5 Green Solutions, Circular Economy

Climate Change
Environment Management System
Water Resources Management
Waste Management
Chemicals Management

Key stakeholders：

Employees
Clients
Shareholders/investors
NGOs

Management Guidelines for Material Topics

Climate Change Responses, Energy and Greenhouse Gas Management, Water Resource Management, Waste Management

Meaning to the Group

- Following the UN's adoption of the Paris Agreement, climate change has become an issue of focus for all governments and enterprises. As a world-class company, the Group has a duty to lead the industry towards a low-carbon economy and society.

Policies and Commitments

- The Group proposed the 1.5°C carbon reduction initiative, put forward three climate targets, and continues to advance energy and carbon reduction measures and other environmental impacts to mitigate the impacts of climate change, thereby achieving our responsibilities of protecting the environment and caring for the planet as we exert our influence on global industrial chains.

Specific Actions

- The Group's energy-saving target for 2022 was 4.2%. The actual energy-saving rate was 5.74%, successfully achieving our annual energy-saving goal.
- Invested 2.37 billion NTD in 1,877 energy-saving projects encompassing transformation of energy-saving production processes, improvement of air-conditioning systems/air compressors/lighting equipment, and other improvements. Total carbon reductions were 306,204 tCO_2e.
- In 2022, Group's total installed capacity reached 260.55MW, and the usage of renewable energies reached 816.13 million kWh and renewable energy usage ratios were 8.28%.
- Optimized production processes to reduce water consumption at the source and also actively implemented wastewater recycling procedures.
- Nanning Campus obtained UL2799 Zero Waste to Landfill Operations Platinum-Level Certification and Shenzhen Longhua Campus obtained UL2799 Zero Waste to Landfill Operations Gold-Level Certification and Longhua Campus is making strides toward a zero-waste campus.

Evaluation Mechanisms

- Our environmental protection division conducted quarterly and annual energy reduction evaluations to achieve our energy and carbon reduction goals.
- We conducted external audits for management systems such as ISO 14001, ISO 50001, and ISO 14064-1.
- We held management review meetings each year to discuss and track our environmental protection targets, and communicate with internal stakeholders such as business groups and employees to understand actual situations and facilitate continued improvements.

The UN climate change report for 2021 stated that the climate actions adopted by various countries are insufficient for curbing global warming. Secretary-General Guterres urged all countries to adopt more aggressive measures to achieve the 1.5°C carbon reduction target proposed by the Paris Agreement. For this reason, the UNFCCC COP26 will be focused on the 1.5°C target.

As a global leader in the electronics technology industry, the Group supports the goal of limiting temperature increases to less than 1.5°C as proposed by the Paris Agreement. In November 2020, the Group was the first Taiwanese enterprise to propose the goal of a net zero emissions supply chain by 2050. In January 2021, we submitted our statement of carbon reduction commitment for achievement of the 1.5°C target to the Science Based Targets initiative (SBTi). In June 2021, we joined the Taiwan Alliance for Net Zero Emission, which was composed of industry leaders in Taiwan, thereby exerting our industrial influence and leading global industries in achieving the 1.5°C target of the Paris Agreement as we work towards a zero carbon and sustainable society.

The Group's three climate targets

1. • Comply with NDCs or carbon emission policies of local governments where Group campuses are located.

2. • Align GHG emissions of our value chain with the Paris Agreement and realize our goal of zero GHG emissions by 2050.

3. • Respond to and act upon the three targets proposed by the Climate Action 100+ steering committee：
   (1) Strengthen climate change governance;
   (2) Implement actions relating to GHG emissions within the Group's value chain;
   (3) Provide disclosures in accordance with the Task Force on Climate-Related Financial Disclosures (TCFD).

Climate Change

The Group emphasizes the urgency of climate risk management to ensure sustainability. We have implemented Task Force on Climate-Related Financial Disclosures (TCFD) using the four main frameworks of governance, strategy, risk management, and metrics and targets for transparent disclosures of key climate risks, opportunities, and current management. During the first phase, we released our first Net Zero Vision Report in 2023 to detail our climate governance, strategies, risk management, and targets and metrics. During the second phase, we aim to conduct analyses and discussions of climate scenarios, as well as quantitative financial impacts. The third phase will integrate results from the first and second phases to generate standardized forms and processes that extend the scope of climate-related financial assessments to the whole world. We also plan to release a Net Zero Strategy Report.

Category	Item	Implementations
Governance	1. Describe board and management oversight and governance of climate-related risks and opportunities.	The Board is responsible for supervising management of climate change issues and the ESG team established under the Sustainability Committee is responsible for planning and implementation of said issues.
Strategy	2. The short-term, mid-term, and long-term impacts of climate-related risks and opportunities on the organization's businesses, strategies, and financial planning.	We segregate various risk management organizations according to the duties of each functional unit, which are responsible for relevant risk identification and assessment, and for subsequent formulation of corresponding management plans according to the levels and priorities of identified risks and opportunities.For more information on the material short-term, mid-term, and long-term impacts of climate risks and opportunities on the Group's businesses, strategies, and financial planning, please refer to our 2020 Net Zero Vision Report.
Strategy	3. Financial impacts from extreme weather events and transformation actions.	The main financial impacts from extreme climate events and transformation actions are mainly increases in operational costs. Please refer to our 2020 Net Zero Vision Report for additional information.
Risk Management	4. Processes for identifying, assessing, and managing climate-related risks, and how they are integrated into overall risk management.	The Group has established a hierarchical risk management process based on risk levels and unit functions. We have built complete climate risk management processes at the Group, business/entity, and factory level according to different management levels and impacts from risk issues.
Strategy	5. Use scenario analyses to assess the resilience of climate change risks, and disclose relevant scenarios, parameters, assumptions, analysis factors, and main financial impacts.	Our first phase was to incorporate the TCFD framework in 2022; for the second phase, we plan to analyze and discuss climate scenarios, as well as quantify the financial impacts of climate-related risks.
Strategy	6. Transformation plans to manage climate-related risks, including the content of said plan, as well as metrics and targets used to identify and manage physical risks and transition risks.	The Group has established the two core concepts of "clean production" and "resource management" aligned with three major climate goals, formulating corresponding net zero and carbon reduction management and monitoring mechanisms for our value chain. The Group is taking gradual steps to achieve net zero through actions mitigating climate change, value chain management, promotion of smart and green transformations, creation of emerging industries, enhancing operational resilience, and other core concepts.
Metrics and Targets	7. If internal carbon pricing is used as a planning tool, the basis for pricing mechanisms should be disclosed.	The Group has not introduced internal carbon pricing.
Metrics and Targets	8. If climate-related targets have been established, included activities, scope of greenhouse gas emissions, scheduled progress, and annual achievements should be disclosed. If carbon offsets or renewable energy certificates (RECs) are used to achieve targets, the source and quantity of carbon offset credits or quantity of RECs should be disclosed.	The Group aims to achieve net zero greenhouse gas emissions by 2050 using 2020 as the base year, reducing emissions by 21% before 2025; by 42% before 2030; and by 63% before 2035.
Metrics and Targets	9. Greenhouse gas inventories and verifications	Please refer to "Scope 1 and Scope 2 GHG Emissions in 2022"

