

5-3 Environmental Pollution Prevention

Based on the environmental protection and commitments of environmental impact assessment, the company regularly monitors environmental impact factors, such as air quality, noise and vibration, the quality of surface water and groundwater, traffic flow, and the ecosystem within the scope of development to truly appreciate its impacts on the environment. There has been no violation of environmental regulations since 2014. In addition, Nanya (Nanya) has checked with the competent authorities that Nanya's developing areas are not at an environmentally sensitive location or a location with specific purposes. In the Environment, Safety and Hygiene Policy, Nanya has made every effort to promote various measures to reduce waste and recycle resources to comply with relevant requirements of regulations as well as to respond to the commitments to environmental protection-related requirements signed by the company. Moreover, Nanya annually evaluates waste that can be reduced and recycled, and the types and amount of recovered waste water, drafts annual plans and goals, and includes the plans into the annual budget and work plan.

Air Pollution Control

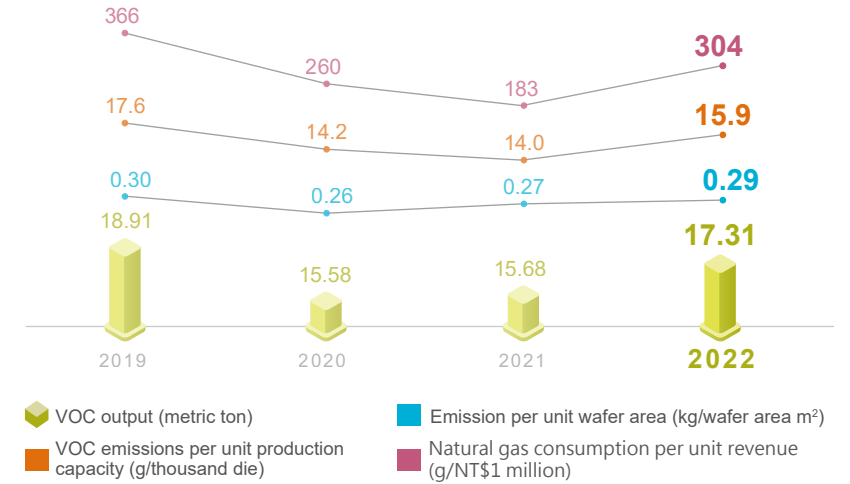
Since the plant was set up, we have put great emphasis on pollution control. Not only have we effectively reduced material consumption and lowered the concentration of waste gas emission, but also have used air pollution control equipment in compliance with statutory standards, including local scrubber, acid/alkaline scrubbers, the VOC zeolite rotor concentration equipment, and post-combustion machinery. Testing proved that the pollutant emission standards set forth in environmental protection regulations of the government were all met (lower than) over the years. Furthermore, the Company does not have any ODS emissions. To continue to maintain the best performance of treatment equipment, every equipment is maintained and inspected periodically. The operators receive complete training and education are to maintain the system in good operation and ensure that the waste gases emitted do not endanger the environment.

Nanya Technology Corporation's main air pollutants include acid and alkaline waste gas and organic waste gas, and raw materials do not use trichloroethylene, so there are no HAPs emissions. Waste gases are channeled to suitable treatment processes and equipment based on their characteristics. Waste gases are channeled into local scrubbers after being generated on the process end. After removing specific substances, acidic or alkaline waste gases are concentrated in acid/alkaline scrubbers and released into the atmosphere after treatment. Organic waste gas is absorbed and concentrated by the zeolite rotor, and then imported into the post-combustion equipment to be directly broken down. The combustion efficiency rate reaches 99%, which substantially exceeds statutory standards. Moreover, the reduction rate of overall volatile organic gas emissions is kept above 90%, meeting the statutory requirements. Organic air pollutants released per unit product (emission intensity) was 0.29 kg VOCs/m² in 2022.

