



Initiatives for Environmental Protection

Nippon Kayaku is committed to achieving a balance between the efficiency of production and reducing its impacts on the environment. For this reason, we consider environmentally friendly management to be an important task. We are now striving to achieve the various environmental targets we have set.

We are working to improve facilities and treatment processes in order to use energy and exhaust gas including green house gas emissions more efficiently and to lower the amount of substances released from effluent and waste that impact the environment. We have added some disclosure items according to GRI (Global Reporting Initiative) this year.

Promotion of Environmental Protection Activities

Nippon Kayaku has established specific numerical targets as one aspect of the mid-term environmental targets it has set for fiscal 2020, and with these targets in mind, we are now implementing activities for environmental protection. Also, to achieve these targets, we are working to reinforce our responses to natural disasters as well as promoting the development and improvement of wastewater treatment technologies.

Results of the Mid-term Corporate Plan for the Environment

Nippon Kayaku has established a mid-term corporate plan for the environment for the period running from fiscal 2011 to fiscal 2020 that consists of six items covering three areas. Fiscal 2019 was the 9th year of this plan. At present, we are currently formulating new mid-term environmental targets for fiscal 2030, mainly in response to climate change.

The scope of reporting covers Nippon Kayaku (non-consolidated).

Mid-term Corporate Master Plan for the Environment (FY 2011 - FY 2020)

	Prevention of Global warming	Prevention of Global warming		Reduction of waste		
	Energy Derived CO ₂ Emission ^{※1} (Production Divisions+ Operation Divisions)	VOC ^{※2} Emissions	COD ^{※3} Emissions	Total waste produced	Recycling Rate	Zero Emission Rate ^{※4}
Fiscal 2018 results	69.2 thousand tons	28.6 tons	145.2 tons	23,204 tons	84.4% <small>Displacement outside of the factory 20,080 tons of which final disposal volume 870 tons</small>	3.6%
Year-on-year	Decreased 0.7%	Increased 11.8%	Increased 9.8%	Increased 8.0%	Increased 3.0 point	Decreased 0.4 point
Target value for fiscal 2020	Under 79.5 thousand tons	Under 42 tons	Under 150 tons	Under 23,500 tons	More than 80%	Under 3.0%

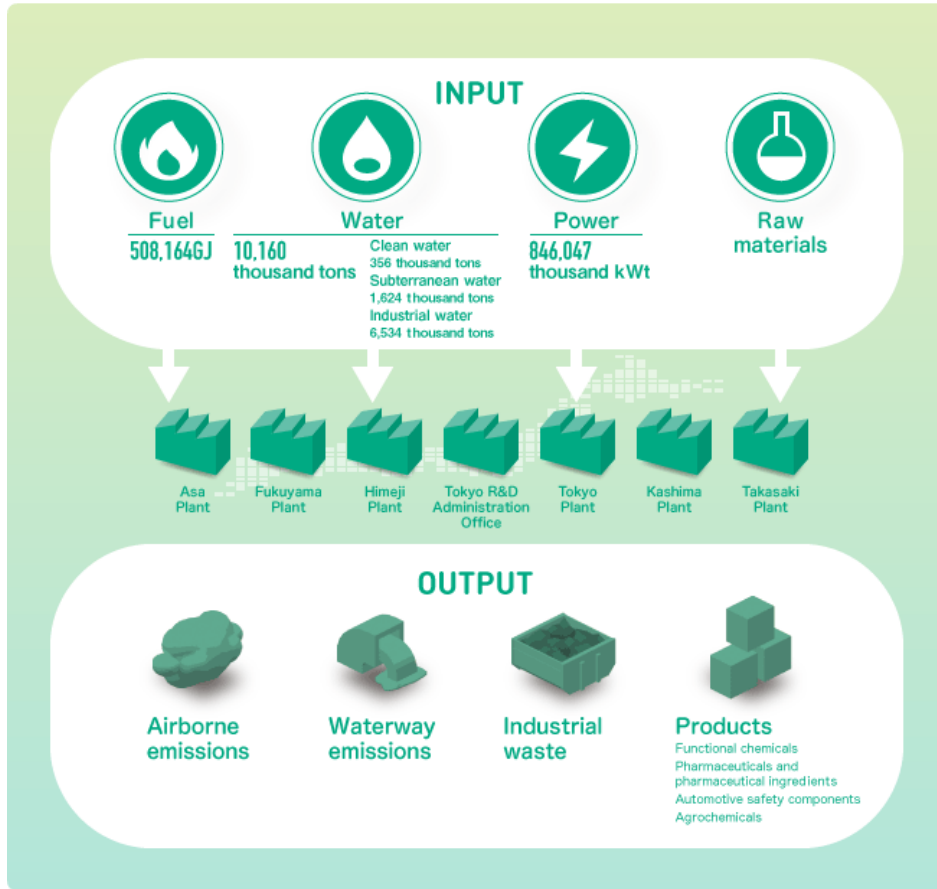
※1 Energy-derived CO₂ emissions: Japanese Government policy is to reduce these emissions by 3.8% versus 2005 (82.6 thousand tons).

