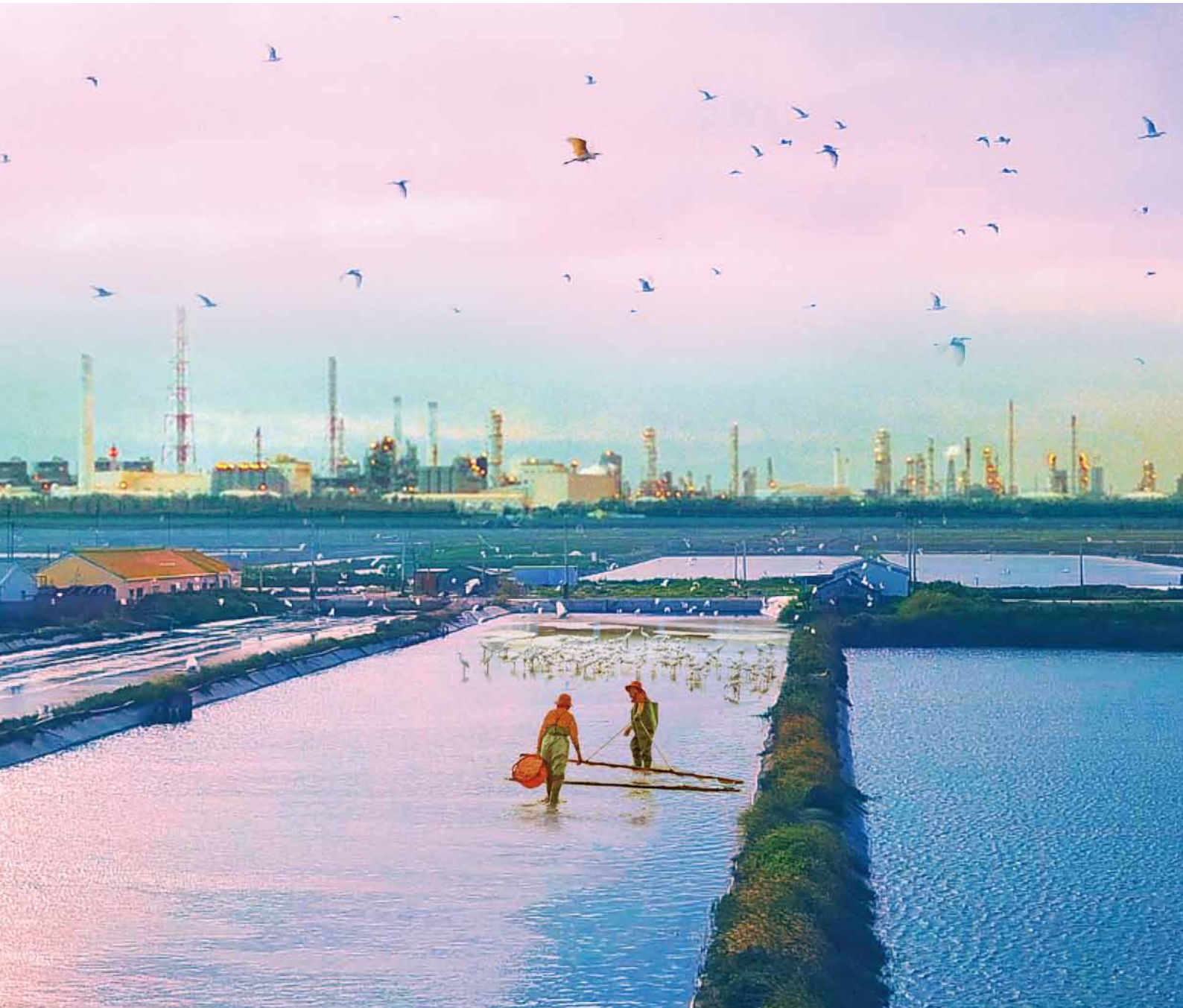




台塑企業
FORMOSA PLASTICS GROUP

The Sixth Naphtha Cracking Project and Economic Development

A Land Expansion Project that Will Elevate National
Economic Competitiveness



Coexistence and mutual prosperity of "industry" and "agriculture"





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, amusement machines, medical devices, 3C and high-tech products, 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 to produce an equal amount of wool requires a pastureland as big as 40,000 square kilometers (bigger than the total area of Taiwan). Based on Taiwan's output of synthetic fibers in 2017 at 1.65 million tons, we need an area 20 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.