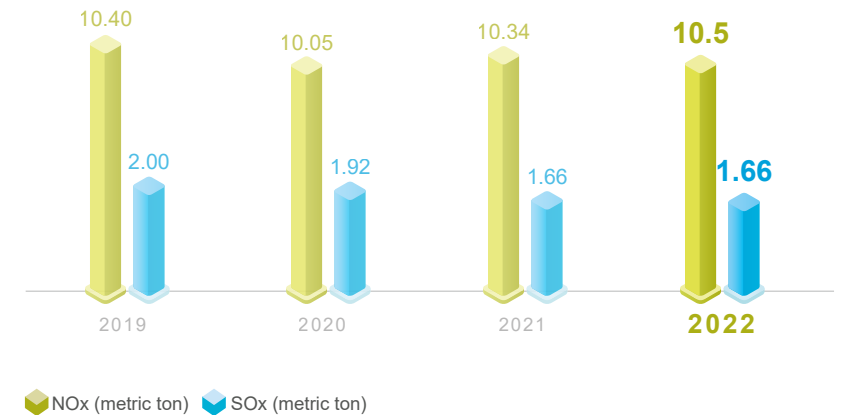
Flowchart of waste gas treatment



VOC emission trends in 2022



Other air pollutant emission trends in 2019-2022



Water Pollution Control

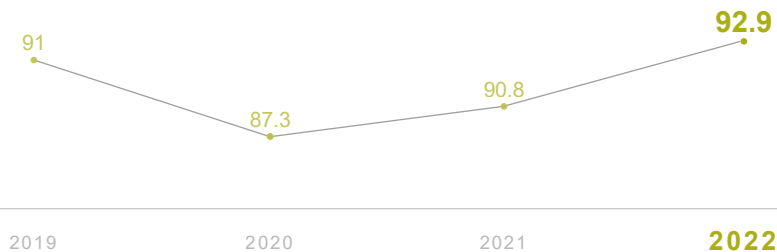
All wastewater generated by Nanya is collected according to property classification and channeled into proper wastewater equipment for treatment. To ensure that the quality of discharged wastewater is in line with regulations, we and the Environmental Protection Department have monitored the quality of effluents via synchronous connections. In addition, off-line sampling, analysis, and detection are outsourced every

quarter to improve the wastewater quality management and control. After water quality meets discharge standards, 100% of wastewater is discharged into Dake River after treatment and meets standards for Category D water bodies, which may be used for irrigation, Class 2 industrial water, and environmental conservation. The water eventually flows into Tamsui River and into the ocean. To avoid environmental pollution and ecological impacts owing to abnormal quality of wastewater, we have spared no effort to prevent and control water pollution, gradually upgrading and investing in wastewater treatment facilities. The in-plant wastewater treatment is carried out in over 20 different pipelines. The wastewater is mainly classified into organic wastewater, general acidic and alkaline wastewater, hydrofluoric wastewater, and high-concentration liquid waste that is outsourced for treatment. In relation to wastewater treatment, wastewater is classified and treated according to different properties. Other than following statutory standards, we also reuse recyclable wastewater that is treated by the recovery system to reduce the discharge amount of wastewater. The plant area is reconstructed on the open space of existing plant so no massive excavation of the peripheral vegetation of the designated land has been made. Wastewater is properly treated before being discharged into the Dake River. Discharged water bodies and relevant habitat are not designated as national or international conservation areas. Investigation shows that the wastewater discharging areas do not involve in affecting the habitat of protected animals or destroying the habitat.

