

Air & water pollution prevention 102-12, 102-15, 103-1



Protect human health and the natural environment by preventing pollution of water and air through the manufacture or use of our products.



Kao's creating value to address social issues

Social issues we are aware of

It goes without saying that air pollution, water pollution and soil pollution can have a significant negative impact on human health, on agricultural crops and other plants, and on ecosystems.

Atmospheric pollutants such as nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter (PM) and volatile organic compounds (VOCs) are known to increase the prevalence of pulmonary diseases such as asthma. Most atmospheric pollutants derive from burning of fossil fuels or usage of organic solvents. Worldwide, around 8.8 million people die prematurely each year because of atmospheric pollution. In Europe alone, the figure is believed to be over 790,000 (according to a study by the University of Mainz in Germany). At the same time, in recent years there has been a trend for indoor spaces to be made as airtight as possible in an effort to make homes more energy-efficient. As a result, chemical substances in indoor spaces remain in those spaces for long periods, and their concentration levels rise. A report (by Yokohama National University in Japan) suggests that this can have a negative impact on human health.

The vast majority of living organisms, including human beings, cannot live without water. Humans

also need access to sanitary water in order to maintain Kirei Lifestyles. The main cause of water pollution is various substances contained in wastewater from factories and household sewage.

Negative impacts on human health resulting from soil pollution include the effects of both direct contacts with polluted soil by touching it or eating it and indirect contacts by using groundwater that has been polluted with harmful substances that have leached out from polluted soil. Significant characteristics of soil pollution include the fact that, once soil pollution starts to occur, harmful substances can accumulate in the soil over a long period, and the fact that people are less likely to be aware of soil pollution than they are of air pollution and water pollution.

We need to speed up the initiatives we are taking, and expand their scope in order to realize the SDGs by 2030. At the United Nations in January 2020, we will start the Decade of Action in relation to the achievement of the SDGs.

Kao's creating value

We are working to prevent air pollution and water pollution in the areas near Kao production plants by reducing emissions of atmospheric pollutants such as

NOx, SOx and VOCs from our plants and reducing organic matter and other substances in wastewater discharged from our plants, by complying faithfully with the relevant laws and regulations in each country and region in which we operate, and by setting reference values that are even more rigorous than those required by law to strictly manage pollutants.

We propose various products for air pollution in Chemical, paying attention to maintain the health of people working around the world.

In order to ensure the groundwater used by locals is not polluted, we periodically survey the soil conditions at each plant for water pollution.

Additionally, we propose various products to help prevent water pollution in all our business units for household, commercial-use and chemical products.

Contributions to the SDGs



- Contents
- Editorial Policy
- CEO Message
- Kirei Lifestyle Plan KPI definitions
- Independent assurance report
- Kirei Lifestyle Plan
- Making my everyday more beautiful
- Making thoughtful choices for society
- Making the world healthier & cleaner
- Walking the right path



