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Target Readers:

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Material Topics	Purpose of Management	Management Approaches and Effectiveness Evaluating Mechanisms
<ul style="list-style-type: none"> Respond to climate change Elevate energy and resource efficiency Prevent and control environmental pollution Instigate production and product innovation Reinforce environmental safety and health management 	<p>To mitigate and adapt to the risks of climate change, reduce production costs and improve competitiveness through energy and resource management, and avoid environmental pollution to minimize impacts on neighboring residents to foster corporate and environmental sustainability.</p>	<ul style="list-style-type: none"> Designate special agencies for energy and environmental management with regular follow-up and review meetings. Establish applicable system and target with continuous performance tracking. Promote applicable certification on environmental and energy management. Understand the latest technological trends with exchanges among production sites. Examine various environmental data with regular review and analysis to identify critical issues on a timely manner and make improvements. Promote various energy and water conservation as well as emission and waste reduction projects and monitor progress and performance. Establish emergency response procedure with regular drills to minimize the effects of accidents on neighboring communities. Report to the highest management level through regular meetings. Ensure that production activities are in full regulatory compliance.

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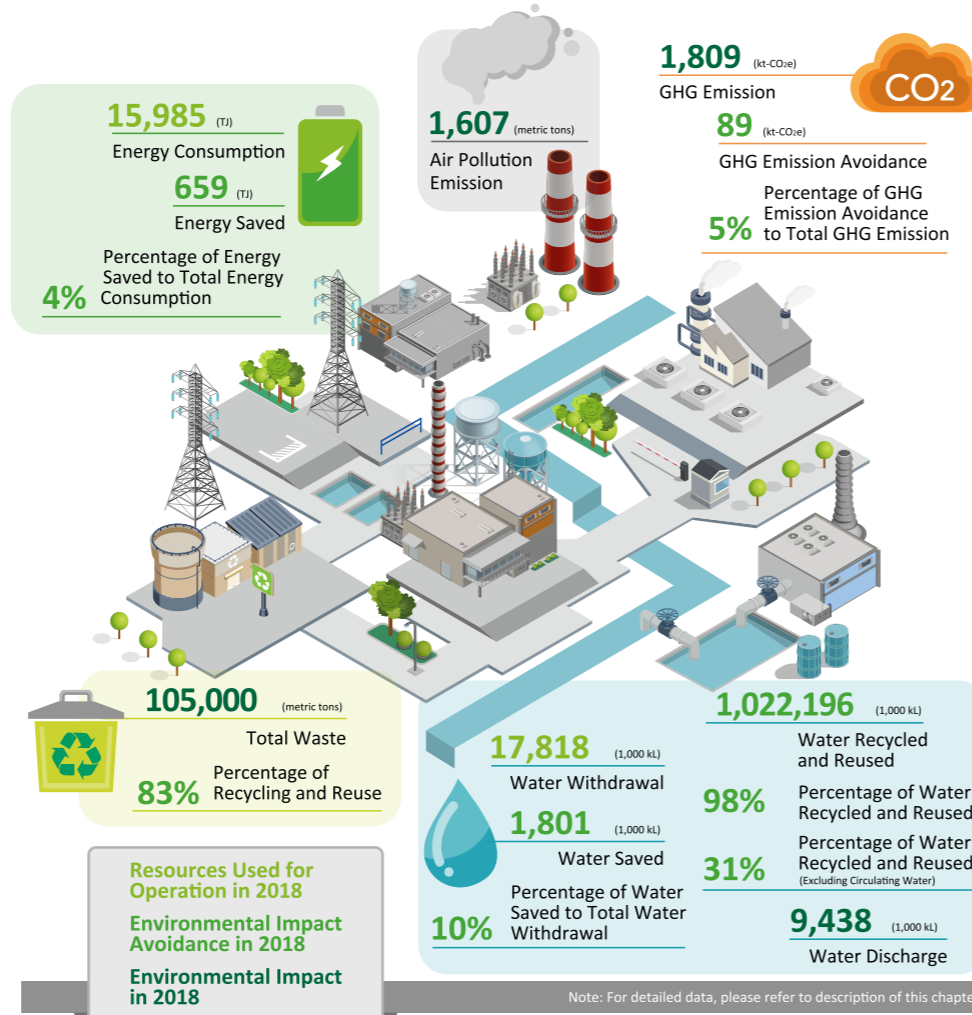
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3.1 Overview of Environmental Data



3.2 Energy and Resource Management

3.2.1 Energy Management

SDG13-Climate Action outlined by the UN specifies that emergency measures must be taken to cope with global and entrepreneurial sustainability risk due to climate change. Hence, FENC takes energy issues seriously. The Company takes active approach in responding to the public energy policies, dedicates itself to improving energy efficiency, promotes measures of energy conservation and carbon reduction, and gradually lower energy consumption to mitigate global climate change.

Energy management methods

- Establish a designated unit responsible for energy management and hold regular meetings for follow up and review.
- Build systems for energy management and set energy conservation goals.
- Set plans and procedures in place for energy conservation and carbon reduction.
- Enhance awareness of energy conservation through publications and case studies on energy conservation and discussions with experts.
- Track the performance of energy conservation projects, which will be references for compensation and incentives.
- Promote certification related to energy management.

The power conservation rate at FENC production sites in Taiwan reached 1.9% in 2015, 2.3% in 2016, 2.0% in 2017 and 2.0% in 2018, which surpasses the power conservation target of 5% in 5 years set by the government. Based on the overall energy policy, the Polyester Business established 4 task forces (production procedure, water resources management, power management, and resource and reuse). Each task force will recruit members according to the area of focus and report progress to the main contact for the project in order to enhance the overall management capacity.

Hsinpu Chemical Fiber Plant monitors power consumption at each production unit with smart electricity management system. The Plant introduced three-stage pricing by setting contract capacity with units with power demand to reduce electricity cost and respond to the governmental objective of energy conservation and carbon reduction. In light of the significant results at Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant also introduced the program in 2018. Hsinpu Chemical Fiber Plant went one step further by integrating public power consumption into the smart electricity management system in 2018. WHFE plans to introduce the three-stage pricing system in 2019.

FEDZ developed a 5-year energy conservation plan starting with 2016 as the base year. By 2020, a reduction of 35% is expected for purchased energy, and 34% for water consumption per unit production. In 2018, water consumption per kilogram of fabric decreased by 34% comparing to the base year, which is ahead of schedule. Consumption of purchased power per unit production is yet to hit the target due to product mix adjustment, more complex production process and addition of environmental protection equipment. Improvements are ongoing.

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All production sites are introducing ISO 50001 Energy Management System, and 4 have passed the certification. OPSC and FEIS are on track to introduce the system in 2019, and WHFE in 2020.

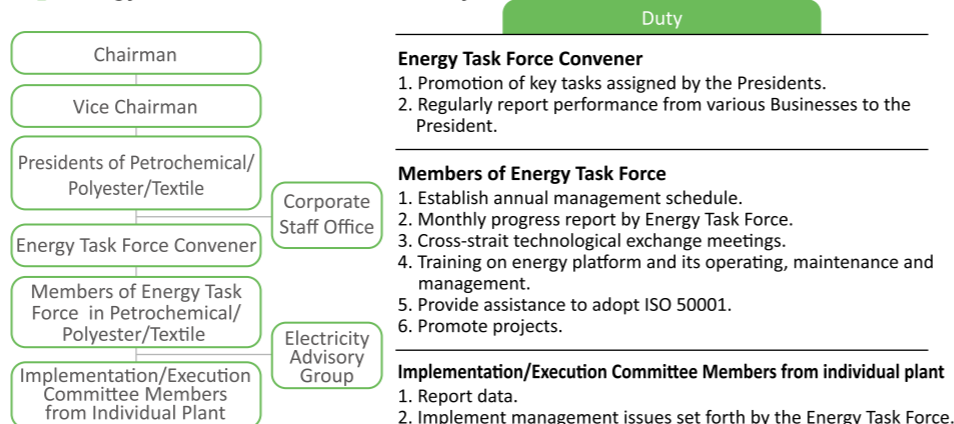
Environmental and Energy Management Certification Passed at Production Sites

Certification Standards	Sites with Certifications
ISO 14001 Environmental Management Systems	Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant, Kuanyin Dyeing and Finishing Plant, OPSC, FEIS, WHFE, OTIZ, FEDZ, FEAV, Headquarters
ISO 50001 Energy Management Systems	The second plant of OPTC, Hukou Mill, FEIW, Headquarters

Energy Task Force

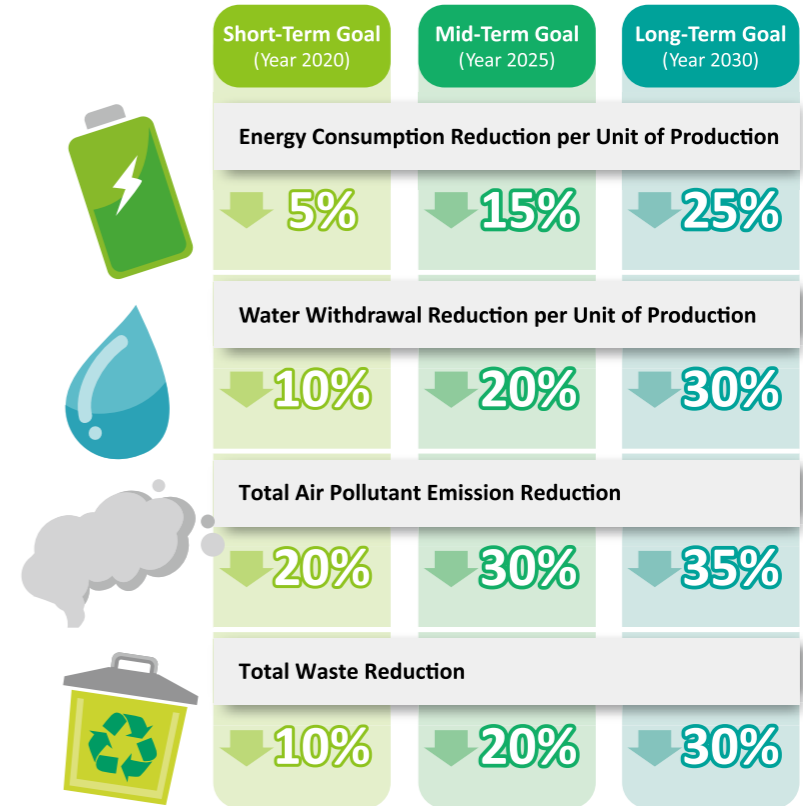
FENC established the intercompany and interdepartmental "Energy Task Force" in 2010. The task force establishes energy-saving goals, conducts regular meetings to review energy consumption and direction for energy saving, tracks performance of energy conservation projects and reports to the governing entity on a regular basis. The task force also organizes technical conferences on energy conservation to explore opportunities for improvements on energy conservation and to enhance the efficiency of energy consumption. All production sites have formulated applicable guidelines and regulations in accordance with the policies established by the Energy Task Force, and fully implemented the required measures. During the monthly meetings, internal staff with the expertise also review energy consumption and propose improvements. Energy conservation audit is conducted in conjunction with energy inspection by the governing authority or customers, and the staff also provide the Energy Task Force with information to the assessment of relevant projects.