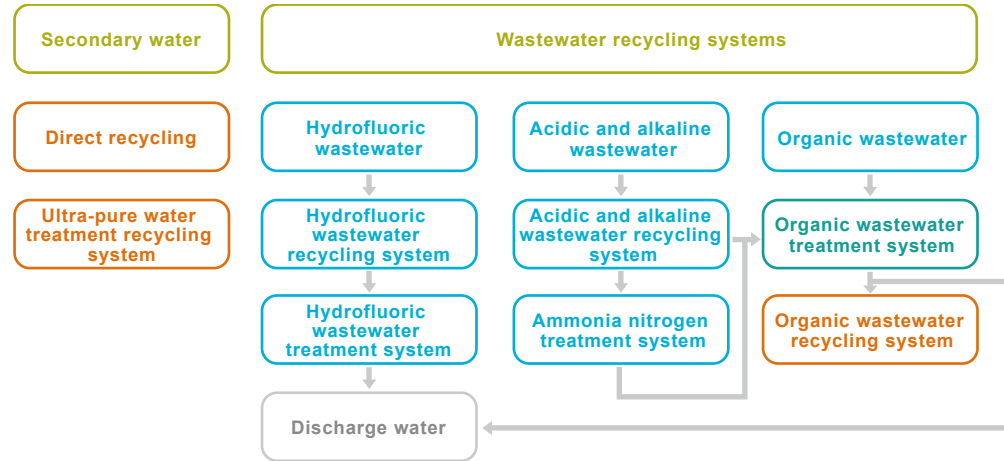
Total waste water discharge volume was 2,695 thousand m³ in 2022, down 0.86% compared to 2021; wastewater discharge volume per unit capacity increased 2.3%, revenue decreased 33.5% compared to 2021, while wastewater discharge volume per unit revenue increased 49%. In coordination with the expansion of FAB-3A-N by Nanya Technology Corporation in 2016, additional wastewater systems and recycling systems were installed. These systems were classified into the following types: acidic and alkaline, organic, and hydrofluoric acid (HF) wastewater systems. The original acidic and alkaline wastewater system was equipped with a reclamation system. In 2017, a reclamation system with reverse osmosis (RO) was added, which could increase 0.288 thousand m³ of reclaimed water per day. With the expansion of the new plant, the installation of additional organic wastewater reclamation system was completed in 2017, which could increase 1.5 thousand m³ of reclaimed water per day. In 2018, the installation of hydrofluoric wastewater reclamation system was completed, which could increase 0.5 thousand m³ of reclaimed hydrofluoric wastewater. Because of the increase in the reclamation volume of wastewater, the annual average process water recycling rate reached 92.9% Note1 in 2022. To coordinate with the expansion of a new factory, we have invested NT\$430 million in building new hydrofluoric wastewater COD and total nitrogen treatment systems. This not only will solve the problem of excessively high hydrofluoric wastewater COD and total nitrogen, but also will recover wastewater at the same time. It is estimated that additional 1 thousand m³ of wastewater will be recovered per day. The systems will be completed and begin operating in March 2023. In response to the decrease in sludge treatment plants and the ever stricter acceptable criteria, starting in 2017, additional isopropanol-concentration system had been built to reduce the load of wastewater COD. In addition, organic sludge dewatering equipment was added, which was completed in 2018, and the moisture content of sludge can be reduced from 84% to below 60%

Note: Nanya's process water recycling rate is calculated using the formula specified by Hsinchu Science Park Bureau, the same as peers in the industry.

Nanya Technology Corporation Process Water Recycling Rate in 2019-2022



Waste water recycling process by Nanya



Types and volume of wastewater discharged by Nanya

Total water discharge (thousand m³1)

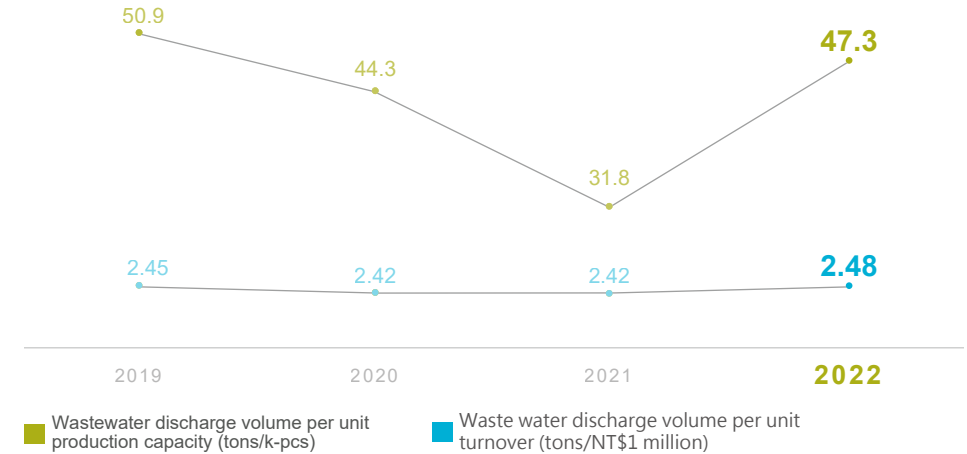
	2019	2020	2021	2022
Divided based on destination¹				
Fresh surface water	2,634	2,705	2,718	2,695
Groundwater, seawater, third party water ² , third party water supplied to other organizations ³	0	0	0	0
Total water discharge				
Freshwater (Total dissolved solids ≤ 1,000 mg/L)	2,634	2,705	2,718	2,695
Other water (Total dissolved solids > 1,000 mg/L)	0	0	0	0
Divided based on wastewater treatment level				
Not treated	0	0	0	0
Treated inside factory to comply with effluent standards of the Environmental Protection Administration	2,634	2,705	2,718	2,695

Note 1: 1 thousand m³ = 1,000 tons

Note 2: The destination of wastewater discharged by Nanya is Dake River (surface water), which is not located in an area with water stress.

