency crisis had a diverse impact on demand depending on who the major users of each product were.

(1) Solid Demand in Export-Oriented Industries

Products for export-oriented industries such as synthetic fiber and home electrical appliances —industries that benefited from devalued local currencies — experienced no major decline in demand. These include purified teraphthalic acid (PTA), used to make polyester, and polystyrene (PS), used for the external chassis of many home appliances.

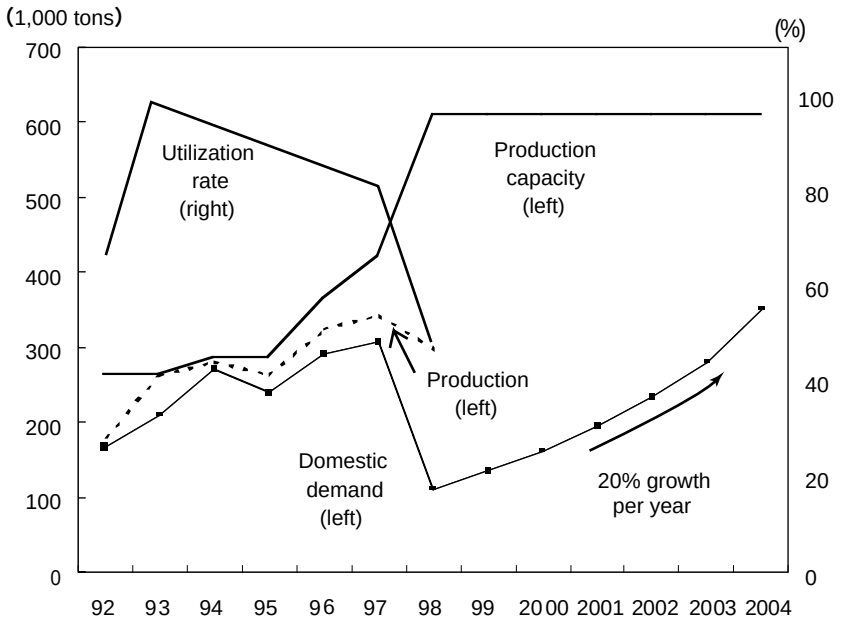
Indonesia, ASEAN's leading synthetic fiber producer, saw its domestic PTA demand in 1998 edge upward from the previous year to approximately one million tons. In Malaysia and Thailand, the two leading ASEAN producers of home appliances, domestic PS demand declined to approximately 150,000 tons each in 1998 (of which 50% was used for home appliances), limiting the year-on-year decline to the 5 to 10% range. Their Japanese suppliers were able to maintain a 90 to 95% capacity utilization rate during this time.

(2) Demand Slump in Domestic-Oriented Industries

On the other hand, demand plunged for polyvinyl chloride (PVC) and polyethylene (PE), products used mainly by domestic-oriented industries. In the Indonesian PVC market, which is dominated by Japanese suppliers, demand fell in 1998 to 110,000 tons, or one-third the

level of the previous year and lower even than in 1992. The major reason for this drop is that 60% of domestic demand consists of PVC pipes for public and private construction projects. Although the export ratio increased from 15% in 1997 to 65% in 1998, the stagnant demand overall caused the industry's capacity utilization rate to fall below 50% (Figure 1).