Energy Task Force Structure and Duty



Note: The issues and projects managed by Energy Task Force include energy, water resources and waste.

Energy and Resource Reduction Goal



Note: 2017 is the base year.

In 2018, FENC set short-term (2020), mid-term (2025) and long-term (2030) goals for energy consumption per unit of production, water consumption per unit of production, as well as reduction in total waste and air pollutant emission with 2017 as the base year. In order to effectively track project progress, the Energy Task Force introduced the framework for "Review Meeting on Energy Conservation, Carbon Reduction and Circular Economy", which includes water resources and waste management under issues to be addressed to expand the current management system. In addition, data on water resources and waste have been systemized and uploaded to "Online Smart Energy Management Platform". The platform was later optimized and renamed "Management Platform of Energy Conservation, Carbon Reduction and Circular Economy", which was launched in January 2019.

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The energy conservation tasks have been ongoing for years. Those with high performance and short payback period have largely been implemented. In 2010, NT\$2 billion was appropriated for special energy-saving budget. In 2017, another NT\$2 billion was appropriated with the aim to move beyond technological bottleneck to seek higher performance on energy conservation. After budget review, a total of NT\$380 million was approved for 113 energy conservation projects in 2018; NT\$870 million was budgeted for 2019, including projects without any expenditure in 2018. The estimated annual performance is approximately NT\$140 million.

2019 Special Energy-Saving Budget and Performance

Energy and Resource	Budget (NT\$ million)	Annual Performance (NT\$ million)	Percentage
Electricity	390	90	64%
Fuel	90	30	21%
Other	390	20	15%
Total	870	140	100%

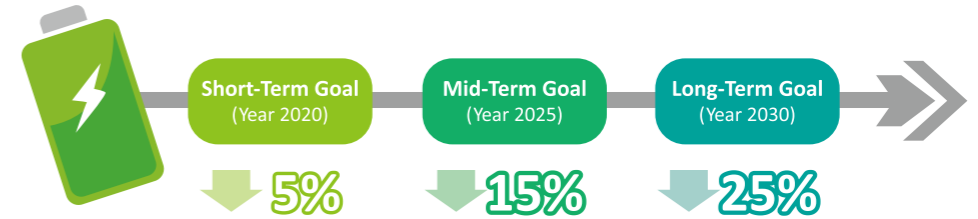
Note: The "Other" category includes water resources, waste, nitrogen and compressed air system.

The Energy Task Force promotes cross communication among all production sites, providing professional expertise and resources on management to foster the synergy. For instance, the Company established electricity advisory group to provide diagnosis on energy consumption at various production sites while providing knowledge on electricity conservation, increasing reasonable use of electricity and improving awareness on conserving electricity. Members of the Energy Task Force held system training and served as instructors for courses on "Management Platform of Energy Conservation, Carbon Reduction and Circular Economy". They coach colleagues on how to use the platform and assist high-level managers to take advantage of the results of data analysis. Each year, the Energy Task Force holds cross-strait technological exchange meetings, inviting industry experts to share their experience on energy conservation and the latest trends.

Considering operating risks posed by insufficient power supply from Taipower, all production sites in Taiwan have evaluated corresponding strategies against electricity rationing. For instance, Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant and FEFC use diesel for power generation; OPTC utilizes excess heat from natural gas boiler. In addition, Hsinpu Chemical Power Plant invested in co-generation system, applying the fuel generated thermal energy for steam and power generation to increase fuel efficiency. The co-generation system is expected to launch in the second quarter of 2019, and another co-generation plant at OPTC is under evaluation.

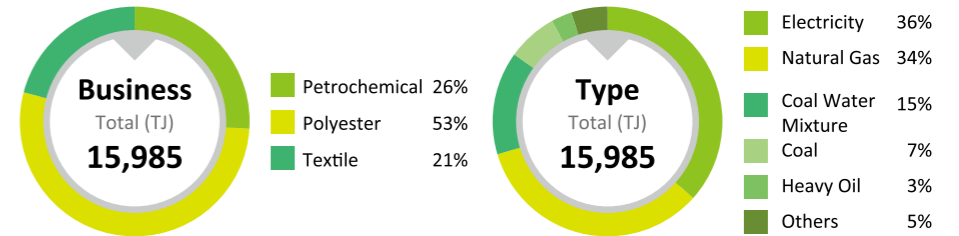
Total energy consumption dropped during 2018. The main factors are the closing of FEIZ and decrease in spun yarn production. OPTC and Hsinpu Chemical Fiber Plant increased production lines and therefore increased energy consumption. An analysis of the energy consumption per unit of production indicates that energy consumption per unit of production increased in Polyester Business mainly because of Hsinpu Chemical Fiber Plant, where the new production line yet to be optimized for energy consumption. Adjustments made in product mix at Hsinpu Chemical Fiber Plant and FEIS are also contributing factors. The Petrochemical and Textile Businesses saw an increase in the efficiency of energy usage, and decrease in energy consumption per unit of production.

Goal for Energy Consumption Reduction per Unit of Production



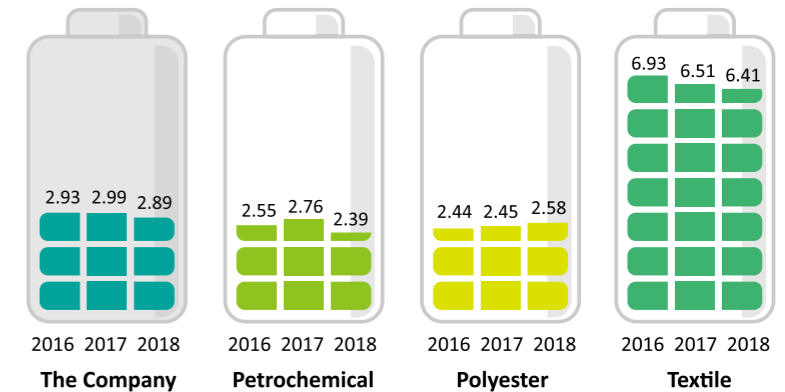
Note: 2017 is the base year.

Energy Consumption in 2018



Energy Consumption per Unit of Production

Unit: GJ / metric ton of product



Note: The Textile Business does not include FEAZ and FEAV.

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Energy Consumption

Unit: TJ

Business Energy Type \ Year	Petrochemical			Polyester			Textile			Total		
	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Purchased Power	1,006	1,046	875	2,839	2,841	2,965	2,033	2,081	1,938	5,878	5,968	5,778
Purchased Green Power	0	0	0	1	1	1	0	0	0	1	1	1
Self-generated Green Power	0	0	0	1	5	4	7	19	30	8	24	34
Electricity	1,006	1,046	875	2,841	2,847	2,970	2,040	2,100	1,968	5,887	5,993	5,813
Natural Gas	2,770	2,913	3,264	1,255	1,396	1,341	1,158	1,146	810	5,183	5,455	5,415
Heavy Oil	0	0	0	250	284	397	44	57	72	294	341	469
Fuel Oil	0	0	0	0	0	0	0	6	0	0	6	0
Coal	0	0	0	1,048	990	1,071	91	81	77	1,139	1,071	1,148
Coal Water Mixture	63	28	11	2,389	2,212	2,285	104	140	107	2,556	2,380	2,403
Ethylene Tar	0	0	0	0	0	0	0	0	0	0	0	0
Purchased Steam	0	0	0	331	393	337	443	424	400	774	817	737
Total	3,839	3,987	4,150	8,114	8,122	8,401	3,380	3,954	3,434	15,833	16,063	15,985

Note:
1. Above figures are energy consumption for production procedure.
2. Heating value is based on heating value coefficient at each production site. 3. Energy consumption outside of the organization is not included.

Measures and Performance on Energy Conservation and Carbon Reduction

FENC continues to promote various energy conservation and carbon reduction measures with 95 projects implemented in 2018. Improvement on the equipment is the main focus for energy conservation, with electricity as the priority for energy conservation. Investment in carbon reduction saw a yearly increase of NT\$220 million in 2018. The main reason is the replacement of conventional dyeing machine with low liquor ratio dyeing machine for the Textile Business.

2018 Energy Conservation and Carbon Reduction Projects

Improvement on Production Process 22

Parameter changes during production process, such as temperature, pressure, operating time, etc.



Improvement on Equipment 58

Optimization, upgrades and updates of production equipment, air conditioning, air compressor, boiler, power generator, motor and lighting. For instance, adding low liquor ratio dyeing machine and bypass reheating to increase viscosity during solid state polymerization.



Energy Management 15

Regulate the variable frequency of compressors, improvements on refrigeration system, as well as adjustment of equipment operating hours and decommission.



2018 Energy Conservation and Carbon Reduction Performance

Type	Performance	Energy Conservation (TJ)	GHG Emission Avoidance (t-CO ₂ e)	
			Scope 1	Scope 2
Project	Improvement on Production Process	230	6,641	17,181
	Improvement on Equipment	337	98	50,878
	Energy Management	92	0	14,397
Business	Petrochemical	57	0	9,602
	Polyester	385	1,311	58,029
	Textile	217	5,428	14,825
Total		659	6,739	82,456

Note:
1. Performance on energy conservation is an estimate derived from comparison to pre-project energy conservation with original production process and equipment.
2. The calculation of heating value is based on the heating value coefficients from all production sites.
3. GHG emission factors: GHG emission factors in Taiwan are based on "GHG Emission Factors" version 6.0.3 from Bureau of Energy, MOEA and Environmental Protection Administration. GHG emission factor for electricity is 0.554 t-CO₂e / 1000 kWh and 0.1518 t-CO₂e / t for steam. Calculation of GHG emission factors for electricity in China is based on the local electrical grid. The remaining calculation is based on "Guidelines on Accounting and Reporting Greenhouse Gas Emissions – China Petrochemical Enterprises (Trial)". The GHG emission factor in Vietnam is 0.57 t-CO₂e / 1000 kWh.
4. Scope 1 includes diesel, natural gas and coal water slurry; Scope 2 includes purchased electricity and purchased steam.
5. GHG includes CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ and NF₃.