Note 3: City government water supplier and sewage treatment plant, public and private utilities companies, and other organizations that participate in the provision, transportation, treatment, disposal, or use of water and sewage

Run chart of 2019-2022 waste water discharge



Testing results of discharged wastewater quality in 2022

	Minimum	Mean	Maximum	Compliant or non-compliant with standards
pH Statutory standards: 6-9	7	7.3	7.5	Compliant
Chemical oxygen demand (COD) Statutory standards:<100 (mg/L)	40.5	49.3	59.5	Compliant
Suspended solids(SS) Statutory standards:<30 (mg/L)	3.2	5.3	6.6	Compliant
Fluoride ion Statutory standards:<15 (mg/L)	8.63	10.6	13	Compliant
Ammonia nitrogen Statutory standards:<30 (mg/L)	1.75	7.3	9.35	Compliant

Waste Management

Waste Generate Structure

Nanya Technology Corporation generated a total of 23,981 metric tons of waste in 2022, and recycled and reused 22,089 metric tons of waste (including waste that was incinerated and used as energy or disposed of using other methods), accounting for 92.1% of total waste generated. Recycling and reuse of waste was 100% outsourced (none of the waste was recycled and reused in our own factory). In 2022, 5,799 metric tons of waste generated by Nanya Technology Corporation was directly

disposed, in which 3,907 metric tons was incinerated and used as energy, accounting for 16.3% of total waste generated; 1,052 metric tons of waste was directly incinerated, accounting for 4.4% of total waste generated; none of the waste was directly buried, but 105 metric tons of waste was solidified and then buried, accounting for 0.4% of total waste generated; 736 metric tons of waste was disposed of using other methods (including physical treatment and recycling, purification and reuse), accounting for 3.1% of total waste generated.

Nanya Technology Corporation's waste generated per unit wafer area was 22.02 kg/kpcs 4Gb eq in 2022, up 0.6% compared to 2021; outsourced hazardous waste disposal amount was 17,598 metric tons, and hazardous waste generated per unit capacity was 16.16 kg/kpcs 4Gb eq, up 3.6% compared to 2021. The treatment of 100% of our main hazardous industrial wastes (acidic waste liquids containing sulfuric acid, phosphoric acid, and hydrofluoric acid) was outsourced and reused used as industrial materials. The recycling rate of hazardous industrial waste reached 97.4% or 17,137 metric tons. The Company will continue to take measures to reduce waste and increase recycling in order to reach the sustainable development goal of effective recycling of wastes.

Furthermore, electronic waste generated by the Company is mainly discarded wafers and defective products. The total weight was 4.34 metric tons and all of the electronic waste was handled by an external contractor, achieving 100% recycling.

Waste Generated in 2022

Unit: Metric Ton

	Generated	Diverted from Disposal	Directed to Disposal
Hazardous waste			
Acidic waste liquid	15,206	14,582	624
Waste solvent	2,353	0	2,353
Container	10	1	9
Electronic waste	4	0	4
Other	24	0	24
Subtotal	17,598	14,583	3,015
General waste (Non-hazardous waste)			
Sludge	5,422	3,507	1,916
Packaging materials	309	0	309
Consumer waste generated by employees	384	0	384
Waste mixed metals	20	1	20
Waste mixed plastics	50	0	50
Other	198	91	107
Subtotal	6,383	3,599	2,785
Total	23,981	18,182	5,799

Note: In coordination with the update to the GRI content index, we compiled more detailed statistics and recategorized waste, which resulted in different recycling percentages compared with previous years, but the total tons of waste was not changed.

Note: There is a slight difference between the total output and the sum of the output of each detail, which is caused by rounding.