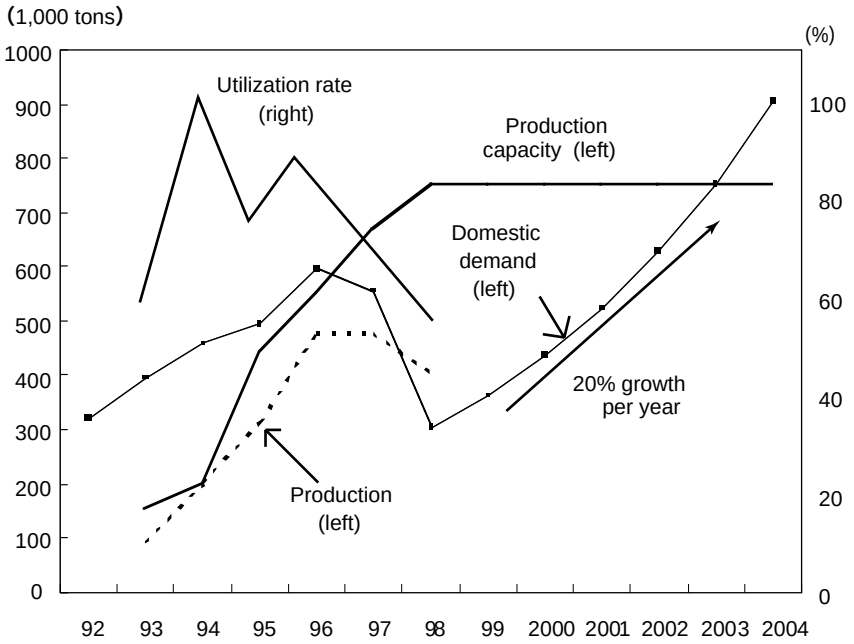
Figure 1 PVC Resin Supply and Demand in Indonesia



Source: Interviews

Indonesia's domestic demand for PE, which is mainly used for packaging materials, declined by half in 1998, falling below the 1992 level. Although the export ratio rose from 20% in 1997 to 50% in 1998, the industry's capacity utilization rate still stopped at slightly over 50% (Table 2). The decline in demand was aggravated by a credit contraction from suppliers, who insisted on advance payment in dollars after the currency crisis.

Figure 2 Polyethylene Supply and Demand in Indonesia



Source: Interviews

3. Excess Supply in the Market

(1) Time Needed to Alleviate Excess Capacity

As already indicated above by the falling capacity utilization rates, all products suffer from varying but significant levels of excess capacity. Capital investment plans were based on the assumption that high growth rates prior to the currency crisis would be maintained.

For example, even assuming that Indonesia's domestic demand for PVC grows 20% annually from 1999, the 1997 level will not be reached until 2004, at which time today's capacity should exceed domestic demand by at least 70% (Figure 1). Likewise, assuming that domestic demand for PE grows 20% annually, demand will reach the 1997 level in 2002 and match capacity in 2003 (Figure 2). As for PTA, while managing to grow slightly in 1998, its production capacity still exceeds domestic demand by 60 to 70% due to a growth rate substantially below projections.

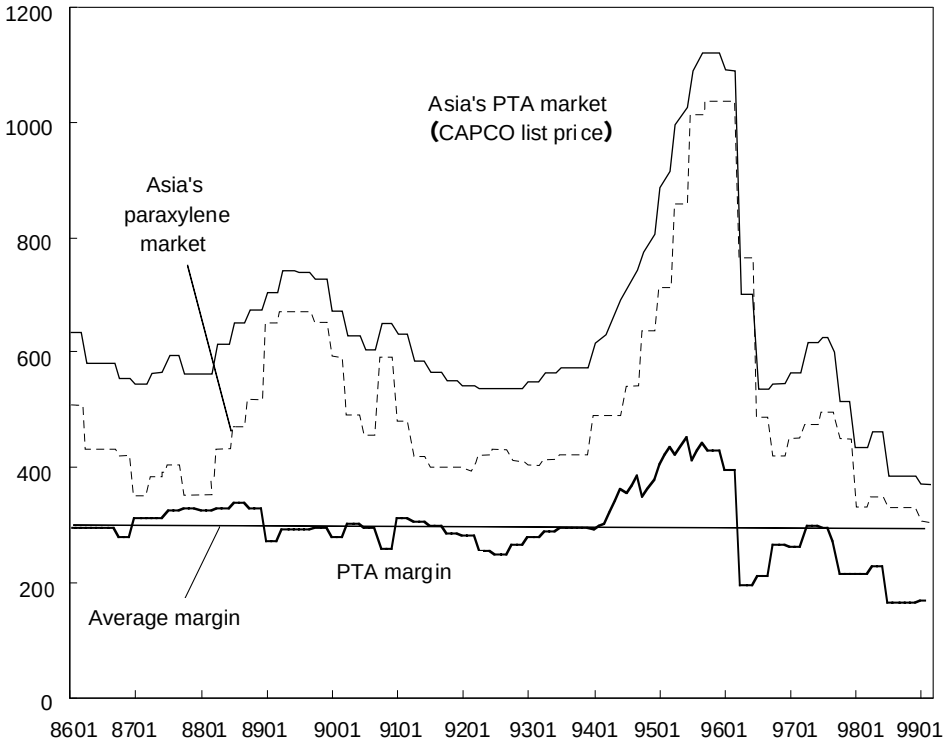
(2) Prices Fall Faster

Asia's demand contraction accelerated a price decline in the already soft global market for