※2 VOC: Volatile Organic Compounds (VOCs). This tally includes all chemical substances of reporting regulation, emitted into the atmosphere.

※3 COD: Chemical Oxygen Demand. An indication of the amount of oxygen needed to oxidize a subject compound under a predetermined condition using oxidizing agents.

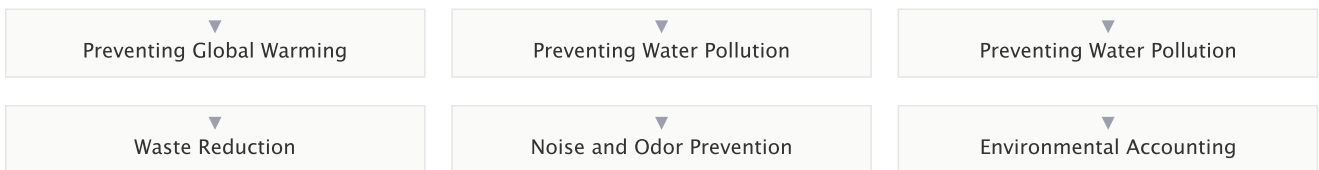
※4 Zero emission rate: The amount of internal and external landfill waste produced as a percentage of total waste produced.

● Overview of business activities and environmental impacts



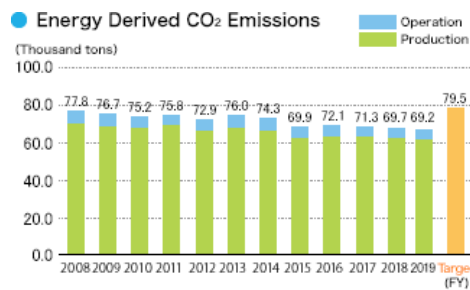
Results of Our Efforts to Reduce Environmental Impacts

As part of its effort to reduce environmental impacts, Nippon Kayaku focuses on preventing air, water and noise and odor pollution as well as stopping global warming and reducing waste.



Preventing Global Warming

At each business site, we have been working on energy conservation measures such as improving the operation of utility equipment, replacing it with high efficiency equipment, and changing to LED lighting. Energy-derived CO₂ emissions have been changing as shown below, and are declining year by year.



■The Nippon Kayaku Group has been investigating and tabulating the energy saving activities of each group company since fiscal 2011.

> [FY2019 Energy saving activity summary sheet of Nippon Kayaku Group](#)

About climate change

The “Paris Accords” adopted at COP21* held in 2015 aims to maintain the average temperature rise of the world before the Industrial Revolution to “below 2°C” and to tackle “below 1.5°C”. In addition, based on this agreement, each country promises national CO₂ emission reduction targets. The Nippon Kayaku Group set the target range for reducing CO₂ emissions from energy sources as only Nippon Kayaku in the fiscal 2020 Medium-Term Environmental Targets, but the new Medium-Term Environmental Targets by fiscal 2030 will expand to the entire Nippon Kayaku Group including overseas bases. We will continue to work on climate change to reduce CO₂ emissions that cause global warming.

* COP21: 21st Conference of the Parties to the United Nations Framework Convention on Climate Change. As a new framework after the Kyoto Protocol, which expires in 2020, all 196 countries have adopted the Paris Agreement held in the suburbs of France.

Disclosure of CO₂ emission data (Scope 3) throughout the supply chain

In recent years, there has been an increasing trend for companies to grasp and manage CO₂ emissions in the entire supply chain, which are indirectly emitted, and disclose them externally. Nippon Kayaku is calculating not only Scope 1 and Scope 2 that have been aggregated and managed until now, but also calculation of CO₂ emissions “Scope 3” in the supply chain. Currently, Nippon Kayaku’s non-consolidated basis is being calculated, but in the future we plan to expand the range to include domestic and overseas group companies. We will continue to collect and manage data based on the guidelines of the Ministry of the Environment to systematically reduce CO₂ emissions throughout the supply chain.