Risks and opportunities related to realization of What Kao Aims to Be by 2030

Items		Content
Risks	Transitional risk	Policies, laws and regulations Various policies and legal restrictions on air and water will be enacted, management costs may increase to comply with them. Investing in better facilities and developing of new technologies to comply with policies and regulations will mean higher equipment and operating costs, which could negatively impact our profitability. Additionally, the delayed production schedule could negatively impact sales, if national and local governments are urged to pass restrictions on operations due to the state of air pollution in areas where our plants are located and the state of water pollution from plant wastewater discharged in public water. Examples of possible policy or regulatory restrictions • Air pollutant regulations • Regulations on substances depleting the ozone layer • Plant wastewater regulation • Regulation of use of chemical substances in products • Product labeling programs for environmental performance or chemical substance
		Technology Increasing R&D expenses to address the risks posed to the air and water will mean higher operating costs, which could negatively impact our profitability. Risk of failing to increase sales if technologies developed do not work out
		Markets When regulations on air pollutants are tightened at a national or regional level, demand for chemical products that contain few or no substances causing air pollution (like organic solvents) increases, whereas sales for conventional chemical products are at risk of decline. When regulations on water pollutants are tightened at a national or regional level, demand for commercial-use products that contain few or no substances causing water pollution (like alkali) increases, whereas sales for conventional commercial-use products are at risk of decline. Sales could be negatively impacted if technological capabilities for products in development are not on a par with market demands.
		Reputation Our brand owner's reputation is at risk of decline due to so-called fragrance pollution from scents in fabric softeners and others.
	Physical risk	Acute Our plants may suspend operations and be unable to continue manufacturing products due to air pollution from forest fires or water pollution from oil tanker accidents. Similar conditions at suppliers' plants could make it impossible for us to procure raw materials, with the risk that we could not continue manufacturing products. There is also the risk that supply chains, from suppliers to our plants, and from our plants to our customers, could be interrupted. These risks, meaning that we could no longer supply our products to the market, would negatively impact sales, and if such risks actually materialized, would require special measures at additional cost, thus reducing our profits. In addition, if restrictions for large-scale air and water pollution significantly impact on the lives of consumers, consumption might fall, which would negatively impact on sales.
Chronic There's a risk that production may be unable to increase at the rate required for future growth due to our plants or supplier's plants being located in areas where air and water pollution are likely to become more severe.		
Opportunities	Resource efficiency Optimizing logistics and reducing the distances that trucks are travelling without loads will curtail emissions of air pollutants and lower transportation costs, which means improved profits.	
	Products, services PM, an air pollutant, has health consequences and in terms of beauty, is one of the causes of dull skin. The coal-fired power generation is expected to decline, decreasing the amount of PM in the atmosphere in the medium to long term with the objective to reduce greenhouse gas emissions. However, PM disappearing from all regions around the world is expected to take some time, which presents an opportunity for products that respond to PM in Beauty care and Fabric and home care. In the industrial sector, there are opportunities for chemical products that reduce organic solvents and dust causing air pollution at worksites. Many of our products are discharged into the water environment after use. Surfactants powerful enough to reduce the usage of surfactants, highly biodegradable polymers and alkali-free professional-use detergents offer an environmental value that improves water environments.	
	Markets The manifestation of air pollution caused by PM presents increased sales opportunities by attracting attention to consumer products that respond to PM. Strengthened regulations on worksite organic solvents and dust present an opportunity to expand demand for chemical products that comply with such restrictions.	
	Resilience Ongoing measures for air pollution and water discharge pollution at plants help increase our resilience to issues with air and water quality in terms of product manufacturing. In addition, the resilience of our businesses needs to be improved with activities suggesting new products by predicting consumer trends based on consumer feedback from the last 60 years or more and a database built for more than 40 years.	

Policies

We utilize a wide range of chemical substances in our products, from home-use products to industrial products, and we continue to implement activities to minimize negative impacts of chemical substances at every stage from development to post-use disposal.

In our Basic Principle and Basic Policies on Environment and Safety, we undertake to “assess environment and safety aspects throughout the entire lifecycle of the products, from manufacture through disposal, when developing products and technologies” and to “offer products with a lower environmental burden.” Furthermore, the Kao Responsible Care Policy contains the following declarations: “We shall ... strive to develop technologies and bring to market products that reduce our impact on the environment, thereby contributing to the peace of mind of our business customers and consumers” and “We shall strive to continue to reduce the environmental impact of our business operations by ... disposing of wastewater and waste gas appropriately.”

Our Environmental Statement embodies our commitment to ensuring that “Kao products utilize original Kao-developed technologies to minimize the impact they have on the environment, not just in the manufacturing process, but in the daily life of the customers who use them. From materials procurement and manufacturing, to distribution, sales, use and final disposal, we want to engage in ‘eco together’ with stakeholders and consumers worldwide.”