petrochemical products. In particular, price cutting in PVC and PE export markets by Indonesia and Thailand accelerated the downtrend in Asia and squeezed earnings. As a result, existing projects are experiencing a slower recovery of and new projects have deteriorated in feasibility.

For example, since 1986 the margin for PTA (after subtracting the raw material cost of paraxylene) has averaged $300 per ton. Historically, Amoco of the U.S. used to exercise its pricing dominance by setting the PTA price at a level that would sustain reinvestment. However, following a sharp squeeze in the paraxylene market in 1994 and 1995, the PTA margin reached new highs, triggering investment in new technology. The margin declined after the currency crisis, and has recently reached the $160 to $170 range (Figure 3).

Figure 3 PTA Margin in Asian Market



Note: PTA margin = PTA price - Paraxylene price x 0.67
Source: Interviews

4. Japanese Presence in Asia

(1) Historical Perspective of the Asian Market

Japanese chemical companies first moved into Asia in the late 1960s when pollution problems at home forced them to seek new production sites overseas. From the late 1970s, prompted by the need to secure sources of raw materials following the oil crisis along with requests for economic cooperation from developing countries, Japanese companies participated in large national petrochemical projects, one of which was in Singapore. These large projects declined temporarily in the structural recession after the second oil crisis. In Asia's rapid growth during the 1990s, Japanese firms participated increasingly in both private projects and national projects for self sufficiency.

However, due to financial weaknesses and slow-moving management, Japanese petrochemical companies were unable to obtain the type of leadership position enjoyed by their counterparts in processing and assembly industries. In fact, among large-scale projects totaling at least $500 million in partnership with local capital or western companies, very few Japanese companies have assumed a lead role (Table 2).

Table 2 Projects of Japanese Companies by Project Size and Capital Participation

	Capital stake	Cumulative project size (US$ million)			
		< 100	100 - 500	500 - 1,000	> 1,000
Indonesia	20-50%	Statomer (Tosoh 30, Mitsui & Co. 20)	Amoco Mitsui PTA (Mitsui Chemicals 45, Mitsui & Co. 5)	PENI (Mitsui & Co. 12.5, Sumitomo Corp. 12.5)	Chandra Asri (Marubeni 20.2, Showa Denko 2.4)
	50-100%	PNR (Toray 47.1, Mitsui Chemicals 41.6, Mitsui & Co. 5.5)	Asahimas (Asahi Glass 52.5, Mitsubishi Corp. 11.5); Bakrie Diafoil (Mitsubishi Chemical 98)	Bakrie Kasei (Mitsubishi Chemical 57.4)	
Singapore	20-50%			Seraya Chemicals (Mitsubishi Chemical 30)	PCS (Sumitomo Chemical 26.5)
	50-100%	Mitsui Bisphenol (Mitsui Chemicals 100)	SMAG (Sumitomo Chemical 52.5, Toagosei 21.1, Nippon Shokubai 13.8, Sumitomo Seika 12.5); Mitsubishi Chemical Infonics (Mitsubishi Chemical 100); Mitsui Phenol (Mitsui Chemicals 90, Mitsui & Co. 10)		
Malaysia	20-50%				
	50-100%	Petrochemicals (Idemitsu Petrochemical 51, Sumitomo Corp.19)	Idemitsu Styrene Monomer (Idemitsu Petrochemical 70)		
Thailand	20-50%		Bangkok Polyethylene (Mitsui & Co. 35); Siam Mitsui PTA (Mitsui Chemicals 50)		
	50-100%	Eternal Plastics (Mitsui Chemicals 35, Mitsui & Co. 25)	Thai Caprolactam (Ube Industries 43.9, Marubeni 16)		

Notes: Contains projects of companies that were interviewed. Classified by total capital participation of Japanese companies. Participating companies and their stakes are in parentheses.
Source: Interviews and company documents.