[Scope 1] GHG emissions generated from emission sources owned or controlled by the business operator (fuel use, emissions from manufacturing processes, etc.)

[Scope 2] Indirect GHG emissions from the use of electricity, heat and steam supplied from other companies (use of purchased electricity, etc.)

[Scope 3] Indirect emissions other than Scope 2 (procurement of raw materials, employee commuting, business trips, waste processing consignment, product use, disposal, etc.)

Categories		Emissions (Thousand tons-CO ₂ e)	
		2017	2018
1	Purchased goods and services	57.0	53.7
2	Capital goods	18.3	22.6
3	Fuel- and energy-related activities (not included in scope 1 or scope 2)	7.9	7.9
4	Upstream transportation and distribution	8.6	8.3
5	Waste generated in operations	16.0	16.5
6	Business travel	0.3	0.4
7	Employee commuting	0.7	0.8
8	Upstream leased assets	0.8	0.7
9	Downstream transportation and distribution	0.7	0.7

Categories		Emissions (Thousand tons-CO ₂ e)	
		2017	2018
10/11	Processing / use of sold products	Not covered	Not covered
12	End-of-life treatment of sold products	8.9	8.4
13	Downstream leased assets	0.4	0.4
Scope 3 total		119.7	120.4
Scope 1		30.8	29.2
Scope 2		43.1	42.9
Scope 1+2+3 total		193.5	192.5

Calculation method: Calculated using the emission factors described in the basic guidelines of the Ministry of the Environment and the Ministry of Economy, Trade and Industry in principle.

※ fiscal 2019 data is under calculation (as of June 2020)

Promoting the Adoption of Material Flow Cost Accounting (MFCA)

To date, Nippon Kayaku has been trying to reduce its burden on the environment by making its production processes more energy-efficient and conserving resources, and now it is working toward the adoption of material flow cost accounting (MFCA) by taking its environmental burden-reducing initiatives as an opportunity for “environmental management.” Adopting MFCA will help us to identify energy losses and material losses in the production process, and this will make it possible for us not only to continuously reduce the environmental burden of our production activities but also to come up with ways to lower our costs.

Since the second half of fiscal 2018, Nippon Kayaku has been working on adopting MFCA for certain products at its Fukuyama Plant, and some results have been achieved. In fiscal 2019, we also adopted MFCA at our Tokyo Plant and our Asa Plant. We plan to expand MFCA to other plants in the future so that we can further promote energy and resource conservation.

Himeji Plant Introduction of a Photovoltaic System

The electricity situation for the Himeji Plant has changed a great deal since before the Great East Japan Earthquake as follows.

- 1. Electricity supply shortages are forecast every year for the Kansai Electric Power Company service area during the summer months because of lost capacity from the shutdown of nuclear power plants, and so customers have been asked to reduce their electricity usage during peak times**
- 2. The minimum necessary electricity needed to contact customers and other related stakeholders during a major disaster is required as part of its BCP measures**

The Himeji Plant began operating a power generation system combining a photovoltaic system and lithium-ion batteries in April 2014 to satisfy the following three conditions.

- 1. Use of a system that can reduce the plant's electricity usage during time of peak demand in non-emergency situations**
- 2. A system that can operate even when external lifelines are cut off**
- 3. A system that can ensure the minimum operations of indirect and sales departments in case of a blackout from a major disaster**

The capacity of each component of the system is as follows.

- **Photovoltaic system: 54kW generating capacity**
- **Lithium-ion batteries: Output of 30kVa**

After putting the system into operation, the Himeji Plant has been able to reduce its use of electricity by up to 50kW during peak demand times in the summer. Additionally, the Himeji Plant was forced to initiate an emergency shutdown due to a nearby accident in December 2014. The photovoltaic system and lithium-ion batteries operated as normal and supported the operations of indirect



and sales departments. In the future, the Himeji Plant will increase the number of solar panels and take further steps for its BCP and energy saving activities.

Click to show the other activities

Activities by Kayaku Safety Systems de Mexico, S.A. de C.V. (KSM) to Reduce its Environmental Impacts

Activities by Kayaku Safety Systems de Mexico, S.A. de C.V. (KSM) to Reduce its Environmental Impacts

KSM is working on a number of themes for improving the environment, including reducing its use of energy to lower its green gas emissions.