Our verified scope 1 and 2 greenhouse gas emissions in 2022 were 5,757,620 tCO_2e, an increase of 5.13% compared with base year 2020 (5,476,802 tCO_2e), mainly due to revenue growth and economic expansion, which raised electricity usage and carbon emissions. However, the Group continued to be active in implementing carbon reductions and utilizing renewable energies. We will continue to work toward net zero GHG emissions in our value chain by 2050.

Scope 1 and Scope 2 GHG Emissions in 2022

Unit：tCO_2e

	China	Taiwan	Vietnam	India	North America	South America	Europe	Total
Market-Based								
Scope 1	208,377	1,032	975	565	7,975	1,975	1,397	222,295
Scope 2	4,909,236	196,881	236,913	71,729	99,058	2,032	19,476	5,535,324
Total	5,117,613	197,913	237,888	72,294	107,033	4,007	20,873	5,757,620

Note：Scope 2 emissions are market based.

Due to the widespread operational scope of the Group, we are still compiling data on Scope 3 GHG emissions for 2022, and aim to disclose this information at the end of 2023. The Group has completed inventory of Scope 3 GHG emissions for 2021, which amounted to 28,742,200.63 tCO_2e.

Scope 1	Total Emissions (tCO_2e)	Intensity (tCO_2e/ thousand NTD)	Verification Institute	Verifications
Parent Company	9.90	2.60E-09	-	-
Subsidiary	222,285.10	7.87E-05	-	-
Total	222,295	3.35E-05	-	-

Scope 2	Total Emissions (tCO_2e)	Intensity (tCO_2e/ thousand NTD)	Verification Institute	Verifications
Parent Company	11,217.00	2.95E-06	-	-
Subsidiary	5,524,107	1.96E-03	-	-
Total	5,535,324	8.35E-04	-	-

Note：Intensities were calculated using revenues for the year and the unit used was NTD.

Energy Management

We systematically manage our energy use through implementation of the ISO 50001 Energy Management System and third-party verifications to identify risks and opportunities for reducing energy use and enhancing energy efficiencies. Additionally, the Group has formulated the "Audit Procedures for Energy-Saving Projects" and "Audit Procedures for Energy-Saving Management" for continued implementation and transformation of energy-saving technologies. We are also actively developing new energy and carbon reduction technologies, products, and business models; exploring our energy-saving potential; and promoting transformation and upgrades to increase benefits. Furthermore, in line with goals relating to global energy transformation and low-carbon economic development, we continue to increase installation capacity by installing and purchasing rooftop and ground-mounted solar stations. We also directly purchase other clean energies to raise our usage volumes and ratios of clean energy while reducing GHG emissions.

At the beginning of each year, the Group formulates energy-saving goals and communicates these to business subgroups. Incentive measures are also implemented to enhance the development of energy-saving technologies in each subgroup. The Group's energy-saving target for 2022 was 4.2%. The actual energy-saving rate was 5.3%, successfully achieving our annual energy-saving goal.

Achievement of Energy-Saving Targets for 2018-2022

	2018	2019	2020	2021	2022
Target value	5%	5%	4.5%	5%	4.2%
Achieved value	5.77%	5.33%	5.18%	5.56%	5.74%

Work Plan for Energy and Carbon Reduction Measures

Key tasks	Description/requirements	Purpose/meaning
Implement energy-saving policies and regulations	We use governmental policies and regulations as a basis for mandatory tasks such as promoting energy and carbon reduction measures; coordinating management; implementing energy management plans; reporting energy usage; obtaining certification for energy management systems; establishing energy management centers; auditing energy usage; formulating energy-saving plans; compiling energy-saving self-assessments, and evaluating new, converted, and expanded energy-saving projects.	We respond to governmental laws and policies through supervision and evaluation measures which help to improve our credit ratings.
Promotion of green manufacturing systems	We continue to implement our "Action Plan for Evaluations of Green Campus Construction Projects," promote establishment of key campuses, and apply for national certifications relating to green manufacturing facilities, green supply chains, green campuses, and green products.	We have established green manufacturing management systems and applied for certifications to enhance our corporate brand image and obtain government funding and incentives.
Diagnosis of industrial energy-saving measures	We diagnose main processes, key energy usage systems, key technologies and equipment, and promote technical consultations and technological transformations and upgrading.	Explore energy-saving potential and promote implementation of energy-saving measures to reduce costs and enhance efficiency.
Action plan for enhancing professional skills	We host training for professional skills, job skills, and new apprenticeships, and organize training for entry-level workers, mid-level workers, senior-level workers, technicians, and senior technicians.	Enhance climate change awareness in employees and cultivate professional energy and carbon reduction talent.
Full certification of energy management systems	We encourage Group entities to obtain and maintain ISO 50001：2018 systems as well as commence implementation of systematic energy and carbon reduction tasks.	Improve energy management systems to ensure long-term implementation of energy management mechanisms.
Execute key energy-saving projects	We focused on optimizing processes, upgrading and replacing equipment, and installing power generators which use renewable energies.	Reduce energy waste, improve energy efficiency, achieve annual energy and carbon reduction targets, and complete government and Group evaluations of energy and carbon reduction targets.