Kirei Lifestyle Plan

Making my everyday more beautiful

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Walking the right path



- Basic Principle and Basic Policies on Environment and Safety
www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/environment-safety-principle-policies.pdf
- Kao Responsible Care Policy
www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/responsible-care-policy.pdf
- Kao Environmental Statement
www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/environmental-statement.pdf

Education and promotion

We recognize the importance of giving our employees who handle chemical substances a variety of opportunities to obtain knowledge about the relationship between our business activities and products and air and water pollution, and to actively engage in pollution prevention activities of their own accord. We have created many opportunities for employee education accordingly.

Our employees take responsibility for air and water pollution prevention activities at plants and R&D on low VOC products and highly biodegradable products. Strengthening employees' air and water quality awareness helps to enhance the overall level of Kao's activities in this area. A further point is that employees are also consumers, and in their role as consumers it is important that they take steps to prevent air and water pollution.

Specifically, we conduct environmental education including on air and water pollution prevention for all employees as part of our Responsible Care activities.

We also provide education encompassing the importance of legal compliance pertaining to air and water pollution to all employees working at plants and research institutes that have obtained ISO 14001 or RC 14001 certification.

Collaboration and engagement with stakeholders

We recognize that, in order to help consumers realize the Kirei Lifestyle, it is vital for us to deepen mutual understanding with a wide range of stakeholders and collaborate with them, by developing two-way communication.

As the substances generated by our production activities that lead to air and water pollution have an impact on local communities, having good communication with local communities is also vitally important. Many of our plants compile an annual environmental report, and communicate with local residents.

Emissions of substances linked to air pollution and water pollution, which are from business activities, are regulated by government agencies. We have established our own voluntary management criteria which are even more rigorous than the statutory requirements, and we comply with these to monitor pollutants. Additionally, we continue to conduct water quality surveys not as a single company but as an industry group.

Distribution initiatives are required to help make improvements to air pollution. We are taking part in programs established by the Cabinet Office in collaboration with other companies in this industry.

Consumer behavior needs to change in order for

consumers to attain the Kirei Lifestyle. We provide opportunities to think about the Kirei Lifestyle through visits to museums and plants that take as its theme the water that all consumers use daily. For example, the Eco-Lab Museum has displays on household sewage and wastewater treatment.

Smart Distribution in partnership with Lion Corporation

We are participating in the Cross-ministerial Strategic Innovation Promotion Program (SIP) promoted by Cabinet Office. We started regular shuttle deliveries between Kao and Lion Corporation in October 2020. This new initiative will reduce the distances that trucks are travelling without loads, by comparison with conventional transportation methods, and is expected to result in a 45% reduction in air pollutants emissions for both companies combined.

Framework

Emissions of pollutants into the air or into bodies of water in relation to our business activities, and the current state of progress in addressing this issue, are managed under our Responsible Care promotion system.



- Responsible care activities / Framework
www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/sus-db-2021-e-all.pdf#page=28



- p. 18 ESG promotion structure

Air & water pollution prevention 103-2, 103-3



- Contents
- Editorial Policy
- CEO Message
- Kirei Lifestyle Plan KPI definitions
- Independent assurance report
- Kirei Lifestyle Plan
- Making my everyday more beautiful
- Making thoughtful choices for society
- Making the world healthier & cleaner
- Walking the right path

Mid- to long-term targets and performance

2025 mid-term targets

Index	Scope	2025 targets
% of plants which disclose VOC and COD emissions	All Kao Group sites	100% disclosure

Anticipated benefits from achieving mid- to long-term targets

Business impacts

Disclosing VOC and COD emissions pertaining to our business activities will improve the transparency of occupational safety measures and pollution measures. Maintaining employees' health and mitigating risks posed by pollution will contribute to lowering operational costs and improving profitability.

Social impacts

We anticipate that disclosing VOC and COD emissions pertaining to our business activities and engaging in an ongoing dialogue about this will improve communication with the residents around our plants and lead to reduced reputational risks concerning these emissions throughout society.