In fiscal 2016, KSM replaced its exterior lighting facilities on the western side of its property. Until then, it had used 400 watt bulbs for exterior lighting, but KSM replaced all of these bulbs with ten 32 watt and twelve 57 watt photovoltaic lights.

This will reduce energy consumption by 32,000kW a year over the 10-year life of the photovoltaic panels. Converting this to environmental impacts, KSM reduce CO₂ emissions by 15 tons, which is the same as reducing coal consumption by 16 tons. By 2018, KSM plans to reduce the amount of electricity it purchases from the Federal Electricity Commission in Mexico by 5%, and then reduce it by another 1% each year until 2023 to reach the goal of a 10% reduction.

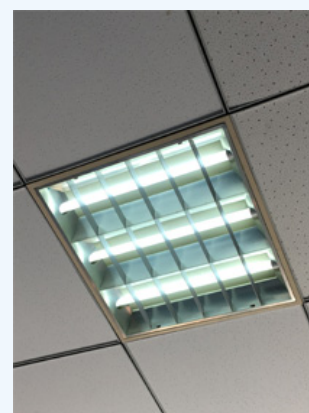


Wuxi Advanced Kayaku Chemical Co., Ltd. (WAC) Switching to LED lighting

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WAC is a Nippon Kayaku subsidiary established in Wuxi City, China in 1996 that manufactures synthetic dyes for textiles and paper. Starting in fiscal 2016, WAC began gradually switching out fluorescent lighting to LED lighting, and thus far it has replaced a total of 362 fluorescent bulbs with LED lights.

These 36 watt fluorescent bulbs were replaced with two hundred fifty 15 watt and one hundred twelve 20 watt LED lights. Simulations show that using these LED lights for eight hours will lower WAC's annual usage of electricity by about 20,000kW. This is equivalent to approximately 6.6 tons of coal used to produce this power. This will also lower WAC's annual carbon footprint by about 17 tons. WAC is committed to working to further reduce its electricity usage as well as maintaining and improving the natural environment.



Rolling Out Eco-friendly Sales Vehicles

Rolling Out Eco-friendly Sales Vehicles

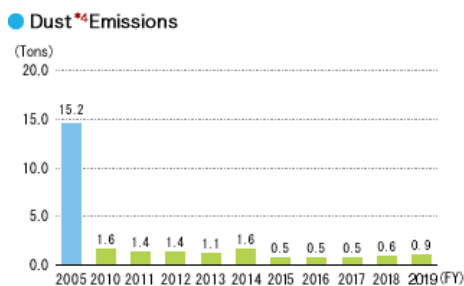
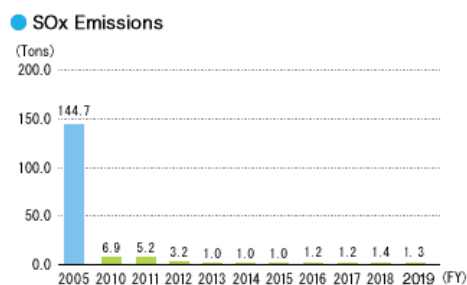
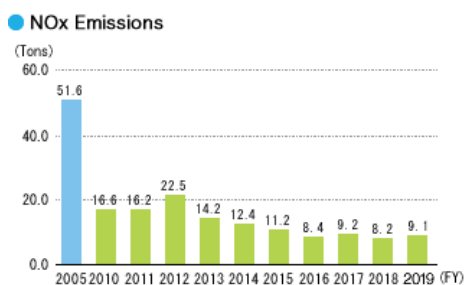
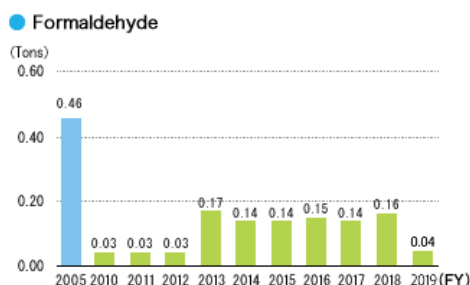
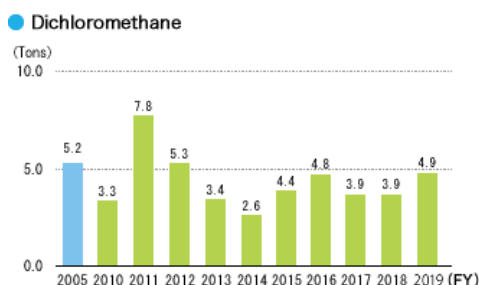
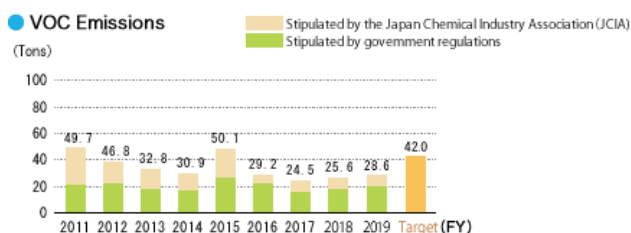
Information on efficacy and safety is essential to ensuring that patients use our pharmaceutical products correctly. Nippon Kayaku stations medical representatives (MR) throughout Japan in order to gather and provide information on our proprietary pharmaceuticals by visiting medical institutions in person. All of the company-owned sales vehicles used by these MR in their daily visits were recently switched over to eco-friendly hybrid vehicles, with the exception of colder weather areas requiring all-wheel drive.