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.

Before The Sixth Naphtha Cracker Project, the self-sufficiency rate of ethylene in Taiwan was only 38%. As a direct result of the Project, the self-sufficiency rate is over 100% now. In addition, a portion of the products produced by The Sixth Naphtha Cracker 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 IIR, to make inner tubes and light oil – light oil imports reached 7 million tons each 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 have started up in China and the Middle East. 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. Also, Europe, United States and Japan are actively expanding related facilities. Thus, 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.

The total output of Taiwan's petrochemical industry accounts 25.7% of that of the manufacturing industry. The importance of petrochemical to Taiwan can be seen. Petrochemical related companies in Taiwan should focus on the R&D and manufacture of high value added products to retain their global competitiveness.





Total occupied area **2,603** hectares
Total Investment US\$**27.84** billion



The inception of The Sixth Naphtha Cracker Project

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 Cracker 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 cracker 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 Sixth Naphtha Cracker Project, including the industrial harbor and the power plant, was US\$27.84 billion, and the project was completed and has already begun production.

Land reclamation

The Mailiao and Haifong Zones that accommodate The Sixth Naphtha Cracker 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 Cracker 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.







Mailiao Port

The Sixth Naphtha Cracker 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) or equal to 0.062% of Taiwan's land area.
- **Engineering foundation :** The total length of piles driven amounted to 4.7 million meters and the total amount of concrete used reached 8.97 million cubic meters (approximately 1.96 million tons cement).
- **Plant construction :** Fifty four plants were built within a single complex, including oil refineries, naphtha cracker 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 (403 ha), Dashe (109 ha), and Toufen (95 ha) petrochemical industrial zones.



Different kinds of coral have been discovered in Mailiao Port, the figure shows Gorgonians.



The water quality in Mailiao Port is good, which provides the white-spotted puffer and other tropical fishes a fine habitat.

2. Mailiao Port

The Project's Mailiao Port occupies an area of 476 hectares. 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.



Humpback dolphins are coming back and swimming in Mailiao Port.

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. 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.

4. Oil refinery

Upon the completion of the Phase IV expansion, refining 540 thousand barrels of crude per day, the equivalent of 25 million tons of petroleum annually, The naphtha capacity increased to 3.75 million tons/year, which is sufficient to supply for the entire Mailiao Complex. Other petroleum products, including gasoline, diesel and kerosene are exported to overseas markets.

5. Naphtha cracker plant

There are three naphtha cracking plants (NCP,) producing ethylene, propylene, and butadiene. Ethylene capacity is 2.935 million tons annually, the biggest capacity in Taiwan and the largest single-plant area capacity in Asia, supplying people's livelihood, special chemicals, information, high-tech and other industries. The plants are industrial infrastructure of national importance.

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 2.75 million kW. After supplying onsite manufacturing needs, excess electricity is sold to Taiwan Power Company to ease Taiwan's power shortage.





Independent power plant has helped ease Taiwan's power shortage.