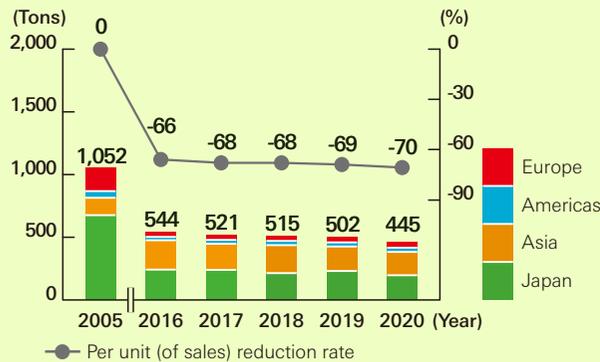


Performance in 2020

Performance*

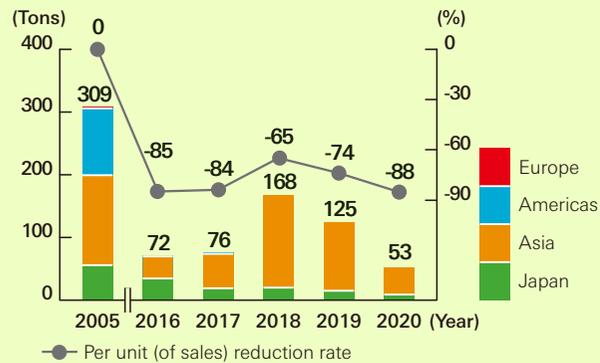
* Per unit of sales is calculated based on Japanese GAAP in FY2005, and on International Financial Reporting Standards from FY2016 onwards.

NOx emissions (all production sites)



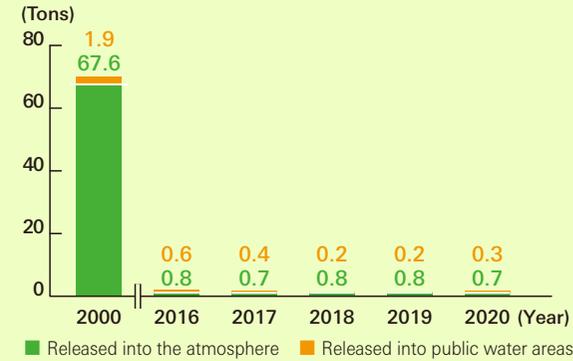
* Boundary: All Kao Group production sites
* Assurance provided for NOx emission figures

SOx emissions (all production sites)



* Boundary: All Kao Group production sites

Total emissions of chemical substances subject to the PRTR system



* Boundary: All Kao Group production sites in Japan

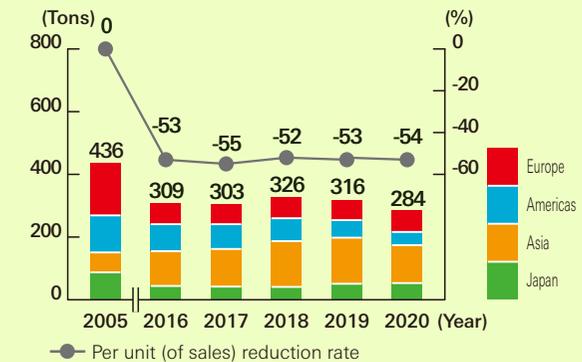
Emissions of VOCs

Although we have no facilities subject to the VOC emission regulations provided in the Air Pollution Control Act, we work to voluntarily cut VOC emissions.

For the 100 VOC substances defined in the notice issued by the Director General of the Environmental Management Bureau, Ministry of the Environment, we set voluntary targets on the annual atmospheric emissions from each plant for each substance (5 tons or less in 2005, 3 tons or less in 2009, 1 ton or less in 2010), conducted emission reduction activities and accomplished our targets. We are managing VOC emissions with the current target of maintaining our activities.