Preventing Air Pollution

To help prevent air pollution, we carefully manage substances subject to Japan's Air Pollution Control Act, hazardous substances released into the air and other air pollutants.

(Under the initiative of the Japan Chemical Industry Association, the industry is taking action to voluntarily manage and reduce emissions of 12 control substances^{*1} that are deemed to be harmful air pollutants. Of these 12 control substances, we used five substances after 1995, but stopped the use of benzene in 1995. Emissions of chloroform and ethylene oxide have been cut to zero since fiscal 2007. About dichloromethane emissions there were few times of zero since fiscal 2007, but have risen slightly since fiscal 2010 because of their minor use in products. Formaldehyde emissions continue to occur, albeit in small amounts, because of its use in products and in sterilization and fumigation. Going forward we will focus particularly on reducing the use and emissions of dichloromethane and formaldehyde through production process improvements and other means.

Air pollutants sulfur oxide (SOx)^{*2} and nitrogen oxide (NOx)^{*3} are emitted during boiler operations. To date, the Nippon Kayaku Group has gradually shifted the fuel for its boilers from Bunker C heavy oil with high sulfur content to other lower sulfur content fuels such as Bunker A, in addition to LPG and natural gas, which are sulfur free. As a result, since fiscal 2008, we maintain to reduce SOx emissions about, we made further reductions. The Nippon Kayaku Group will continue to make efforts. to properly maintain air pollution prevention equipment, carry out regular inspections and upkeep, and reduce overall emission of air pollutants into the atmosphere.



- *1 12 control substances subject to voluntary controls: acrylonitrile, acetaldehyde, vinyl chloride monomer, chloroform, 1,2-dichloroethane, dichloromethane, tetrachloroethylene, trichloroethylene, 1,3-butadiene, benzene, formaldehyde, and ethylene oxide.
- *2 SOx (sulfur oxide): SOx is emitted when fossil fuels that contain sulfur are burned. SOx reacts with water in the atmosphere to form sulfuric acid and sulfurous acid, which are causes of air pollution and acid rain.
- *3 NOx (nitrogen oxide): NOx is produced when burned chemical substances react to nitrogen in the air and when fuels and chemical substances that contain nitrogen compounds such as coal are burned. Not only is it a major cause of air pollution including photochemical smog and acid rain, but NOx also has a harmful effect on the human respiratory system. In addition, NOx is also known to include the greenhouse gas dinitrogen monoxide.
- *4 Dust: Dust mainly refers to fine particulate soot found in dust smoke produced when burning fossil fuels. In addition to a major cause of air pollution, humans can contract pneumoconiosis or other harmful health conditions when breathing dust in high concentrations.

Some of the products manufactured at the Fukuyama Plant are made utilizing organic solvents which are target compounds of VOC emission control.

While removal of such compounds is a required process at the final stage of manufacturing, a small amount of these organic solvents are released into the atmosphere during this process. Upon reviewing the potential of recovering and reusing these organic solvents, we achieved a reduction of VOCs released into the air by more than 30% as well as reduced the amount of organic solvents used through equipment modifications and process improvement.

