台塑關係企業
FORMOSA PLASTICS GROUP

No. 6 Naphtha Cracking Project and Economic Development

A Land Expansion Project that Will Elevate National Economic Competitiveness

The petrochemical industry is intimately associated with our daily lives

Petrochemical products are around in practically every aspect of our lives; things we see and use everyday, such as toothbrush, towel, food container, clothes, building materials, decorative materials, transportation vehicles and amusement machines, have petrochemical components in them. One example can depict the importance of petrochemical industry in its application to the apparel industry. A synthetic fiber factory with an annual output of 90,000 tons only occupies an area of 5,000 square meters (roughly the size of a soccer field). But toproduce an equal amount of wool requiresa pastureland as big as 40,000 square kilometers (bigger than the total area of Taiwan). Based on Taiwan's output of synthetic fibers in 2005 at 2.68 million tons, we need an area 33 times as big as Taiwan in order to produce the same amount of wool. Intimately associated with our lives, petrochemical industry not only provides us with comfort and high-quality living, it is also an indispensable industry to the development of economy and technology civilization.

The petro-chemical industry embraces beauty when it becomes a part of life.



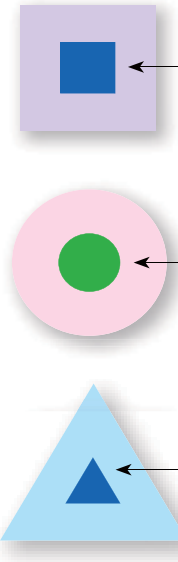




Petrochemical industry and economic development

Petrochemical industry has had a significant impact on Taiwan's economic development. Its related sectors cover a wide variety of products, ranging from chemical fertilizer, pesticide, detergent, apparel, plastics, rubber to paint. The total output of Taiwan's petrochemical industry amounted around US$132 billion in 2010, accounting for 29.3% of that of the manufacturing industry and topping other sectors in terms of breadth and depth of influence. In the past few years, petrochemical-related products have been widely applied to high technology in the fields of electronics and aerospace, making immense contribution to the transformation and upgrade of Taiwan's industry. Thus, petrochemical industry is regarded as the locomotive to our national economic development.

- **Output value and workforce of petrochemical and downstream industries:**



Output value

Around US$132 billion
Accounting for 29.3% of Taiwan's total manufacturing output

Workforce

420,000 employees
Accounting for 16.8% of Taiwan's total manufacturing workforce

Number of factories

Over 16,000
Accounting for 21% of total number of factories in Taiwan

The locomotive of economic development

Cherishing the limited resources and maximizing their effects

After the world has been through two energy crises, oil is considered one of the most precious resources in the world. With known crude oil reserves in the world at approximately 1 trillion barrels, it will last about only forty years based on the current consumption rate of 65 million barrels per day. It implies the world's oil resources will be depleted in less than half a century. Therefore, almost every country is vigorously seeking alternative energy resources. It is anticipated that by the beginning of the 21st century, oil will be replaced by other forms of energy, except for aviation fuel. Even gasoline for automobiles might become obsolete. By then, petroleum will be used mainly for the production of petrochemical products and become indispensable from another perspective. The importance of petrochemical industry can be discerned from the fact that advanced nations in Europe, United States and Japan are actively expanding related facilities. Petrochemical industry is not an energy-consuming, low-efficiency industry. On the contrary, for a country like Taiwan that is scarce in land and densely populated, it is a vital industry that is essential for creating economic prosperity and elevating living standard.

Maximizing the benefits of petroleum

Characteristics of Taiwan's petrochemical industry and its underlying problems

Taiwan's petrochemical industry was developed as an integrated system, with upstream, midstream and downstream segments intimately linked. Such a system, having achieved considerable scale in the past few decades, is unique in the world and has assisted in the development of Taiwan's economy.

However, with no ability for the further expansion of the production of upstream, basic petrochemical materials, the country has experienced a long-term supply shortage of these materials. This has greatly affected midstream and downstream manufacturers, forcing them to rely heavily on imports. Thus, when international demand for petrochemical products tightens, domestic manufacturers have been compelled to spend more on intermediate raw material costs, reducing their competitiveness in the international market.