The group in Japan handled 33 types of VOCs in quantities over 1 ton in 2020, with total emissions into the atmosphere of 6.2 tons.

COD pollution load (all production sites)



* The amount of COD pollution load for wastewater entering sewer systems takes into account the removal rate from sewer systems.
* Assurance provided for COD pollution load

Compliance with environmental legislation

In 2020, there was an omission of the notification for minor changes to wastewater treatment facilities (sludge dewatering facilities) at the Kawasaki Plant, an omission of the regular inspection of the dust collector at Kao Specialties Americas LLC and insufficient water flow in the scrubber water (fine of 146,000 yen), and a leakage of ammonia water at Quimi-Kao, S.A. de C.V. (fine of 460,000 yen).

Compliance status with environmental laws and regulations

Category	Unit	2018	2019	2020
Number of violations*1	incidents	4	0	4
Of which, number of leaks	incidents	1	0	1
Total fines*2	1,000 yen	644	0	607
Of which, number of leaks	1,000 yen	0	0	460

*1 All incidents detected by authorities during the reporting period
*2 Fines paid during the reporting period



Our initiatives

Initiatives to prevent air pollution

Efforts at plants

Compliance with laws and regulations

The amounts and densities of pollutants emitted into the atmosphere are regulated by government agencies. We have established our own voluntary management criteria which are even more rigorous than the statutory requirements, and we comply with these to monitor pollutants.

Using cleaner fossil fuels

As burning of fossil fuels is accompanied by emission of NOx, SOx, PM, etc., we use natural gas—which is a clean fossil fuel—at all plants outfitted with the necessary infrastructure. Our plants do not use any coal.

Reducing emissions of chemical substances subject to the Japanese PRTR system

We began activities in this area by setting a voluntary target for annual emissions of one ton or less for each substance from each plant in FY2000. We achieved this target in FY2002. Since then, we have continued to achieve this voluntary target, excluding leaks of chlorofluorocarbon and similar emissions.

The number of chemical substances subject to the Japanese Pollutant Release and Transfer Register (PRTR) system of which we handled over 1.0 ton in 2020 was 72, and the total discharge of such substances into the atmosphere and public water areas was 1.0 ton. In addition, we are voluntarily monitoring and controlling releases and transfers (in

the same way as would be done for chemical substances subject to PRTR) of chemical substances that the Japan Chemical Industry Association has specified as being subject to voluntary surveys.

Reducing emissions of VOCs

Our production plants outside Japan include some plants where they have not been possible to monitor VOC emissions, or where the emissions are relatively high. We are working to monitor and reduce VOC emissions at these plants.

Initiatives taken in relation to logistics

Smart Distribution in partnership with Lion Corporation

We are participating in the SIP promoted by Cabinet Office. We started regular shuttle deliveries between Kao and Lion Corporation in October 2020. This new initiative will reduce the distances that trucks are travelling without loads, by comparison with conventional transportation methods, and is expected to result in a 45% reduction in atmospheric pollutants emissions for both companies combined.

Initiatives taken in relation to our products

LUNAJET water-based pigment inkjet ink

Using the pigment nano-dispersion technology that we had previously developed, we successfully developed LUNAJET, the world's first water-based pigment inkjet ink, featuring a VOC-free design* which ensures that only very small quantities of VOCs

are emitted during printing operations, thereby helping to prevent air pollution and also making a major contribution toward improving the working environment of printing workers. We also confirmed that this water-based pigment inkjet ink technology can be applied to water-based gravure-printing ink.

* VOC-free design: "VOC-free" is defined as emitting less than 700 ppmC (in carbon conversion terms) of VOC during the printing process.

VOC is a collective term for organic compounds that are volatile and are transformed into gaseous form in the atmosphere. In Japan, VOC emissions are regulated by the revised Air Pollution Control Act.