Global energy consumption in 2022

	Purchased power		Natural gas/Liquefied natural gas (NG/LNG)		Gasoline		Diesel		Liquefied petroleum gas		Energy consumption
	kWh	GJ	m^3	GJ	m^3	GJ	m^3	GJ	Tons	GJ	GJ
China	8,642,255,996	31,117,721	76,658,768	2,988,090	2,240	69,550	1,462	51,821	0	0	34,227,182
Taiwan	361,565,976	1,301,872	432,584	16,862	34	1,061	14	498	14	723	1,321,016
Vietnam	375,158,616	1,350,814	-	-	1	16	316	11,186	41	2,081	1,364,097
India	114,708,174	413,024	-	-	-	-	67	2,372	131	6,566	421,961
North America	263,984,668	950,516	3,162,394	123,267	101	3,136	181	6,416	298	14,972	1,098,307
South America	39,748,119	143,119	2,400	94	10	310	106	3,757	565	28,387	175,667
Europe	57,277,967	206,238	446,110	17,389	137	4,267	65	2,309	-	-	230,203
Total	9,854,699,517	35,483,303	80,702,256	3,145,702	2,523	78,340	2,211	78,359	1,049	52,728	38,838,433

Notes：1. Heating values for all energy sources were calculated using local coefficients.

Electricity Usage in 2018-2022

	Unit	2018	2019	2020	2021	2022
Power consumption	Million kWh	8,930	9,583	8,423	9,364	9,855
Energy intensity (Power consumption/ revenues)	Million kWh/ million NTD	0.00169	0.00179	0.00157	0.00156	0.00148

Energy-Saving Technological Transformations

In 2022, we invested 2.37 billion NTD in 1,877 energy-saving projects encompassing transformation of energy-saving production processes, improvement of air-conditioning systems/air compressors/lighting equipment, and other improvements. Total energy savings were 495,796 MWh, equal to total carbon reductions of 306,204 tCO_2e.

Inputs		Outputs
We calculated our total investments and commenced our energy-saving projects Total investments：2.37 billion NTD Total number of projects：1,877		
Transformation of energy-saving production processes	Invested amount：1.79 billion NTD Number of projects：1,877	→ Total energy savings：495,796 MWh Total carbon reductions：306,204 tCO_2e
Air-conditioning systems/air compressors/lighting equipment	Invested amount：440 million NTD Number of projects：492	Total energy savings：330,306 MWh Total carbon reductions：203,997 tCO_2e
Other improvements	Invested amount：140 billion NTD Number of projects：150	Energy savings：83,645 MWh Carbon reductions：78,725 tCO_2e Energy savings：38,021MWh Carbon reductions：23,482 tCO_2e

Energy-Saving Incentive Mechanisms

To enhance employee emphasis on climate change and internalize relevant concepts into the core cultures of each department, we formulated annual "Appraisal Items and Scoring Guidelines for Energy Management" for use in our Chinese campuses. Appraisal items included energy management, energy reduction systems, implementation of energy-saving measures, supervision of energy reduction measures, and energy-saving KPIs. Detailed quantitative scores were presented for each item, and those ranking within the top three for the quarter/year and units that obtained high scores on specific items were awarded bonuses and incentives. We provide team and individual cash rewards for outstanding energy-saving technological transformation projects that enhance energy efficiency. In 2022, we awarded 278,000 NTD to 4 teams and 10 individuals with outstanding energy-saving contributions.

Development and Usage of Clean Energy

Clean energy has become one of the most important international issues, and governments from all countries have formulated clean energy usage targets to reduce usage of high-pollution fuels while making strides toward low-carbon energy structures. As a leader in the electronics industry, the Group has a duty to promote low-carbon developments. Therefore, the Group is actively increasing installation capacity by installing and purchasing rooftop and ground-mounted solar stations, while also directly purchasing other clean energies. In 2022, our total installed capacity was 260.55 MW and we generated 289.6908 million kWh in a year. Our usage of clean energies reached 816.1311 million kWh, equivalent to 2,938,601 GJ, achieving a clean energy usage ratio of 8.28%.

Clean Energy Usage for 2022

	Unit	China	Taiwan	Vietnam	India	North America	South America	Europe	Total
Total installed capacity of clean energies	MW	259.61	0.74	0.06	-	0.1368	-	-	260.55
Generated power	10,000 kWh	28,847.72	109.59	5.74	-	6.03	-	-	28,969.08
Direct purchases of clean energies at Chinese campuses	10,000 kWh	3,139.42	-	-	-	-	-	-	3,139.42
Renewable energy certificates from power trading and purchases of clean energies in Chinese campuses	10,000 kWh	46,094.00	-	-	-	-	-	-	46,094.00
Purchases of other clean energies (wind power or biomass)	10,000 kWh	-	236.00	-	1,118.85	193.68	1,798.70	63.39	3,410.62
Total clean energy usage	10,000 kWh	78,081.14	345.59	5.74	1,118.85	199.71	1,798.70	63.39	81,613.11
Proportion of clean energy usage	%	8.29%	0.96%	0.02%	9.75%	0.76%	45.25%	1.11%	8.28%

Clean Energy Usage Volumes and Proportions for 2020-2022

	Unit	2022	2021	2020
Total clean energy usage	10,000 kWh	81,613	48,388	104,857
Proportion of clean energy usage	%	8.28%	5.17%	12.45%

Signed an MOU for green power procurement to achieve 50% renewable energy usage in Taiwan campuses by 2030

The Group signed a green power procurement MOU with Shinfox Energy. We planned to purchase 2.36 million kWh of green electricity in 2022, then gradually increase our procured volumes every year, and we expect to accumulate 70 million kWh of green electricity by 2030, equivalent to around 35,140 tons of carbon emissions, the amount that would be absorbed by 2.92 million trees. We mitigate the impacts of climate change through practical actions.

Environmental Management System

We have given priority to environmental protection principles since our establishment. The Group has implemented and completed verification of ISO 14001 Environmental Management Systems at all campuses starting from the construction phases, and we also use the "Plan, Do, Check, and Action (P-D-C-A) model" to promote continuous improvements. We confirmed environmental considerations arising from our production processes, activities, and services; assessed all environmental considerations and their impacts on the environment; and compared their severity and other factors through comprehensive evaluations to ensure prior identification of major potential factors, then formulated improved measures and operating processes that reduced and prevented the impacts from these factors. Additionally, we simultaneously operate environmental treatment facilities and campus production processes to ensure that our wastewater, exhaust emissions, and waste materials comply with local regulatory requirements. We incurred no major environmental protection violations in 2022.