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◆ Energy Conservation and Carbon Reduction Performance

Category	Year	2016	2017	2018
Actual Investment (NT\$1,000)		384,486	239,134	454,498
Savings (NT\$1,000)		156,618	106,466	143,379
Energy Conservation (TJ)		1,193	1,422	659
GHG Emission Avoidance (t-CO ₂ e)		166,252	153,751	89,195

Simplified High Viscosity Solid State Polymerization System

To produce polyester chip products at Hsinpu Chemical Fiber Plant, reheating was required in the original manufacturing process to increase viscosity for solid state polymerization. To conserve energy, Hsinpu Chemical Fiber Plant optimized the reactor design and dramatically increased the viscosity of the melts, while changing the pellet form and maintaining the temperature of the finished product. This modification in the manufacturing process was launched in 2018. The energy required for reheating is no longer required after this modification. The new process saves 10,861,000 kWh / year in electricity, and reduces GHG emission by approximately 6,017 t-CO₂e per year.

Note: The emission factor for the calculation of GHG emission of electricity is 0.554 t-CO₂e / 1,000 kWh.

Recycling and Reusing Excess Heat from Production

The steam boiler at OPTC creates high pressure steam, which is used toward tail gas oxidation and preheating the slurry purification system. To reduce energy consumption for the steam boiler, OPTC utilizes excess heat from the manufacturing process to increase tail gas temperature and effectively allocate thermal energy to reduce energy consumption. This project saves 1,800 cubic meters of natural gas per year, and NT\$13.93 million in costs per year.

Recycling and reusing excess heat from production

Pressure Filter Tail Gas Capture Project

In the past, OPTC discharged the tail gas from pressure filters directly into the atmosphere, which generates massive amount of pressurized (3 barg) tail gas and noises. Another equipment, the oxidation dryer, requires large amount of low-pressure (1 barg) tail gas to convey the products after drying. Typically, this process involves depressurizing high-pressure (7.5 barg) tail gas to serve the purpose. However, if the tail gas from pressure filters can be captured and reused, the high pressure tail gas can be conserved generate power for the expander, which reduces costs and minimizes waste of resources.

Hence, OPSC devised an innovative approach to recover the tail gas, which is to install de-watering purification system onto the pressure filter and send the tail gas to the air supply of oxidation dryer after cooling, de-watering and drying. This design also reduces air and noise pollution, fulfilling the goals of energy conservation, recycling as well as reusing resources. The project saved approximately 3 million kWh of electricity per year, reduced 2,415 t-CO₂e in GHG emission per year, and saved NT\$10.2 million in annual costs.

Note: The emission factor for the calculation of GHG emission of electricity is 0.805 t-CO₂e / 1,000 kWh.

The pressure filter

Installing Permanent-Magnet Synchronous Motor on Fan Coil Unit and Return Air Fan

The fan coil unit / return air fan at Hukou Mill had been running for nearly 30 years. The motor is operating on low efficiency with high power consumption. In 2018, the plant replaced all of the 138 motors with permanent-magnet synchronous motor (PMSM). The replacement reduces energy consumption by 10%, which translates to approximately 1.16 million kWh in energy conservation and GHG emission reduction by approximately 642 t-CO₂e / year with a decrease in costs by NT\$2.55 million per year.

Note: The emission factor for the calculation of GHG emission of electricity is 0.554 t-CO₂e / 1,000 kWh.

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3.2.2 Material Cycle Management

FENC introduced new system and technology into all production sites with proposals on measures to improve production process and manufacturing technique to increase efficiency of material use. Additionally, we fully implement equipment maintenance and evaluation of suppliers in order to ensure material quality and yield, and ultimately reduce material consumption.

We have established safety management system on hazardous materials, including user guidelines, storage instruction, and emergency response to leakage, for instance. We also provide training for staff in charge of relevant duties. There was no leakage of oil, fuel or disposed chemical products during the year 2018.

Material Management

FENC aims at reducing material consumption as well as recycling and reusing materials. The Company optimizes its production process, introduces new manufacturing techniques and reviews achievement rate on a regular basis. Hsinpu Chemical Fiber Plant introduced the smart scheduling system for the polymer production line, using the computer to configure the best production schedule based on big data that contains the inventory of raw materials and packaging materials, as well as sales information. The system reduced time spent on scheduling from 5 hours to 15 minutes. Waste scraps are reduced to nearly zero.

Recycling and Management of Packaging Materials

FENC is highly concerned about the choice of packaging materials. Eco-friendly materials is our top choice. The Company also recycles and reuses packaging materials, and avoids excessive packaging. In addition to recycling and reusing packaging materials in house, the Company also collaborates with qualified recycling companies to recycle packaging materials from customers supplying to domestic market. Packaging materials in good conditions are reused at FENC production sites.

FEFC recycles the pallets, paper tubes and peg boards from major customers. These recycled materials account for 45-75% of packaging materials used, and save approximately NT\$11.5 million per year. WHFE recycles pallets from adjacent customers and provides rebates in the form of selling price. Currently, the pallets used within the plants either came with the raw materials or recycled from product shipment.

We optimize the production method of packaging materials to encourage recycling. The PTA bags used by OPSC were originally printed with company trademark. When the bags are recycled, the trademark must be removed with oil paint. Starting from the second half of 2018, OPSC is printing the trademark on a label that is sewn onto the bag instead. Customers may peel off the label and reuse the bag. Such design was well received by the customers. The samples that Apparel Division of FENC delivers to Tommy Hilfiger are also no longer individually packaged. This practice reduces the consumption of packaging materials.



OPSC sewed the label printed with company trademark onto the packaging.

We calculate the quantity of packaging materials recycled, the percentage recycled and the completion rate on a monthly basis, and review the underperformed items. The recycling of packaging materials prolongs the lifecycle of raw materials, reduces material consumption, lowers costs and minimizes waste. In 2018, the average recycling rate from all production sites is 63%.



Biodegradable Packaging for Apparels

Apparels are typically accompanied by plastic packaging materials such as plastic bags and hangers. If plastic can be replaced by a more eco-friendly material, plastic pollutants can be reduced drastically.

In 2018, FENC collaborates with Levi's and Helly Hansen to replace the conventional plastic wrapping materials with biodegradable bags. In 2018, 3.5 million of the biodegradable bags were used, and they will be more widely used in the future.



Biodegradable packaging



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Catalyst Recycling and Reuse



Two heavy metals, cobalt and manganese, are catalysts during the PTA oxidization process. With proper recovery and treatment during the production process, the concentration of heavy metals in wastewater as well as the production costs may be lowered.

OPTC has installed Catalyst Recovery Pretreatment Unit and PTA Mother Liquid Catalyst Recovery Unit. During oxidation, the catalyst recovering retreatment technology keeps the temperature and pH value at an ideal level, which results in particle residues of cobalt-manganese oxides after neutralization and oxidation occur. They are then recycled through the pressure filter and made into cobalt / manganese catalyst filter cake. During the purification process, the PTA mother liquid catalyst recovery unit allows the two heavy metals to attach to macromolecules through ion exchange, and creates ionic fluid. The cobalt / manganese catalyst filter cake and the regenerated ionic fluid can be remanufactured into catalysts and reused during production. In 2018, approximately 500 metric tons of these two substances were recovered, which reduced NT\$60 million in costs.



Catalyst recovery pretreatment unit



Mother liquid catalyst recovery unit

3.2.3 Water Resources Management

FENC is vastly concerned about water resources management. In 2018, the Company established water withdrawal reduction goal and adopted various measures for water resources management, including the review of water resources efficiency for daily operation. In addition to documenting the meter readings on a daily basis, the Company also evaluates and examines water withdrawal and water conservation during monthly meetings, and devises solutions and improvement plans to fully utilize water resources information and reduce unnecessary waste. The Company also conducts regular maintenance, adopts new manufacturing technology, increases recycling and reuse of water resources, and documents water related statistics in detail in order to lower the consumption of water resources and continuously enhancing the management of water resources.

FENC takes the governmental policies, corporate development and industry changes into consideration when planning for water resources consumption. In addition, the Company also takes into account neighboring residents' needs for water resources to reasonably and effectively allocate and management the use of water resources. The water withdrawal and the approach used pose no negative effects to the neighboring residents and the natural habitat near the water source.

While conducting environmental impact assessment prior to plant construction, the second plant of OPTC made the commitment of treating domestic reclaimed water as one of the major water sources once Taoyuan Reclaimed Water project is completed in 2024. This plant is the first in Taiwan to make such commitment, and the use of reclaimed water will reduce operating risks associated with water shortage.

In 2018, FEDZ and Kuanyin Dyeing and Finishing Plant replaced a total of 29 conventional dyeing machines with low liquor ratio dyeing machine, which account for 22% of the total makeup. The replacement will conserve approximately 657,000 kL of water per year, and minimize the environmental impact from the dyeing process. This plant adopts the latest green production process and recycles wastewater, reducing water consumption by approximately 771,000 kL per year.

Measures of Water Resources Management



Reduction in Water Consumption

- Introducing water conservation equipment



Water Resources Management

- Water quality inspection
- Leakage prevention and control



Tap Water Recycling/ Rainwater Reuse

- Tiered water reuse
- Rainwater collection and storage
- Wastewater treatment, recycling and reuse
- Water cycle utilization

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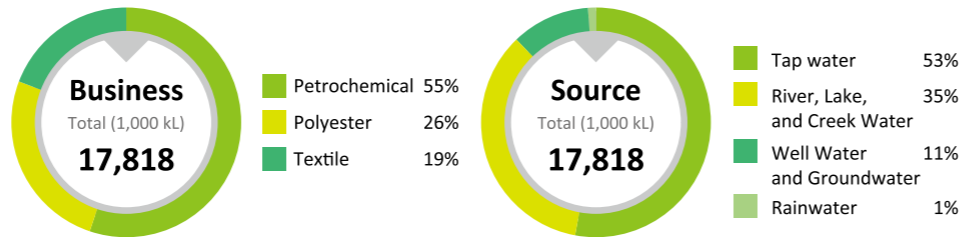
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Goal for Water Withdrawal Reduction per Unit of Production



Note: 2017 is the base year.

Water Withdrawal in 2018



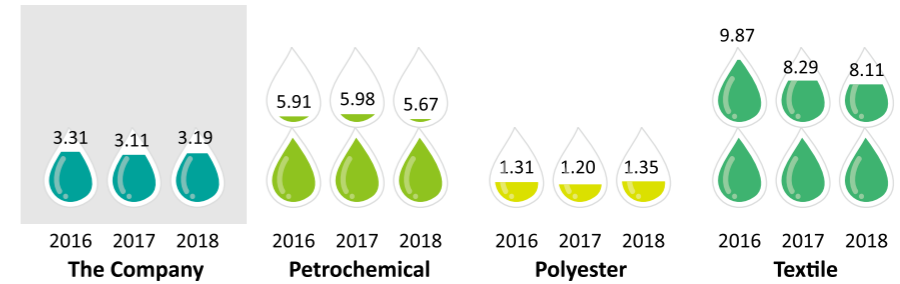
Water Withdrawal

Unit: 1,000 kL

Type	Business Year			Petrochemical			Polyester			Textile			Total		
	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Tap Water	7,483	7,099	6,340	1,853	1,735	1,880	1,462	1,407	1,249	10,799	10,241	9,469			
River, Lake, and Creek Water	1,406	1,316	3,467	840	880	1,027	2,792	2,388	1,802	5,038	4,584	6,295			
Well Water and Groundwater	0	0	15	1,814	1,516	1,682	309	257	201	2,123	1,774	1,898			
Rainwater	0	209	22	0	0	0	64	48	133	64	257	155			
Total	8,889	8,624	9,844	4,507	4,131	4,589	4,627	4,100	3,385	18,023	16,855	17,818			

Water Withdrawal per Unit of Production

Unit: kL / metric ton of product



Note: The Textile Business does not include FEAZ and FEAV.