Machinery Shop



Boiler Shop



Application of Spandex fiber



Silicon Wafer plant



7. Machinery Shop and Boiler Shop

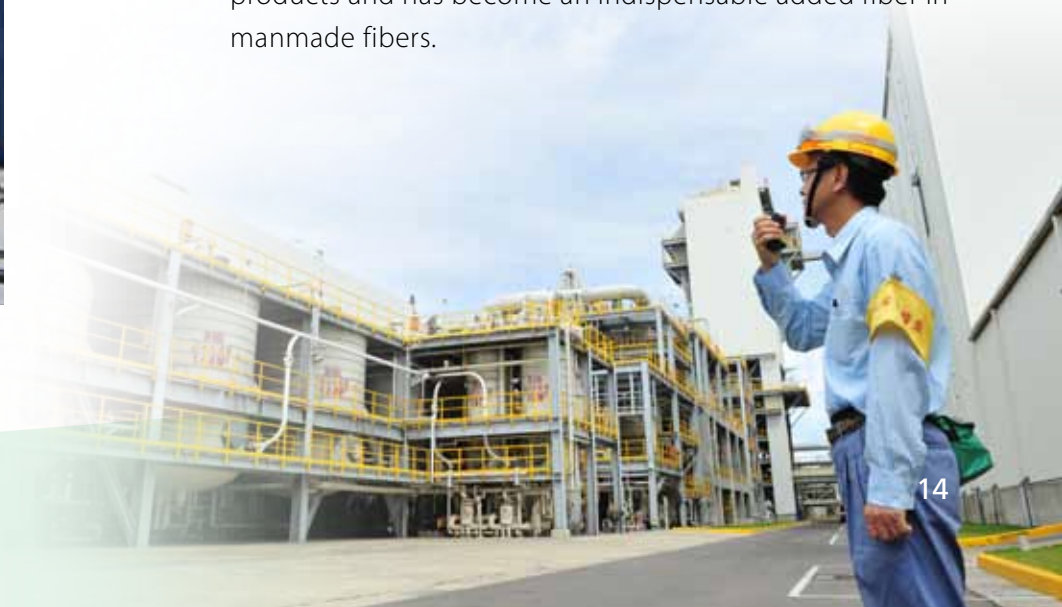
The machinery shop mainly engages in the design, manufacture, installation, and construction of oil refining and petrochemical process equipment such as reactors, towers, pressure vessels, earth covered tanks, etc. The overall manufacturing capability is 10M^øx100^Lx1000MT, it means the actual capability of producing a single equipment is up to 10 meters in diameter, 100 meters in length and 1,000 tons in weight. The project team and the boiler shop participate in the planning, design, manufacture, installation, and construction of the 50-150MW co-generation power plant and the 600MW independent power plant.

8. Silicon Wafer 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 200mm and 3.36 million pieces for 300mm. Silicon wafers are the most important substrate materials for integrated circuit of semiconductors and are also supplied for use as solar battery substrate material.

9. Formosa Asahi Spandex Co. Ltd.

Formosa Asahi Spandex Co. Ltd., with an annual capacity of 5,000 MT for spandex and 21,000 MT for polytetramethylene ether glycol (PTMG), is a joint venture between Formosa Plastics and Asahi Kasei of Japan. Spandex is widely used in functional clothes and medical products and has become an indispensable added fiber in manmade fibers.