Before the construction of No. 6 Naphtha Cracking Plant, the self-sufficiency rate of ethylene in Taiwan was only 38%. As a direct result of the Project, the self-sufficiency rate is 90% above now.In addition, a portion of the products produced by No. 6 Naphtha Cracking Plant is available for export, mainly to Taiwanese merchants in China. The remainder is used domestically for midstream and downstream plants for processing and export. This has enabled these producers to be free from import pricing and supply disruptions; they have become more competitive in the international marketplace.

At the present, however, the petrochemical industry in Taiwan remains susceptible to adverse market forces both at home and abroad. For example, the country still depends heavily on imported raw materials, such as IPM and IIR, to make inner tubes and light oil – light oil imports are projected to reach 10 million tons this year. Taiwan must be self-sufficient in these types of materials to ensure that its industries will be free from uncertain global raw material prices and availability.

Also, world-class petrochemical plants are expected to start up in China and the Middle East later this year. Once these plants are operational, the output of ethylene from just the Middle East may account for up to 20% of the world's total ethylene output. These plants' low cost advantage will have an adverse economic impact on the petrochemical industry in Taiwan. The country and its petrochemical industry must achieve the necessary economy of scale in the production of these products to retain its global competitiveness.

The inception of the No. 6 Naphtha Cracking Project and its final settlement in Mailiao

In view of the long-term shortage of basic petrochemical materials in Taiwan that dampened development of the midstream and downstream petrochemical industries, Formosa Plastics Group proposed the Sixth Naphtha Cracking Project for alleviating the problem and acquired government approval in 1986. The first selection for the project site was a 280-hectare property in Lizi, Yi-Lan. Due to subsequent irrational objections of local opposition, the project was moved to Guanyin, Taoyuan in 1988, and then aborted for similar reasons.

In 1991, with blessings of both the local government and the residents, the project chose to settle down in the off-shore industrial zones in Yunlin County of Mailiao and Haifong, by way of reclamation, for building up an oil refinery plant with annual capacity of 25 million tons of crude oil, naphtha cracking plants for producing 2.94 million tons ethylene per annum, and other petrochemical plants, heavy machinery plants, a co-generation plant, and the Mailiao Industrial Harbor. In addition, in view of the serious power shortage in Taiwan, which impacts greatly on people's lives as well as on businesses, a thermal power plant with a capacity of 3 million kilowatts was therefore planned; all of the generated power will be incorporated into the TPC power supply system, for assisting on the relief of the domestic power shortage.

Total investment of 54 plants in the four phases of the No. 6 Naphtha Cracking Project, including the industrial harbor and the power plant, was US$17.7 billion, and the project was completed and has already began production.

FPG intends to invest another US$ 8.57 billion for the 5th phase expansion at No. 6 Naphtha Cracking Plant. This will enchance the Industry's ability to compete, and succeed, in tomorrow's global market.

Faith and sweat turn the sea into mulberry fields

Land reclamation

The Mailiao and Haifong Zones that accommodate No.6 Naphtha Cracking Project are situated at the estuary of Chuoshui Creek at the northern end of Yunlin County. Approximately 8 km long from south to north, the area extends more than 4 km along the coastline out toward the sea. A great portion of the land lies below sea level most of the time and one can observe some sandy land at low tide which is totally submerged during high tide. The Cracking Project required massive land reclamation efforts to create 2,255 hectares of new land. Since the two sections have a waterway segregating them from the fish farms along the coast, geological improvement to shore up the foundation was required before the plants could be built.

Land reclamation was carried out by first constructing dike of stone in the sea and enclosed the area expected to be the base of plant, then sand was extracted from government-sanctioned waters to level up the area inside the embankment.

Mailiao is located in a region that is commonly dubbed "head of the windstorm and end of the waterflow," with the northeast monsoon blowing half of the year. Inconvenient transportation and poor weather made the reclamation work doubly formidable. It is truly a giant undertaking to turn sea into mulberry fields.