Waste Diverted from Disposal in 2022

Unit: Metric Ton

	Onsite	Offsite	Total
Hazardous waste			
Preparation for reuse	0	0	0
Recycling ¹	0	14,582	14,582
Other Recovery Operations	0	1	1
Subtotal	0	14,583	14,583
General waste (Non-hazardous waste)			
Preparation for reuse	0	1	1
Recycling ¹	0	3,598	3,598
Other Recovery Operations	0	0	0
Subtotal	0	3,599	3,599
Subtotal	0	18,182	18,182

Waste Directed to Disposal in 2022

Unit: Metric Ton


	Onsite	Offsite	Total
Hazardous waste			
Incineration (with energy recovery)	0	2,554	2,554
Incineration (without energy recovery)	0	9	9
Landfilling	0	24	24
Other disposal operations ¹	0	428	428
Subtotal	0	3,015	3,015
General waste (Non-hazardous waste)			
Incineration (with energy recovery)	0	1,353	1,353
Incineration (without energy recovery)	0	1,043	1,043
Landfilling	0	81	81
Other disposal operations ²	0	308	308
Subtotal	0	2,785	2,785
Total	0	5,799	5,799

Note 1: Other disposal methods for hazardous waste include physical treatment and chemical treatment.

Note 2: Other disposal methods for general waste refers to physical treatment (broken down and sorted).

Note: There is a slight difference between the total output and the sum of the output of each detail, which is caused by rounding.

The general industrial wastes and the hazardous industrial wastes of the Nanya are all managed by the Output Department in terms of storage, clearance, detections, and reduction promotions. In addition, the company periodically audits waste contractors to see whether the contractors follow the regulations of waste disposal to handle the waste clearance, in order to confirm the legality of the contractors, ensure that all wastes are well-processed or recycled, and prevent impacts on the environment again. Nanya Technology Corporation did not ship any hazardous waste to other countries in 2014-2022, and output of all hazardous industrial waste was outsourced to certified domestic waste disposal contractors; a total 48 certified domestic waste disposal contractors was commissioned in 2022.




Upstream

Impact sources

- Used large numbers of 53-gallon drums of chemicals.
- Used large numbers of small gas cylinders, resulting in more residual gases.

Mitigation measures

- Replaced 53-gallon drums with tank trucks to store and transport chemicals or recycled empty drums.
- Replaced small gas cylinders with large cylinders to reduce residual gases and numbers of cylinders.




Nanya

Impact sources

- Sources of raw materials and related materials contained hazardous substances.
- Used large numbers of acidic and alkaline chemicals.
- Used monitor wafers in large quantities.

Mitigation measures

- Through the establishment of Hazardous Substance Free (HSF) management system of materials, we ensured that the produced wafers, rear-end IC packaging, and DIMM module products would conform to the international regulations and related specifications of clients towards HSF management.
 - Completed 24 raw material consumption improvement proposals.
 - Recycled wastes in the plant, for example, copper sulfate waste liquid was directly converted to copper cakes for recycling.
 - Acidic wastes were outsourced for recycling, such as sulfuric acid and phosphoric acid.
 - Dummy wafers were recycled for 8-11 times.



Downstream

Impact sources

- Products required many packaging materials.
- Products contained hazardous substances.

Mitigation measures

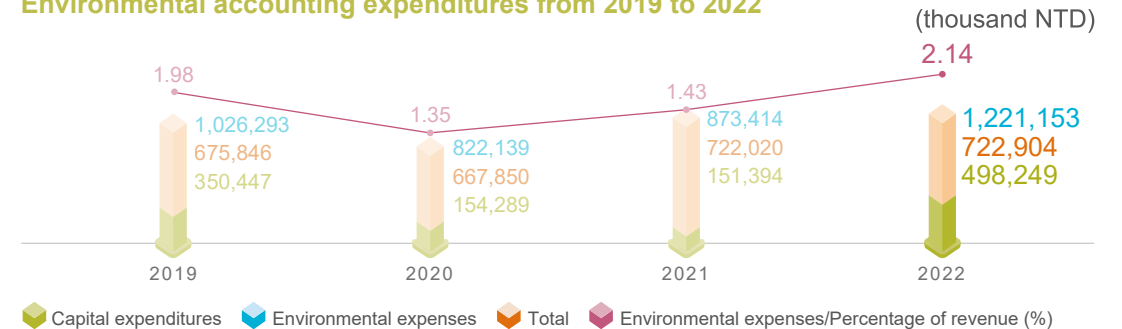
- Clients were encouraged to recycle packaging materials for Nanya to reuse.
- Waste electronic equipment had to conform to the EU's environmental protection directives, including WEEE, RoHS, and EuP.