The Sixth Naphtha Cracker Project Investments

Investing Company	Item	Factory	Product	Capacity (10000 MT/Y unless otherwise noted)
Formosa Plastics Corp.	1	Acrylic Acid & Ester plant	AA/AE	10.8/15.4
	2	Polyvinyl Chloride plant	PVC	49.8
	3	Vinyl Chloride Monomer plant	VCM	80
	4	Caustic Soda plant	Caustic Soda	133
	5	High Density Polyethylene plant	HDPE	35
	6	Carbon Fiber plant	Carbon Fiber	0.88
	7	Ethylene-Vinyl Acetate plant	EVA	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
	14	SAP plant	SAP	6
Nan Ya Plastics Corp.	1	Plasticizer plant	DEHP	35
	2	Epoxy Resin plant	EPOXY	16
	3	Propionic Anhydride plant	PA	22.8
	4	Isooctanol plant	2EH	20
	5	Bisphenol A plant	BPA	42
	6	Ethylene Glycol plant	EG	144
	7	Hydrogen Peroxide plant	ESO/H ₂ O ₂	2/2
	8	1,4-Butylene Glycol plant	1,4BG	10
	9	Iso-nonyl Alcohol plant	INA	11.5
	10	Maleic Anhydride plant	MA	6
Formosa Chemicals & Fibre Corp.	1	Aromatic Hydrocarbon plant	BZ/PX/OX/MX	133/197/48/10
	2	Styrene Monomer plant	SM	132
	3	Purified Terphthalic Acid plant	PTA	110
	4	Phenol Synthesis plant	PHENOL/ACETONE	44/27.1
	5	Polypropylene plant	PP	56
	6	PABS plant	PS/ABS/PBT	20/14/3
	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 Cracker plant	Ethylene	293.5
	3	Utilities Supply plant	Steam Electricity	11,580 T/H 2,754MW
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 Cogeneration and utility power plants	500T/H X 4ST
Formosa Sumco Technology Corp.	1	Wafer fabrication plant	8-inch wafers	3.84million pcs.
			12-inch wafers	3.36million pcs.
Formosa Asahi Spandex Co.	1	Spandex plant	SPANDEX/PTMG	0.5/2.1
Nan Chung Petrochemical Corp.	1	Ethylene Glycol plant	EG	36
Simosa Oil Co, Ltd.	1	Asphalt plant	Asphalt	30



Environmental Protection Plan in The Sixth Naphtha Cracker 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\$4.04 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 8 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, Mailiao Industrial Complex is the only complex which process waste within the complex area in Taiwan. We have 2 incinerators which can process 150 tons of waste daily, a immobilization factory, a landfill site and an ash pond.



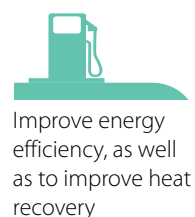
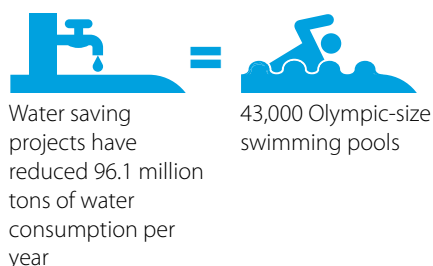
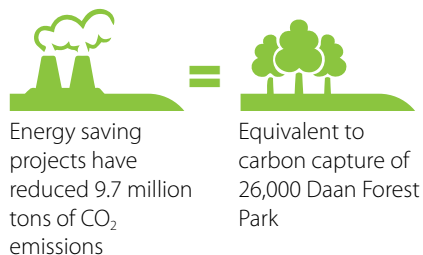
Flocks of black-tailed gulls are searching for food in Mailiao port harbor area.



A Taiwan blue magpie is walking around the Mailiao Industrial Complex.



Wang Zhan-Yang Memorial Park in Mailiao Industrial Complex





Wang Zhan-Yang Memorial Park in Mailiao Industrial Complex



Discharged water with proper treatment can be used to breed koi carp.

Circular Economy at Mailiao Industrial Complex

In order to achieve the best profit-making point between economic development and environmental ecology, FPG established the “Energy Saving and Carbon Reduction and Pollution Prevention Promotion Organization” in 2017, with a long-term investment in human resources and material resources, promote energy saving and emission reduction and cross-company, cross-factory energy resources integration work.

The organization has conducted several projects to reduce water consumption, including process water reduction and wastewater and rainwater recycling. As a result, the complex has attained a water recycling rate of 86.2%. According to calculation, the Mailiao complex uses every drop of water 7.3 times. In addition, 1,484 water saving projects have reduced 96.1 million tons of water consumption per year. This amount is equivalent to the water consumed by 1,053,000 people in one year. This is also equivalent to conserving water of 43,000 Olympic-size swimming pools.

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 2017, FPG has conducted 4,652 energy saving projects at Mailiao Industrial Complex. It has reduced 9.7 million tons of CO₂ emissions, which is equivalent to 1,293 million trees’ carbon uptaking for one year. This is also equivalent to carbon capture of 26,151 Daan Forest Park.

