CHAPTER 3

MARKETING ANALYSIS

3.1 PETROCHEMICAL INDUSTRY IN THE ASEAN REGION

There are 10 countries in the ASEAN block; they are Thailand, Singapore, Malaysia, Indonesia, Philippines, Brunei, Vietnam, Lao, Combodia and Myanmar. During the last 10 years the economic growth rate for the ASEAN member countries is considered high with a big combined population figure. This shows that there is a strong market for petrochemical products with strong potentials. As this reason, the countries in this region have undertaken a keen interest in developing their petrochemical industry quickly. This is true even if some types of raw materials are greatly dependent on importation as to better cope with the expanding market locally and among the countries in the ASEAN region.

From the forecast of the production capacity of petrochemical products by the year 2000 for the country within the ASEAN regions as shown in the table 3.1, Thailand can become a leader in the petrochemical industry. The steps in developing the petrochemical industry of each country, all have a different potential. These countries would be both important competitors and market of Thailand.

TABLE 3.1 Production Capacity of Countries in the ASEAN Region

Units: '000 ton/year

	Thailand		Singapore		Malaysia		Indonesia		Philippines	
	1996	2000	1996	2000	1996	2000	1996	2000	1996	2000
Upstream										
Ethylene	751	2,351	450	965	550	1,230	550	1,100	-	450
Propylene	379	1,328	305	569	650	650	490	860	-	200
Intermediate										
VCM	280	595	-	-	-	400	-	250	-	-
PTA	400	1,650	-	-	-	500	475	1,625	-	-
SM	200	380	-	315	-	200	100	200	-	-
Downstream										
PE	790	2,030	340	730	400	440	400	700	-	200
PP	440	1,010	193	313	200	200	480	480	-	180
PS	214	314	-	100	-	82	100	200	-	-
PVC	420	810	25	25	30	210	347	707	48	108

Remark: Brunei, Vietnam, Lao, Combodia and Myanmar have no Petrochemical Production.
Source: Thailand Investment Promotion Journal. Aug 8,1996.

LAO, COMBODIA and MYANMAR

These three countries are new members of the ASEAN. They still have many political problems and just open their countries to the world during the last five years. It is expected that they could not be competitors for Thailand. However, these countries can become export markets for Thailand in the future.

MALAYSIA

Malaysia saw its advantage of having rich natural resources in the form of natural gas and crude oil. These advantages meant that raw material prices are lower. However, Malaysia has a low population at 19.65 million people, meaning a smaller market size. Malaysia, therefore aims to be an important player regionally. The government also provides protection to its petrochemical industry, in particular on the import tariff side. The government sets a policy that products and the petrochemical industry to be in the "exclusion list". The import duties stand at 30 percent, raw materials both ethylene and propylene having import duties of 2-5 percent. The countries would use these tariffs as long as the lenient period of AFTA applies. Furthermore, the government also sets that plastic pellet importers must be certified by the local plastic pellet manufacturers and from the government itself. This is because there are specific technical barrier which is a non-tariff barrier, thus making Malaysia an important competitor of Thailand.

INDONESIA

The development of the petrochemical industry of Indonesia is still in the first stage and under close watch from the government. The aromatics plant currently in operation could not meet the local demand even if Indonesia is an oil exporting country and is rich in natural resources in the form of hydrocarbons such as natural gas and crude oil. At present, the potential and condition of Indonesia' s petrochemical industry is not progressive as it should be. If considering Indonesia as a target market, even with the largest population within the ASEAN region of 193.75 million people, the per capita income is still very low. This has resulted in the low product consumption capacity and demand. Aside from this, Indonesia has implemented changes of surcharge on imported plastic pellets as tariff barrier. The reason is that Indonesia considers its petrochemical industry as a protected industry and is in the exclusion list for tariff. Therefore, Indonesia is not an attractive target market of Thailand and is not an potential competitor at present.

SINGAPORE

The potential and state of the petrochemical industry in Singapore is considered at a matured state because it was the first ASEAN country to develop its petrochemical industry to become fully integrated. Singapore has opened itself Petrochemical Company constructed an olefins plant to manufacture both ethylene and propylene by using napthta, which are obtained from oil refineries. The output of which are used as raw materials for downstream petrochemical sector particularly plastic pellets. Even if the Singaporean market is not large enough to absorb petrochemical products produced, with a population of 2.99 million people, but it is an important commercial and transportation hub in this region. Because of these factors, Singapore is an important exporter of petrochemical products. Singapore is targeting Thailand as a market and reshipment to Indonesia. This makes the local producers to become more alert of petrochemical exports from Singapore and should be prepared to cope a strong competitor as Singapore

PHILIPPINES

Due to political problems, the petrochemical industry became underdeveloped and exports of plastic pellets were very small when compared with other ASEAN countries. The current condition is that the Philippines has to import large quantities of plastic pellets of the type LDPE, HDPE and PP. Majorities of which are imported from Singapore. The Philippines, however, have a master plan to build up its petrochemical industry to become fully integrated. It also lacks the local availability of raw material, making importation a must. Hence, the Philippines is not considered as an important competitor of Thailand at present. With a population of 68.42 million people, it is considered as an important target market for petrochemical exports from Thailand.

BRUNAI and VIETNAM

Brunei is a small country with only a population of 260,000, this makes Brunei a very small market. Therefore, the country has to depend on the importation of petrochemical products. As present, Vietnam has given tariff exemption for plastic pellets because the country still does not produce locally, but the Asian Federation Plastic Industries (AFPI) meeting reached a conclusion that if Vietnam develops her petrochemical industry, the government would set up tariff barriers in protection of its industries. Therefore, both Brunei and Vietnam can become an important export market for Thailand.

3.2 POLYESTER MARKET OUTLOOKS

Thailand Polyester Outlook

The supply/demand outlook is based on Chem Systems'[1] proprietary data. Capacities for individual producers are provided in Table 3.2 for 1994-2000 including planned expansions. Totally, The polyester supply, demand, and trade for Thailand for major applications including polyester fiber, PET resin, and polyester film and derived demand for PTA are shown in Table 3.3. The forecasts and underlying assumptions for each application segment are discussed in detail below.

(1) Chem Systems means a leading management and technology consultants for the global chemical, petroleum and related process industries, is committed to effective business solutions.a leading research organization in the petrochemical industry, which we use all data in this marketing analysis include of demand/supply and price forecasting.

Thailand's polyester industry is well established and growing while PET resin is expected to develop strongly in the future. Polyester fiber and PET resin capacities within Thailand will expand sharply across the next several years. Annual capacity for all polyester segments in 1996 totaled 537 thousand metric tons, an increase of about 43 thousand metric tons over capacity in 1995. Chem Systems projects that polyester capacity for all applications will expand to approximately 1.5 million metric tons per year by 2000 including expansions by existing producers and new entries. For some of the larger scale capacity additions planned, Chem Systems has assumed only part of the expansion will develop to reflect the projected market conditions. We expect these expansions to proceed with important exceptions noted below.

(a) Polyester Fiber

Thailand is undergoing a major expansion in polyester fiber along with other polyester producing countries in ASEAN region. As a result, we expect strong competition for exports of fiber, low operating rates, and corresponding pressure on fiber pricing. Major expansions planned by polyester fiber producers in Thailand are highlighted in Table 3.4. Total polyester fiber capacity totaled 491 thousand metric tons per year in 1996 expanding by approximately 100 thousand metric tons since 1994, as a result of expansions by Sun Flag, Teijin Thailand, and Tuntex. In addition, Jong Satit recently announced its plans to back integrate to fiber. Total polyester fiber capacity is expected to expand to approximately 1.1 million metric tons per year by 2000.

TABLE 3.2
THAILAND POLYESTER PRODUCER CAPACITY
(metric tons)

Bangkok Polyester	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**
Filament Yarn													
Partially Oriented Yarn													
Staple Fiber													
Fiber Chip Grade													
PET Resin				30,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000
Film & Other													
Total				**30,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**
Chiem Patana Synthetic Fiber													
Filament Yarn													
Partially Oriented Yarn and DTY	10,500	17,500	17.5	17,500	17,500	17,500	105,000	108,000	111,000	114,000	116,000	116,000	116,000
Staple Fiber	17,500	21,000	21,000	21,000	21,000	21,000	126,000	129,000	132,000	135,000	136,000	136,000	136,000
Fiber Chip Grade				3,500	3,500	3,500	21,000	15,000	9,000	3,000	0	0	0
PET Resin													
Film & Other													
Total	**28,000**	**38,500**	**21,018**	**42,000**	**42,000**	**42,000**	**252,000**	**252,000**	**252,000**	**252,000**	**252,000**	**252,000**	**252,000**
Hoechst													
Filament Yarn													
Partially Oriented Yarn													
Staple Fiber													
Fiber Chip Grade													
PET Resin													
Film & Other			1,500	5,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Total			**1,500**	**5,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**	**16,000**
Indopet (Indorama)													
Filament Yarn													
Partially Oriented Yarn													
Staple Fiber													
Fiber Chip Grade													
PET Resin				25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Film & Other													
Total				**25,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**
Jong Satit													
Filament Yarn													
Partially Oriented Yarn						52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
Staple Fiber						52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
Fiber Chip Grade													
PET Resin													
Film & Other													
Total						**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**
Kangwal Polyester													
Filament Yarn													
Partially Oriented Yarn					12,000	12,000	12,000	15,000	18,000	18,000	18,000	18,000	18,000
Staple Fiber					42,000	42,000	42,000	54,000	66,000	66,000	66,000	66,000	66,000
Fiber Chip Grade					30,000	30,000	30,000	15,000	0	0	0	0	0
PET Resin													
Film & Other													
Total					**84,000**	**84,000**	**84,000**	**84,000**	**84,000**	**84,000**	**84,000**	**84,000**	**84,000**

Source : Chem Systems Research for East Asia Polyester Producer Capacity 1996

TABLE 3.2 (cont'd)
THAILAND POLYESTER PRODUCER CAPACITY
(metric tons)

Oriental Floor (chip only)	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**
Filament Yarn													
Putridly Cranial Yarn													
Steps Fiber	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**
Shinkong Synthetic													
Filament Yarn													
Fertility Oriented Yarn													
Staple Fiber													
Fiber Chip Guide													
PET Resin				45,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000
Film & Other													
Total				**45,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**	**105,000**
Siam Polyester													
Filament Yarn	6,200	7,000	7,000	0	0	0	0	0	0	0	0	0	0
Partially Oriented Yarn	13,200	14,000	14,000	0	0	0	0	0	0	0	0	0	0
Staple Fiber	16,500	17,500	17,500	0	0	0	0	0	0	0	0	0	0
Fiber Chip Grade													
PET Resin	12,000	15,000	15,000	0	0	0	0	0	0	0	0	0	0
Film & Other													
Total	**47,900**	**53,500**	**53,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Sun Flag													
Filament Yarn		3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Partially Oriented Yarn	11,700	25,000	25,000	25,000	25,000	35,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Staple Fiber	41,800	25,000	25,000	25,000	25	15,000	0	0	0	0	0	0	0
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**53,500**	**53,500**	**53,500**	**53,500**	**28,525**	**53,500**	**53,500**	**53,500**	**53,500**	**53,500**	**53,500**	**53,500**	**53,500**
Teijin Thailand													
Filament Yarn	6,000	7,000	7,200	7,200	7,200	7,200	7200	7,200	7,200	7,200	7,200	7,200	7,200
Partially Oriented Yarn	2,500	12,600	12,960	30,240	30,240	30,240	30,240	30,240	30,240	30,240	30,240	30,240	30,240
Staple Fiber		28,000	32,400	64,800	64,800	64.8	64,800	64,800	64,800	64,800	64,800	64,800	64,800
Fiber Chip Grade			29,940										
PET Resin													
Film & Other													
Total	**8,500**	**47,600**	**82,500**	**102,240**	**102,240**	**37,505**	**102,240**	**102,240**	**102,240**	**102,240**	**102,240**	**102,240**	**102,240**

Source : Chem Systems Research for East Asia Polyester Producer Capacity 1996

TABLE 3.2 (Cont'd)
THAILAND POLYESTER PRODUCER CAPACITY
(metric tons)