Water Recycled and Reused

Unit: 1,000 kL

Business Type	Year	Petrochemical			Polyester			Textile			Total		
		2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Circulating Water	Cooling Water	461,657	462,145	568,526	347,304	371,315	396,051	24,847	34,470	35,635	833,808	867,931	1,000,213
	Others	28,270	15,957	12,853	1,403	1,434	1,237	0	0	0	29,673	17,390	14,091
Recycled Water	Recycled Water Excluding Reclaimed Water	342	391	376	709	612	690	3,130	3,169	3,000	4,181	4,171	4,066
	Reclaimed Water	1,322	1,184	1,377	196	268	186	1,313	1,762	1,831	2,832	3,214	3,394
Others		148	162	432	0	13	0	40	35	0	188	211	432
Total		491,738	479,839	583,565	349,612	373,643	398,165	29,330	39,436	40,467	870,681	892,918	1,022,196

Note:

1. Circulating water refers to used water that is not discharged, but applied back to the original circulation and reused.
2. Recycled water refers to used water that is discharged out of the original circulation, but then recovered and reused.
3. Other circulating water includes water from the boiler, manufacturing process, turbine condensate and low pressure condensate. The circulating water at Hsinpu Chemical Fiber Plant and OPTC is from the boiler; circulating water at OPTC and WHFE is recovered from the manufacturing process; turbine condensate and low pressure condensate are sources of circulating water at OPSC.
4. The "Other" category includes produced water which enters the company premise as a result of the manufacturing

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Percentage of Water Recycled and Reused

Business \ Year	2016	2017	2018
Petrochemical	98%	98%	98%
Polyester	99%	99%	99%
Textile	86%	91%	92%
The Company	98%	98%	98%

Note: Percentage of water recycled and reused = total water recycled and reused ÷ (total water withdrawal + total water recycled and reused) × 100%

Percentage of Water Recycled and Reused (Excluding Circulating Water)

Business \ Year	2016	2017	2018
Petrochemical	17%	17%	18%
Polyester	17%	18%	16%
Textile	49%	55%	59%
The Company	29%	31%	31%

Note: Percentage of water recycled and reused (excluding circulating water) = (total water recycled and reused – circulating water) ÷ (total water withdrawal + total water recycled and reused – circulating water) × 100%

Outcome of Water Saving Project in 2018

Business \ Outcome	Investment (NT 1,000)	Water Saved (kL/year)	Percentage to Water Withdrawal
Petrochemical	99,830	843,636	9%
Polyester	3,750	135,660	3%
Textile	247,769	821,292	24%
The Company	378,349	1,800,588	10%

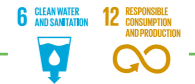
Note: Water saved is calculated by before the project with the same facility and same production procedure

Water withdrawal for Petrochemical Business and Polyester Business increased in 2018 mainly because of increased production capacity at OPTC and Hsinpu Chemical Fiber Plant. An analysis indicates that water withdrawal per unit of production at OPTC decreased due to the water conservation effect of the new production process. Water withdrawal per unit of production for Polyester Business saw an increase, which is mainly because of changes in product mix at Hsinpu Chemical Fiber Plant.

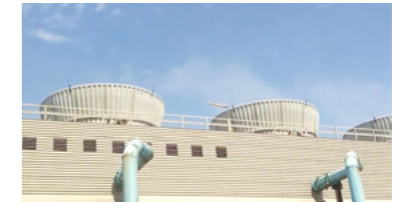
In 2018, the main focus of water conservation for the Textile Business is at FEDZ and Kuanyin Dyeing and Finishing Plant. The conventional dyeing machine were replaced with low liquor ratio dyeing machine in both plants, and Kuanyin Dyeing and Finishing Plant purchased the water free dyeing machine. For the Petrochemical Business, the second plant of OPTC launched the wastewater recycling and reuse campaign.



Installing De-Fogging System on Cooling Tower



The cooling tower at OPTC generates white fog during the cooling process. The fog is especially noticeable when the atmospheric temperature drops. The public often misconstrues the innocuous vapor as pollutants, and therefore views OPTC through a negative lens. Aside from the negative impression, the vapor could have been recycled and reused. Not pursuing such option would result in the waste of water resources.

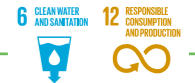


De-fogging System (left) on the cooling tower reduced the white fog.

In light of this, OPTC installed the de-fogging system for the cooling tower to collect and conserve water. By drilling holes on the wall, the system introduces cold air that mixes with hot air to form droplets and reduces the moisture content in the air, thereby preventing fogging. The condenser then collects the droplets to be reused. The system was installed on one cooling tower in 2018, and has collected 42,336 kL of water in one year, which is 8% recycling rate. The system also reduced fogging by 50%. Five additional towers will be equipped with the de-fogging system in 2019.



Replacing Underground Pipes with Exposed Pipes to Minimize Leakage



OTIZ was originally built with underground pipes. Over the years, because of sedimentation and aging infrastructure, the occurrences of leakage are often undetected until damages are done because the pipes are buried underground. In September 2018, OTIZ replaced 2,100 meters of underground pipes with exposed pipes. Once installed, the new pipes saved approximately 24,000 kL / year, which translates to a saving of NT\$690,000 in costs.

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3.3 GHG Management

In response to the trend of global warming caused by GHG that result from human activities, FENC has established GHG management measures. Before the regulatory mandates were in place, FENC took the precautionary measure and launched a GHG emission inventory and audit at all production sites and established a sound foundation for further reduction of GHG emission.

The enactment of "Trial Procedures of Shanghai Municipality on Carbon Emission Administration" in 2013 put a cap on carbon emission for OPSC and FEIS. The two subsidiaries ensure regulatory compliance by formulating various carbon reduction and monitoring measures, and establishes energy conservation and carbon reduction goals at year ends for the coming year. The progress is reviewed monthly during energy conservation meetings, where improvements measures are also proposed with designated lead agency for action. Each day, staff track the fluctuation of carbon pricing and report during the monthly meeting. China launched the national carbon trading market in 2017 and included the power generation industry during the first phase. In addition to compiling reports in accordance with existing regulations in Shanghai, said 2 subsidiaries are also required to compile annual carbon emission report and emission monitoring plan in accordance with the system of national carbon trading market. In addition to effectively manage carbon rights, OPSC and FEIS will continue to reduce GHG emission through improvements on equipment and optimization of production process. In 2018, OPSC conducted 9 energy conservation projects, and reduced GHG emission by approximately 3,595 t-CO₂e per year. FEIS conducted 22 major energy conservation projects with an estimate of 5,020 t-CO₂e in reduction of GHG emission per year. OPSC and FEIS will continue to enhance energy conservation to effectively manage and control GHG emission. (Please refer to "3.2.1 Energy Management" for details on various carbon reduction measures.)

Carbon Quotas and Emissions of OPSC and FEIS Unit: kt-CO₂e

Production Sites and Item	Year	Year		
		2016	2017	2018
OPSC	Quota	265	144	175
	Actual Emissions	167	161	159
FEIS	Quota	375	366	344
	Actual Emissions	319	328	307

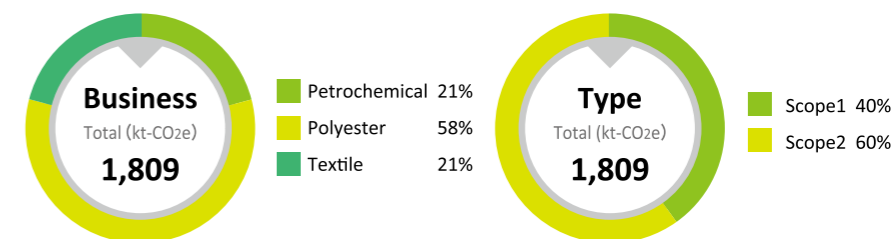
Note: The Quota of OPSC in 2017 was corrected from estimated emissions to government approved quota.

FEIW aims for 1% annual reduction in GHG emission; Hsinpu Chemical Fiber Plant and Kuanyin Chemical Fiber Plant aim for reaching 2% annual decrease; the target for Kuanyin Dyeing and Finishing Plant is 2.5%; WHFE is striving for 3%. FEIS sets 2015 as the base year with a goal of 15% reduction by 2020 and 35% by 2030. Meanwhile, dialogue with the governing authority is ongoing, which is an indication of the significance of this issue to the entire Company.

3.3.1 GHG Inventory

In order to fully control GHG emission, all production sites under FENC conduct an inventory of GHG emissions with calculation in accordance with ISO 14064-1 (greenhouse gas emissions) or local regulatory standards, and must complete third party auditing once every 3 years. Currently, all production sites have completed GHG emission audit by the third party. We believe that by establishing inventory, FENC can prioritize implementation projects to fulfill goals in carbon reduction, and ultimately mitigate the effects of climate change.

GHG Emission in 2018



GHG Emission Unit: kt-CO₂e

Category	Business			Petrochemical			Polyester			Textile			Total			
	Year	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Scope 1		242	250	222	442	433	445	69	70	48	753	753	715			
Scope 2		176	179	152	579	592	605	390	370	337	1,145	1,141	1,094			
Biofuel CO ₂ Emission		20	18	13	0	0	0	0	0	0	20	18	13			
Total Emission		418	429	374	1,021	1,025	1,050	459	440	385	1,898	1,894	1,809			

Note:

- Scope 1: direct emission includes CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ and NF₃; scope 2 indirect emission includes CO₂, CH₄, and N₂O; total emission does not include CO₂ emission from biofuel.
- OPSC and FEIS conform to SH / MRV-004-2012, which only CO₂ emission is calculated.
- Production sites which have completed ISO 14064-1 standards for GHG inventories in 2016 included: OPTC, Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant, OPSC and FEIS.
- Production sites which have completed ISO 14064-1 standards for GHG inventories in 2017 included: OPTC, Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant, Kuanyin Dyeing and Finishing Plant, OPSC and FEIS, FEIW, OTIZ, FEDZ, FEAZ and FEAV.
- Production sites which have completed or were in progress of ISO 14064-1 standards for GHG inventories in 2018 included: OPTC, Hsinpu Chemical Fiber Plant, Kuanyin Chemical Fiber Plant, FEFC, Hukou Mill, OPSC, FEIS and WHFE.
- The total emission in 2018 for FENC's 5 production sites in Taiwan is 775 kt-CO₂e.