No. 6 Naphtha Cracking Project - magnitude and facilities

1. Civil works

- **Land reclamation :** 109.15 million cubic meters of sand were poured to create land, sufficient in volume to construct a three story tall, eight-lane wide building along the 373 km-long stretch of freeway from Keelung to Kaohsiung. The total area of reclaimed land is 2,255 hectares, about 8% the size of Taipei City (27,180 hectares) and 14.7% the size of Kaohsiung City (15,359 hectares), or equal to 0.062% of Taiwan's land area.
- **Engineering foundation :** The total length of piles driven amounted to 4.5 million meters and the total amount of concrete used reached 8.48 million cubic meters (approximately 1.72 million tons).
- **Plant construction :** Fifty four plants were built within a single complex, including oil refineries, naphtha cracking plants, co-generation plants, power plants, heavy machinery plants, boiler plants, wafer fabrication plants and petrochemical-related plants. Piping inside the plant area alone extends for 3,000 km.
- **Complex area :** The area of the entire complex totals 2,603 hectares, more than four times the total of the Linyuan (388 ha), Dashe (115 ha), and Toufen (96 ha) petrochemical industrial zones.

Pipeline end of land reclamation

Land reclamation

2. Mailiao Port

The Project's Mailiao Port occupies an area of 476 hectares, comparable to the size of Taichung Port (487 ha) and more spacious than Keelung Port (384 ha). With a water depth of 24 meters during mid-tide, the Port can accommodate 300,000 ton vessels. Therefore, it is Taiwan's deepest port and the first privately funded industrial port. The Mailiao Port has the ability to handle up to 70 million tons of cargo a year, second only to Kaohsiung Harbor. Although Mailiao Port was constructed for industrial purposes, its operations in Yunlin County incorporates the vast adjacent hinterland area into the port zone. Consequently, the access to convenient marine transportation promotes development of local industry.

No. 6 Naphtha Cracking Project - magnitude and facilities

3. Independent power plant

The Project includes a large thermal power plant equipped with three power generation units that each generate 600,000 kW of electricity, for a total generating capacity of 1.8 million kW. Since commercial operation of these units officially commenced in June 1999, September 1999 and September 2000, respectively, all electricity generated has been sold to the Taiwan Power Company and incorporated into the national power grid. This contribution has helped ease Taiwan's power shortage.

Setting the foundation for national economic development

4. Oil refinery

The oil refinery's capacity increased from 450,000 to 540,000 barrels/day upon the completion of the Phase IV expansion. Meanwhile, the naphtha capacity increased to 4 million tons/year, which is sufficient to supply for the entire Mailiao Complex. Other petroleum products, including gasoline, diesel, kerosene and Liquefied Petroleum Gas (LPG) are exported to overseas markets.

No. 6 Naphtha Cracking Project - magnitude and facilities

5. Naphtha cracking plant

There are three naphtha cracking plants (NCP). Upon the completion of the NCP1 de-bottlenecking project, ethylene capacity will increase from 0.45 million tons/year to 0.7 million tons/year; the NCP2 unit's ethylene capacity is 1 million tons/year. The NCP3 unit, with a capacity of 1.2 million ton/year, was completed in 2007, bringing the total combined ethylene capacity to 2.9 million tons/year.

6. Co-generation plant

The plant is designated to generate electricity, steam, and water for industrial use, as well as produce hyperpure water, nitrogen, oxygen, and compressed air for use by plants within the complex. The largest co-generation plant in Taiwan, it has 16 generation sets with a total capacity of 2.82 million kW. After supplying onsite manufacturing needs, excess electricity is sold to Taiwan Power Company to ease Taiwan's power shortage.

7. Machinery Shop and Boiler Shop

The machinery shop primarily engages in the design, manufacture, installation, and construction of oil refining and petrochemical process equipment such as reactors, towers, pressure containers, earth covered tanks, etc. It has the capability of producing very large vessels – up to 10 meters in diameter, 100 meters in length and 1,000 tons in weight. During the project, the shop participated in the planning, design, manufacture, installation, and construction of the 50-150 MW co-generation power plant and the 600 MW independent power plant. Today, it produces large vessels for external commercial sale.