● VOC Emissions

FY	ton
2013	12.0
2014	10.0
2015	11.5
2016	5.6
2017	5.2
2018	6.0
2019	5.3

Response to Water Risks

The Sustainable Development Goals (SDGs) were adopted at the UN Summit in September 2015. The SDGs consist of 17 goals and 169 targets to achieve by 2030. Within the 17 goals, Goal 6 (water and sanitation), Goal 12 (sustainable production and consumption), Goal 13 (climate change), Goal 14 (ocean conservation), and Goal 15 (ecosystems and forests) are items related to water risks*. The Nippon Kayaku Group is working not only to resolving waste water issues as discussed in the Special Feature article of fiscal 2018 CSR report, but also the reduction of water usage.

* Water risks refer to the following three main categories.

1. Physical risk: impact on business operations due to drought, flood, and water pollution
2. Regulation risk: tightening water quality standards and revisions to waterworks and sewerage charges
3. Reputation risk: declined corporate image based on response to water access rights

■ Preventing Water Pollution

The Nippon Kayaku Group has set voluntary wastewater discharge control standards that are tougher than requirements laid out in national laws and local ordinances.

And The Nippon Kayaku Group produces color material-related products including dyes and ink jet printer ink, among others. Our Tokyo and Fukuyama plants, where color material-related products are manufactured, fully decolorize colored wastewater before it is discharged.

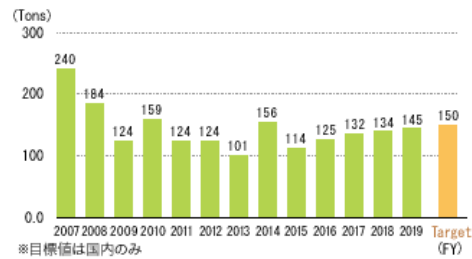
The Nippon Kayaku Group has made efforts to reduce its COD emissions by employing activated sludge treatment equipment at plants with high levels of COD emissions. In fiscal 2019, phosphorus emissions increased due to the impact of production items, but there is no problem with the wastewater standards.

■ PRTR*¹ Initiatives

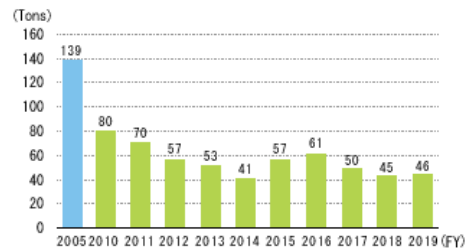
Since 1995, the Nippon Kayaku Group has participated in the Japan Chemical Industry Association led initiative to reduce compounds identified in the PRTR regulation, working to reduce its emissions of PRTR controlled compounds into the environment. In fiscal 2019, our emissions of PRTR controlled substances totaled 32.2 tons which marked about 13% increase from 28.5 tons in fiscal 2018. The reason for this is that the production volume of products handling PRTR materials increased at the Fukuyama Factory, Asa Factory, Himeji Factory and Kashima Factory in fiscal 2019. Toluene decreased from 15.5t in fiscal 2015 to 4.4t in fiscal 2018, but increased to 5.3t in fiscal 2019.

The result of the VOC emission reduction effect surely appeared.