Teijin Polyester	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**
Filament Yarn	24,480	24,500	25,200	25,200	25,200	25,200	40,300	40,300	40,300	40,300	40,300	40,300	40,300
Partially Oriented Yarn													
Staple Fiber	78,000	77,000	79,200	79,200	79,200	79,200	125,100	125,100	125,100	125,100	125,100	125,100	125,100
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**102,480**	**101,500**	**104,400**	**104,400**	**104,400**	**104,400**	**165,400**	**165,400**	**165,400**	**165,400**	**165,400**	**165,400**	**165,400**
Thai Melon Polyester													
Filament Yarn	9,600	10,500	10,500	10,500	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Partially Oriented Yarn	15,000	17,500	17,500	17,500	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750	8,750
Staple Fiber	39,000	42,000	45,500	45,500	35,250	35,250	35,250	35,250	35,250	35.25	35,250	35,250	35,250
Fiber Chip Grade				49,000	24,000	0	0	0	0	0	0	0	0
PET Resin					52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
Film & Other													
Total	**63,600**	**70,000**	**73,500**	**122,500**	**125,750**	**101,750**	**101,750**	**101,750**	**101,750**	**66,535**	**101,750**	**101,750**	**101,750**
Toray Fiber													
Filament Yarn	12,000	12,000	12,000	20,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Partially Oriented Yarn													
Staple Fiber													
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**12,000**	**12,000**	**12,000**	**20,000**	**24,000**	**24,000**	**24,000**	**24,000**	**24,000**	**24,000**	**24,000**	**24,000**	**24,000**
Toray Nylon Thailand													
Filament Yarn	9,600	10,200	10,200	10,200	10,200	10,200	10,200	10,200	10,200	10,200	10,200	10,200	10,200
Partially Oriented Yarn	3,600	4,200	4,200	4,200	4,200	4,200	4.2	4,200	4,200	4,200	4,200	4,200	4,200
Staple Fiber													
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**13,200**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**
Tuntex													
Filament Yarn				14,400	14,400	14,400	26,900	26,900	26,900	26,900	26,900	26,900	26,900
Partially Oriented Yarn	36,000	56,400	56,400	85,200	85,200	85,200	110,300	110,300	110,300	110,300	110,300	110,300	110,300
Staple Fiber	40,000	46,800	46,800	133,200	133,200	133,200	208,000	208,000	208,000	208	208,000	208,000	208,000
Fiber Chip Grade													
PET Resin													
Film & Other													
Total	**76,000**	**103,200**	**103,200**	**218,400**	**218,400**	**218,400**	**345,200**	**345,200**	**345,200**	**137,408**	**345,200**	**345,200**	**345,200**
Total Polyester	**408,180**	**497,200**	**522,518**	**785,440**	**1,022,715**	**1,063,955**	**1,526,490**	**1,526,490**	**1,526,490**	**1,283,483**	**1,526,490**	**1,526,490**	**1,526,490**

Source : Chem Systems Research for East Asia Polyester Producer Capacity 1996

TABLE 3.3
THAILAND POLYESTER SUPPLY AND DEMAND
(metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Polyester Capacity													
Filament Yarn	67,880	74,700	75,600	91,000	89,750	89,750	117,350	117,350	117,350	117,350	117,350	117,350	117,350
POY	92,500	147,200	147,560	179,640	182,890	245,390	372,990	378,990	384,990	387,990	389,990	389,990	389,990
Staple Fiber	232,800	257,300	267,400	368,700	400,450	442,950	653,650	668,650	683,650	686,650	687,650	687,650	687,650
Subtotal Fiber	**393,180**	**479,200**	**490,560**	**639,340**	**673,090**	**778,090**	**1,143,990**	**1,164,990**	**1,185,990**	**1,191,990**	**1,194,990**	**1,194,990**	**1,194,990**
Fiber Chip Grade	0	0	29,940	52,500	57,500	33,500	51,000	30,000	9,000	3,000	0	0	0
PET Resin	12,000	15,000	15,000	100,000	312,500	312,500	312,500	312,500	312,500	312,500	312,500	312,500	312,500
Film & Other	0	0	1,500	5,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
Total Capacity	**405,180**	**494,200**	**537,000**	**796,840**	**1,059,090**	**1,140,090**	**1,523,490**	**1,523,490**	**1,523,490**	**1,523,490**	**1,523,490**	**1,523,490**	**1,523,490**
Polyester Demand													
Filament Yarn	58,261	58,552	60,473	64,554	67,781	71,170	74,729	78,465	82,388	86,508	90,833	95,375	121,725
Partially Oriented Yarn	67,760	68,438	69,532	79,826	86,212	92,929	99,976	107,350	115,043	123,048	131,353	139,946	186,541
Staple Fiber	191,300	210,430	214,356	231,998	243,597	255,776	268,564	281,991	296,090	310,894	326,439	342,761	437,459
Subtotal Fiber	**317,321**	**337,420**	**344,361**	**376,378**	**397,590**	**419,875**	**443,269**	**467,806**	**493,521**	**520,450**	**548,625**	**578,082**	**745,725**
Fiber Chip Grade	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
PET Resin	23,000	31,856	36,763	51,468	69,482	90,327	125,000	140,375	153,009	165,249	178,469	190,962	267,834
Film & Other	2,100	2,730	3,649	4,436	5,545	6,654	7,653	8,418	9,049	9,728	10,457	11,085	14,834
Total Demand	**345,421**	**375,006**	**387,773**	**435,282**	**475,617**	**519,856**	**578,922**	**619,599**	**658,579**	**698,427**	**740,551**	**783,129**	**1,031,393**
Polyester Imports													
Filament Yarn	800	800	600	400	400	400	400	400	400	400	400	400	400
Partially Oriented Yarn	0	0	0	0	0	0	0	0	0	0	0	0	0
Staple Fiber	11,000	8,400	6,000	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800
Subtotal Fiber	**11,800**	**9,200**	**6,600**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**	**5,200**
Fiber Grade Chip	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
PET Resin	12,800	19,106	11,263	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Film & Other	2,100	2,730	2,124	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Imports	**29,700**	**34,036**	**22,987**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**	**14,200**

Source : Chem Systems Research for East Asia Polyester and PTA Supply and Demand 1996

TABLE 3.3 (cont'd)
THAILAND POLYESTER SUPPLY AND DEMAND
(metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Polyester Exports													
Filament Yarn	237	9,478	2,119	9,556	5,317	3,722	18,378	18,162	15,412	12,466	9,901	7,120	(16,883)
Partially Oriented Yarn	10,865	64,042	41,138	65,682	61,929	110,744	194,686	203,422	204,499	202,864	202,088	199,345	160,550
Staple Fiber	39,463	24,394	21,609	71,449	85,568	116,673	252,620	271,102	276,139	270,692	266,302	260,295	179,349
Subtotal Fiber	**50,565**	**97,914**	**64,866**	**146,687**	**152,814**	**231,139**	**465,684**	**492,686**	**496,050**	**486,022**	**478,291**	**466,760**	**323,016**
Fiber Grade Chip	0	0	14,970	26,250	28,750	16,750	25,500	15,000	4,500	1,500	0	0	0
PET Resin	0	0	(12,750)	31,532	154,268	142,798	123,750	124,000	114,491	103,501	92,156	80,913	15,291
Film & Other	0	0	0	1,314	10,655	9,546	8,547	7,782	7,151	6,472	4,943	4,795	1,366
Total Exports	**50,565**	**97,914**	**67,086**	**205,783**	**346,487**	**400,233**	**623,481**	**639,468**	**622,192**	**597,495**	**575,390**	**552,468**	**339,673**
DMT Based Polyester Production	57,726	62,160	60,865	19,845	0	0	0	0	0	0	0	0	0
DMT Imports	**59,458**	**64,025**	**62,691**	**20,440**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
PTA Based Polyester Production	308,560	376,724	370,906	607,020	807,903	905,890	1,188,202	1,244,867	1,266,572	1,281,722	1,301,741	1,321,396	1,356,866
PTA Demand	**268,447**	**327,750**	**322,688**	**528,108**	**702,876**	**788,124**	**1,033,736**	**1,083,034**	**1,101,917**	**1,115,098**	**1,132,515**	**1,149,615**	**1,180,474**
Thailand PTA Capacity													
ATC								350,000	350,000	350,000	350,000	350,000	350,000
Tuntex		100,000	380,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000	420,000
							450,000	450,000	450,000	450,000	450,000	450,000	450,000
Siam Mitsui PTA					25,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000
Total Capacity	**0**	**100,000**	**380,000**	**420,000**	**445,000**	**770,000**	**1,220,000**	**1,570,000**	**1,570,000**	**1,570,000**	**1,570,000**	**1,570,000**	**1,570,000**
PTA Capacity Surplus/(Shortfall) Over Demand	**(268,447)**	**(227,750)**	**57,312**	**(108,108)**	**(257,876)**	**(18,124)**	**186,264**	**486,966**	**468,083**	**454,902**	**437,485**	**420,385**	**389,526**

Source : Chem Systems Research for East Asia Polyester and PTA Supply and Demand 1996

TABLE 3.4
POLYESTER FIBER CAPACITY IN THAILAND
(thousand metric tons per year)

Producer	1996 Capacity	Expansions	Timing
Chiem Patana	38	88,105 (POY,SF)	2000
Jong Satit		53,53 (POY,SF)	1999
Kangwal		12,42 (POY,SF)	1998
Oriental Fiber (chip)	3		
Siam Polyester	39	(39)	1997
Sun Flag	53	25 (POY)	2000
Teijin Polyester	104	15,46 (FY,SF)	2000
Teijin Thailand	52	17,13 (POY,SF)	1997
Thai Melon Polyester	73	49 (SF)	1998/99
Toray Fiber	12	12 (FY)	1997/98
Toray Nylon Thailand	15		
Tuntex	103	14,29,86 (FY,POY,SF)	1997
		13,15,75 (FY,POY,SF)	2000

Source: Chem Systems Research for East Asia Polyester Capacity 1996

Siam Polyester shut down completely early in 1997, and Thai Melon has not proceeded with a major restructuring. We assume that Siam Polyester remains shut down and that Thai Melon will continue operations at 50 percent of the previously assumed capacity. Demand for all polyester fiber is projected to grow from approximately 344 thousand metric tons in 1996 to 443 thousand metric tons by 2000 corresponding to an average growth of approximately 6.5 percent annually. Imports, from industry figures, are assumed to remain about at current levels, reflecting possible relationships among the textile/garment producers with fiber suppliers outside of Thailand. For example, Japanese producers, e.g., Teijin or Toray, may import technical products, such as microdenier polyester fiber for fine apparel, which are produced in Japan but not in Thailand.

It is expected that Thailand's exports to expand as a result of the planned polyester fiber expansions, as producers will work to maximize capacity utilization. However, expansions in other ASEAN and East Asian countries and competition for exports will effectively limit the operating rates. On balance, we project that Thailand's polyester fiber exports will expand from about 65 thousand metric tons in 1996 to a peak of 500 thousand metric tons in 2000/01. Operating rates are expected to drop to 81 percent in 1997 and to remain in the low 80 percent range through the remainder of the decade.

(b) PET Resin

Thailand's PET resin industry is at an early stage of development. The Siam Polyester with a capacity of 15 thousand metric tons per year had been the sole producer of PET resin in Thailand until its shutdown in early 1997. Indorama (an affiliate of the Indian PET resin producer, Indopet) will begin production in mid-1997 with a capacity of 50 thousand metric tons per year. Indorama will initially imports PET chip but plans to construct and start up polycondensation facilities by late 1998. Other announced expansions considered as firm for the 1997/98 time frame total 263 thousand metric tons per year and include Bangkok Polyester, Shinkong, and Thai Melon. These expansions are expected to expand PET resin capacity within Thailand to 313 thousand metric tons per year by the end of 1998. Plans for the individual producers are highlighted in Table 3.5.

TABLE 3.5
PET RESIN CAPACITY IN THAILAND
(thousand metric tons per year)

Producer	1996 Capacity	Expansions	Timing
Bangkok Polyester		105	1998
Indopet (Indorama)		50	1997
Shinkong Synthetic		105	1998
Siam Polyester	15	(15)	1997
Thai Melon Polyester		53	1998

Source: Chem Systems Research for East Asia PET Capacity 1996

Consumption of PET resin within Thailand for carbonated soft drinks (CSD) and mineral water bottles is presently on the order of 37 thousand metric tons per year or about 0.5 kg per capita per year. Year-on-year growth rates for PET resin at this early stage of development can be very high and difficult to predict since this growth is largely the result of substitution for existing glass and aluminum applications, and secondarily to general economic development and introduction of new applications. Leadership in new product development rests in the United States, followed by Western Europe and Japan. PET resin consumption per capita for a number of countries are highlighted in Table 3.6. The phenomenal growth of PET resin consumption in the United States reflects the extent of development and sophistication of this market, including and notwithstanding developments in the environmental and recycling areas. At the other end of the spectrum, PET resin consumption in China and developing Asia is presently very low, e.g., 0.2 kg per capita or less.