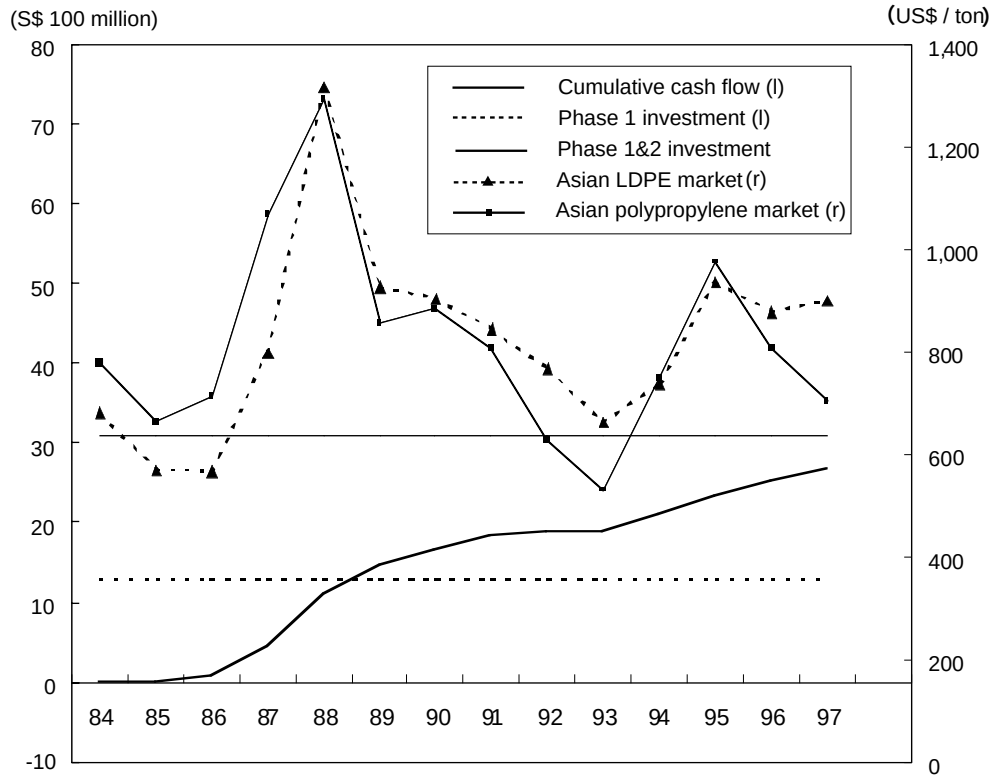
(2) Widening Earnings Gap

The growing excess capacity is causing the earnings gap to widen among local Japanese companies. To explore the factors affecting the performance of petrochemical projects in Asia, we compare two firms: Petrochemical Corporation of Singapore (PCS), led by Sumitomo Chemical, and Chandra Asri (Indonesia), in which Marubeni holds a stake. Both cases are integrated projects with a total investment value of around US$2 billion.

1. Sharp contrast in recovery of investment

PCS was able to recover the initial investment in its Phase 1 project in six years after beginning operation in 1984. Thus it was able to internally fund almost 80% of the US$1.3 billion investment for Phase 2 starting in 1997 (Figure 4).