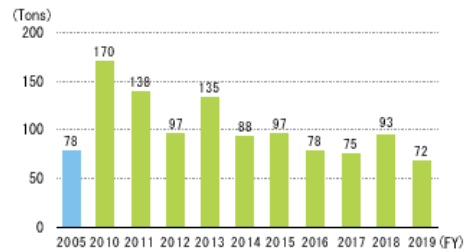
● COD Emissions



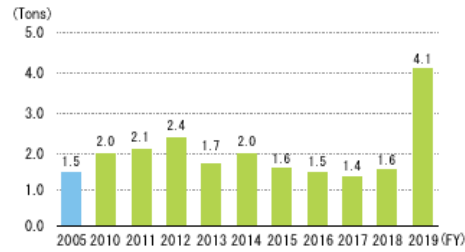
● SS*2 Emissions



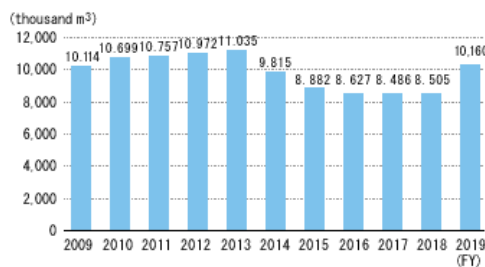
● Nitrogen Emissions



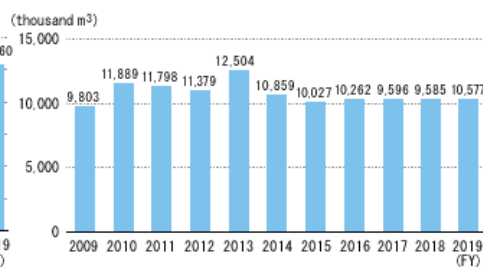
● Phosphorus Emissions



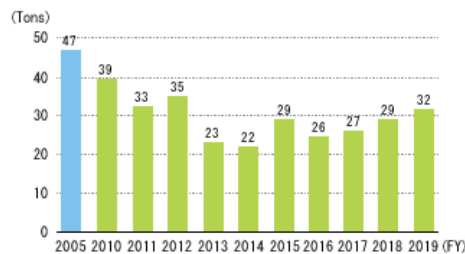
● Water Consumption



● Drainage



● Emissions of PRTR Controlled Substances



- ※1 PRTR: Pollutant Release and Transfer Register. The PRTR regulation is designed to prevent occurrences of environmental safety incidents by encouraging businesses to improve their own chemical substance management.
- ※2 SS: Suspended Solids. SS is a water-quality indicator generally referring to insoluble substances of 2 mm or less in diameter suspended in water. The organic matter and metal originating in particulate-like mineral, animals-and-plants plankton and its corpse, a sewer, factory effluent, etc. are contained. The increase in SS worsens transparency, and influences underwater photosynthesis by preventing light penetration.

Fukuyama Plant Initiative to Reduce Water Usage

As of 2015, the amount of contracted volume of industrial water usage was 24,000 m³/day. In addition, we have reduced from 23,000 m³/day to 22,000 m³/day from fiscal 2018.

The Fukuyama Plant conducts treatment of waste water resulting from the colorant manufacturing process at its own expense. The treated water is then released into the Seto Inland Sea. Since the beginning of 2000, we have strived to optimize the treatment method of waste water resulting from the manufacturing of colorants for inkjet printer ink. This included many efforts to implement individualized treatment by brand and to revise the manufacturing process to realize reduced wastewater amounts.

Through these efforts, we have achieved a reduction in industrial water usage as stated above since 2015. At present, we are still working to develop better wastewater treatment techniques. Moreover, in addition to industrial water, we also use the city water supply during the manufacturing and equipment cleaning processes, which is also target for our reduction initiative.

Kayaku Safety Systems Europe a. s. (KSE) Effective Rainwater Usage

KSE has introduced a system in order to utilize rainwater more effectively following capital investment activities to support the environment and environmental protection policies. This system both contributes to the Nippon Kayaku Group's CSR-centered management and saves on costs both through reduced usage of potable water and the efficient use of non-potable water. The installation of water storage tanks at KSE began in November 2017. From that time to the end of the fiscal year, 2019, water storage tanks with capacities totaling 650.5m³ have been put into service. In 2020, KSE plans to install two more water storage tanks, which will lead to an additional capacity of 89m³. This will result in the supply of non-potable water to eight KSE buildings.



As a result of using the system, KSE had saved 3,612m³ of potable water by the end of 2019 – a savings of JPY 2,456,368. The anticipated savings for 2020 are 4,887 m³ (JPY 2,888,758). Simply put, the amount of potable water saved at KSE corresponds to the annual water consumption of all KSE employees and their families (approx. 4,000 people).

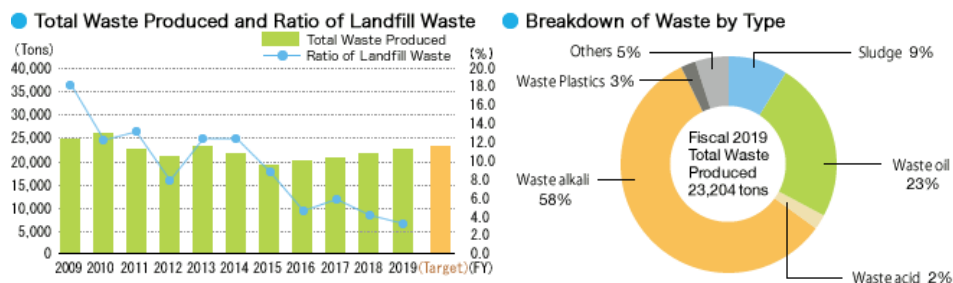
In addition to rainwater, wastewater from reverse osmosis stations supplies water tanks. KSE production areas require regulated humidification controlled by an air-conditioning system. This air-conditioning system requires demineralized water, which is attained through mineral removal in osmosis stations. Half of the water treated in this manner becomes wastewater. This wastewater serves as an additional source feeding the water tanks.