TABLE 3.6
PET RESIN CONSUMPTION PER CAPITA
(kilogram per capita per year)

	1990	1995	2000	2005	2010
United States	1.9	4.6	6.8	8.6	9.5
Western Europe	0.6	2.1	3.8	5.5	6.8
Japan	0.8	1.7	3.0	4.6	5.7
South Korea		2.0	3.4	5.1	6.2
Taiwan		1.5	2.8	4.2	5.2
Mexico	0.06	1.0	2.8	3.9	4.7
China	0.04	0.08	0.3	0.6	0.9
Thailand		0.5	2.0	2.9	3.9
Indonesia	0.06	0.2	0.7	1.1	1.6

Source: Chem Systems Research for East Asia PET Consumption 1996

Presently, a large share of Thailand's CSD and mineral water industry is still served by glass, aluminum, PVC and paper (e.g., aseptic brick packages). Based on the experience in other developing countries (e.g., Mexico), conversion to PET is expected to take place over a relatively compressed time frame building on already established technology and marketing experience and led by international soft drink companies, local bottlers, and consumer products companies. Based on Thailand's stage of economic development and availability of polycondensation and solid-stating technology and injection blow-molding equipment, we expect PET resin consumption within Thailand grow sharply over the next several years. However, consumption rates within Thailand are expected to remain below those of more advanced economies such as the United States, Western Europe, Japan, South Korea, and Taiwan. It is projected that demand for PET resin in Thailand to expand to approximately 125 thousand metric tons by 2000, corresponding to an average growth in excess of 30 percent annually. Based on the planned capacity additions, Thailand's capacity reached at 243 thousand metric tons per year in 1998. It is assumed that exports of PET chip would limit PET resin producers to have operating rates in the 70 percent range through 2000, limited by the competition for exports within the ASEAN region. Also, this forecast assumes that Slam Polyester's PET resin facility remains shut down and production by Thai Melon's facility is delayed until 1999.

(c) Polyester Film and Other

PTA is currently used in Thailand for the manufacture of coating resins. Polyester film's major uses are in electronic insulating applications, magnetic media, and packaging applications. Globally, electronic thin-films, e.g., 1-2 micron film for printed circuit board capacitors, micro switch insulation, etc., and electronic thick-films e.g., for motor insulation, are dominated by DuPont, Teijin, Toray, and Mitsubishi Diafoil while magnetic media base films are dominated by Japanese and Korean polyester film producers including Teijin, Toray, Mitsubishi Diafoil, Sunkyong, Cheil and Kolon. Based on polyester film's relatively small market size and capital intensity, manufacturing facilities are generally sized to supply regional markets.

ASEAN Polyester Outlook

The total polyester production in ASEAN countries in all applications grows from 1.5 million metric tons in 1996 to 3.16 million metric tons in 2000, corresponding to an average annual growth of 22 percent. ASEAN polyester production is projected to reach 5.5 million metric tons by 2010 as shown in Table 3.7. Through 2000, Indonesia is expected to remain the largest ASEAN polyester producing country followed by Thailand. These two countries together are expected to account for 90 percent of ASEAN's total production.

Between 1996 and 2000 approximately 1.6 million metric tons of new polyester capacity is expected to start up in ASEAN region, increasing the region's capacity to approximately 3.7 million metric tons. By 2010, ASEAN polyester capacity is expected to reach nearly 6 million metric tons per year.

TABLE 3.7
ASEAN POLYESTER PRODUCTION
(thousand metric tons)

	1994	1995	1996	997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	492	624	832	1,132	1,291	1,471	1,526	1,676	1,841	2,023	2,223	2,443	3,325
Malaysia	70	112	179	228	277	301	309	331	354	378	405	433	550
Philippines	40	41	47	56	65	74	83	88	92	97	102	107	126
Thailand	367	438	432	628	808	906	1,188	1,245	1,266	1,282	1,301	1,321	1,356
Regional Production	**969**	**1,215**	**1,490**	**2,044**	**2,441**	**2,752**	**3,106**	**3,340**	**3,553**	**3,780**	**4,031**	**4,304**	**5,357**

ASEAN POLYESTER CAPACITY
(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	520	665	1,086	1,265	1,405	1,600	1,650	1,800	1,900	2,200	2,400	2,500	3,600
Malaysia	70	250	280	280	385	385	385	385	385	420	450	500	600
Philippines	60	65	80	80	80	80	110	110	110	110	110	120	140
Thailand	405	494	537	797	1,059	1,140	1,523	1,523	1,523	1,523	1,523	1,523	1,523
Regional Capacity	**1,055**	**1,474**	**1,983**	**2,422**	**2,929**	**3,205**	**3,668**	**3,818**	**3,918**	**4,253**	**4,483**	**4,643**	**5,863**

Source: Chem Systems Research for East Asia Polyester Production and Capacity 1996

3.3 PURIFIED TEREPHTHALIC ACID OUTLOOK

Thailand PTA Outlook

Until startup of Tuntex's PTA plant in the fourth quarter of 1995, Thailand's PTA requirements were supplied entirely by imports by Amoco, ICI, Mitsubishi, and Mitsui. Tuntex produced approximately 100 thousand tons in 1995 and around 400 thousand metric tons in 1996. Tuntex is considering a 900 thousand ton per year PTA plant in Thailand for startup in 2000 or later but the success of the project is dependent on both the near term industry outlook, the recovery of the Thai stock market, and Tuntex's success in its initial public offering required to raise equity for this project together with Tuntex's aromatics project. Chem Systems has assumed about half of Tuntex's planned PTA capacity will proceed by the end of the decade (consider this as an overall probability adjustment). The Siam Cement-Mitsui joint venture plant (Siam Mitsui PTA Co.) will have a capacity of 350 thousand metric tons per year. They have awarded the engineering, procurement, and construction contract to Mitsui Shipbuilding and the unit has a planned startup by late 1998.

Chem Systems, a leading research organization in petrochemical industry, projects PTA demand within Thailand to grow from 323 thousand metric tons in 1996 to 1.0 million metric tons by 2000, corresponding to an average growth of nearly 35 percent annually. All of the polycondensation expansion projects under planning or construction in Thailand are PTA-based. Thai Melon has purchased DMT from Petrocel (Mexico) historically and there is cross holding of shares between the companies. For purposes of this forecast we have down rated Thai Melon's polyester fiber volumes and delayed startup of the PET resin plant until 1998, other assumptions remaining the same. Including Tuntex's existing PTA plant and the new Siam Mitsui PTA's plant, It is expected that Thailand would have a capacity shortfall versus demand until 2000 (Table 3.8) when Tuntex's planned expansion is expected to start up. Tuntex and Mitsui are expected to target PTA exports to their polyester affiliates within the region and a net trade surplus is expected after 2000. Startup of the Thai PTA facility in 2001 would effectively remove 350 thousand metric tons per year of available demand from the market leaving a surplus of 487 thousand metric tons in 2001 for the other PTA suppliers.

TABLE 3.8
THAILAND PTA CAPACITY AND DEMAND
(thousand* metric *tons)

	1995	1996	1997	1998	1999	2000	2001
Capacity							
Tuntex	400	420	420	420	420	870	870
Siam Mitsui PTA					350	350	350
Thai PTA							350
Total capacity	**400**	**420**	**420**	**420**	**770**	**1,220**	**1,570**
Demand	328	323	528	703	788	1,033	1,083
Capacity surplus/ (Shortfall)	72	97	(108)	(283)	(18)	187	487

Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

ASEAN PTA Outlook

We project total capacity for PTA equivalents within ASEAN to expand by nearly 2.0 million metric tons, from 1.7 million metric tons per year in 1996 to 3.69 million metric tons per year in 2000. The ASEAN's' supply and demand outlook is provided in Table 3.9. Growth in demand for PTA equivalents is spread approximately evenly across the region as shown in figure 3.1. Thailand and Indonesia are expected to experience the largest growth in demand. Demand within ASEAN's region is projected to grow at 22 percent annually through 2000, from 1.3 million metric tons in 1996 to 2.7 million metric tons in 2000 as shown in figure 3.2. Indonesia's demand for PTA equivalents is projected to grow at nearly 16 percent per year, from 724 thousand metric tons to 1.3 million metric tons, while Thailand consumption is expected to grow at more than 22 percent annually during this period.

Not only demand in PTA is increased in ASEAN region but also supply is increased in order to support ASEAN demand as shown in figure 3.3 and 3.4. But in the year 1994 through 1997, supply is inadequate to cover all the demand for PTA in ASEAN region. Till 1998 through the end of this decade such PTA is over the demand for PTA as shown in the figure 3.5.

Malaysia is expected to be the major contributor to ASEAN's PTA surplus after 1999 as shown in table 3.10. It is expected that Amoco Malaysia to supply Hualon Malaysia, Penfibre, Eastman, and other local PET resin producers and will serve as an Amoco platform for exports within the region.

TABLE 3.9

ASEAN PTA EQUIVALENTS DEMAND

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	428	543	724	985	1,123	1,280	1,328	1,458	1,602	1,760	1,934	2,125	2,893
Malaysia	61	98	156	198	241	262	269	288	308	329	352	377	403
Philippines	35	36	41	48	56	64	73	76	80	84	88	93	110
Thailand	319	381	376	546	703	788	1,034	1,083	1,102	1,116	1,132	1,149	1,180
ASEAN Demand	**843**	**1,058**	**1,297**	**1,777**	**2,123**	**2,394**	**2,704**	**2,905**	**3,092**	**3,289**	**3,506**	**3,744**	**4,586**

ASEAN PTA EQUIVALENTS CAPACITY

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	475	525	825	1,865	1,865	1,865	1,865	1,865	1,865	1,865	2,200	2,300	3,000
Malaysia	0	0	500	500	600	600	600	600	600	600	600	600	600
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
Thailand	0	400	400	420	420	770	1,220	1,570	1,570	1,570	1,570	1,570	1,570
ASEAN Capacity	**475**	**925**	**1,725**	**2,785**	**2,885**	**3,235**	**3,685**	**4,035**	**4,035**	**4,035**	**4,370**	**4,470**	**5,170**

ASEAN PTA EQUIVALENTS SUPPLY

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	304	350	560	1,000	1,250	1,400	1,400	1,458	1,602	1,760	1,934	2,125	2,893
Malaysia	0	0	225	450	500	550	550	550	550	550	550	550	550
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
Thailand	0	100	370	420	420	770	1,054	1,207	1,228	1,244	1,260	1,282	1,365
ASEAN Supply	**304**	**450**	**1,155**	**1,870**	**2,170**	**2,720**	**3,004**	**3,215**	**3,380**	**3,554**	**3,744**	**3,957**	**4,808**

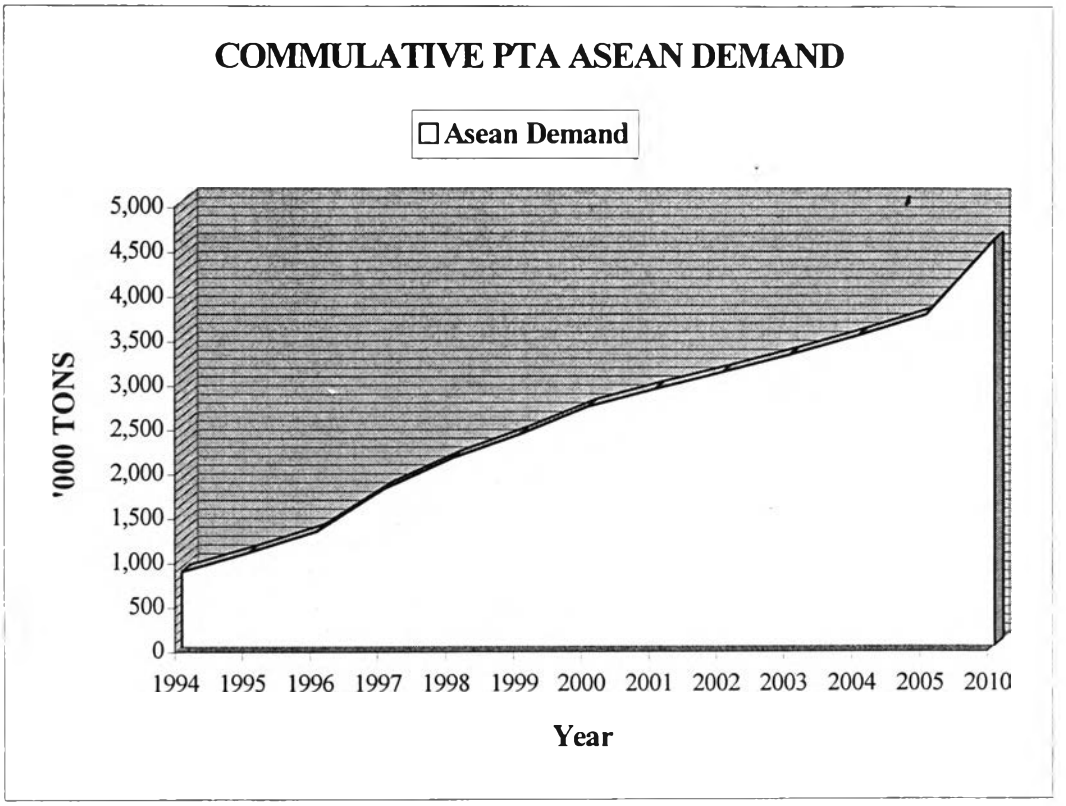
ASEAN PTA EQUIVALENTS SUPPLY/DEMAND BALANCE