To realize our low-carbon and green manufacturing targets, we gradually implemented green campus and green supply chain management measures into our operational locations in accordance with green manufacturing standards in China, and were recognized as national/provincial green campuses.

Water Resource Management

Municipal water is the main water source used in all our campuses. We do not impact surrounding water sources. Our campuses conduct reviews of water-saving plans and water facilities each year to reduce water consumption. Additionally, we actively promote recycling and reuse of water resources, and have incorporated renewable/biodegradable components into our production materials to effectively reduce environmental impacts of production processes. Following identification of water resource risks, we began promoting various water-saving measures and reducing discharge of standard wastewater to achieve our goals relating to effective usage of water resources, reduce wastewater discharge, and decrease environmental impacts.

Unit：Thousand tons

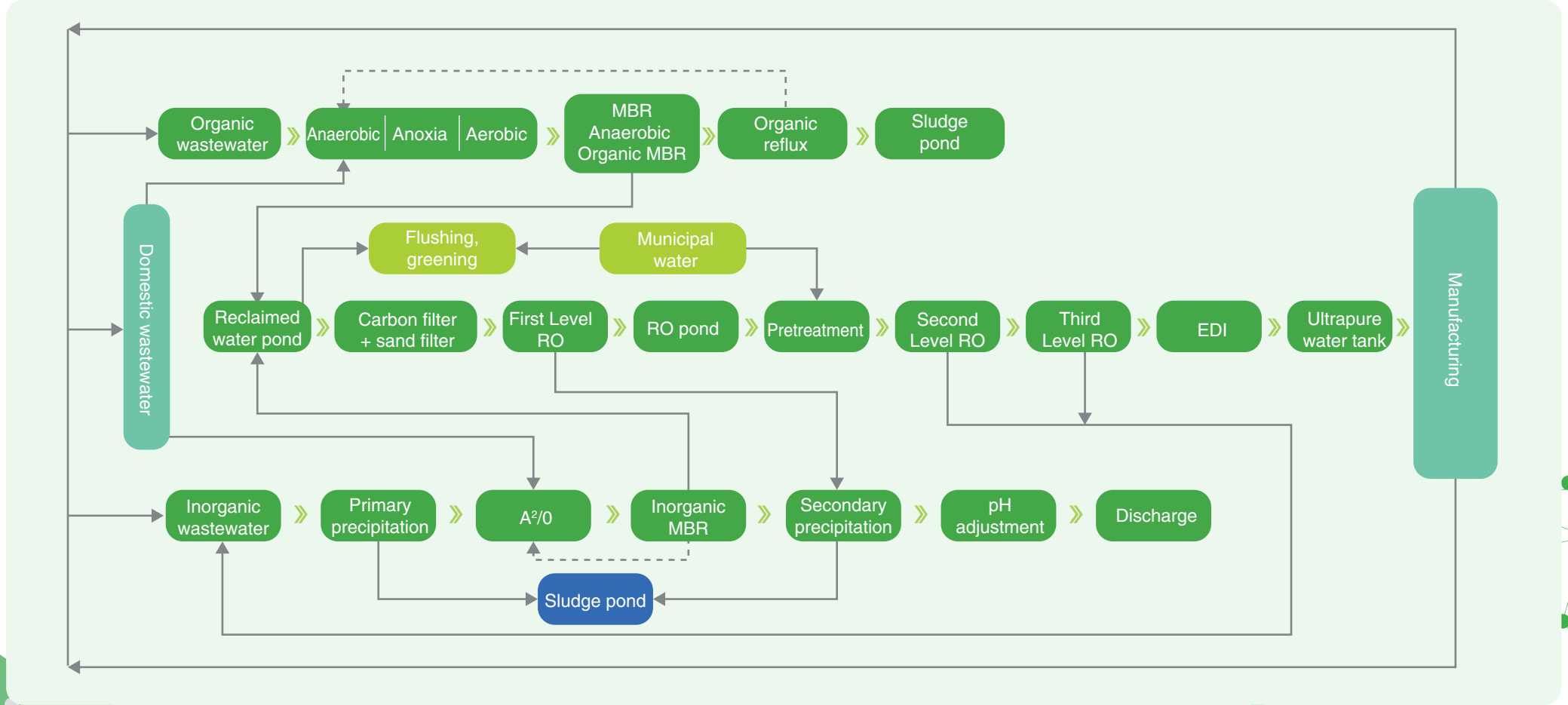
		China	Taiwan	Vietnam	India	North America	South America	Europe	Total
Water withdrawal	Municipal water	85,505	848	1,542	762	386	4	78	89,124
	Ground	2,064	-	-	-	224	58	-	2,346
	water	87,568	848	1,542	762	610	62	78	91,471
Discharge	Total water withdrawn	70,055	678	1,058	610	488	45	32	72,966
	Domestic wastewater	13,887	293	17	-	67	-	41	14,303
	Industrial wastewater	83,941	971	1,075	610	555	45	73	87,269
Recycled water	Total discharge	4,287	-	483	67	107	-	-	4,944
	Recovery ratio	4.90%	0.00%	31.30%	8.81%	17.55%	0.00%	0.00%	5.40%

Note：Domestic wastewater volumes in China, Taiwan, India, and North America were calculated using water consumption volumes multiplied by 0.8.

Wastewater Management

The Group works to optimize production processes to reduce water consumption at the source. We also actively implement wastewater recycling procedures and reuse treated domestic wastewater in production processes and environmental greening, greatly reducing our impact on external environments. Additionally, to ensure that our wastewater does not cause environmental pollution, all campuses have wastewater treatment facilities that are regularly inspected and maintained by dedicated personnel. Discharged wastewater complies with sewage standards and is periodically inspected by qualified external institutes. No environmental pollution incidents occurred in 2022.

Wastewater Management & Water Reuse System



Waste Management

Since the industrial age, large amounts of solid waste have been generated due to the needs of manufacturing processes and private individuals. Waste that is not properly disposed of can enter the soil, water sources, and the air; cause pollution to the environment; and produce large amounts of waste that take a long time to decompose, affecting future generations. Waste has become an environmental issue of increasing importance. Because of this, the Group has implemented "zero waste" policies at all key campuses in China to gradually reduce amounts of incinerated and landfill waste, ensuring compliance with maximum limits of 100% waste conversion rates and 10% incineration rates. Our "zero waste" policies have become one of our most important strategies. These policies minimize generated waste through source reduction of raw materials; we are also actively engaged in recycling and reuse of inner and outer packaging materials which enhance waste recycling and reuse rates.