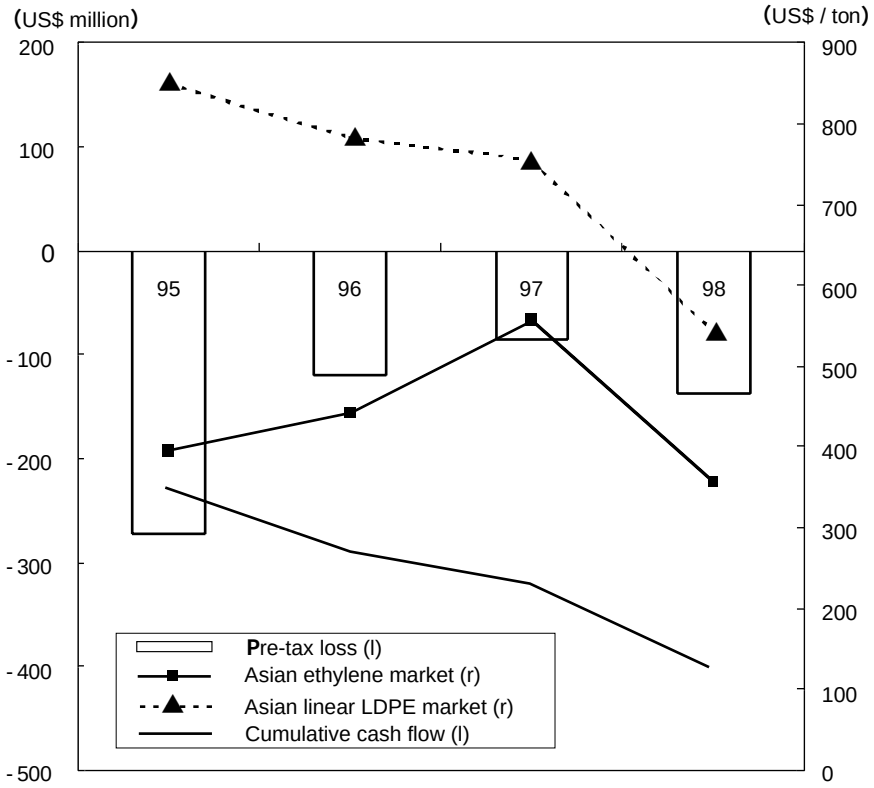
Figure 4 PCS's Recovery of Investment and the Asian Petrochemical Market



Notes: Shows combined investment for PCS and TPC (The Polyolefin Company Singapore). Cash flow is estimated from investment and Asian market conditions.
Source: Interviews, Bloomberg (ICIS data), others.

On the other hand, since the start of operation in 1995, Chandra Asri has posted successive net losses and a cumulative cash flow of minus US$400 million by the end of 1998 (Figure 5).

Figure 5 Chandra Asri's Earnings and the Asian Petrochemical Market



Source: Company materials, Bloomberg, others.

This earnings gap between the two firms may be attributed to the following factors.

2. Investment timing

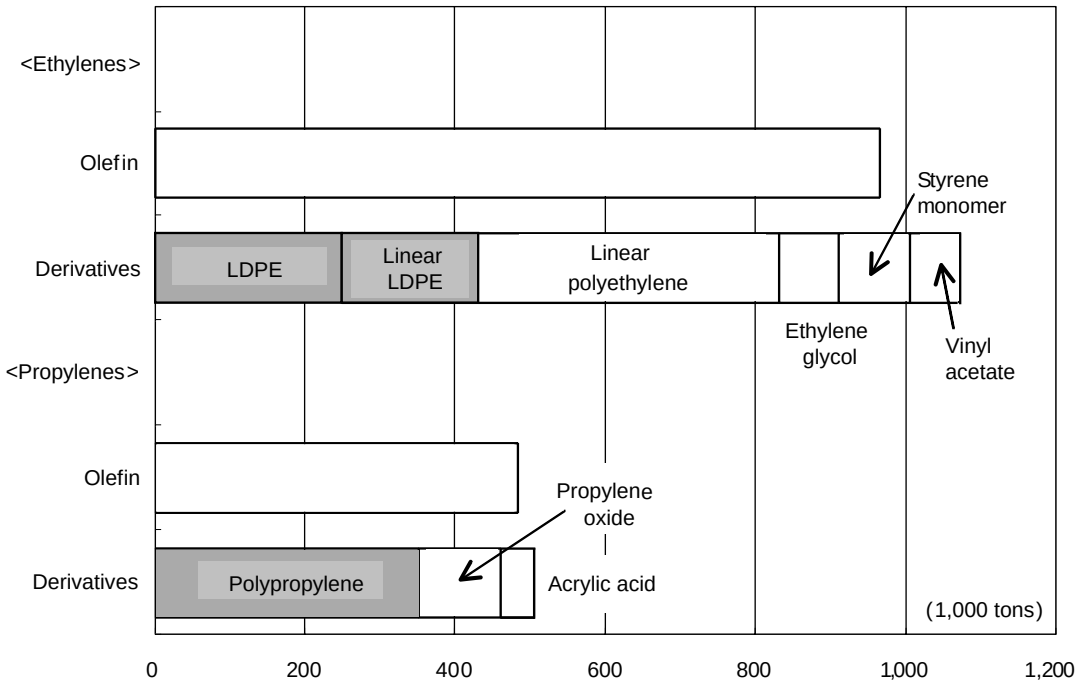
The most critical factor in capital intensive industries is investment timing, because it affects not only earnings but investment cost. For PCS, the startup phase, when capital outlays are most intense, coincided with an upswing in the petrochemical market. In contrast, because Chandra Asri was forced to delay construction at least one year when Indonesia tightened its monetary policy in 1991, the project began operation in 1995 just after the petrochemical market had peaked (Figures 4 and 5). Moreover, Chandra Asri incurred a large total investment of almost US$1.9 billion because of high construction costs in the booming market, construction delays, and redundancy with earlier investments by derivatives makers. Thus Chandra Asri was handicapped by both high total investment costs and a product market downturn immediately after starting operation.