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Indonesia	(124)	(193)	(164)	15	127	120	72	0	0	0	0	0	0
Malaysia	(61)	(98)	69	252	259	288	281	262	242	221	198	173	147
Philippines	(35)	(36)	(41)	(48)	(56)	(64)	(73)	(76)	(80)	(84)	(88)	(93)	(110)
Thailand	(319)	(281)	(6)	(126)	(283)	(18)	20	124	126	128	128	133	185
ASEAN S/D Balance	**(539)**	**(608)**	**(142)**	**93**	**47**	**326**	**300**	**310**	**288**	**265**	**238**	**213**	**222**

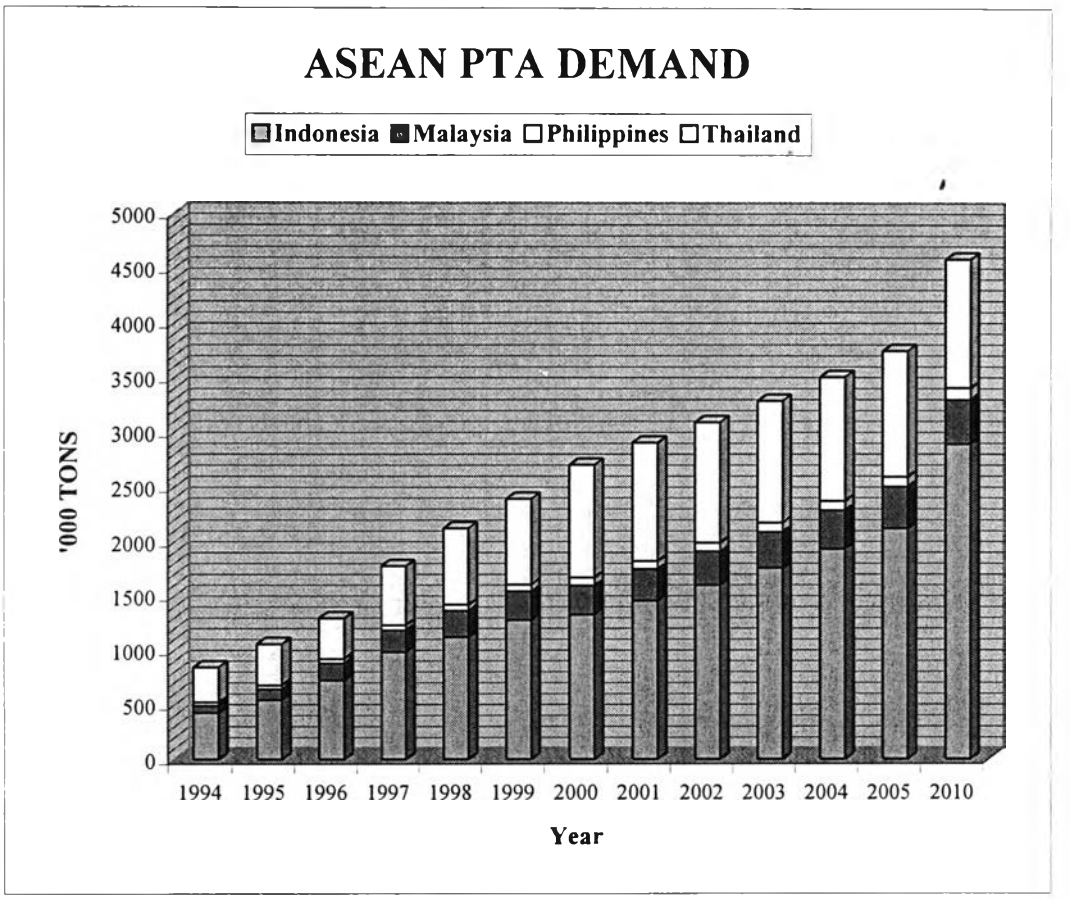
Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

FIGURE 3.1
COMMULATIVE PTA ASEAN DEMAND



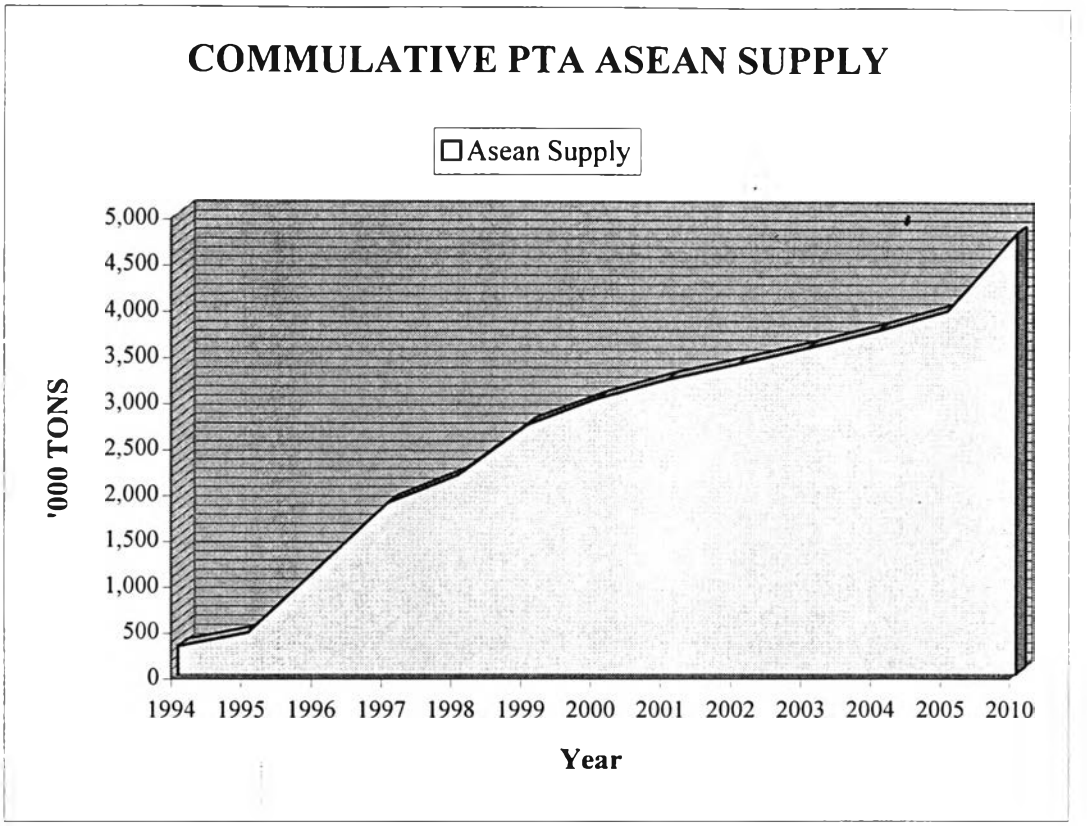
Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

FIGURE 3.2
ASEAN PTA DEMAND



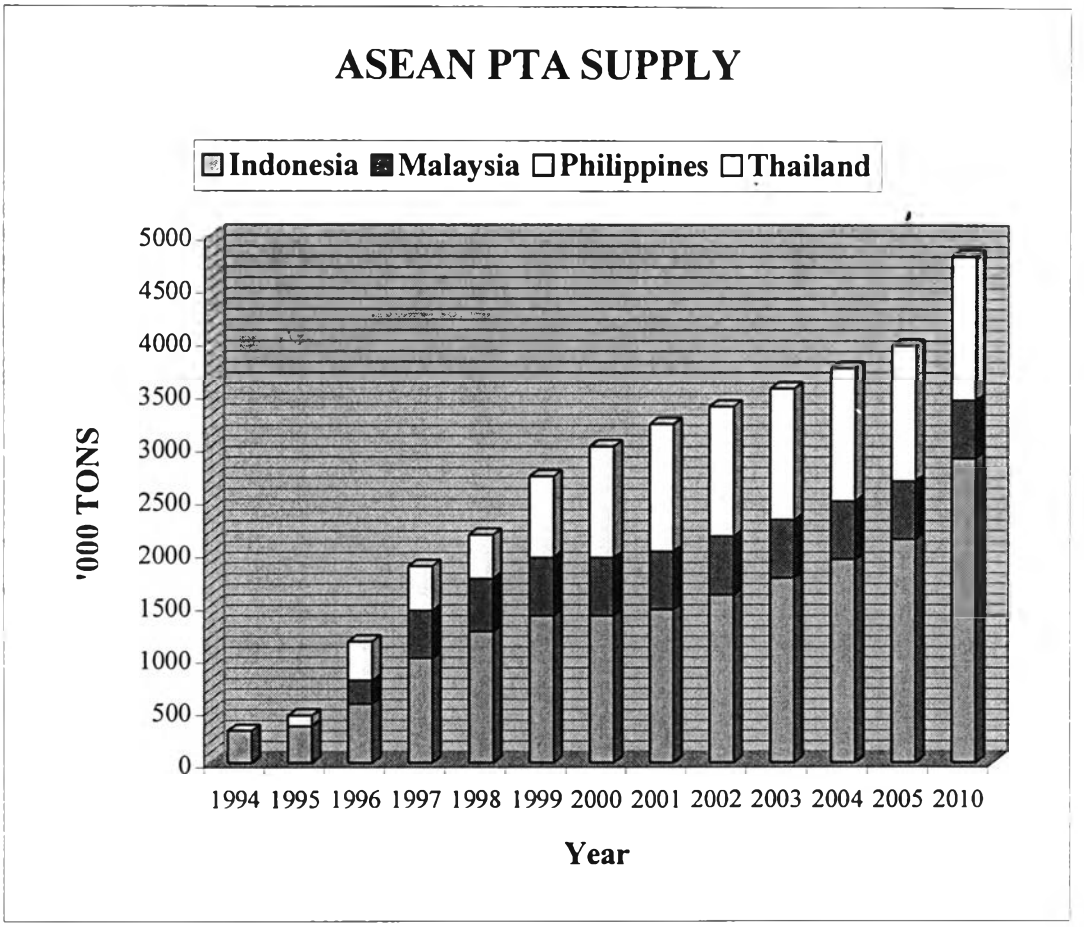
Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

FIGURE 3.3
COMMULATIVE PTA ASEAN SUPPLY



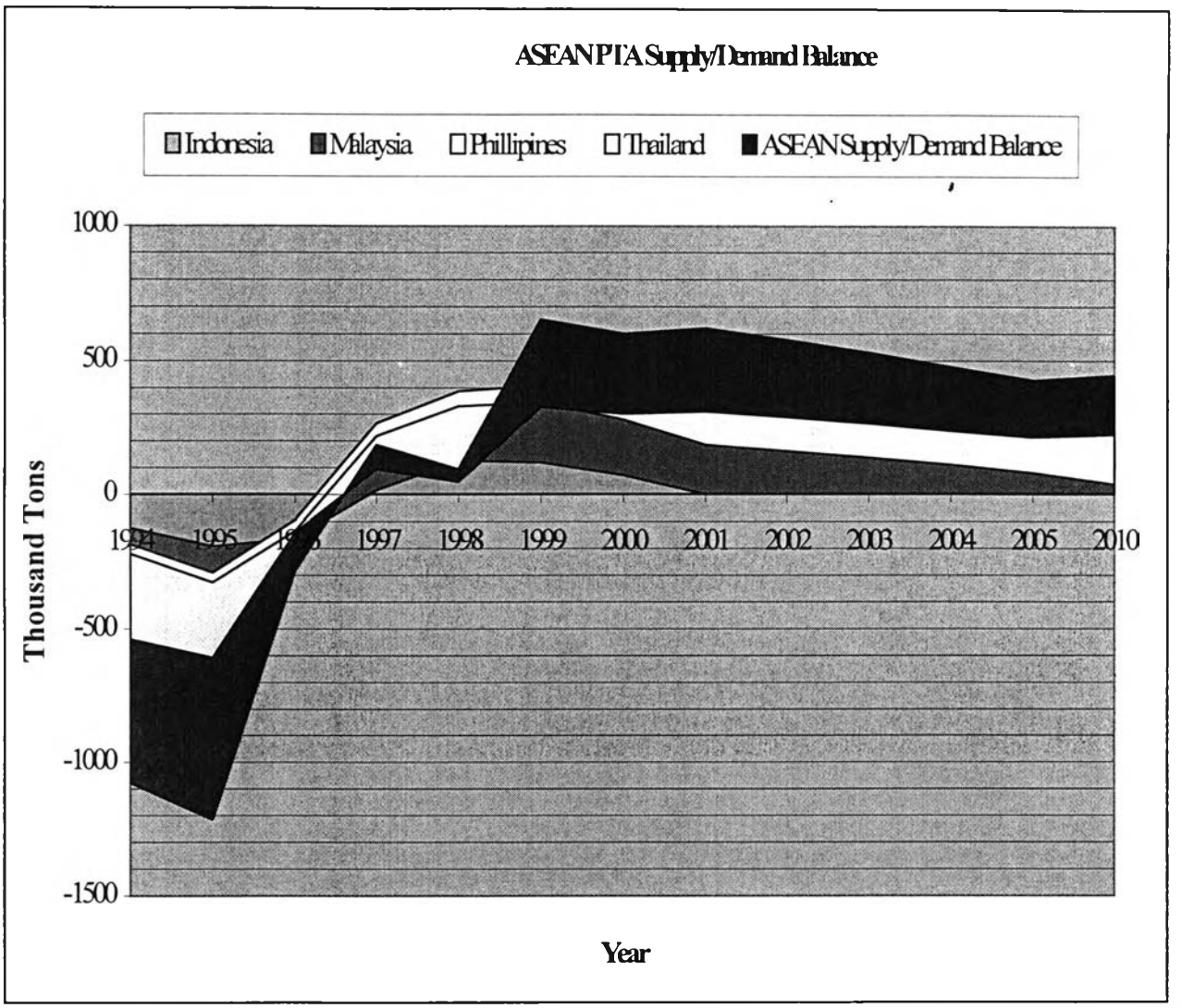
Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