To ensure that all waste is legally and effectively disposed of, all campuses comply with internal waste management procedures to secure bids for waste handling. The legal qualifications of waste disposal companies are reviewed according to open, fair, and impartial principles. We use the above procedures to screen and select waste management vendors with the lowest level of risk to conduct appropriate waste disposal and record-keeping. The Group periodically audits waste disposal vendors to ensure that our waste is handled in compliance with regulatory requirements. All waste managed by external vendors are disposed of using legal processes.

Unit：Tons

		China	Taiwan	Vietnam	India	North America	South America	Europe	Total
Waste categories	Total hazardous waste	139,416	58	1,814	32	447	166	17	141,950
	Total solid waste	433,420	1,445	31,184	74,825	30,392	2,628	14,567	588,461
	Total domestic waste	42,573	2,296	3,855	490	3,264	119	360	52,957
	Total kitchen waste	29,602	160	1,842	933	2,191	357	0	35,085
Disposal methods	Landfill	6,333	0	11	475	5,957	59	243	13,078
	Recycling and reuse	537,576	1,224	35,976	75,199	29,885	2,267	13,491	695,619
	Anaerobic / Composting decomposition	27,019	119	3	559	290	420	6	28,416
	Incineration	54,680	2,306	1,829	47	42	374	1,080	60,358
	Other (such as physical or chemical treatment/storage/production of solid fuels)	19,403	310	876	0	120	150	123	20,982

Zero Waste Factories

"Circular economy" is a key strategy in the Group's promotion of sustainable development and enhancement of resource usage efficiency. Our core goal is to build zero waste campuses that implement "zero landfill" policies. We have signed memorandums of cooperation with UL international verification institutes and aim to build "Zero Waste Pilot Campuses" through incorporation of Turbo Waste management systems, digital management of waste using cloud technologies, and quantitative systems that enable waste reduction. Apart from tracking improvements, we have also extended these policies throughout the entire corporation to achieve our goal of "Zero Waste Campuses," building upon our philosophy of "Sustainable Management=EPS+ESG" and setting an example for the industry.

To ensure that our products and the products of our clients meet the highest environmental specifications, we have included our supplier partners in this memorandum of cooperation. Our central procurement and supply chain management departments have already convened suppliers for systematic training based on the framework laid out in this memorandum of cooperation to enhance their professional skills and technologies.

We have incorporated the Turbo Waste system into our Longhua and Nanning Campuses for accurate tracking of waste processes and volumes. System response rates were 100%. In 2022, our Shenzhen Longhua Campus obtained UL 2799 Gold-Level Certification, becoming the world's first comprehensive eco-park. During the certification period, our waste conversion rate was 99% and energy recovery rate from incineration was 7%, fulfilling the criteria for gold-level certification. In future, we will continue to increase our conversion rates and work to achieve platinum-level certification.

Air Pollution Governance

The Group has established comprehensive scientific air pollution management regulations. We select the best available technologies based on the composition and characteristics of waste emissions and actively adhere to all government air pollution management measures. We have formulated practical and feasible contingency measures, regularly maintain and improve treatment facilities for waste emissions, and ultimately achieve waste emissions that 100% adhere to discharge standards.

Current status of the Group's waste gas treatment

In respect of the Group's internal emissions, we initially consider the appropriate treatment method based on the composition, characteristics and concentration of the emissions, and finally decides on the treatment technique to be used by taking into account the economic and practical situation.

According to the data, the activated carbon adsorption method is currently the most popular treatment method used by the Group for the following two main reasons：

1. Most of the Group's internal emissions have already met the emission standards without treatment, so in order to further optimize and regulate the emissions, the simple activated carbon adsorption process is usually chosen. To further optimize and regulate emissions, simple activated carbon technology is usually chosen;

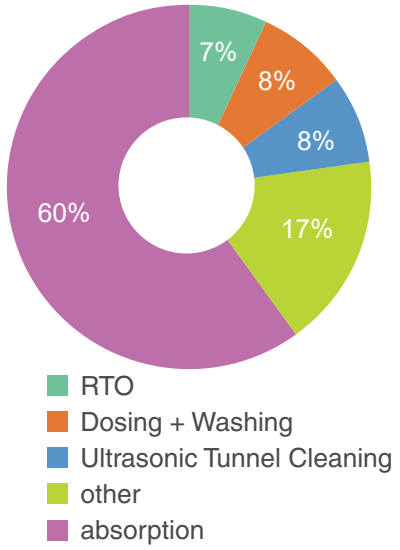
2.The activated carbon adsorption method is less costly due to a combination of economic factors and the actual situation.

Installation of automatic monitoring equipment

For example, at our plants in Mainland China, the Group strictly complies with relevant laws and regulations and cooperates with environmental protection government agencies to install automatic pollution source monitoring equipment at the emission outlets of key pollution sources.

The installation of automatic pollutant source monitoring equipment, an automatic monitoring system capable of automatic data monitoring and network uploading, and the timely disclosure of pollutant emission data to the community in accordance with regulations not only fulfilled the Group's corporate obligations, but also enhanced the Group's own environmental image and environmental credibility, as well as fulfilled the Group's corporate social responsibility to protect the environment.

Management of exhaust pipes：Scientific numbering	We have carried out comprehensive inventory of all pollutants at our Shenzhen Longhua Campus and numbered all exhaust pipes using scientific codes to ensure that all pipes have a unique number code and are linked to our systems for timely tracking of waste emission concentrations. We plan to gradually implement this framework at all campuses to form a scientific exhaust pipe management system.
Waste emission treatment：Diverse processes	Analysis of our survey results show that the Group's main waste emissions come from cleaning, spraying, dispensing, and other manufacturing processes.
Enhancing treatment efficiency：Multi-stage processing	In order to improve the treatment efficiency of waste emissions, we implement multi-stage treatments for different processes using composite treatment measures that can be adjusted flexibly based on the components of different waste emissions for better adaption to actual emissions treatment conditions.