Visco Top UT thickener for concrete spraying construction

We developed then launched full-scale sales for Visco Top UT thickener which significantly decreases dust generated when spraying concrete for mountain tunnel construction. Visco Top UT is able to substantially reduce the amount of dust generated even when using powder accelerator, which tends to stimulate dust dispersion. With only half as much thickener as would be needed with a conventional dust reducer, the dust concentration level can be reduced to 2mg/m³ or less (as recommended by the new dust guidelines that came into effect in April 2021). This is registered in NETIS*, the new technology provision system (Number: KT-200035-A) and is anticipated to be utilized in the various tunnel construction commissioned by national and local governments.

* NETIS: Database system operated with the objective of the Ministry of Land, Infrastructure, Transport and Tourism sharing and providing information on new technologies



Initiatives to prevent water pollution

Initiatives taken in relation to product development

In product development, we incorporate considerations for impacts on the water environments of discharged water after product use. More specifically, we have investigated the biodegradability of raw materials that may be discharged into the environment and their impacts on common aquatic organisms using river water and activated sludge used at wastewater treatment plants. Through this investigation, we are actively promoting the development and use of raw materials with reduced environmental impact. We also plan to use AI and other technologies to investigate chemical substances with high environmental compatibility.

Efforts at plants

Compliance with wastewater related laws and regulations

The amounts and / or densities of pollutants discharged into rivers, the ocean and sewage systems are regulated by government agencies. We have installed and conduct high-level maintenance and management of wastewater treatment facilities at many plants. After properly treating plant wastewater, it is discharged outside the plant. We have established our own voluntary management criteria which are even more rigorous than the statutory requirements, and we comply with these to monitor pollutants.

Surveys of groundwater and soil contamination

In light of our past history of chemical substance use, every year we voluntarily measure the levels of substances regulated by environmental standards in

the groundwater within plant premises.

Initiatives relating to wastewater after product use

We are focusing on understanding the actual situation in relation to wastewater discharge after product use and we are conducting our own field surveys on an ongoing basis, such as environmental monitoring of river water to get an idea of the ecological risks of chemical substances.

To respond to globalization, we collaborate with experts to verify the effectiveness of mathematical models and develop new models for monitoring environments outside Japan and predictions of chemical substance concentration in rivers, aiming to ensure our business activities are environmentally friendly on the local environment. Recently in Japan, we are analyzing in detail the impact of chemical substances on ecosystems using data gathered from the river environment.

We are also participating in environmental monitoring that has been undertaken by the Japan Soap and Detergent Association since 1998. Currently we assess the environmental risks posed to ecosystems targeting four major surfactants in municipal rivers (measured four times per year at seven sites in four rivers). In the surveys conducted so far, the results show that these surfactants have consistently low risks to aquatic organisms.

Initiatives taken in relation to our products

Visco Top high-performance specialty thickener

When undertaking civil engineering work near water (for example, on riverbanks or on the coast), it is vitally important that measures are taken to protect

the water from being contaminated. In the case of bridge pier construction for long bridges or suspension bridges that cross ocean straits, because the piers are actually built in the riverwater or seawater, special underwater concrete that has high viscosity and is resistant to washout is used. Furthermore, when construction is undertaken near underground watercourses, care must be taken not to contaminate the groundwater. For work in this kind of water-related environment, the use of additives to increase the viscosity of inorganic materials such as grouting materials and concrete can enhance underwater anti-washout performance.

We have developed *Visco Top*, a high-performance specialty thickener that provides un-precedented viscosity for grouting materials and concrete, and makes it possible to undertake construction work without polluting the riverine or ocean environment. *Visco Top* has been also used in the removal of high concentration contaminated water from trenches at the Fukushima Daiichi Nuclear Power Plant.



Without the addition of *Visco Top*

With the addition of *Visco Top*

Air & water pollution prevention



***Smash* alkali-free commercial use detergent**

Alkali detergent used for hard-to-remove kitchen stains must adjust (neutralize) its pH when the cleaning liquid is discharged to prevent water pollution, whereas neutral detergent without alkali generally doesn't have sufficient cleaning effects.