FIGURE 3.4
ASEAN PTA SUPPLY



Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

FIGURE 3.5
ASEAN PTA SUPPLY/DEMAND BALANCE



Source: Chem Systems Research for East Asia PTA Supply and Demand 1996

TABLE 3.10
ANNOUNCED ASEAN PTA EXPANSIONS
(thousand metric tons)

	Company	Location	Capacity	Timing
Indonesia	Amoco/Mitsui	Merak	350	1997
	Polysindo	West Java	340	1997
	Polyprima	Merak	350	1997
Malaysia	Amoco	Kuantan	100	1998
Thailand	Mitsui-SCC	Map Ta Phut	350	1999
	ATC	Map Ta Phut	350	2001
	Tuntex	Map Ta Phut	900	2000

Source: Chem Systems Research for East Asia PTA Expansion 1996

3.4 PARA-XYLENE MARKET OUTLOOKS

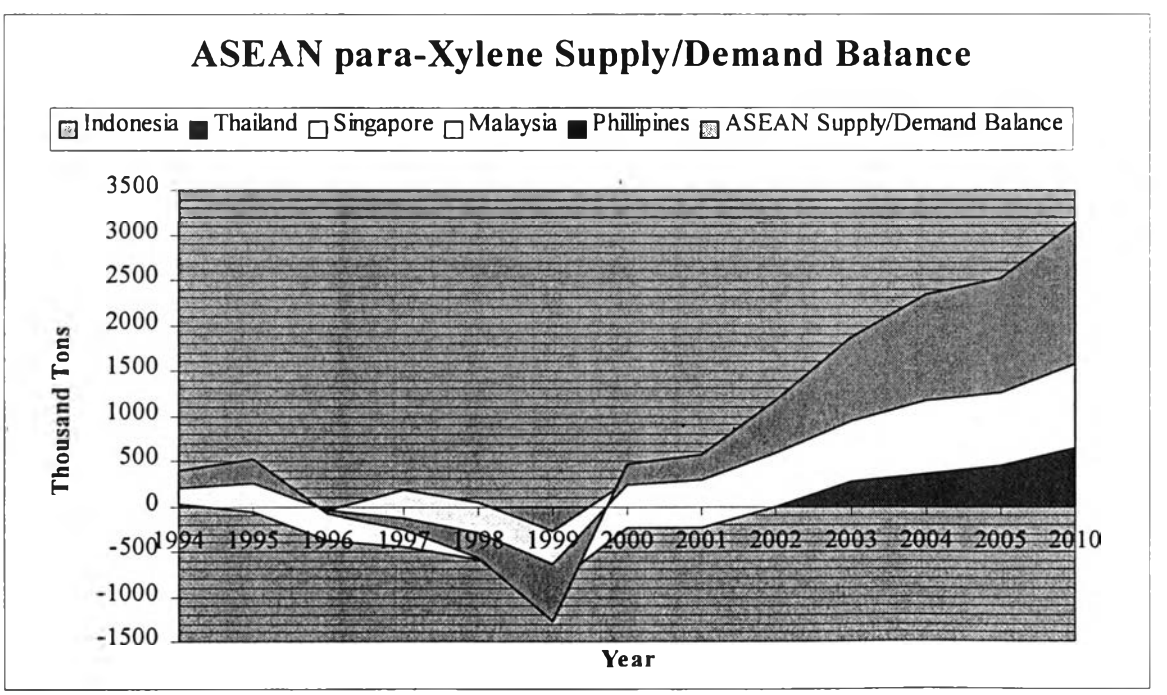
Thailand para-Xylene Outlook

Demand for para-Xylene stands at 281 thousand metric tons per year based on Tuntex's consumption which will increase to 516 with the startup of Siam Mitsui PTA's plant in 1999. ATC has started up its 322 thousand metric ton per year plant, the first domestic production, and is developing a 45 thousand metric ton per year debottlenecking project for 1999. After Siam Mitsui PTA's plant startup, Thailand will have net import requirements of over 200 thousand metric tons per year. Additional para-Xylene projects under development and capacities (thousand metric tons per year) include Thai Oil (300), Chevron/PTT (675), and Exxon Sri Racha (300). Thai Oil has started its mixed xylenes production at its refinery, and para-Xylene production is expected in 2000. We has assumed that the Chevron and Exxon projects will be implemented after 2000 and Thailand is projected to become a major regional supplier of para-Xylene. In addition, Tuntex has received BOI approval for an 800 thousand metric ton per year para-Xylene facility.

ASEAN para-Xylene Outlook

Demand for para-Xylene in ASEAN of 0.6 million metric tons in 1996 is projected to grow to 2.0 million metric tons by 2000. Thailand is expected to grow above this level and becomes the major importer during this period. ASEAN production is expected to expand from 580 thousand metric tons in 1996 to 2.2 million metric tons in 2000, and to 4.8 million metric tons in 2010. So, ASEAN will remain a major importer with import requirements ranging from 0.04 million to 0.06 million metric tons until 2000. ASEAN's supply/demand is provided in Table 3.11 and figure 3.6. Also, major ASEAN expansions are highlighted in Table 3.12.

FIGURE 3.6
ASEAN para-Xylene SUPPLY/DEMAND BALANCE



Source: Chem Systems Research for East Asia para-Xylene Supply and Demand 1996

Table 3.11
ASEAN PARA-XYLENE DEMAND
(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	204	235	375	670	838	938	938	977	1,073	1,179	1,296	1,424	1,938
Thailand	0	67	248	281	281	516	706	809	823	833	844	859	915
Singapore	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia	0	0	0	302	335	369	369	369	369	369	369	369	369
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
ASEAN Demand	**204**	**302**	**623**	**1,253**	**1,454**	**1,823**	**2,013**	**2,155**	**2,265**	**2,381**	**2,509**	**2,652**	**3,222**

ASEAN PARA-XYLENE SUPPLY
(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	230	240	250	250	250	250	938	977	1,073	1,179	1,296	1,424	1,938
Thailand	0	0	0	257	281	335	466	569	816	1,102	1,200	1,300	1,550
Singapore	170	320	330	623	640	600	520	572	630	694	837	841	950
Malaysia	0	0	0	0	0	0	320	326	332	338	350	350	350
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
ASEAN Supply	**400**	**560**	**580**	**1,130**	**1,171**	**1,185**	**2,244**	**2,444**	**2,851**	**3,313**	**3,683**	**3,915**	**4,788**

ASEAN PARA-XYLENE SUPPLY/DEMAND BALANCE
(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	26	5	(125)	(420)	(588)	(688)	0	0	0	0	0	0	0
Thailand	0	(67)	(248)	(24)	0	(181)	(240)	(240)	(7)	268	356	441	635
Singapore	170	320	330	623	640	600	520	572	630	694	837	841	950
Malaysia	0	0	0	(302)	(335)	(369)	(49)	(43)	(37)	(31)	(19)	(19)	(19)
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
ASEAN Supply/Demand	**196**	**258**	**(43)**	**(123)**	**(283)**	**(638)**	**231**	**289**	**586**	**931**	**1,174**	**1,263**	**1,566**

Source: Chem Systems Research for East Asia para-Xylene Supply and Demand 1996

TABLE 3.12
ANNOUNCED para-Xylene EXPANSIONS
(thousand metric tons per year)

Producer	1997	1998	1999	2000-2005
Indonesia				
Bakrie				428
Kresna Aromatics				423
TPPI				497
Malaysia				
Petronas/Mitsubishi				420
Singapore				
Mobil				350
South Korea				
Thailand				
Chevron				675
Exxon				300
Thai Aromatics	322		45	
Thai Oil				300
Tuntex				800
Total ASEAN	**1202**	**2770**	**575**	**6013**

Source: Chem Systems Research for East Asia para-Xylene Expansion 1996

3.5 ACETIC ACID OUTLOOK

Thailand Acetic Acid Outlook

Thailand's demand for acetic acid is approximately 20 thousand metric tons per year. Consumption will be primarily driven by PTA production and is expected to more than double by 1999 with the start up of Siam Mitsui PTA's facility, and increase to about 80 thousand metric tons by 2005. All acetic acid supplies are currently imported and no local production is considered in the outlook. Based on the planned expansions in the region and continued availability of global exports, we expect the Thai PTA project to be able to secure supplies for all of its acetic acid requirements.

ASEAN Acetic Acid Outlook

Demand for acetic acid in ASEAN reached 0.07 million metric tons in 1996 and is projected to exceed 0.74 million metric tons by 2000, an average annual growth of about 40 percent. Growth is mainly driven by PTA and VAM expansions in the region. BP is currently considering a joint venture project with Petronas for a 0.5 million metric ton per year plant in Malaysia by 2000. A VAM plant, the major offtake for acetic acid, is also being considered as part of the investment. Hoechst Celanese (HC) has also announced plans for a major expansion of 500 thousand metric tons per year in Southeast Asia, possibly Singapore, where a VAM plant is currently under construction. We assumed that the BP Malaysia project will develop before HC's plans as a result of restrictions imposed on HC by a licensing agreement with BP until 1998. The ASEAN region is expected to import approximately 150 to 200 thousand metric tons per year until 2000 when the BP/Petronas plant is expected to start up. The highlight of ASEAN acetic acid expansions is provided in Table 3.13.

TABLE 3.13
MAJOR ASEAN ACETIC ACID EXPANSIONS
(thousand metric tons per year)

Producer	Location	Expansion
BP	Gebeng, Malaysia	500 (1999)
Hoechst Celanese	Pulau Sakra, Singapore	500 (after 2000)

Source: Chem Systems Research for East Asia Acetic Acid Expansion 1996

Such supply and demand forecasting for Acetic acid in ASEAN region is shown in the table 3.14 and figure 3.7 as following.