3. Captive Use and Ethylene Plant Operating Rates

The most important factor in the success of petrochemical projects is whether cracked products such as ethylene, which is continuously produced and expensive to ship, are consumed within the complex to make derivative products, thereby improving margins and maintaining operating rates.

Using technology introduced from Sumitomo Chemical, PCS was structured so that olefin (ethylene and propylene) is pipelined to derivatives plants to produce polyolefin (PE and polypropylene; Figure 6).

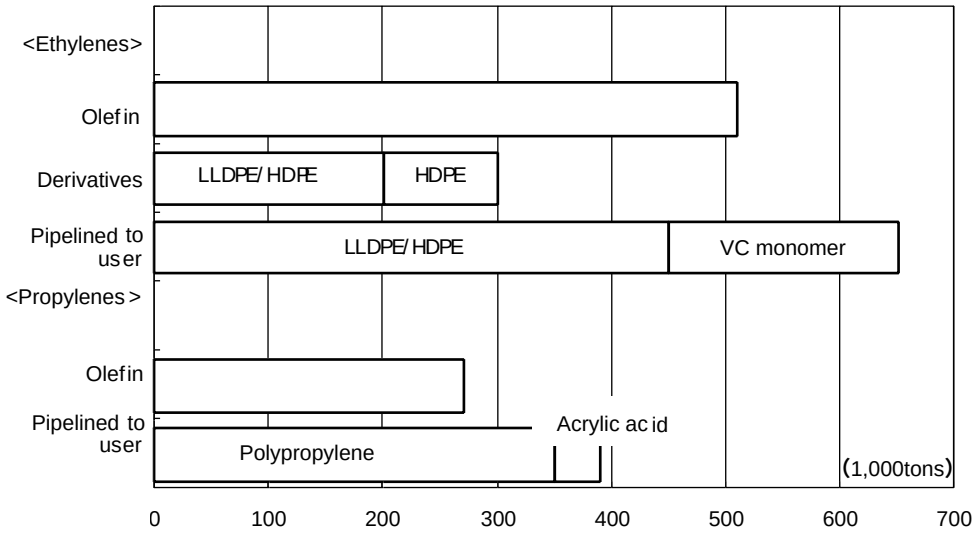
Figure 6 Olefin Balance of PCS



Note: Shows present annual capacity. Values for derivatives are calculated from olefin. Shaded area denotes products made using Sumitomo Chemical technologies (TPC company).
Source: Company documents, interviews.

On the other hand, the only cracked product consumed within Chandra Asri's complex is ethylene to produce PE. While its olefin could ostensibly be fully consumed by users connected later by pipeline, these users have also been using imported olefin, thus exposing Chandra Asri to intense international competition from its start (Figure 7). For 1998, the ethylene operating rate for PCS was 100%, reflecting its captive use of olefin, compared to 85% for Chandra Asri.