Smash, the newly debuted kitchen oil stain detergent, works safely with a neutral formula that has the same cleaning power as an alkali detergent, and contributes to preventing water pollution with its gentle ingredients.



Smash kitchen oil stain detergent

Employees' voice

For the safety and security of all people working with food

Noboru Matsuo

(Photo on the left)
Household Products Research
Division 5
Kao Corporation



When our researchers visited customers' kitchen worksites, they noticed that some inexperienced foreign workers were cleaning with alkaline cleaning agents without knowing the danger (chemical burns). Therefore, we decided to develop a new detergent that cleans safely no matter who does the work, and provides a desirable finish. This strong desire triggered diligent research, which was able to break through several technology barriers to create *Smash*.

Going forward, we will take on the challenge to neutralize alkali in our cleaning and sanitary operations taking into consideration the safety and security of all people working with food.

- Contents
- Editorial Policy
- CEO Message
- Kirei Lifestyle Plan KPI definitions
- Independent assurance report

- Kirei Lifestyle Plan
- Making my everyday more beautiful
- Making thoughtful choices for society
- Making the world healthier & cleaner
- Walking the right path



Stakeholder engagement

Assessments and expectations for Kao's initiatives on prevention of air and water pollution



Kenji Furukawa

Professor Emeritus
Kumamoto University

Kao's sincere activities to prevent air and water pollution based on its corporate philosophy can be found out by reading the Kao Sustainability Data Book. Below I'd like to comment on Kao's initiatives to prevent air and water pollution.

Initiatives to prevent air pollution

Exhaust gas measures are necessary when using fossil fuels during manufacturing. While NOx emissions have steadily been reduced, SOx emissions are increasing or decreasing at production sites in Asia, which is of concern.

VOC emissions have been drastically reduced compared to 2000 by Kao voluntarily setting reduction targets for VOCs. These VOC measures have only been adopted at domestic plants for now, but overseas plants should promptly implement these measures.

Initiatives to prevent water pollution

Plant wastewater is treated by wastewater treatment facilities at or below effluent standards and discharged into public waters. Regulations on the total emissions of COD, nitrogen and phosphorous are in place when plant effluent is discharged into a closed water area. Kao has established its own voluntary management criteria, which are even more stringent than the regulated levels.

As a company handling multiple varieties of chemicals, Kao is required to treat wastewater to a level that can be used as recycled water. Although there's little fear of water resource shortages in Japan, recycling of treated wastewater should be considered as a countermeasure for droughts that may occur with climate change.

Reduction of sludge production by using Tubifex worms

In the activated sludge process commonly employed for the treatment of plant wastewater, half of the influent organic matter is converted into carbon dioxide gas through catabolism with activated sludge microorganisms, and the remaining half is converted into sludge through anabolism. Part of the settled sludge is withdrawn as excess sludge to maintain a level of activated sludge concentration able to separate solids and liquids in the settling tank. At Kao, the dehydrated excess sludge is disposed of by incineration. As the required cost for excess sludge treatment is comparable to the cost for wastewater treatment, various measures are in place to reduce the amount of excess sludge (sludge reduction).

Kao conducted bench-scale treatment tests at the

Wakayama Plant in collaboration with the Industrial Technology Center of Wakayama Prefecture (WINTEC), focusing on methods developed by WINTEC to reduce the weight of excess sludge by using Tubifex worms, which are at the top of the food chain in activated sludge treatment and live inside pile fiber sheets, a local specialty of Wakayama, placed in the activated sludge tank. Because Kao has already confirmed the effectiveness of this method, I anticipate the practical application of this treatment method after verifying its cost-effectiveness.

Finally

Nowadays, the trend of conscious consumption is on the rise, with Generation Z purchasing products with an ESG perspective even if they are slightly more expensive. I hope that Kao continues developing products with an even lower environmental footprint taking into account this recent trend.