Table 3.14

ASEAN ACETIC ACID DEMAND

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	29	32	36	40	55	91	181	195	209	225	242	260	401
Thailand	8	13	23	20	26	45	63	72	74	74	76	77	87
Singapore	8	6	4	34	88	96	103	110	114	115	115	115	122
Malaysia	11	15	10	11	12	14	15	21	39	44	48	53	153
Philippines	3	2	0	0	5	5	5	6	6	6	7	7	9
ASEAN Demand	**59**	**68**	**73**	**105**	**186**	**251**	**367**	**404**	**442**	**464**	**488**	**512**	**772**

ASEAN ACETIC ACID SUPPLY

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	14	14	21	28	28	28	29	28	30	28	29	29	130
Thailand	0	0	0	0	0	0	0	0	0	0	0	0	0
Singapore	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia	0	0	0	0	0	0	135	290	405	406	406	421	595
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0
ASEAN Supply	**14**	**14**	**21**	**28**	**28**	**28**	**164**	**318**	**435**	**434**	**435**	**450**	**725**

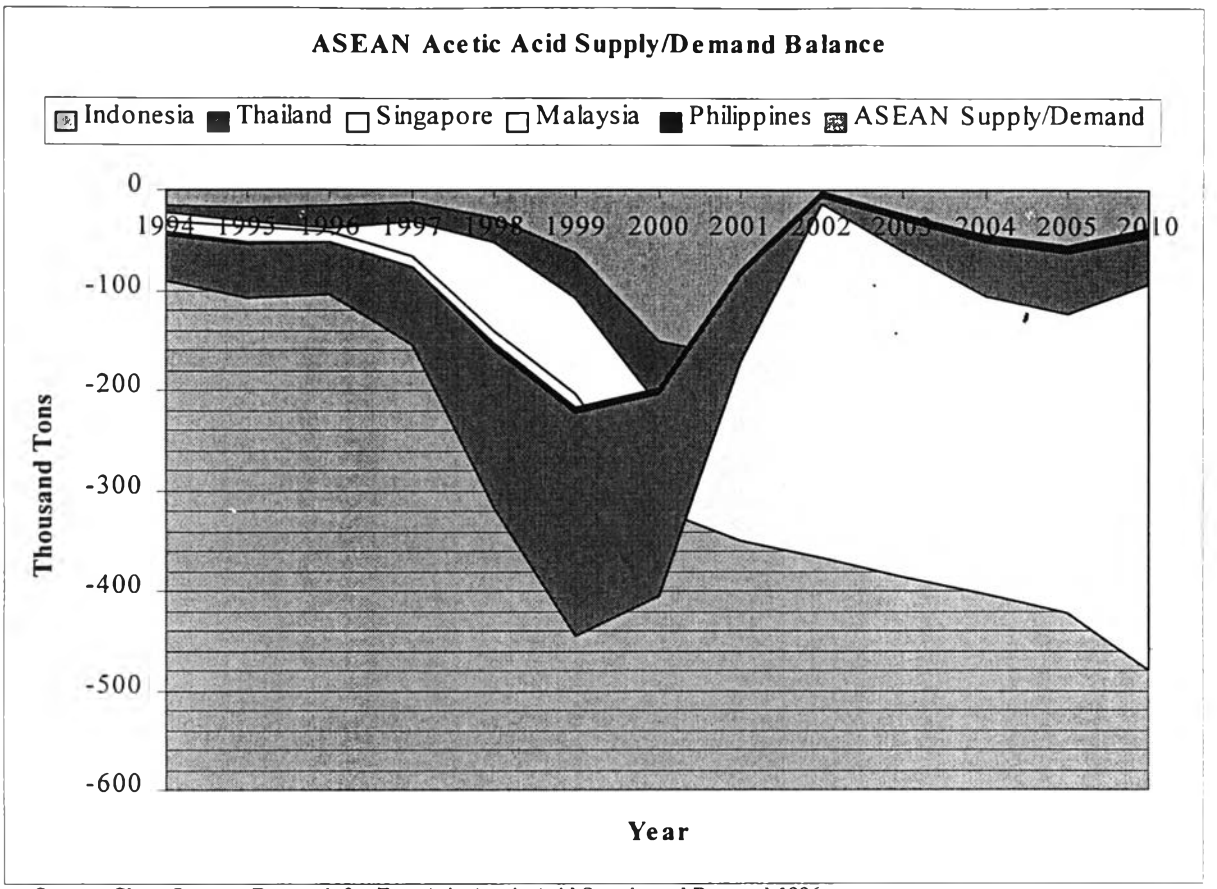
ASEAN ACETIC ACID SUPPLY/DEMAND BALANCE

(thousand metric tons)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
ASEAN Countries													
Indonesia	(15)	(18)	(15)	(12)	(27)	(63)	(152)	(167)	(179)	(197)	(213)	(231)	(271)
Thailand	(8)	(13)	(23)	(20)	(26)	(45)	(63)	(72)	(74)	(74)	(76)	(77)	(87)
Singapore	(8)	(6)	(4)	(34)	(88)	(96)	(103)	(110)	(114)	(115)	(115)	(115)	(122)
Malaysia	(11)	(15)	(10)	(11)	(12)	(14)	120	269	366	362	358	368	442
Philippines	(3)	(2)	0	0	(5)	(5)	(5)	(6)	(6)	(6)	(7)	(7)	(9)
ASEAN Supply/Demand	**(45)**	**(54)**	**(52)**	**(77)**	**(158)**	**(223)**	**(203)**	**(86)**	**(7)**	**(30)**	**(53)**	**(62)**	**(47)**

Source: Chem Systems Research for East Asia Acetic Acid Supply and Demand 1996

FIGURE 3.7
ASEAN ACETIC ACID SUPPLY/DEMAND BALANCE



Source: Chem Systems Research for East Asia Acetic Acid Supply and Demand 1996

3.6 PRICE ANALYSIS

3.6.1 Introduction

The price forecasts for crude oil and petrochemicals are highlighted in this section. We use an forcast of Chem Systems to be our price assumption for PTA product and its raw materials. Chem Systems utilizes a cost-based approach to forecast prices which is comprised of: a projection of the underlying crude oil price outlook; projection of the global and local economic environments (e.g., outlook for real economic growth and price inflation); and projection of the business outlook for each of the key refined products and petrochemicals as reflected by industry supply, demand, operating rates, and structural changes, which determine margins and profitability. In addition, Chem Systems' forecast of inflation is developed after reviewing a number of "expert" forecasts which are widely used within the financial community, including those published by the World Bank, the IMF, "Blue Chip Economic Indicator," and individual forecasts published by leading international banks.

3.6.2 Crude Oil Price Outlook

OPEC Marker/Dubai Crude Oil

Many factors affect the availability and demand for crude Oil. The fly-up of prices to the $40 per barrel level for brief periods during the 1991 Middle East War and the subsequent return to the $15-$20 level during the second quarter of 1991 were not predicted by any forecasting service. Future disruptions and "events" will surely occur over the next 10 years, and pricing is expected to remain volatile. Chem Systems' approach to developing outlooks for crude oil pricing is to forecast trend price levels, with the recognition that actual prices will vary considerably on a short-term basis. The following elements are considered:

- Fundamentals of global supply/demand
- Trends in resource depletion
- Exploration and production costs
- Feedback and expectations of the petroleum industry

During the past ten years, the international crude oil market has been transformed from one dominated by "Government Selling Prices," notably the marker Saudi Light price, to one in which most transaction prices are determined by short-term commodity trading. Currently there are two truly international "markers," Dubai and Brent. In addition to being an international "marker" crude oil, Dubai is the benchmark crude oil for all sour crude oils sold in Asia. Term prices for all major Middle East crude oils supplied to Asia are linked to Dubai crude oil spot prices. Brent is the marker for crudes traded in Europe.

Chem Systems has recently updated its baseline outlook for crude oil which, after considering the numerous factors that have potential to affect price, is considered the most likely outlook on a sustained, trend basis. Chem Systems' outlook for OPEC marker crude (Dubai), provided in Table 3.15. is for a price of $19.5 per barrel in 1997 and then for prices to remain at $17 per barrel, FOB, on a constant 1996 dollar basis (i.e., zero real growth). In current dollar (inflated) terms, relative to an actual price of $18.5 per barrel in 1996, this is equivalent to $19.1 per barrel in 2000 and $26.1 per barrel in 2010.

TABLE 3.15
DUBAI. CRUDE OIL PRICES
***(FOB Arabian* Gulf)**

	1996 *($/bbl)*	Current *($/bbl)*
	Historical	
1985	37.1	26.5
1986	17.7	13.0
1987	22.4	17.0
1988	16.9	13.3
1989	19.4	15.9
1990	23.9	20.4
1991	18.8	16.7
1992	18.9	17.2
1993	16.0	15.0
1994	15.4	14.7
1995	16.4	16.1
1996	18.5	18.5
	Forecast	
1997	19.0	19.5
1998	17.0	17.9
1999	17.0	18.5
2000	17.0	19.1
2001	17.0	19.7
2002	17.0	20.3
2003	17.0	21.0
2004	17.0	21.6
2005	17.0	22.3
2006	17.0	23.0
2007	17.0	23.8
2008	17.0	24.5
2009	17.0	25.3
2010	17.0	26.1

Source: Chem Systems Research for Crude Oil Price 1996

Chem Systems' outlook for crude oil prices reflects a number of -new factors that, on balance, are expected to lessen the likelihood of significant "real" increases in crude price during the next 10 years. The key factors considered in this analysis that are expected to moderate future price include:

- Resumption of Iraqi output
- Potential shift toward non petroleum energy sources (post-2000)
- Current abundant availability of supply
- Potential recovery of Russian output
- Exploration and production technology developments

Underlying all of these factors is the expectation that OPEC will increase its share of global markets during the coming decade. OPEC's share of global production is expected to expand from the current level of 43 percent to 44 percent in 2000, and to 47 percent in 2010. OPEC's influence in international crude oil markets is expected to remain significant, but well below that during the peak OPEC production of 1973/74.

3.6.3 Petrochemicals Price Forecast Methodology

Our projection of prices for the key petrochemicals in ATC's proposed PTA complex was developed using the methodology described below. Price projections were developed for PTA, para-Xylene, and acetic acid. This methodology starts with its latest forecast for prices at the USGC. Southeast Asian prices are then developed based on the expected price relationships between the regions.

3.6.4 Forecasting Methodology

The price forecasting methodology for petrochemicals and polymers is based on the relationship between industry operating rates and profitability as measured by return on investment or cash cost margins for Leader and Laggard plants. Prices are forecast by relating historical trends in supply/demand and operating rates to cash cost margins in the industry. We forecast future operating rates based on the forecast demand and expected additions to plant capacity, including speculative additions.

Prices are forecast by adding the expected cash cost margin to the forecast of cash costs. Cash costs are determined for each product in each year based on Chem Systems' forecast of crude oil prices, energy costs, and prices for refined products.

Chem Systems defines "Leader" and "Laggard" plants as follows:

- A Leader plant represents one of the most economical plants in operation. Twenty to thirty percent of industry capacity is at or above this level, excluding plants that derive cost advantages from special situations such as below market transfer pricing. Therefore, the Leader plant may not necessarily have lowest cost production in the industry.

- A Laggard plant is representative of the least economical 20 percent of the plants in the industry (excluding exceptional cases reflecting, e.g., very small capacities, old plants, inefficient producing locations, etc.).

By analyzing historical industry data based on Chem System' models for Leader and Laggard plants, the relationship between operating rates and constant dollar cash cost margins has been determined. Operating rates are defined as production divided by nameplate capacity, expressed as a percentage of capacity. Most, but not all products, exhibit a relationship in which profitability increases with operating rates. Profitability, as measured by constant dollar cash cost margins, increases slowly as operating rates increase from low levels to the 90 to 95 percent range, and then usually increases more rapidly. For example, the relationship for para-Xylene Leader plants based on mixed Xylenes in the United States, shown in table 3.16, follows this pattern.

The shape of the operating rate-profitability relationship differs from product to product. For example, polypropylene margins tend to begin to increase sharply at an operating rates of only 90 percent; this is in part because stated capacities are based on manufacturing one grade of product, and capacity is reduced when producing multiple grades. Conversely, with undifferentiated commodities such as styrene or ethylene, supply becomes tight and prices and margins increase only when operating rates are in excess of 95 percent of capacity. For para-Xylene, nameplate capacities can sometimes be ambiguous as a result of alternate uses of refinery feedstocks, and have tended to reduce over time as the purity requirement has increased.

In addition, we consider other factors in order to refine the product forecast including:

- For products which require capacity additions to meet forecast demand, the return on investment should be adequate to allow reinvestment.

- Shifts in supply patterns which might result in permanent changes in the industry profitability, such as a transition from a concentrated supply base (oligopoly) to a highly competitive supply structure.

- Chem Systems' near-term price forecast is adjusted to reflect actual price movements, e.g., following a major fly-up in prices such as the one which occurred for para-Xylene in 1995.

- The price forecast for the United States is compared to the price forecast for other regions to ensure that price differentials remain approximately linked by freight. Otherwise large incentives would develop for arbitrage.

- Petrochemical prices must be roughly equivalent to prices for competing materials based on a cost and performance basis. As a result, polymer prices, for example, tend to maintain reasonable and historic relationships to one another.

Chem Systems has developed trend price forecasts for PTA, para-Xylene, and acetic acid. The trend line forecast corresponds to an average of the expected prices resulting from operating margins/profitability which usually are expected to cycle over time for the basic petrochemicals.