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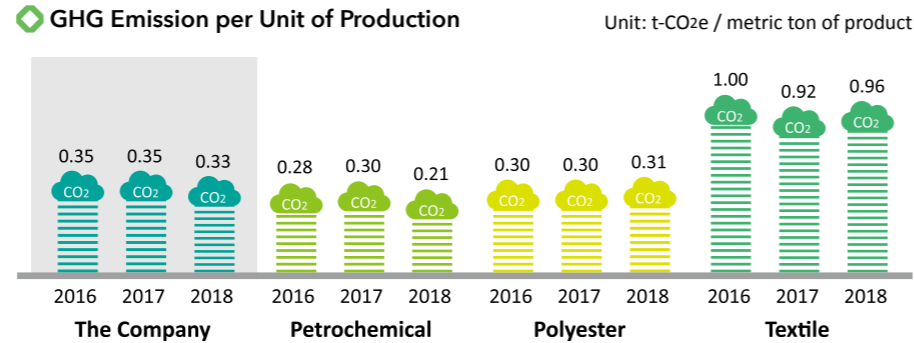
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Note: The textile business does not include FEAZ and FEAV.

In 2018, the total GHG emission decreased. Such phenomenon is mainly attributed to the closing of FEIZ and the new energy saving production process implemented at OPTC. Analysis of the GHG emission per unit of production indicates an increase from the Polyester Business, which is mainly caused by adjustment in product mix at FEIS and Hsinpu Chemical Fiber Plant.

To fully implement GHG management, FENC includes staff business trips and waste treatment into the calculation of carbon inventory. The scope of staff business trip covers the mileage of air travels from and to production sites in Taiwan and China. Calculation of carbon emission between the departure and arrival points is based on the air travel carbon calculator established by International Civil Aviation Organization (ICAO). The 2018 carbon emission produced during staff business trips by air travel is 1,049 tCO₂e.

GHG Inventory Scope 3 - Expanded Scope of Waste Treatment Statistics

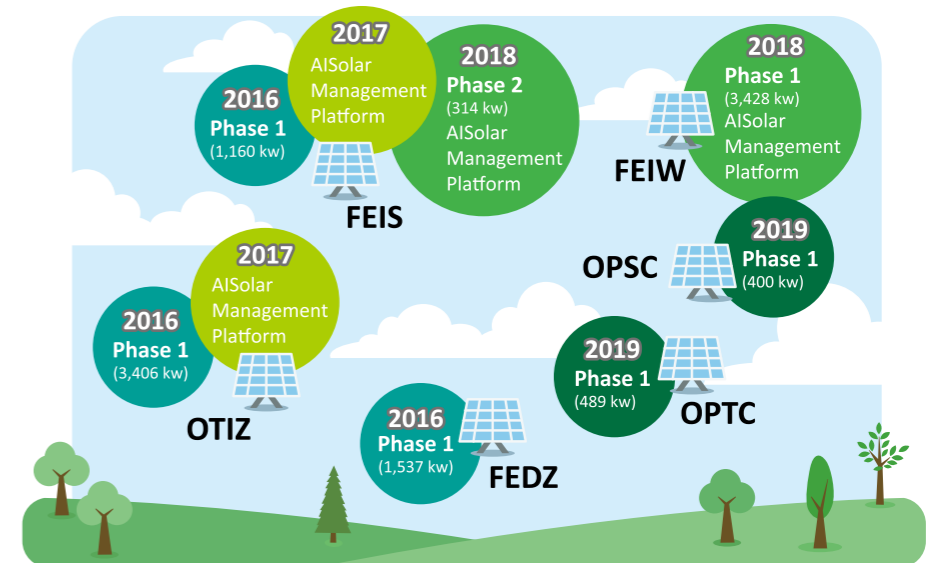
In 2018, FENC expanded the calculation of carbon emission of waste disposal to cover production sites in China and Vietnam in addition to Taiwan, which comes to a total of 16 sites. The calculation of carbon footprint per ton per kilometer for waste disposal at production sites in Taiwan is based on the carbon footprint emission factors released by the Environmental Protection Administration. Calculation for production sites in China and Vietnam is based on the carbon footprint coefficient issued by State Administration for Industry and Commerce's website on carbon trading. In 2018, the annual CO₂ emission for waste disposal is 2,278 tCO₂e. The highest is from the Polyester Business, which is 1,118 tCO₂e. The CO₂ emission for Petrochemical and Textile Businesses are 813 tCO₂e and 347 tCO₂e, respectively.

3.3.2 Incorporate Renewable Energy

FENC supports the use of renewable energy as well as reduction of GHG and impacts of production on the environment with actions. In 2016, phase I of solar power station began operating at OTIZ, FEDZ and FEIS. In 2018, FEIW constructed the solar power station and phase II began operation at FEIS. As of the end of 2018, a total of 18,275,000 kWh of solar had been generated at various production sites. Solar panels are typically installed on rooftops, making inspection a dangerous task. However, data provided by suppliers is unable to provide panel-specific condition. Hence the IT department of FENC developed AISolar, an information management platform which detects malfunctions and conducts real-time analysis to reduce the need for on-site patrol and inspection, which minimizes occupational hazards and enhances performance of the facilities. OPTC and OPSC plan to construct solar power stations in 2019.

In Taiwan, FENC had been voluntarily purchasing green energy from Taipower since 2015. When Taiwan Renewable Energy Certification (T-REC) was initiated in Taiwan, the Company purchased T-REC from the Southern Region Campus of Industrial Technology Research Institute. The total renewable energy purchased has reached 900,000 kWh. In 2019, FENC will continue purchasing green energy certification. OPTC will also apply for the purchase of T-REC once the solar power station is completed in 2019, which is a show of support for the renewable energy policy in Taiwan.

Scheduling and Planning for Construction of Solar Power Station



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3.4 Pollutant Prevention and Waste Management

In line with the guidance of Social Corporate Responsibility policies, FENC adopts pollution prevention and control measures. The Company focuses on waste disposal and prevents the pollution of water, air and soil. During the various production processes, concern for environmental risks takes precedence. We are committed to minimizing pollution during production, truthfully reporting data on waste and pollutants produced and complying with all regulatory mandates.

In recent years, environmental awareness is on the rise and environmental regulations are enacted around the world. Starting in 2018, China transitioned from collecting pollutant discharge fees to environmental protection tax, levying for atmospheric pollutant, water pollutant, solid waste and noise. During the same year, the City of Shanghai mandated corporate monitoring of soil pollution in accordance with Shanghai City Soil Pollution Prevention and Control Action Plan.

To improve the performance on environmental protection and ensure corporate compliance, the Company appropriated a total of NT\$330 million for 2018 and 2019. As of the end of 2018, total expenditure amounted to NT\$32 million. Eighty environmental protection projects are in the pipeline for 2019. They mainly focus on wastewater reduction and air pollution and control, followed by noise reduction.



Soil Pollution Prevention and Control

OPSC and FEIS are both monitored for soil quality by the municipal authority in Shanghai. Regulatory mandates required that they undergo soil pollution investigation in 2018. Starting from 2019, the two corporations conduct self-monitored tests to evaluate the degree of pollution, prevent violations through analyzing historic data and establishing timely prevention and control measures.

The 2 corporations took an active role in monitoring the soil environment in 2018. A comprehensive survey is conducted on the soil conditions in the vicinity of the production site to determine possible source of pollution. Soil monitoring projects are then programmed to assess the degree of pollution to decide whether restoration is necessary. OPSC established 14 soil testing stations and 7 ground water monitoring station with 54 items to be monitored. All testing was completed in 2018. The results show no sign of violation. FEIS plans to set up 9 soil testing points and 6 ground water monitoring point, which will complete the testing in 2019.



3.4.1 Air Pollutant Management

FENC established air pollutant reduction plan in 2018 and devoted ongoing efforts in treating pollutants created during the production process through pollution prevention and control equipment. The Company examines existing facilities and reviews the production process on a regular basis. The boilers and exhaust system also undergo regular inspection to ensure all emissions are within regulatory requirement.

In November 2018, China International Import Expo was held in Shanghai. The event took place during winter, a period when smog reached the peak. Hence, the local government placed stringent control over corporate air pollutants. OPSC and FEIS responded to the government mandate and carried out annual maintenance in November. In the case of severe air pollution, the plant temporarily discontinues operations that are prone to generate dusts, and reduces transport vehicles by half to reduce air pollutant.

In 2018, Taiwan and China amended regulations governing the discharge of NOx. The amended Boiler Air Pollutant Emissions Standards stipulates that the NOx concentration of all existing boilers must be capped under 100ppm prior to July 2020. The amended Shanghai Emission Standard of Air Pollutants for Boilers requires that NOx concentration for boilers must be lower than 50ppm before September 2020. To comply with the regulatory requirements, all production sites modified the production process and added equipment to lower NOx emission. Hsinpu Chemical Fiber Plant and Kuanyin Chemical Fiber Plant invested approximately NT\$120 million to install Selective Catalytic Reduction (SCR) System for denitrification. SCR allows NOx and ammonia to mix through a special catalyst, and converts the mixture into innocuous nitrogen and water. The system is expected to reduce 70% of NOx in the coal water slurry. The 4 sets of equipment were fully installed in 2018 and the 6 sets in Hsinpu Chemical Fiber Plant are expected to be installed by 2020. Hukou Mill plans to replace oil-fired boiler with electric steam humidification system, which will reach zero NOx and SOx emission. Construction is planned to commence in 2019.

Regulations governing production tail gas are increasingly stringent in China. In 2018, OTIZ installed 2 regenerative thermal oxidizers, which decompose volatile organic compounds (VOC) into water vapor and CO2 with approximately 95% removal efficiency. FEDZ is expected to add the 4th smoke purification system for the forming machine to reduce VOC with 90% removal efficiency. Two additional sets will be installed in 2019.