No. 6 Naphtha Cracking Project - magnitude and facilities

8. Wafer fabrication plant

This wafer plant is a joint venture owned by Formosa Plastics, Asia-Pacific Investment and Japan's SUMCO TECHXIV CORPORATION for the production of silicon wafers used in semi-conductor, with an annual capacity of 3.84 million pieces for 8-inch and 2.4 million pieces for 12-inch, planning to expand 12-inch annual capacity to 3.6 million in 1Q 2013. The plant was qualified by ISO-9001:2000 in December 2002, ISO-14001 in March 2001, QS9000 in March 2003, and TS16949/ OHSAS18001 in April 2005. In December 2006, the plant further received the "TPM Excellence Award" from Japan Institute of Plant Maintenance (JIPM) and in August 2007 it also received the "Golden Merchant Award." Furthermore, the plant was qualified by TOSHMS in May 2010 and received the "TPM Excellence Consistent Award" in January 2012.

9. Formosa Asahi Spandex Co. Ltd.

Formosa Asahi Spandex Co. Ltd., with an annual capacity of 5,600 MT for spandex and 21,000 MT for polytetramethylene ether glycol (PTMG), is a joint venture between Formosa Plastics and Asahi Kasei Fibers of Japan. The plant was qualified by ISO-14001:2004 certification in November 2009, OHSAS 18001:2007 in November 2009, and ISO-9001:2008 in September 2010.

10. Sixth Naphtha Cracking Project Investment Items (See table below for details)

No. 6 Naphtha Cracking Project Investments

Setting the foundation for national economic development

Investing Company	Item	Factory	Product	Capacity (10000 MT/yr unless otherwise noted)
Formosa Plastics Corp.	1	Acrylic Acid & Ester plant	AA/AE	10.8/15.4
	2	Polyvinyl Chloride plant	PVC	49.4
	3	Vinyl Chloride Monomer plant	VCM	80
	4	Caustic Soda plant	Caustic Soda	123
	5	High Density Polyethylene plant	HDPE	35
	6	Carbon Fiber plant	Carbon Fiber	0.88
	7	Ethylene-Vinyl Acetate plant	EVA/LDPE	24
	8	Acrylonitrile plant	AN	28
	9	Linear Low Density Polyethylene plant	LLDPE	26.4
	10	Methyl Methacrylate plant	MMA	9.8
	11	C4 plant	MTBE/B-1	17.4/3.2
	12	Epichlorohydrin plant	ECH	10
	13	NBA plant	NBA	25
Nan Ya Plastics Corp.	1	Plasticizer plant	DEHP	35
	2	Epoxy Resin	EPOXY	16
	3	Propionic Anhydride plant	PA	22.8
	4	Isooctanol plant	2EH	20
	5	Bisphenol A factory	BPA	42
	6	Ethylene Glycol plants	EG	132
	7	Hydrogen Peroxide plant	ESO/H_2O_2	2/2
	8	1,4-Butylene Glycol plant	1,4BG	10
	9	Iso-nonyl Alcohol plant	INA	11.5
	10	Antioxidant plant	AO/CPE	0.3/1
Formosa Chemicals & Fibre Corp.	1	Aromatic Hydrocarbon plants	BZ/PX/OX/MX/TOL	133/178/48/10/2
	2	Styrene Monomer plant	SM	132
	3	Purified Terphthalic Acid plant	PTA	110
	4	Phenol Synthesis plant	PHENOL/ACETONE	44/27.1
	5	Polypropylene	PP	51
	6	PABS	PS/ABS/PBT	18/14/3
	7	Polycarbonate plant	PC	20
Formosa BP Chemicals Corp.	1	Acetic Acid Plant	HAC	30
Formosa Petrochemical Corp.	1	Refinery plant	Naphtha, gasoline, diesel	2,500(Refinery)
	2	Naphtha Cracking plant	Ethylene	293.5
	3	Utilities Supply plant	Steam	11,580 T/H
			Electricity	2,820MW
Mailiao Power Corp.	1	Power station	Electricity	600MW X 3
Formosa Heavy Industries Corp.	1	Equipment for Machinery Shop	Equipment for refinery, petrochemical plants	4.3
	2	Boiler Shop	Equipment for CO-generation and utility power plants	500T/H X 4ST
Formosa Sumco Technology Corp.	1	Wafer fabrication plant	8-inch wafers 12-inch wafers	3.84 million pcs. 2.4 million pcs.
Formosa Asahi Spandex Co.	1	Spandex plant	SPANDEX/PTMG	0.6/2.1
Nan Chung Petrochemical Corp.	1	Ethylene Glycol plants	EG	30
Simosa Oil Co, Ltd.	1	Asphalt plant	Asphalt	30

Environmental Protection Plan in the No. 6 Naphtha Cracking Project

In order to reinforce our environmental protection, FPG established Safety Health & Environment Center to monitor and control the air, wastewater, waste articles, noise and ecological environment conditions. We adopted most advanced Best Available Control Technology (BACT) to reduce the negative impacts on the environment. The invested budget for pollution control and prevention is about US$2.95 billion. The outcome is very significant. It not only surpasses our national official standards but also meet the standards of the most developed countries.