3.6.5 PTA Price Outlook

Southeast Asia

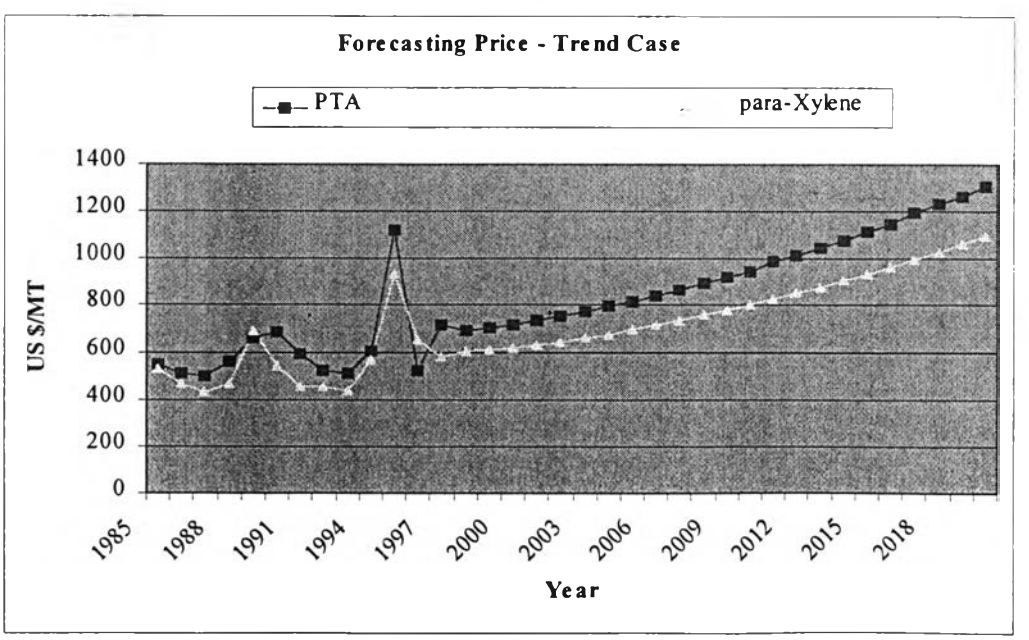
Chem Systems' projection of East Asian PTA prices considers the cash costs and cash margins of the marginal supplier (reflecting plant size and configuration, technology, capacity and cost structure) and projected operating rates and trade flows. East Asia historically has been a net importer of PTA (primarily from Amoco in the United States, Mitsui and Mitsubishi in Japan and ICI in Taiwan). East Asia's net import requirement will disappear as a result of new capacity coming on stream, and operating rates are expected to remain in the low 70 percent range for the balance of the decade.

We expect Japan, South Korea, Malaysia (Amoco), and possibly India to be the major East Asian countries competing for exports and expects South Korean producers to be the marginal suppliers (e.g., Sam Nam, Sunkyong, and Samsung General) pricing aggressively to maximize sales volumes. Chem Systems' PTA price projections reflect a Korean laggard producers cash cost plus a small margin depending on market conditions (operating rates).

PTA prices were volatile during 1995/96 as a result of demand and supply patterns and startup of new capacity. So, this is a major result of high price and demand of para-Xylene, acetic acid and PTA. Chem Systems' long-term forecast does not attempt to predict quarter-to-quarter volatility resulting from events such as Chinese buying patterns or the unexpected shutdowns of PTA plants.

PTA contract prices are projected to increase to $570 per metric ton (1996$) in 1997 and to be $625 per metric ton (1996$) on average throughout the forecast period. On average, Southeast Asian contract prices are forecast to be $27 per metric ton (1996$) higher than USGC prices for the forecast period. The trend case forecasts for PTA and para-Xylene contract prices for Southeast Asia are shown in figure 3.8 and Table 3.16.

FIGURE 3.8
PTA and para-Xylene PRICE FORECASTING TREND CASE



Source: Chem Systems Research for East Asia PTA and para-Xylene Price 1996

TABLE 3.16
SOUTHEAST ASIA CONTRACT PRICE FORECASTS - TREND CASE
(US Dollars Per Metric Ton)

Current dollars		
	PTA	*para-Xylene*
	Historical	
1985	548	531
1986	511	465
1987	495	427
1988	558	464
1989	658	688
1990	686	541
1991	592	452
1992	523	452
1993	510	436
1994	602	564
1995	1,120	931
1996	525	656
	Forecast	
1997	714	581
1998	688	604
1999	700	609
2000	716	619
2001	732	630
2002	750	641
2003	770	657
2004	794	675
2005	817	695
2006	842	714
2007	867	735
2008	893	756
2009	920	777
2010	948	800
2011	987	825
2012	1,017	852
2013	1,048	879
2014	1,079	907
2015	1,112	936
2016	1,145	966
2017	1,193	997
2018	1,229	1,029
2019	1,266	1,062
2020	1,304	1,096

Source: Chem Systems Research for East Asia PTA and para-Xylene Price 1996

Para-Xylene Price Outlook

Para-Xylene is a global business, and most world para-Xylene transactions have used USGC as the reference or marker price, and the starting point for price negotiations. Variations in East Asian prices derive from two sources:

- USGC prices vary (cycle) depending on supply/demand conditions
- Export differentials ("alpha") vary off of the USGC price depending on regional and global supply/demand conditions, specifically the availability of para-Xylene for exports to the region and the intensity of competition to supply the region's import requirements.

Chem Systems reviewed and updated its forecast of USGC and East Asian para-Xylene prices to reflect the updated crude forecast and expected growth in the polyester chain and the para-Xylene capacity buildup. Chem Systems has applied its judgment on which projects are likely to proceed and has included assumptions on rationalization or shutdown of unspecified surplus capacity during periods of very low operating rates. The forecast of East Asian contract prices is expected to be consistent with East Asian reference prices which might be used in some supply contracts and reflects the expected cash costs and cash margins of the marginal supplies to the region.

Southeast Asian Prices

Historically, East Asia has been the world's major importer of para-Xylene, primarily from the United States and Japan, and prices have reflected prices for shipments to Taiwan, the largest importing country (to CAPCO, Tuntex, ICI, and Formosa). Tuntex has a long-term contract with ATC to supply a minimum of 250 thousand metric tons per year a "domestic" net price reflecting import parity. Chem Systems' forecast through the balance of the decade reflects South Korean laggard producers selling with minimal cash margins.

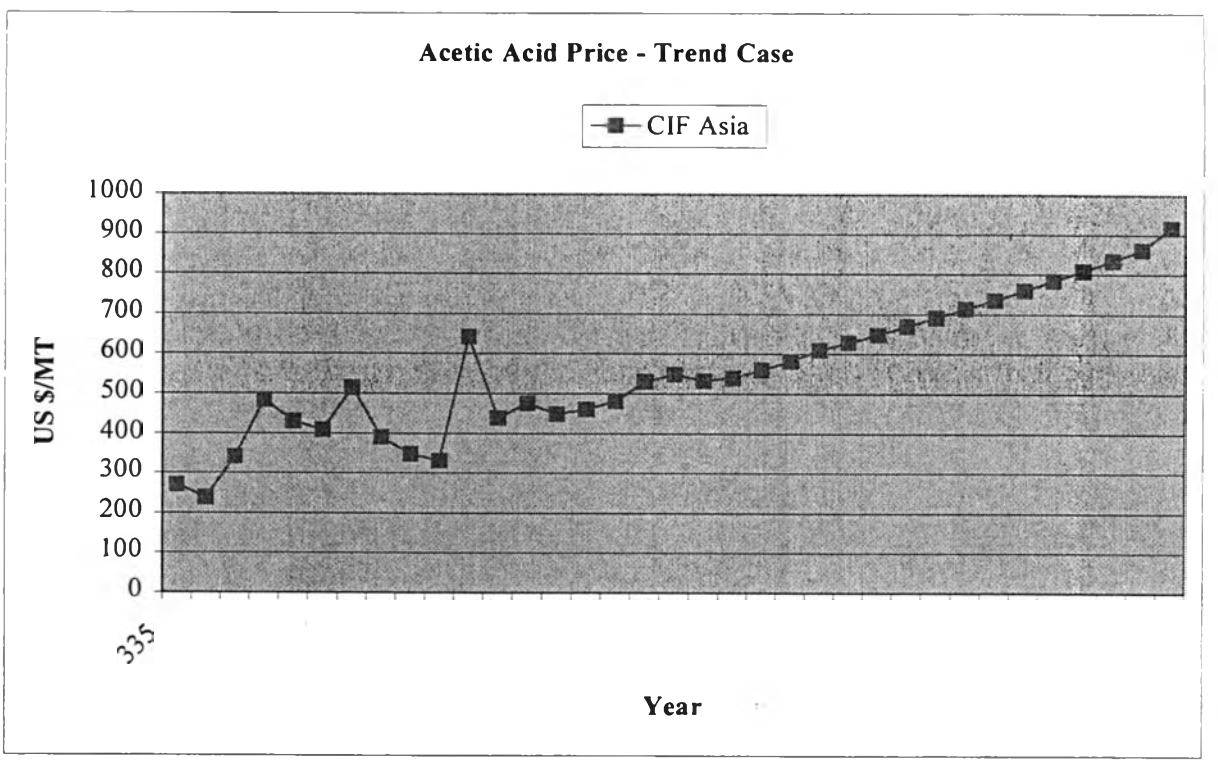
For the trend case, Southeast Asia contract prices are projected to be $526 per metric ton (1996$) on average throughout the forecast period as shown in Table 3.16 and figure 3.8.

3.6.6 Acetic Acid Price Outlook

Chem Systems' projected acetic acid prices are based on historical prices and margins for a Leader- producer. USGC prices for acetic acid peaked in 1994 at $439 per metric ton (1996$). Forecast prices are expected to remain relatively, ranging from $358 to $331 per metric ton (1996$). In general, acetic acid prices have not been cyclical.

Historically (from 1984 to 1996), CIF Southeast Asia acetic acid prices averaged $76 per metric ton (1996$) above USGC domestic pricing. The CIF Southeast Asia forecast maintains this price differential, which represents the average cost of freight from the United States to Southeast Asia the destination of most of the US exports. Chem Systems' projected USGC and CIF Southeast Asia acetic acid prices and price differentials are provided in figure 3.9 and Table 3.17.

FIGURE 3.9
ACETIC ACID PRICE FORECASTING-TREND CASE



Source: Chem Systems Research for East Asia Acetic Acid Price 1996

TABLE 3.17
ACETIC ACID PRICE FORECAST
(US Dollars Per Metric Ton)

Current dollars

	USGC Domestic	CIF Asia	Difference
		Historical	
1985	303	270	(33)
1986	255	238	(17)
1987	257	340	83
1988	335	483	148
1989	326	430	104
1990	321	408	87
1991	354	514	160
1992	333	390	57
1993	335	348	13
1994	419	331	(88)
1995	378	642	263
1996	344	439	95
		Forecast	
1997	398	475	78
1998	369	449	80
1999	378	460	82
2000	397	481	84
2001	443	530	87
2002	459	548	90
2003	439	532	93
2004	444	539	96
2005	461	559	99
2006	479	581	102
2007	504	609	105
2008	520	628	108
2009	536	648	112
2010	554	669	116
2011	571	691	119
2012	590	713	123
2013	609	735	127
2014	628	759	131
2015	648	783	135
2016	669	808	140
2017	690	834	144
2018	712	861	149
2020	759	917	158

Source: Chem Systems Research for East Asia Acetic Acid Price 1996

3.7 DATA COMPARISON BETWEEN 1996 AND 1998

Even though, all data which we used in this thesis are not updated that is in 1996 before Thailand economic crisis in July, 1997. So, we would like to prove that such data in 1996 is still valid for use in the thesis by comparison between data in 1996 and update data in 1998 (only actual situation) that PTIT [1] has collected for their studying. The data between 1996 and 1998 only for Thailand are shown in the table 3.18 below.