FEDZ installed the smoke purification system

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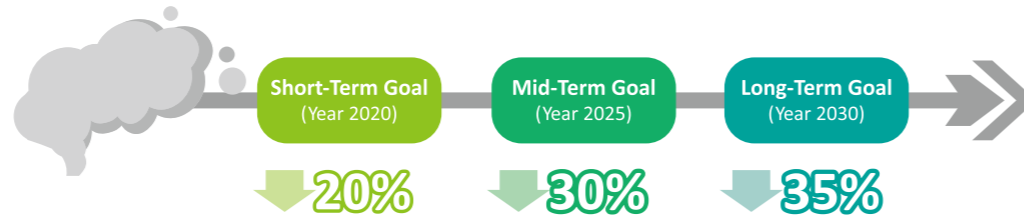
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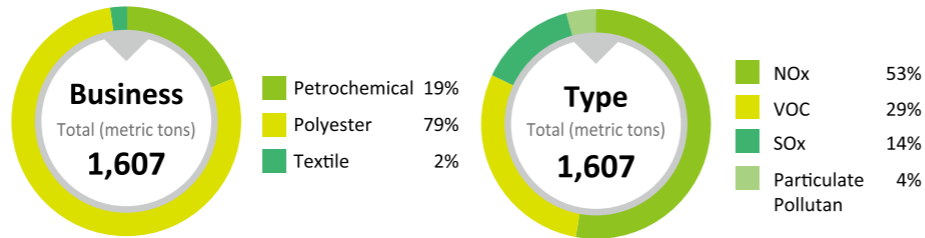
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Goal for Total Air Pollutant Emission Reduction



Note: 2017 is the base year

Air Pollution Emission in 2018



Air Pollution Emission

Unit: metric tons

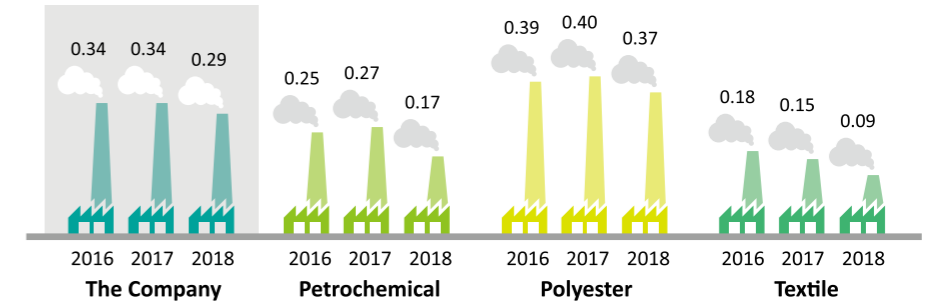
Type \ Business	Petrochemical			Polyester			Textile			Total		
	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
NOx	167	161	131	750	854	713	34	26	10	952	1,041	854
SOx	123	125	56	153	153	162	7	6	1	284	284	219
VOC	87	103	108	339	324	349	16	20	6	443	447	464
Particulate Pollutant	2	2	3	113	38	46	23	21	19	138	61	68
Total	380	391	299	1,356	1,369	1,271	80	73	37	1,816	1,833	1,607

Note:

1. Only gases emitted are listed.
2. Particulate matter pollutants include PM, dust and smog.
3. The data includes four types: actual measured values, annualized sample values, calculate values, and permitted amounts of emissions. Actual measured values come from Hsinpu Chemical Fiber Plant (NOx, SOx, particulate pollutant), Kuanyin Chemical Fiber Plant (NOx, SOx, particulate pollutant), FEFC, the second plant of OPTC (VOC, particulate pollutant), OPSC (NOx, SOx), WHFE, FEIW, FEDZ and FEAZ; annualized sample values are from OPSC (VOC), Kuanyin Dyeing and Finishing Plant, FEIS and FEAV; calculated values are from the first plant of OPTC, the second plant of OPTC (NOx, SOx), Hsinpu Chemical Fiber Plant (VOC), Kuanyin Chemical Fiber Plant (VOC), Hukou Mill, Neili Texturizing Plant and FEIZ; permitted amounts of emissions are from OTIZ.

Air Pollution Emission per Unit of Production

Unit: KG / metric ton of product



Note: The Textile Business does not include FEAZ and FEAV.

In 2018, emission of air pollutants decreased significantly with 12% reduction comparing to the previous year, and 15% decrease per metric ton of air pollutants (equivalent of 0.05 kg/ton). The decrease in emission is universal across all business units, and so is pollutant emission per unit of production. Reduction from the Petrochemical Business is mainly attributed to the second plant of OPTC, which adopted an eco-friendly production process. The move reduced air pollutants significantly. Reduction from the Polyester Business is contributed greatly by Kuanyin Chemical Fiber Plant, which installed denitrification system and reduced NOx as a result. Kuanyin Dyeing and Finishing Plant switched from oil-based ink to water-based ink, which reduced VOC emission and tremendously reduced air pollutants for the Textile Business. The closing of FEIZ also contributed to the decrease in air pollutants.

3.4.2 Wastewater Discharge and Management

FENC has comprehensive guidelines and operational procedure in place for wastewater treatment. Pollutants are treated according to the procedure with regular testing on wastewater quality to endure regulatory compliance on effluent water quality. The Company also obtains industrial wastewater discharge permit in accordance with regulatory procedures prior to discharging treated wastewater into water bodies where discharge is permitted. In addition, we strengthen wastewater recycling to increase the volume recycled and truly fulfill the recycling and reuse of resources. The wastewater from FENC is not utilized by other organizations, and there was no occurrence of leakage in 2018.

In 2018, Hsinpu Chemical Fiber Plant started constructing separated sewage system. Rainwater and wastewater are collected through separate pipes, which reduce wastewater discharge. The project is expected to be completed in 2019, reducing wastewater discharge by 109,500kL/year. FEIS installed oil water separator, which divides the mixture of oil and water into separate compounds. The pure water separated from the oil may be recycled and reused with condensed water, which also reduces wastewater discharge. The system began operating in 2017. In 2018, wastewater discharge reduced by approximately 29,700kL. Kuanyin Dyeing and Finishing Plant asked the suppliers to provide toxin-free solvent in 2018, making it easier to treat wastewater and increase the volume of recycled water that can be reused.

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Wastewater Sites and Volume

Unit: 1,000 kL

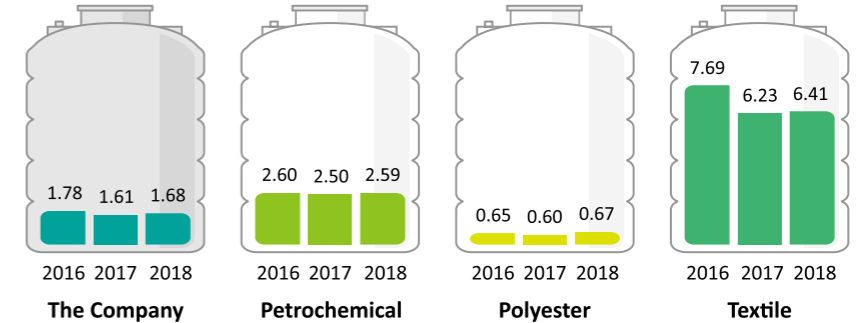
Business	Production Site	Wastewater Volume			Wastewater Treatment Method and Discharge Location
		2016	2017	2018	
Petrochemical	OPTC	2,571	2,179	3,023	Wastewater goes through biotreatment (deep shaft aeration and anaerobic treatment) within the plant. Once the water quality meets the effluent standards, it is discharged into Shulin River and Dajiyue River.
	OPSC	1,347	1,423	1,463	Wastewater is treated within the plant until meeting the required standards, and then discharged through the municipal pipelines to Fengxian District East Wastewater Treatment Plant. Once fully treated, the wastewater is discharged into the Hangzhou Bay.
Polyester	Hsinpu Chemical Fiber Plant	1,025	907	1,082	Wastewater goes through biotreatment within the plant. Once meeting effluent standards, it is discharged into Fengshan River.
	Kuanyin Chemical Fiber Plant	439	394	430	Wastewater goes through biotreatment within the plant. Once meeting effluent standards, it is discharged into Shulin River.
	FEFC	99	98	97	Industrial and domestic wastewater goes through biotreatment (contact oxidation) and sedimentation within the plant. Once the water meets the effluent standards, it is discharged into Shulin River.
	FEIS	651	669	650	Wastewater is treated within the plant until meeting the required standards, and then discharged through the municipal pipelines to Fengxian District East Wastewater Treatment Plant. Once fully treated, the wastewater is discharged into the Hangzhou Bay.
	WHFE	12	13	13	Treated in the wastewater treatment facility within the plant first, the wastewater then goes through the municipal wastewater treatment facility. Once fully treated, the wastewater is discharged into the Yangtze River.
Textile	Kuanyin Dyeing and Finishing Plant	545	497	485	Wastewater is treated in house, discharged to the wastewater treatment plant in the industrial park for further treatment, and then discharged into Shulin River.
	Neili Texturizing Plant	110	63	45	The plant obtains the permission to discharge wastewater directly into the drainage ditch within the plant, which connects to Taoyuan Canal.
	Hukou Mill	74	72	62	Wastewater goes through biotreatment (oxidation and aeration) within the plant and then discharged into Desheng River.
	OTIZ	138	239	368	Wastewater is treated within the plant until meeting the required standards, and then discharged through municipal pipelines to Hedong Wastewater Treatment Plant. Once fully treated, the water is discharged to the Jing-Hang Grand Canal.
	FEIZ	11	25	-	FEIZ has closed down in 2018.
	FEIW	73	70	63	The wastewater goes through Wuxi municipal sewage pipelines to the wastewater treatment facility. Once treated, the water is discharged into the Jing-Hang Grand Canal.
	FEDZ	2,474	1,965	1,498	Wastewater is treated within the plant until meeting the required standards, and then discharged through municipal pipelines to Hedong Wastewater Treatment Plant. Once fully treated, the water is discharged to the Jing-Hang Grand Canal.
	FEAZ	93	88	85	Wastewater is treated within the plant until meeting the required standards, and then discharged through municipal pipelines to Chengnan Wastewater Treatment Plant. Once fully treated, the water is discharged to the Jing-Hang Grand Canal.
FEAV	76	71	74	The wastewater is treated at the treatment center within the industrial park and then discharged to Saigon River.	
Total		9,739	8,773	9,438	

Note:

- The difference between wastewater discharge and withdrawal are mainly attributed to evaporation at the cooling tower. There is also loss of water during the production process.
- There is no significant impact from wastewater discharge on the water bodies and related habitat.
- Wastewater at OPSC includes wastewater from the manufacturing process, domestic wastewater, lab wastewater and wastewater from the cooling tower; wastewater at Hsinpu Chemical Fiber Plant, FEFC and FEIS is from the manufacturing process, cooling tower, domestic wastewater and cleaning water; wastewater at WHFE and FEDZ is from the manufacturing process, domestic wastewater and lab wastewater; wastewater at Kuanyin Dyeing and Finishing Plant, OTIZ and FEIZ is from the manufacturing process and domestic wastewater; wastewater at OPTC and Kuanyin Chemical Fiber Plant is from the manufacturing process and the cooling tower; wastewater at Neili Texturizing Plant, Hukou Mill, FEIW, FEAZ and FEAV is from domestic wastewater.
- Calculation of wastewater at Hukou Mill also includes the Biomedical Business Unit of Oriental Resources Development Limited.

Wastewater Volume per Unit of Production

Unit: kL / metric ton of product



Note: The Textile Business does not include FEAZ and FEAV.