Take the air pollution as an example, in the thermal power plant, we adopt sealed systems for coal transportation and storage in order to prevent the coal dust or ashes blown out of the system to cause pollution. All of the emitted gas has to pass various treatments, such as ventilated denitrification and desulfuration, static electricity dust collection to make sure the pollutants were eliminated before the gas emitted. As to water pollution control, we set up 10 comprehensive wastewater processing pools. Before flowing out, all of the wastewater will be well treated by chemical and biological process treatments. It's proven the flown out wastewater is clean for keeping the carps. Meanwhile, the 6th naphtha is the only complex which process waste within the complex area in Taiwan. We have 2 incin erators which can process 150 tons of waste daily, a immobilization factory, a landfill site and an ash pond.

Water and energy saving program at Mailiao Complex

In the wake of water and energy resource constraints, FPG formed a couple task groups, "The Center For Water Resource Utilization And Development" and "The Project Team of Energy Saving and Carbon Reduction", to research for ways to improve water and energy conservation rate. Both task groups have conducted several projects to reduce water consumption, including process water reduction and wastewater and rainwater recycling. On the energy front, task groups also put in a lot of efforts to slow global warming effect and to improve energy efficiency, as well as to improve heat recovery and to develop alternative energy such as wind turbines.

Up to the end of 2011, FPG has conducted 1,459 energy saving projects at Mailiao Complex. It has reduced 6.47 million tons of CO_2 emissions, which is equivalent to 860 million trees' carbon uptaking for one year. In addition, 757 water saving projects have reduced 84.07 million tons of water consumption per year. The amount is equivalent to one year's water consumption of 921 thousand persons.

Feedback to the local community

Presently, all offshore industrial zones are poverty-stricken areas that lack medical, cultural or recreational facilities. In addition, Central Taiwan faces the greatest lack of medical facilities; Taiwan also lacks comprehensive planning of recreational facilities. Furthermore, the proportion of senior citizens has now risen to 9%, evidence of the gradual ageing of the population. As National Health Insurance has now been implemented, public demands for medical care have also increased, so there is a need to set up medical facilities to raise quality of life.

The goal of economic development is to let citizens enjoy a higher quality of life. Achieving this requires attention to non-economic aspects of life (such as health, transportation, environment, leisure, culture and welfare). In recent years, Taiwan's economic development has borne fruit and the government has invested in the basic non-economic resources of society, such as transport infrastructure construction, healthcare, and recreational and cultural facilities.

For our social responsibility commitment, FPG plans to build a 500-bed Chang Gung Memorial Hospital branch in Yun-lin County. The hospital will begin operation by the end of 2009 with more than ten departments established. It is expected to improve the quality of clinical services and public health for the region.