TABLE 3.18
DATA COMPARISON BETWEEN 1996 AND 1998

Supply and Demand Balance (thousand metric tons) Surplus/ (Shortfall)Comparison						
Description	**Source of Data**	**1994**	**1995**	**1996**	**1997**	**1998**
PTA	Chem Systems	(319)	(281)	(6)	(126)	(283)
	PTIT	(306)	(290)	25	23	(171)
Para_Xylene	Chem Systems	0	(67)	(248)	(24)	0
	PTIT	0	(87)	(222)	11	79
Acetic Acid	Chem Systems	(13)	(23)	(20)	(26)	(45)
	PTIT	(10)	(22)	(18)	(24)	(31)

Price (U.S. Dollar Per Metric Ton)Comparison						
Description	**Source of Data**	**1994**	**1995**	**1996**	**1997**	**1998**
PTA	Chem Systems	602	1,120	525	714	688
	PTIT	610	1,112	586	560	440
Para_Xylene	Chem Systems	564	931	656	581	604
	PTIT	543	920	543	352	312
Acetic Acid	Chem Systems	331	642	439	475	449
	PTIT	328	650	420	468	429

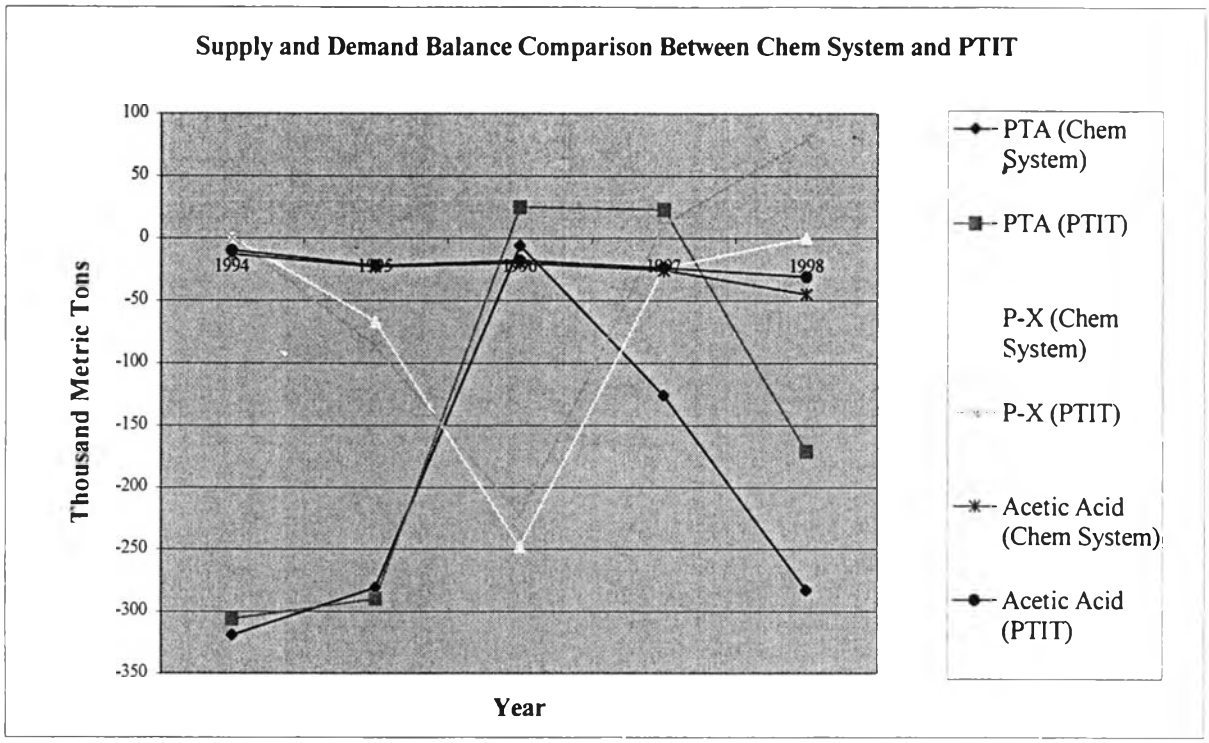
Source: Chem Systems Research for East Asia Supply/Demand and Price Forecasting
PTIT Journal Special Annual Issue 1996
PTIT Journal Special Annual Issue 1997
PTIT Journal Special Annual Issue 1998
PTIT Thailand Petrochemical Market 1997

From the table as shown above, some data are error due to the forecasting but it still has the same trend not only supply/demand but also price forecasting. For clearly understanding and interpret the data from table, the graphic method is coming to the best solution for this case. So, the figure 3.10 is show the trend comparison of supply and demand of PTA, para-Xylene and Acetic Acid between Chem System and PTIT and figure 3.11 is show the trend of price comparison between Chem Systems and PTIT.

(1) PTIT Means Petroleum Institute of Thailand is a leading organization which do a research in petrochemical for all state enterprise and government in Thailand.

From the figure 3.10 as shown below, such as PTA supply/demand balance, however, in 1995 and 1996 are error but in 1998 the balance is go to the same trend which is minus value that show us that Thailand is shortfall for PTA.

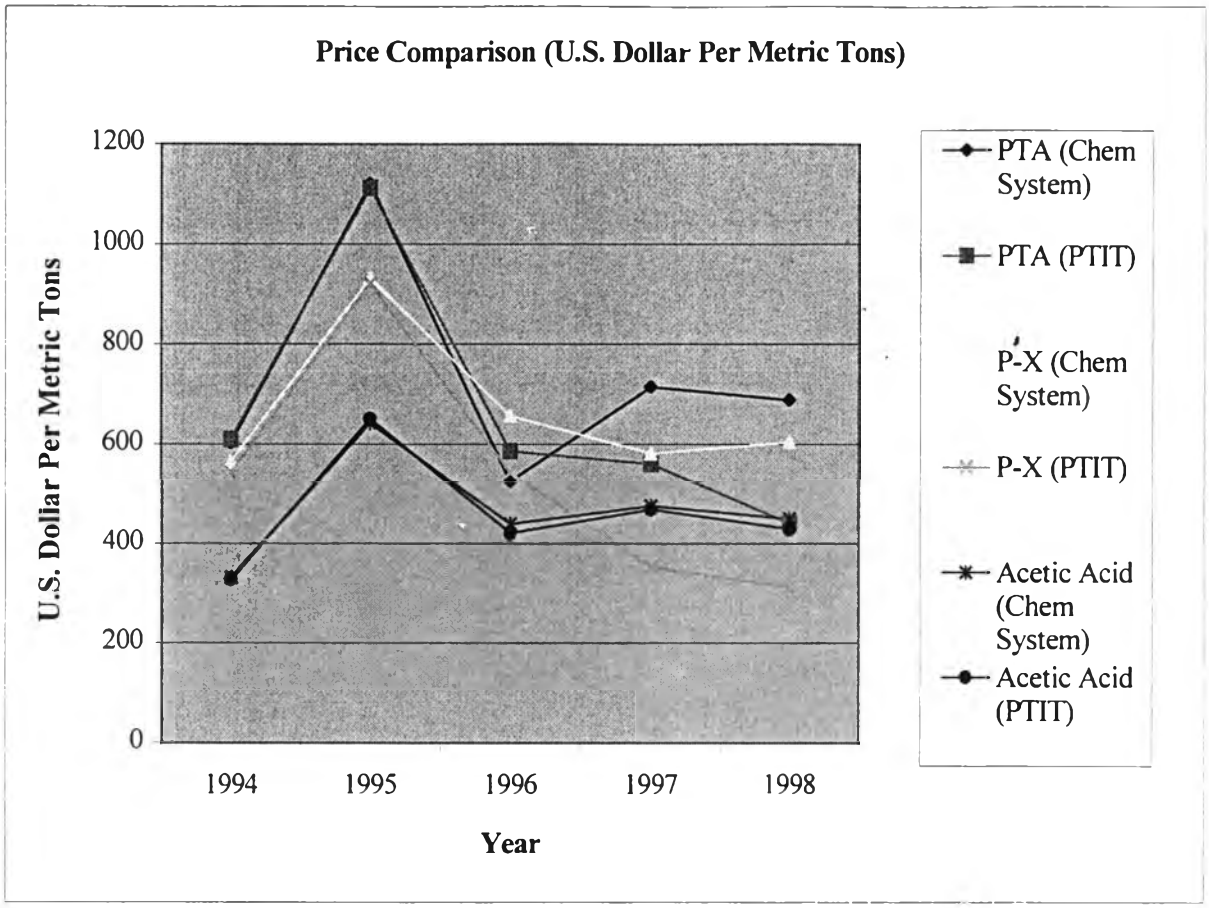
FIGURE 3.10 SUPPLY AND DEMAND BALANCE COMPARISON BETWEEN CHEM SYSTEMS AND PTIT



Source: Chem Systems Research for East Asia Supply/Demand and Price Forecasting
PTIT Journal Special Annual Issue 1996
PTIT Journal Special Annual Issue 1997
PTIT Journal Special Annual Issue 1998
PTIT Thailand Petrochemical Market 1997

Moreover from the figure 3.11 as shown below, the price forecasting of PTA is still has the same trend as Chem Systems predicted, however, all the actual data are a little bit lower than expectation. In order to make decision that PTA price is still valid, the para-Xylene price should be considered. Because para-Xylene is the major raw material to produce PTA. The price of para-Xylene is a little bit lower than Chem Systems forecasting but in our case if the para-Xylene price is lower while the PTA price is still higher such project must be more feasible to operate.

FIGURE 3.11 PRICE COMPARISON BETWEEN CHEM SYSTEMS AND PTIT



Source: Chem Systems Research for East Asia Supply/Demand and Price Forecasting
PTIT Journal Special Annual Issue 1996
PTIT Journal Special Annual Issue 1997
PTIT Journal Special Annual Issue 1998
PTIT Thailand Petrochemical Market 1997

From the explanation above, we can conclude that **we can only respect the trend of data from Chem Systems but the value of data not only demand and supply, but also price should be adjusted for more accurate in term of forecasting which consequential use in the financial model.**

So, after studied the forecasting data, such demand and supply of PTA and price of PTA and para-Xylene should be adjusted by calculated from the percentage of change in each year which started from 1996 to 1998 and determined the average of percentage of change in each data. Afterward, such average percentage of change value will use for adjust the trend of Chem Systems. Finally, the new forecasting data will come out and will be used for further analysis in this thesis.

The selected data, which need to adjust by using an average percentage of change, are shown in the table 3.19 below.

TABLE 3.19 ADJUSTED VALUE FOR SELECTED DATA FROM CHEM SYSTEMS PRICE AND SUPPLY/DEMAND FORECASTING -TREND CASE

	1996	1997	1998	Average
Supply/Demand of PTA (Chem Systems)	(6)	(126)	(283)	
Supply/Demand of PTA (PTIT)	25	23	(171)	
% Change	-516.66%	-118.25%	-39.57%	**-224.83%**
Price of PTA (Chem Systems)	525	714	688	
Price of PTA (PTIT)	586	560	440	
% Change	11.62%	-21.57%	-36.04%	**-15.33%**
Price of para-Xylene (Chem Systems)	656	581	604	
Price of para-Xylene (PTIT)	543	352	312	
% Change	-17.22%	-39.41%	-48.34%	**-34.99%**

From the calculation as shown above, we can adjust the forecasting data from Chem System as shown in the table 3.20 and table 3.21 below. Noted that such data will be calculated from year 1999 to 2020.

TABLE 3.20 PTA SUPPLY AND DEMAND BALANCE IN THAILAND
(metric ton per year)

	1999	2000	2001	2002	2003	2004	2005	2010
Thailand	-18	20	124	126	128	128	133	185
Adjusting Value (%)	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25
New Value	**22.5**	**25.0**	**154.8**	**157.3**	**159.8**	**159.8**	**166.0**	**230.9**

From the new calculation, we expected that in the year 2000 such supply of PTA will over from the demand of PTA and continuously over through the year 2010 and so on. But for supply and demand of para-Xylene and Actetic Acid will follow the forecasting of Chem Systems which mention in the table 3.11 and 3.14.

TABLE 3.21 PRICE FORECASTING FOR PTA AND PARA-XYLENE
(US$ per metric ton)

Year	PTA	Adjusted Value	PTA New Price Value	para-Xylene	Adjusted Value	para-Xylene New Price Value
1999	700	-0.1533	**593**	609	-0.3499	**396**
2000	716	-0.1533	**606**	619	-0.3499	**402**
2001	732	-0.1533	**620**	630	-0.3499	**410**
2002	750	-0.1533	**635**	641	-0.3499	**417**
2003	770	-0.1533	**652**	657	-0.3499	**427**
2004	794	-0.1533	**672**	675	-0.3499	**439**
2005	817	-0.1533	**692**	695	-0.3499	**452**
2006	842	-0.1533	**713**	714	-0.3499	**464**
2007	867	-0.1533	**734**	735	-0.3499	**478**
2008	893	-0.1533	**756**	756	-0.3499	**491**
2009	920	-0.1533	**779**	777	-0.3499	**505**
2010	948	-0.1533	**803**	800	-0.3499	**520**
2011	987	-0.1533	**836**	825	-0.3499	**536**
2012	1,017	-0.1533	**861**	852	-0.3499	**554**
2013	1,048	-0.1533	**887**	879	-0.3499	**571**
2014	1,079	-0.1533	**914**	907	-0.3499	**590**
2015	1,112	-0.1533	**942**	936	-0.3499	**608**
2016	1,145	-0.1533	**969**	966	-0.3499	**628**
2017	1,193	-0.1533	**1010**	997	-0.3499	**648**
2018	1,229	-0.1533	**1041**	1,029	-0.3499	**669**
2019	1,266	-0.1533	**1072**	1,062	-0.3499	**690**
2020	1,304	-0.1533	**1104**	1,096	-0.3499	**713**

From the calculation above, we expect that the price of PTA and para-Xylene will lower than Chem Systems forecasting, but for the price of Acetic Acid will follow Chem Systems Price forecasting as shown in the table 3.17.

Finally, in our financial model as mentioned in Chapter 7, we will use the data in the year 2001 in order to be ensured that the data will not too much error from the future effect and economic crisis effect that very difficult to expect and predict.