Wastewater Management



Wastewater Monitor and Control

- Establishing applicable management guidelines
- Onsite monitor and control
- Wastewater plant management
- Water quality testing by external agency and reporting to governing authority
- Compilation and reporting of operational status



Staff Training and Equipment Maintenance

- Promotion on water pollution prevention and control
- Regular equipment care and maintenance
- Regular training for management personnel, and obtaining appropriate license

The 2018 discharge is higher than the previous year mainly due to increase in production capacity at OPTC and higher production at OTIZ. Increased water consumption during the production process led to increase in wastewater. An analysis of the increase in wastewater per unit of production in Taiwan indicates that the main contributing factor is product restructuring at Hsinpu Chemical Fiber Plant and OPTC.

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3.4.3 Waste Management

FENC established waste reduction goals in 2018 and reinforced waste management. We continue to introduce new production process and equipment to reduce waste from the very beginning. Meanwhile, the Company strives for raising the percentage of reused recycled waste in the manufacturing process. All waste treatments meet regulatory requirements, including the permit application, quantity reported, the hiring of qualified professional waste management companies for waste disposal. The guiding principle for waste management is "classification for reduction; converting waste into earnings; transforming earnings into valuables". Production units strictly enforce waste classification. Procurement Department sells waste with monetary value to external organizations, which will then recycle or reuse the waste. Those without monetary value will be handled by waste management companies with proper qualifications. We scrutinize these companies with stringent standards, inspecting the waste disposal randomly with GPS tracking. However, rising waste treatment costs and lower return have made recycling disincentivizing for these companies. Hence, FENC tackles waste reduction from the source and fully implement waste classification to reduce waste. The Company works with R&D to develop alternatives for waste materials that cannot be reintroduced into production cycle. All hazardous waste is stored in designated sites and then processed by qualified companies. FENC also conducts random checks by following the waste collecting trucks to ensure compliance.

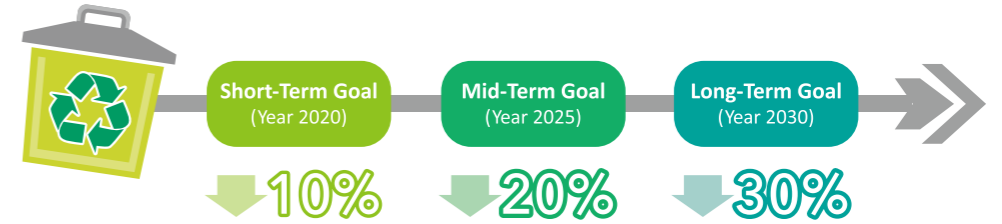
In recent years, an emphasis on wastewater treatment led to increase in sludge. Hence, the Company initiated a series of sludge reduction projects. In 2015, Hsinpu Chemical Fiber Plant led the way by introducing the sludge drying system. Sludge drying system reduces the moisture content in sludge. Seeing remarkable results, OTIZ and Kuanyin Chemical Fiber Plant also installed the system in 2016 and 2017, respectively. The newly installed system, once in operation, reduces the moisture content in sludge down to 25-40%, which would reduce waste treatment costs by NT\$12.24 million per year. In 2018, FEDZ installed 2 sludge dryers with plate and frame filter press, which may reduce the moisture content in sludge down to 70-75% through high-pressure dewatering, and lower sludge discharge by 45%. Kuanyin Chemical Fiber Plant installed upflow anaerobic sludge bed in 2018, which reduces sludge in wastewater through organic redox reaction with microorganisms.

All production sites continue to optimize waste management and actively promote waste classification and recycling. Hsinpu Chemical Fiber Plant has designated Wednesdays as the recycling day to help employees develop the habit of waste classification. FEIW focused on kitchen waste in 2018 and commissioned professional waste management companies with qualifying credentials to handle kitchen waste, and ensure that the entire process is harmless to the environment. FEAV introduced the waste management system, which aims to classify waste for data management, analysis and query. The system is set to begin in 2019.



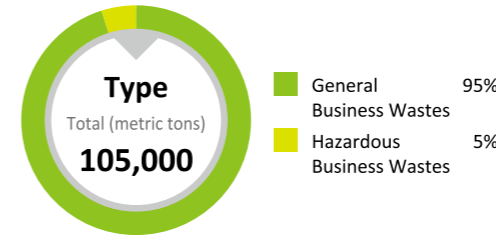
Installation of 2 sludge dryers with plate and frame filter press at FEDZ

Goal for Total Waste Reduction

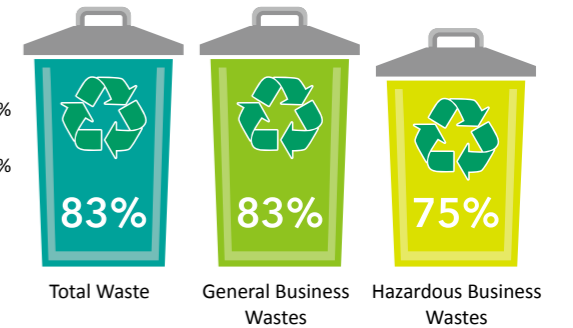


Note: 2017 is the base year.

Type of Waste in 2018

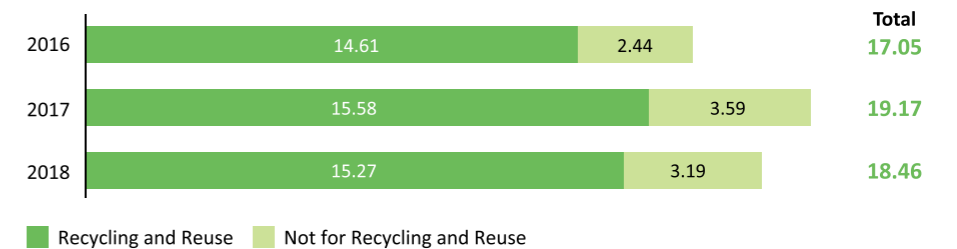


Percentage of Recycling and Reuse in 2018



Waste Volume per Unit of Production

Unit: KG / metric ton of product



Note: The Textile Business does not include FEAZ and FEAV.

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FAR EASTERN NEW CENTURY CORPORATION
2018 CSR Report

Navigating a Green Future

Data of Waste

Unit: metric tons

Type and Treatment Method		Year	2016	2017	2018
General Business Wastes	Manufacturing Process Wastes	Recycling and Reuse	75,263	79,131	80,194
		Energy Uses	207	8,334	5,939
		Incineration	8,854	5,700	6,046
		Landfilling	339	475	1,089
		Other Treatment Methods	871	1,151	1,581
	Subtotal	85,534	94,791	94,849	
	Domestic Wastes	Recycling and Reuse	2,417	2,397	3,055
		Energy Uses	340	340	368
		Incineration	1,102	1,369	1,374
		Landfilling	365	351	333
Other Treatment Methods		110	110	110	
Subtotal	4,334	4,567	5,240		
Total General Business Wastes			89,868	99,358	100,089
Hazardous Business Wastes	Recycling and Reuse	2,538	3,860	3,702	
	Energy Uses	0	0	413	
	Incineration	872	1,267	774	
	Landfilling	0	0	0	
	Other Treatment Methods	66	109	22	
Total Hazardous Business Wastes		3,476	5,236	4,911	
Total			93,344	104,594	105,000

Note: Recycling and reuse includes recycling and reuse by the plants, selling of waste materials, and recycling by commissioned contractors.

The volume of waste generated in 2018 is close to the previous year. Waste generated per unit of production decreased by 3% (the equivalent of 0.7kg / ton) comparing to 2017. The percentage of recycled and reused waste out of total waste increased by 1% in 2018.



Collaboration with Supply Chain, Turning Recycled PET Shrink Film into Imitation Wood Products



FENC produces PET shrink film, which is then further processed by the downstream printing houses. Typically, the scraps from the printing houses are incinerated. In order to create new values for customers and help them reduce waste, Hsinpu Chemical Fiber plant provided an alternative for the manufacturer of imitation wood products by using recycled PET shrink film. The Company also provided technological support on recycling.

This project started in 2016. With multiple testing on the product, the efforts finally came to fruition when the Company successfully developed imitation wood made with recycled PET shrink film. The hardness of this product is superior to that of other plastic materials. In 2018, the Company successfully produced imitation wood flooring that is used in the vicinity of Zaociao Railway Station in Miaoli County using. The project required 15 metric tons of recycled PET shrink film. It is estimated that demand for recycled PET shrink film in 2019 will reach 300 metric tons.

The recycle and reuse technology, which is a core to FENC, is applied in this project. In addition to solving waste treatment issues for customers, this technology brought new business opportunities for the manufacturers of imitation wood. This project is the quintessential exemplification of circular economy, creating win-win for FENC and its partners.



Optimization of Waste Recycling System



At Kuanyin Chemical Fiber Plant, scraps and PET chips that do not meet quality standards are treated and remanufactured. In 2018, Kuanyin Chemical Fiber Plant replaced the single screw extruder with twin-screw and added the vacuum system. This adjustment increased processing capacity by more than 3 times, which increased production efficiency. The adjustment also increased the recycled waste by 5,100 metric tons per year, reduced energy consumption by 563,000 kWh per year, and decreased GHG emission by 312t-CO₂e per year.

Note: The emission factor for the calculation of GHG emission of electricity is 0.554 t-CO₂e / 1,000 kWh.

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Installing Modified Upflow Anaerobic Sludge Bed



In 2018, Kuanyin Chemical Fiber Plant installed modified upflow anaerobic sludge bed (UASB) to treat wastewater. The anaerobic organism turns the organic materials in the wastewater into methane and CO₂, which reduces the total organic compounds. Different from the activated sludge process, which utilizes aerobic organism, the anaerobic organism does not require aeration. The process requires less energy and generates less sludge. Methane produced during the process can also be captured and reused. During the year 2018, one UASB was added to Kuanyin Chemical Fiber Plant, and the system treated 98,600 kL of wastewater per year, reducing approximately 120 metric tons of sludge per year.

3.5 Green Production

FENC is dedicated to environmental sustainability, and passionate about reducing energy consumption during the production process. The Company has set zero waste production as the long-term goal, and responds to SDG12 – responsible consumption and production set forth by the UN. With steady strides, the Company will continue to march toward the green industry.

The third production line at OPTC, which is newly added and equipped with the latest PTA manufacturing process, has begun production. Comparing to other production lines, the new production line emits less GHG and air pollutants, and increases the percentage of recycled and reused wastewater. All of which minimize impact on the environment. Adjustments are ongoing even after production began. The current unit GHG emission is approximately 0.27 t-CO₂e per metric ton of PTA, which is 44% lower than conventional production; the unit NO_x discharge is 0.030 kg per metric ton of PTA, which is 93% less than convention production; percentage of wastewater recycled has increased to 60%. Furthermore, the new production line incorporates AI and constructs models using algorithm, giving it the ability to predict abnormality in production quality and energy consumption. Managing staff will be notified immediately, which prevents waste of resources and fulfills the goal of sustainable production.