Figure 7 Olefin Balance of Chandra Asri



Notes: See Figure 6. Does not include users not connected by pipeline.
Source: Company documents, interviews.

4. Product differentiation

PCS's member company TPC (The Polyolefin Company, Singapore) was the first local polyolefin supplier in Southeast Asia. When new suppliers emerged as a result of national projects for self-sufficiency, TPC added high-margin products such as high-quality films and industrial uses. Once quality stabilizes, these niche products tend to maintain market share even when demand declines. Technical support for advanced resin technology came from its major stockholder, Sumitomo Chemical.

5. Recommended Asian Strategy for Japanese Companies

(1) Strategic Investment for an Expanding Equilibrium

Since Japan's major chemical companies tend to focus on short-term capital efficiency, there is a danger that recent poor returns may prompt them to scale down and cut personnel in their petrochemical businesses.

Due to the growing emphasis in capital markets on shareholder value, companies need to continuously improve their return on invested capital as they strive toward an expanding equilibri-

um. However, excess capacity is forcing companies with poor earnings to scale down in the near term. As the industry sheds excess capacity and strong companies consolidate their position in the domestic market, they should hold open their strategic options for petrochemical investment in Asia in anticipation of growth resuming in the medium to long term.

In addition to declining prices, the Asian market will see more direct competition from European and American majors establishing a local presence. At the same time, financially stronger companies stand to reap large gains by concentrating on products in core skill areas while timing their investments. Another possibility is to shop for bargains among the petrochemical holdings of local industrial groups undergoing restructuring.

(2) Core Skill Areas

During the two years from fiscal 1995 to 1997, internal funds available for strategic investment at Japan's top four integrated chemical companies ranged from ¥120 billion to ¥190 billion. These figures were calculated by taking the consolidated cumulative cash flow for the period, and then subtracting dividend payments (normally six yen per share) and recurring investment (Table 3).

Table 3 Funds Available for Strategic Investment at the Seven Integrated Chemical Companies (Cumulative for FY 1995-97; consolidated basis)

(¥billion)

	Pre-tax profit (A)	Depreciation cost (B)	Cash flow (C) = (A) + (B)	Dividend payout at ¥6 per year (D)	Recurring investment (E)	Possible strategic investment (C) - (D) - (E)
Asahi Chemical Ind.	62.8	212.9	275.7	26	88	161.7
Showa Denko	16.7	65.1	81.8	12.5	42.7	26.6
Sumitomo Chemical	62.1	187.9	250.1	29.2	87.5	133.4
Mitsubishi Chemical	39.2	315.9	355.1	37.6	123.2	1943
Tosoh	35.8	69.4	105.2	10.8	36.5	57.9
Mitsui Chemical	45.6	143.7	189.3	14	55.3	1200
Ube Industries	19.6	101.1	120.7	15.1	48.2	57.5

Notes: Post-tax profit includes portfolio loss reported in extraordinary loss. Recurring investment is assumed to be 40% of actual investment. Showa Denko covers a two-year period from fiscal 1996 to 1997 because companies with financial year ending in December began posting consolidated investment and depreciation figures in fiscal 1996.
Source: *Yuka Shoken Hokokusho*

Unlike their overseas counterparts, since Japan's major chemical companies do not have sufficient funds for a diversified investment approach, they should instead focus their Asian strategy on derivatives projects that utilize core skills of catalysis, polymerization, or oxidation technologies, and invest either alone or through a majority stake in a joint venture. Moreover,

to ensure a stable olefin supply, avoid high transport costs, and benefit from vertical integration, they should also consider investing jointly in an ethylene plant upstream.

(3) Singapore's Growing Attractiveness

As the Asian economy heads toward recovery in the longer term, Singapore's attractiveness as an overseas site is increasing, particularly as a result of the currency crisis.

The government intends to expand Singapore's annual ethylene production capacity to 3 million tons by 2010. Presently, PCS's existing ethylene plant and Exxon's project slated to go online next year account for a capacity of 1.8 million tons, indicating that another one or two large-scale ethylene plants will be built. Moreover, since government plans also call for cracked products to be consumed by derivatives plants making differentiated products, Japanese companies will have major investment opportunities coming their way.