Environmental Costs and Benefits

Nanya introduced the environmental accounting system in 2008 and the environment benefit accounting system in 2009, which was officially implemented in 2010. The introduction of the environmental accounting system made it possible to access information on the environmental expenditures, assess the benefits of the expenses, and provide the stakeholders with concrete and accurate environmental protection acts. Statistics are compiled for each category of environmental protection expenditures according to the rules established by the Environmental Protection

Administration, and are used for internal management, so that the public will understand the environmental protection efforts of enterprises. According to the consolidated statistics, the environment capital expenditure in 2022 was NT\$498,249 thousand, and the environmental expense was approximately NT\$722,904 thousand, totaling NT\$1,221,153 thousand. Environmental expenditures accounted for 2.04% of our 2022 consolidated revenue of NT\$56.952 billion.

Environmental accounting expenditures from 2019 to 2022



Environmental accounting expenditures in 2022 (thousand NTD)

	Recurrent expenditures	Capital expenditures
Operating costs		
Pollution prevention expenses: air pollution, water pollution, and other pollution prevention costs	564,617	498,249
Global environmental protection expenses: (1) Climate change prevention expenses (2) Other expenses related to global environmental protection	27,842	0
Resource and energy conservation and recycling expenses: (1) increase the efficiency of resource use (2) costs of waste reduction, recycling, and reprocessing (3) Energy expenses saved	111,683	0
Related costs from upstream and downstream of suppliers and customers (1) Green procurement (2) Expenses of providing products for environmental protection	102	0
Management costs (1) Personnel environmental education and training costs (2) Expenses incurred in obtaining external verification (3) Expenses incurred in measuring environmental impacts (4) Other	15,174	0
R&D costs expenses incurred in researching and developing products because of environmental protection	0	0
Social activity costs expenses incurred in improving the environment such as nature protection, afforestation, and landscaping the environment	788	0
Environmental taxation and fees (1) Expenses incurred by air pollution (2) Pollution prevention review fee and certificate fee	2,698	0
Total	722,904	498,249
Total	1,221,153	

Performance of promoting the ISO 14001 management solutions over the years

NT\$: thousand NTD

	2019	2020	2021	2022
Energy (electricity) conservation plan	64,934	52,397	18,166	11,680
Waste reduction program	3,360	234	3,759	0
Program of reducing consumption of process raw materials	5,221	6,865	4,973	8,233
Substantive benefits of industrial waste recycling	10,386	9,564	5,118	13,195
Electricity fees saved owing to low power consumption and advanced processes	697,553	888,574	969,353	1,081,896
Total benefits	781,454	957,634	1,001,369	1,117,026
Records of violating environmental protection regulations	0	0	0	0
Amount of fines for violation of environmental laws and regulations	0	0	0	0
Fines for violation of environmental laws and regulations not yet paid	0	0	0	0

Internal management system audit records in the last four years

ISO 14001 (2019~2022)			
9 cases	Improvement was completed for 9 items, including environmental considerations form not updated, incorrect form version cited, and incomplete spot inspection records.	Case closing rate	100 %
7 cases	Improvement was completed for 7 items, including the environmental considerations form not updated or incorrect form version cited, management deficiencies at the waste storage site, management plan not periodically tracked, and follow up was not completed for new announced regulations.	Case closing rate	100 %
2 cases	Improvement was completed for 2 items, including management deficiencies at the waste storage site and management plan not periodically tracked.	Case closing rate	100 %
9 cases	Improvement was completed for 9 items, including labels in waste storage site not updated, inspection of environmental considerations incorrectly filled in, and significance evaluation incomplete or not updated.	Case closing rate	100 %
ISO 45001 (2019~2022)			
13 cases	A total of 7 defects in integrity of filling in hazard identification forms, accounting for the majority of the defects, followed by 3 defects in failing to send staff to participate in consultations of workers; improvements were all completed.	Case closing rate	100 %
15 cases	A total of 7 defects in failing to comply with criteria for operations and site management, and problems in appropriateness of automated checklist content, accounting for the majority of the defects, followed by 4 defects in management of equipment cabinets for emergency response; improvements were all completed.	Case closing rate	100 %
6 cases	Improvements were completed for incomplete hazard identification forms and regulation identification forms, as well as abnormal maintenance of environmental detectors.	Case closing rate	100 %
29 cases	Improvements were completed for hazards identification form incomplete, insufficient training, documents not updated, risk control measures inadequate, deficiencies in drills not included in amendments to regulations, and insufficient follow-up on abnormal events.	Case closing rate	100 %