Innovative measures：Smart environmental protection monitoring platform

The Group has created a smart environmental protection monitoring platform to establish a real-time monitoring mechanism that meets government requirements and lowers disaster risks. The platform enables centralized information monitoring, real-time monitoring of air quality, instant notifications and feedback for abnormality handling, risk classifications, and creation of visual maps.

The environmental protection monitoring platform is composed of a sensor layer, a data integration layer, and decision-making layer. All three layers are intertwined and complement each other. With the help of this smart environmental protection monitoring platform, we are able to compile environmental protection information, manage different classifications of environmental pollution risks, implement digital audits and real-time warnings to reduce environmental impacts, effectively control pollution, intelligently track carbon emissions, and display emission concentration changes in an intuitive manner.

Chemicals Management

Employee health and safety is the foundation of the Group. We strictly abide by chemical safety regulations of all local governments and client requirements related to restricted substances. We monitor all processes and adhere to the five-noes principle of "no design, no procurement, no inputs, no manufacturing, no outputs." We classify and manage chemical substances used in production and operational processes, and work to minimize reductions, control, and eliminate impacts of hazardous substances on employee health and safety as we move toward our goal of "zero hazards and zero pollution."

No chemical leakages or other related incidents occurred in 2022.

Chemical Management Policies

Chemical Management Regulations

The Group strictly abides by 23 international regulations and national standards in China, including the EU Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive (RoHS); EU Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH); POPs Regulation; Toxic Substances Control Act (TSCA); AfPS GS 2019：01 PAK (PAH); California Proposition 65; Limits for Volatile Organic Compounds Content in Cleaning Agents; Limit of Volatile Organic Compounds Content in Adhesive, and 23 projects of Chinese national standards.

To effectively control chemical usage, the Group has established a Chemical Management Committee to coordinate chemical management tasks within the Group, including：

- Dynamic adherence with environmental protection/health laws and regulations/standards of different countries as well as regular review of compliance with chemical regulations so internal regulations can be updated in a timely manner.
- Active responses to client proposals regarding chemical substance management that exceed legal regulations to ensure that our products adhere to client requirements.
- Formulated a series of internal bylaws, including "Specification for Hazardous Substances and Materials Management," "Chemical/Substances Management System Regulations," "Chemicals/Substances Registration Management Regulations," "Chemicals/Substances Risk Assessment Regulations," "Chemicals/Substances Classification and Management Regulations," "Chemicals/Substances Replacement Management Regulations," "Hazardous Chemicals Safety Management Regulations," and "Process Safety Assessments and Verification Implementation Management Regulations" to incorporate risk controls throughout our product life cycles and provide comprehensive protections for safe chemical usage to manufacture safe and reliable products.
- Formulated and released prohibited, restricted, and controlled chemicals lists.
- Conducted comprehensive inventory of all chemicals used in production processes, non-production processes (including wastewater management, operating equipment and facilities, cleaning procedures, and so on), and laboratories, and implement unified management of chemical purposes, usage volumes, types, hazard levels, and content information.
- Established an audit team which conducts annual audits of chemical usage and replacement conditions in all campuses around the world (no fewer than three audits a year for Chinese campuses, no fewer than one audit a year for European and American campuses, and no fewer than two audits a year for other campuses), closely monitors implementations by all units, ensures compliance of chemical usage, records non-compliance and hidden danger items in our electronic management system, requires corrections within specific time limits, and conducts reviews following said time limits.

Established "Chemical and Substance Control List" based on related regulations, client requirements, and the Group's self-conducted risk assessment results.

- Inclusion in the Prohibited List：immediate phase-out
- Inclusion in the restriction list：confirm whether the restriction conditions are met, and replace if not.
- Inclusion in the control/monitoring list：to strengthen the use control and gradually implement the phase-out plan

We have identified 100% of the chemicals used, proactively managed hazardous substances and deployed elimination plans in advance for substances under restriction/monitoring. In addition, we will regularly disclose the "Hazardous Substances Improvement Checklist" on the Company's official website.

Hazardous Substances Replacement Progress and Achievements in 2022

Improvement methods include substance replacement (using no/low-hazard substances to replace high-hazard substances) and process changes, including

Replaced Substances	Replacement Achievements	Completion Time
Paint remover	Dichloromethane is harmful to human health	February 2022
Fungicides	Fungicides used for wastewater treatment contain PCP, which is harmful to human health	April 2022
Used FSA-C-03 detergent to replace FSA-C-01	Cleaning processes use detergents that contain boron, which can poison humans if accumulated. We therefore replaced these agents with boron-free FSA-C-03.	April 2022
Used FTY-C01 surfactant to replace Ram-HZ	The surfactant used for anode processes contained the SVHC substance polyoxyethylene ether. We therefore replaced it with the non-SVHC surfactant FTY-C01 to lower exposure risks of anode personnel and reduce environmental pollution	November 2022
Replaced BTEX chemicals	Our PCBA processes use the UV glue PC-40 which contains toluene and xylene, substances that are harmful to human health. We therefore replaced it with NG T7 to reduce occupational health hazards.	April 2022
Used EC326 detergent to replace acetone	Dispensing stations use acetone (a class A or B, flammable, and explosive substance with a low flash point) for cleaning, which carries a high explosive risk. We therefore used EC326, a class C non-flammable detergent, to replace this class A/B detergent.	May 2022
Used a copper surface micro-etching solution to replace sulfuric acid and hydrogen peroxide mixture	PCB pre-processing procedures use sulfuric acid, a high-risk precursor chemical, which we replaced with a copper surface micro-etching solution which contains 15% sulfuric acid, greatly lowering risks compared with the original formula.	September 2022
Used carbon dioxide foaming machines to replace ST-710 detergent	Used eco-friendly carbon dioxide foaming machines to clean production materials, replacing ethylene glycol ether solutions, resulting in no solvent residuals and no secondary pollution.	October 2022

VOC Reduction Actions in 2022

We formulated reduction plans for VOCs used in production processes (detergents, coating agents, adhesives, and inks) and promoted use of water-based detergents, water-based coating agents, UV coating agents, hot-melt adhesives, UV inks, and other eco-friendly solvents. We encourage use of solvents with environmental certification labels to reduce generation of VOCs at the source, including

VOC Reductions	Reduction Achievements
Replacement of flux agents	Used the methanol-free F6812 flux agent to replace EF-6103, lowering methanol content from 38.1% to 0%.
Lowered VOCs in covered production lines	Ink production requires A/B agents with respective VOC emission rates of 8.7% and 3.3%. We replaced these agents with water-based UV eco-friendly inks, lowering overall VOC emission rates to 3.7%.
Used cutting fluid to replace cutting oil	Replaced flammable, oil-based cutting oil used in CNC processing procedures with non-flammable, water-based cutting fluid to eliminate fire hazards and reduce VOC emissions, and promoted use of this agent to all campuses with CNC processing procedures.