A ecological park benefiting both the industry and community

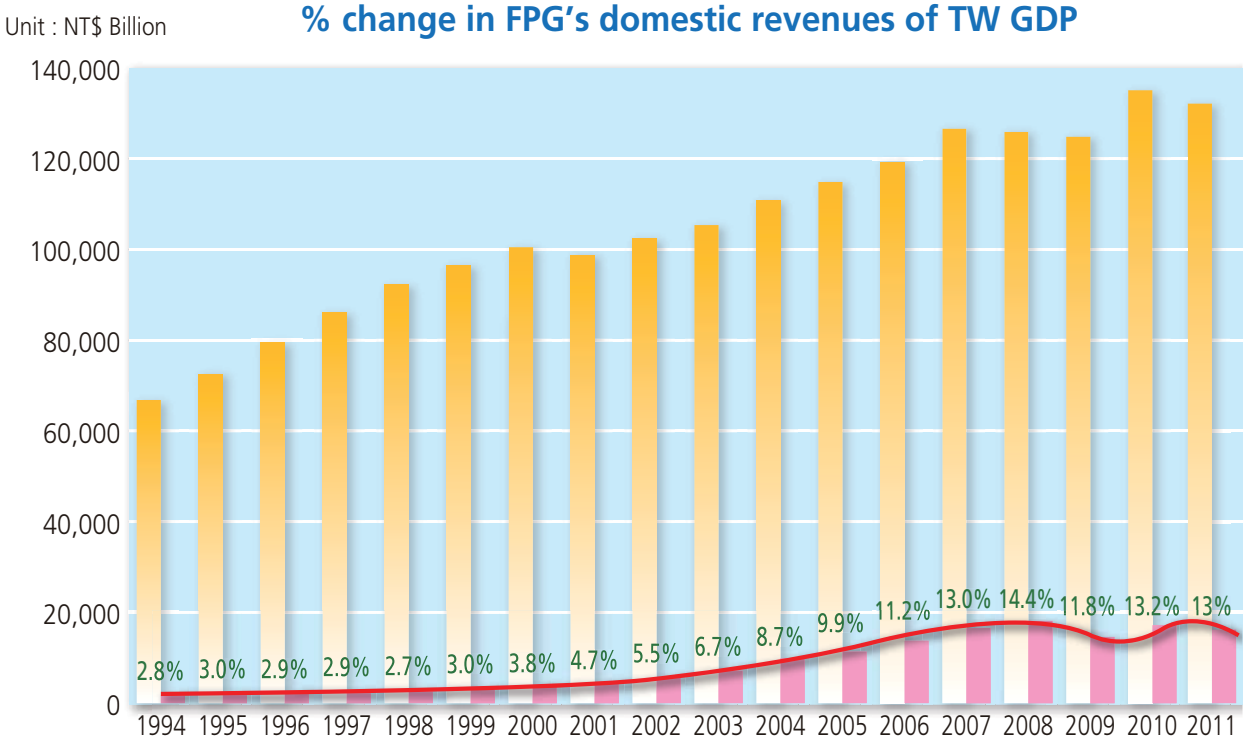
Projected economic contributions

Total investment in one to four phase of No. 6 Naphtha Cracking Project is US$17.5 billion, of which environment protection budget is US$2.95 billion, accounting for 16.6% of the total investment. During its construction phase, the annual investment is about US$2.19 billion, which boosts the growth rate of macro-economic and private investment.

The contributions of the No. 6 Naphtha Cracker Project to Taiwan are multiple. It boosts the confidence of the private sector, stabilizes development of the petrochemical industry, promotes upgrade of the petrochemical industry and balanced regional development, and shortens the gap between city and countryside. Other materialized benefits of the project include:

A contribution to the country

1. **The self-sufficiency rate of ethylene increased from 38% in 1994 to over 90.2% in 2011.**
2. **Annual production value in 2011 has reached US$50.8 billion, which is 9.2% of Taiwan's GDP for the same year.**
3. **Increasing government tax revenues by average over US$693 million per year.**
4. **It leads the middle and down stream industries development and improves industrial output and working opportunities.**
5. **Mailiao Port offers a more accessible gateway to local commerce, and improves the economic growth for the region.**
6. **The excess electricity of the power plant will solve the problem of power shortage in Taiwan.**
7. **We created land area of 2,255 hectares for Taiwan.**



Outlook for the future

In its more than five decades of operations, Formosa Plastics Group, approaching everything with the attitude of "seeking perfection," has been adhering to the spirit of "diligence and simplicity" and the goal of developing manufacturing industry to make a contribution to the national economy. Taiwan is an island country characterized by scarce resources and a small domestic market. Most products must rely on export. Only by observing the traditional virtue of industriousness and persistently seeking the development of manufacturing industry can the country maintain its economic growth. That is why Formosa Plastics Group has surmounted towering obstacles to push for the No. 6 Naphtha Cracking Project. Thanks to assistance and support from all sectors, we will put forth all our efforts to complete this gigantic undertaking and establish a new milestone for the economic development of the country. We beseech your continuing support and advice. Let us work together to create a better tomorrow.

Sharing the fruits of fulfilled dreams

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