Modification of Oxidation Reactor



OPTC had been actively introducing new technology and optimizing the production process while continuing improving the production line. The goal is to reduce energy and resource consumption and increase recycling in order to coexist with the environment sustainably.

“Oxidation reactor” is the core of production at OPTC. Its long-running operation results in slags accumulating on the interior walls, which hinders its efficiency and drives up consumption of raw material. To address this issue, OPTC collaborates with a renowned German stirrer supplier. For the first time, the German supplier incorporated its state of the art stirrer into PTA production, which improved the efficiency of the reactor. Many simulations were conducted during a 2-year period to overcome the limitations posed by original equipment, and thereby minimized risks during the modification process. The modification, which was accomplished during the 12-day Chinese New Year period, was an ultimate success. The result also reduces the consumption of catalyst and electricity, which amounts to approximately NT\$35.5 million per year. In addition, the production volume, quality and stability are also greatly improved while reducing waste as a result.



Installation of PTA Mother Liquid Solid Recovery Unit



OPTC installed the PTA Mother Liquid Solid Recovery Unit, which reduces the temperature of mother liquid separated from the liquid-solid separator during purification. Organic crystalline then precipitated from the mother liquid. After filtering, the organic solid acid is separated and recycled. It is then forwarded to the oxidation reactor system to produce PTA. In 2018, OPTC produced 3,576 metric tons of PTA from recycled mother liquid. This technology recycles and reuses resources with higher efficiency, and greatly lessens the burden on wastewater treatment.

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Investment in the Second Water Free Dyeing Machine

To reduce resource consumption during the dyeing process, Kuanyin Dyeing and Finishing Plant invested in the second water free dyeing machine in 2018. This technique uses the recyclable "CO₂" in place of "water" as the medium. The entire process does not involve the use of water at all, which reduces energy consumption required for heating water and the use of dyeing and finishing agent. Water free dyeing also produces zero wastewater. In 2018, the second set of equipment was installed. The two water free dyeing machines generate 80 metric tons/month in production capacity, conserving 8,000 metric tons of water per month, and reducing the consumption of dyeing and finishing agent by 16 metric tons per month.



The Switch to Steam Hydrolysis Regeneration System

FEIS used to clean the filter rod with EG under high-temperature boiling. When the process concludes, EG is discharged in the form of high-temperature gas. Such process not only demands more EG, but also creates environmental pollution and causes occupational hazards. Hence, FEIS switched to a boiler system that utilizes hydrolysis on all production lines, which cleans thoroughly without causing occupational hazards. This alternative reduces EG consumption, processing costs, as well as loss associated with downtime. All of which amount to NT\$9.35 million in saving per year.



3.6 Community Dialogue and Response

Most of FENC's production sites are located in industrial parks. Only a minor portion is located in residential areas, such as Hsinpu Chemical Fiber Plant and Hukou Mill. We actively engage in dialogue with the neighboring residents, listen to their concerns, and then formulate and implement alternatives for improvements. We believe that there is a close connection among the employees, the physical environment of the plant and the surrounding neighborhood. Physical improvements at the plant will help maintain rapport with neighboring communities, increase employee performance and more efficient production.

To increase trust and understanding between all production sites and their neighboring residents, we take active approach in the engagement of programs that encourage dialogue. In 2018, Hsinpu Chemical Fiber Plant held a town hall meeting on co-generation to discuss the construction project with representatives of neighborhood associations and local residents. OPTC voluntarily invited the residents to tour the plant so that they could see firsthand that the environmental standards against which these plants are measured against are even higher than the government mandates.

To minimize disturbance to neighboring residents as a result of night time noise, OPSC and FEIS examined the sources of noise in 2018. The two plants installed acoustical barrier to buffer equipment that generates loud noises, and added acoustical barrier for high-pressure conduits. The improvements reduced the noises level by 10-15 decibels, capping the night time noise under 55 decibels, which is in accordance with the regulatory requirement. In addition, OPSC and FEIS enclosed the wastewater discharge line, improve the pumps, and cover the ditches within production area to minimize any nuisance caused by odor.



FEIS installed acoustical barrier around equipment.



OPSC installed acoustical barrier around equipment.

In addition, all production sites have emergency response procedure in place and conduct drills regularly to minimize the impact of accidents on neighboring communities. These communities may also file grievances through multiple channels. Please refer to "1.4.4 Grievance Procedure" for the available channels and means of communication between production sites and neighboring residents.

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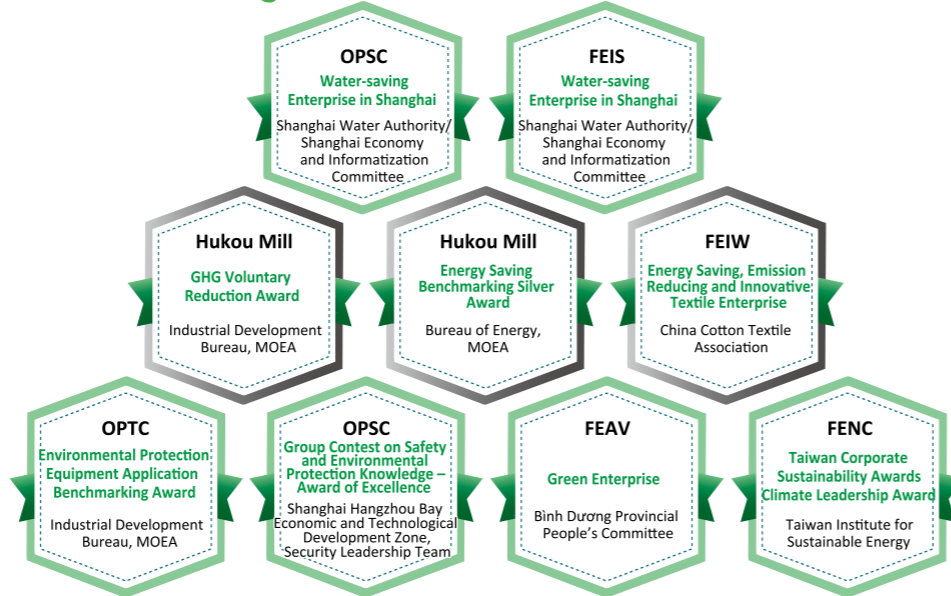
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3.7 Outstanding Achievement



2018 Taiwan Corporate Sustainability Awards - Climate Leadership Award

FENC established the "Energy Task Force" to manage sustainability issues, including energy, water resources and waste management. The approaches that the Company adopts include establishing energy conservation and carbon reduction goals, appropriate special budget, promote energy / water conservation and waste reduction campaigns, and regularly review progress. Additionally, the Energy Task Force held the Cross-Strait Energy Conservation Technical Conference and established an expert advisory group. They provide opportunities for sharing success stories and recommendations for improvements among production sites. FENC was awarded the Climate Leadership Awards of the 2018 Taiwan Corporate Sustainability Awards. This particular award aims to encourage corporations to monitor, manage, disclose and reduce GHG emission.

Hukou Mill Received Energy Saving Benchmarking Silver Award, and the Title, GHG Voluntary Reduction Award for the Third Consecutive Year

Hukou Mill had been promoting energy conservation and GHG reduction campaigns for a long time and has won multiple recognitions. In 2018, the plant was awarded the Energy Saving Benchmarking Silver Award for the first time. In addition, the plant won the third consecutive "GHG Voluntary Reduction Award". Hukou Mill is the only textile company winning both awards.

Energy Saving Benchmarking Award evaluates contenders based on the establishment of energy management system, performance on energy conservation and carbon reduction, and summer energy saving measures. Criteria for GHG Voluntary Reduction Award include the establishment of GHG management system, GHG emission reduction performance and the innovativeness of emission reduction measures. The main source of GHG emission and energy consumption at Hukou Mill is electricity. Therefore, the plant features the slogan, "excess reduction, high efficiency, consolidation and integration, variable volume", to promote energy conservation measures while achieving GHG reduction. For instance, Hukou Mill focused on "excess reduction" and "variable volume" when implementing the energy conservation project for the dedusting system. The plant installed automatic shut-off valve to shut off excess energy for the negative pressure exhaust and change the control of the exhaust into variable frequency. The smart air conditioning project incorporates the "variable volume" concept by changing the fan coil unit / return air fan into variable frequency control, which makes adjustments according to the negative pressure on site and exterior air. The system conserves 26% energy. Hukou Mill saved 4.5 million kWh of electricity in 2017, and 3.5 million kWh in 2018, which is the equivalent of reducing 4,400 t-CO₂e in GHG emission in two years.

Note: The emission factor for the calculation of GHG emission of electricity is 0.554 t-CO₂e / 1,000 kWh.



Video: Hukou Mill receiving the Energy Saving Benchmarking Award. (Chinese)



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OPTC and FEIS Were Designated as Water-Saving Enterprise in Shanghai

OPTC and FEIS answered the call for water conservation set forth in "Regulations of the Shanghai Municipality on Water Saving" with avid engagement in promoting water conservation campaigns to reduce resource consumption. In 2018, FEIS and OPSC were chosen as Water-saving Enterprise in Shanghai, which is recognition toward their exceptional performance in water conservation. Criteria for water-saving enterprise include quantitative and determinative indices as well as the promotion of wastewater reuse. Scoring over 90 out of the total score of 110 qualifies a corporation as water-saving enterprise. FEIS and OPSC scored phenomenally between 104 and 105, including perfect scores for many indices. Aside from a sound water conservation system, FEIS and OPSC installed rainwater and reclaimed water treatment facilities, replacing tap water with recycled water. In 2018, the two corporations recycled 1.15 million kl of water per year.



Certificate of Water-saving Enterprise in Shanghai for FEIS



Certificate of Water-saving Enterprise in Shanghai for OPSC



FEAV Was Awarded the Highest Honor of Green Enterprise

To encourage corporations to focus on environmental protection, Binh Dương Department of Natural Resources and Environment, Vietnam rates "Green Enterprise" twice a year to reward corporate efforts that have excelled in environmental protection. In 2018, FEAV was awarded the hard-earned title, Green Enterprise, which is the highest honor. Award criteria are compliance with environmental protection regulations and performance in energy and resource conservation. In addition to being law-abiding, FEAV is also reaping the rewards from various conservation measures, including replacing factory-wide lighting from fluorescent light to LED, recycling and reusing excess boiler heat, and setting automatic timer to switch the air compressor on and off. The total electricity conserved for the year amounted to 900,000 kWh, which reduced annual GHG emission by 513t-CO₂e / year, thus winning top recognition.

Note: The emission factor for the calculation of GHG emission of electricity is 0.570 t-CO₂e / 1,000 kWh.




Award ceremony for Green Enterprise FEAV's award trophy for Green Enterprise