Chemical inventory results over past three years：

Year	Production use/tons	Non-production use/tons	Laboratory use/ tons	Total usage/tons
2020 年	/	/	/	106,556
2021 年	102,061	35,598	22	137,681
2022 年	92,312	44,766	66	137,144

Note：The figures for 2020 only included data from China; figures for 2021 and 2022 included global data.

In February 2023, the EU released an amendment to the POPs Regulation which included PFHxS in Attachment I, Section A of said Regulation. This amendment would take effect 20 days after being passed, and would increase the number of POPs prohibited/restricted substances from 28 items to 29 items. The Group completed inventory of raw materials in March 2023, meeting these regulations ahead of schedule.

ECHA officially released the 28th batch of 9 SVHC items on its corporate website in February 2023. We will continue to track and keep informed of regulatory updates, and incorporate these new substances into the Group's existing list of controlled substances.

Source Management：Green Chemicals

The Group collaborated with clients to increase transparent disclosures of chemical composition and safe chemical usage. Starting from the end of 2020, we began collecting information on process detergents/degreasing agents and SDS certifications from our component vendors to conduct evaluations based on GreenScreen® and the US EPA Safer Choice Program for selection of eco-friendly chemicals to use in our production lines.

Case Study

In March 2022, the Group initiated the "Green Chemical" project at the Chengdu Campus and conducted comprehensive investigation and composition analysis of all seven detergents and degreasing agents used in a product process, then assessed their impacts on human health, the environment, and safety. The project lasted for eight months (including the introductory technical verification stage), following which we replaced one anode cleaning and degreasing agent with a safer and green chemical agent (HW-10104), which was officially introduced into production process in November. (This chemical agent passed campus evaluations, and can also be used for stamping and CNC cleaning processes.)

Project Implementation Schedule

Detergent/degreasing agent confirmation

On-site surveys and collection of the following information:
1. Detergent/degreasing agent types
2. Chemical manufacturer information
3. Process information: Techniques and methodologies

Disclosure of chemical safety information

Compositions and ratios list
1. SDS (Safety Data Sheets)
2. TDS (Technical Data Sheet)
3. Third-party component testing reports

(Note: We sign NDAs with suppliers if confidential formulations are involved and also provide composition lists to clients)

Detergent/degreasing agent screening and assessment

▶ Adheres to specifications
1. Client controlled substance specifications
2. Local regulated limits on VOCs (GB 38508-2020)

▶ Assessment methods
1. GreenScreen®
2. EPA Safer Choice Program

Incorporate green chemicals into production processes

1. Chemical composition and physicochemical properties adhere to process conditions.
2. Confirmation of production yield and use conditions.

Management of Hazardous Substance Life Cycles

1. Design

We adhere to green design concepts and comply with the "General Guidelines for Product Eco-Friendly Designs" and "General Guidelines for Eco-Friendly Product Design Evaluations." Our eco-friendly product designs adhere to the four main requirements of "harm-free, energy-saving, waste reduction, and easy to recycle." During the product design and development stages, we systemically consider the environmental/health impacts of all stages from selection of raw materials, production, sales, use, recycling, and treatment; minimize use of materials containing toxic and hazardous substances; reduce generated and discharged pollutants; and strive to minimize product environmental/health impacts.

2. Procurement

To ensure "no procurement" of materials with hazardous substances, the Group formulated the "Green Procurement Management Manual" and "Supplier Management Manual," and also used our hazardous chemical management platform to incorporate green product management requirements into all supplier management processes.

The Group has formulated supplier environmental protection and social responsibility commitment forms which suppliers are required to sign as part of their commitment to Group standards for environmentally friendly products. We also require our suppliers to submit the "Environmental Management Substance Composition or Component Breakdown Form" and declare the hazardous substances contained within products or components. EU RoHS 10 controlled substance directives require suppliers to submit periodically updated third-party test reports for corresponding materials, which must also pass Group verification.

3. Registration

The Group adhered to the "Global Chemical Unified Classification and Labeling Regulations," "Chemical Classification and Management Manual," and "Guidelines for Registration of Existing Chemical Substances," and other industry standards/regulations in formulating our internal "Chemicals/Substances Registration Management Regulations" and we also referenced RoHS, REACH, TSCA, POPs, and other international chemical control regulations to formulate the Group's controlled chemicals lists (prohibited substances list, restricted substances list, and controlled substances list). Chemicals that enter campuses are strictly reviewed, classified, and managed, and we also establish corresponding disposal processes.

4. Assessment

We have established the "Chemicals/Substances Risk Assessment Regulations" and require all units to form professional risk assessment teams composed of members from the industrial safety management, production, and product development departments. We conduct at least one comprehensive risk assessment of all chemicals each year and adopt corresponding control measures based on risk grades to maintain risks within acceptable levels.

We determine hazard groups, dispersion conditions, and usage of existing chemicals to confirm risk grades and corresponding management methods. New chemicals are required to undergo the procedures listed in the "Chemicals/Substances Registration Management Regulations" to confirm that they comply with the Group's controlled hazardous substances list, following which we conduct risk assessments.

Risk levels	Management Measures
Grade 1	Overall air exchange procedures; access control for non-essential personnel
Grade 2	Process controls such as partial air exchanges/ ventilation; access control for non-essential personnel
Grade 3	Segregation, including containment processes, planning of operational spaces, area identification; access allowed for trained essential labor
Grade 4	Reference occupational safety management documents established by the International Labour Organization or other countries, and establish specific management methods complying with expert guidance

Note：Grade 4 chemicals have been included in the Group's "Controlled Chemical Substances List"

5. Use

We register all chemicals used in production and non-production processes to manage their hazard characteristics. New or updated chemicals with uncertain hazard properties are required to undergo comprehensive safety assessments; classification, labeling, and segregated management of eco-friendly materials and equipment; and compliance confirmation of hazardous substances to prevent production of non-eco-friendly products.