Feedback to the local community

There were only a few agricultural activities and fishing pools in the early development stage of Mailiao area. Due to poor geographical and weather conditions, the area lacks resources and faces severe problem of brain drain. However, the Sixth Naphtha Cracking Project has created many employment opportunities and has brought economic prosperity to Mailiao Township. The presence of various shops has gradually enriched local life. Mailiao is also the only township seeing population growth in Yunlin in recent years.

Formosa Plastics Group has always adhered to the concept of “taken from the society to benefit the society”, giving feedbacks to society through practical actions, combining corporate resources and creating a better community together with its neighbors.

Local Infrastructure

Formosa Plastics Group has always attached great importance to education, which is crucial for every person. In addition to setting up schools, it has also committed to old school building reconstruction projects to provide students with a safe and comfortable learning environment. At the same time, it has successively donated public facilities to Mailiao and the neighboring townships. Both software and hardware equipment are also provided for free to the disadvantaged groups. Formosa Plastics Group concerns and takes care of the community in the most practical way.



Yunlin Chang Gung Memorial Hospital increases the medical quality for local residents



Free health check and care for local residents



Coaching of agricultural and fishing industries to assist in the development of local agricultural and fishing industries



Health Improvement

In order to provide quality health care for local residents, Formosa Plastics Group has conducted health improvement project and established Yunlin Chang Gung Memorial Hospital to improve local medical services and quality. Residents can get good medical care without time-consuming transportation.

Agriculture and Fishery Counseling

Formosa Plastics Group cooperates with professional academic teams to promote agriculture and fishery counseling programs, assisting local farmers and fishermen by introducing a scientific management model called "less pesticides and less antibiotics", turning Mailiao into a township of non-toxic agriculture. In addition, local agriculture and fishery are promoted by marketing campaigns, and in recent years, the products such as lettuce, Taiwan tilapia, and tomatoes from Mailiao have been well-received by international markets.



Culture Cultivating

Mailiao is located in the coastal zone, where there are few opportunities to see performing arts. Formosa Plastics Group has sponsored a number of Taiwanese arts and cultural groups such as Taiwanese opera troupes, puppet troupes, children theater troupes, etc., in the hope of bringing shows and performances to nearby towns as well as a cultural atmosphere. By doing so, the arts and cultural groups can also obtain capital and applause to gradually grow and prosper.



Sponsoring the cultural and artistic performance in the countryside to inject cultural atmosphere

Projected economic contributions

Total investment in one to four phase of The Sixth Naphtha Cracker Project is US\$27.84 billion, of which environment protection budget is US\$4.04 billion. The contributions of The Sixth 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:

- The self-sufficiency rate of ethylene increased from 38% in 1994 to over 100% in 2017.
- Annual production value in 2017 has reached US\$40.45 billion.
- Increasing government tax revenue by an average of at least US\$603 million annually over the past 5 year.
- It leads the middle and down stream industries development and improves industrial output and working opportunities.
- Mailiao Port offers a more accessible gateway to local commerce, and improves the economic growth for the region.
- The excess electricity of the power plant will solve the problem of power shortage in Taiwan.
- We created land area of 2,255 hectares for Taiwan.



The water quality in Mailiao Port is good, which provides many tropical fishes a fine habitat.



Outlook for the future



In its more than six 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 Sixth Naphtha Cracker 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.



CORPORATE HEADQUARTERS

.....

201 Dunhua N. Road,

Taipei, Taiwan

Tel : (02)27122211

Fax : (02)27129211

<http://www.fpg.com.tw>



FORMOSA PLASTICS GROUP MAILIAO INDUSTRIAL COMPLEX

.....

No.1 Formosa Plastics Group Industrial Complex,

Mailiao, Yun Lin County, Taiwan

Tel: (05)681-2345

(2018.7.1000.37)