Operational sites for hazardous chemicals reference relevant FM standards, and we have established special storage cabinets and anti-leakage measures. Chemical use strictly adheres to standard operating procedures, and we have established emergency drills and on-site disposal plans to ensure employee health and safety.

6. Outputs

The Group has established a large-scale testing institute with 24 professional laboratories in different fields and 8 branch institutes. Our chemical analysis laboratory is responsible for testing and verification of hazardous substances. The lab is equipped with more than 50 types of chemical analysis equipment (including ICP-MS, ICP-OES, GCMS, PYGCMS, and LCMSMS equipment). The lab obtained CNAS certification in 2006 and also has testing capabilities for RoHS2.0, REACH, halogen, VOCs, and other hazardous substances.

Since its founding, the lab has completed more than 500,000 tests of hazardous substances and assisted business units in monitoring chemicals used in all processes from material selection, material inputs, manufacturing processes, finished products, wastewater, waste emissions, and treatment of solid wastes to protect the health and safety of personnel working on Group materials, products, and waste, and also to ensure that all processes adhere to environmental requirements.

The Group has initiated inventories of materials used in end products. In 2022, 100% of products adhered to RoHS controls, of which 94% have obtained testing reports and 6% of products adhere to client requirements. Additionally, 100% of products adhere to Group REACH controls, of which 17% have obtained testing reports, 16% adhere to client requirements, and 67% have submitted applications to be verified for non-hazardous substances. Furthermore, current information and data obtained from our business groups confirm that Group products contain less than 0.1% of SVHC substances. Detailed inventory reports and product SVHC information have been released on our corporate website.

IECQ QC080000 Hazardous Substance Process Management System Requirements

The Group used ISO9001 as a foundation for promoting establishment of the IECQ QC080000 Hazardous Substance Process Management System Requirements, ensuring that management of all hazardous substances used in products from client proposals to finished goods have been controlled, enabling us to achieve Hazardous Substance Free (HSF) status.

As of the end of the reporting period, the Group's 26 subsidiaries have obtained IECQ QC080000 system verification, and we continue to promote this management system at our other subsidiaries.

Chemical Safety and Technical Data Sheet Review

To ensure effective and accurate audits of chemical information, the Group requires suppliers to submit REACH SVHC declaration forms, environmental management substance compositions, and component forms, as well as complete and correct chemical SDS documents. Suppliers are also required to undergo third-level audits for specific items conducted by business group product development departments, business group industrial safety departments, and the Group's central industrial safety department. We use information technologies to collect/review chemical SDS documents, accurately grasp chemical hazard properties and compositions, and provide data to support graded management of chemicals. The Group requires suppliers to update SDS documents once every three years (or within a month if substance classification labels change) and undergo third-level audits conducted by business group product development departments, business groups, and the Group's central industrial safety department prior to initiating use.

The Group is also developing an SDS digital collection platform which used the same material numbers as our procurement systems, allowing us to keep informed of all material compositions and hazard properties.

Personnel Cultivation and Corporate Culture

To strengthen employees and contractors understanding of chemicals, the Group formulates detailed training plans each year and continues to invest in chemical safety training for employees and contractors encompassing green material management policies, client requirements, and implementation requirements for the latest laws and regulations. We organized 724 hours of training associated with chemicals in 2022. We also organize at least two annual chemical emergency drills each year as well as training on personal protective equipment for on-site vendors and contractors with chemical exposure risks.

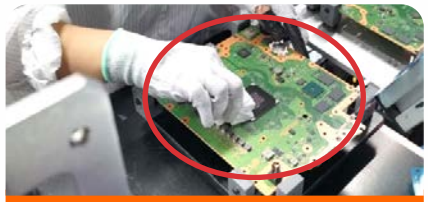
Improve Innovation Evaluations and Promotions

We encourage all units to actively replace/reduce use of hazardous substances and enhance management of hazardous substances. The Group has established incentive and assessment mechanisms based on professional, technical, and promotional indicators. In 2022, we received 63 outstanding innovative improvement proposals from our campuses around the world and distributed 46,030 NTD in rewards. Outstanding cases were shared with all units worldwide.

Improvement Proposals

Replacing alcohol with UV sterilizers to clean IC chips

Some products require IC surfaces to be cleaned before coating. Currently, cleaning processes are implemented manually using paper towels and alcohol. However, accidents occur easily as alcohol is flammable and explosive. We use UV sterilizers and ultraviolet cleansing in accordance with product quality needs to reduce risks of ignition and explosion, use of chemicals, and even manufacturing costs. We estimate that we save 770,000 NTD each month in manpower and material costs, amounting to a total of 9.24 million NTD each year.



before improvement
artificial alcohol test

Improvement plan
UV furnace ultraviolet disinfection instead of artificial alcohol wiping

Reductions of cleaning chemicals for molds

Chemicals are used for routine mold repair, maintenance, and cleaning. Due to the large quantities of molds involved, we use large amounts of chemicals which impact operational environments and endanger personnel health.

We therefore implemented oil-free lubrication technologies. Mold components are made of high-strength copper alloys and graphite materials rather than high-carbon chromium bearing steel materials. The surfaces of thimbles and other moving parts are covered with titanium coating to enhance wear resistance and eliminate the need for oiling during use, thereby reducing monthly chemical usage volumes from 36 bottles to 2 bottles, achieving a reduction rate of 94.4%.

External Collaborations to Strengthen Industrial Actions

Collaborations with External Industry Associations

In addition to pioneering use of green chemicals, the Group also actively cooperates with external industry associations to establish industry standards based on our own experiences. In March 2021, we were invited by our clients to work with other international enterprises and the IPC in formulating the Standard for Green Cleaners Used in Electronics Manufacturing (IPC-1402), which was released on November 1, 2022. The new standard is mainly focused on regulation of detergents/degreasing agents and cleaning chemicals used in electronics manufacturing processes, providing a standard that adheres to environmental, health, and safety requirements.

Online Supplier Seminars

In June 2022, the Group's General Procurement Division convened the "Green Product Management Conference," guiding 276 Group suppliers in organizing systemic training on chemical regulations.

In March 2022, the Group invited 64 suppliers to participate in the "Green Supply and Sustainable Development Policies and Requirements Conference" to promote the Group's carbon neutral, zero waste, and green product policies and requirements.