In these times, when a lack of precipitation is becoming a global issue, it is more essential than ever to implement water-recycling practices close to the source. In achieving this initiative, KSE comes closer to the fulfillment of the KAYAKU spirit.

※ [KSE] A company belonging to the KAYAKU Group located in the Czech Republic that manufactures automotive safety components.

Waste Reduction

In fiscal 2019, the Nippon Kayaku generated 23,204 tons of waste, which represents 8.0% increase compared to fiscal 2018. Landfill waste in fiscal 2019 amounted to 844 tons, and Zero Emissions rate of 3.6%. It was a decrease of 0.4 points from fiscal 2018, so we will continue to make efforts toward the 2020 target.



Fukuyama Plant

Fukuyama Plant Achieved Zero Net Emissions through Changes to its Sludge Treatment Process

Many types of wastes are produced during the Fukuyama Plant's production activities. Sludge that occurs from the treatment of waste liquids accounts for a considerably large portion of these wastes.

This sludge is difficult to dispose of because it contains moisture. In the past, this sludge was disposed of in landfills after undergoing appropriate treatment, but after examining whether this sludge could be recycled to reduce environmental impacts, the Fukuyama Plant found that it could be utilized as fuel for adjusting the heat used in waste incineration plants. Also, our waste disposal vender now has a source of recycled fuel, so both it and the Fukuyama Plant are able to utilize this sludge more effectively.

As a result, the Fukuyama Plant was able to reach its zero emission rate target (less than 1%) for the portion of its waste disposed of in landfills. Not only this, but it was also able to increase the recycling rate of waste and lower disposal costs.

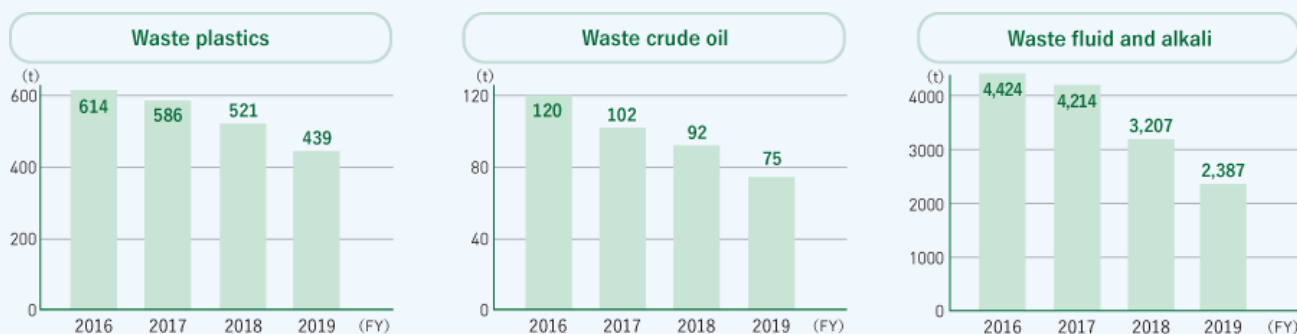
Polatechno Co., Ltd. Industrial Waste Reduction CHANGE&CHALLENGE

Polatechno Co., Ltd. generates waste plastics, waste resin, waste fluids, and other industrial waste materials in the process of producing polarizing plates, its major product. In its continuing efforts to conserve resources and to reduce the generation of and recycle waste, the company formed an Industrial Waste Reduction Subcommittee to change its traditional methods of reducing waste (CHANGE) and challenge itself to come up with new ideas for achieving waste reduction (CHALLENGE).



First, the fiscal 2016 results were examined and reviewed from the standpoint of zero emissions. Then, we adjusted raw material and product inventories when we changed our production process to producing small volumes of a large variety of items. After that, we changed to a bulk production process, which cut down on the volume of waste plastics and waste fluids. Next, we reduced our surplus generation of resin by ascertaining the optimal amounts of resin to be used in adhesive processing. In fiscal 2018, we were able to significantly reduce waste liquid by operating a recycling facility that reuses waste liquid, and in fiscal 2019 we are continuing to reduce the amount of industrial waste generated. We will continue to work to reduce industrial waste to contribute to environmental protection.

■ Amount of waste generation Result of FY2016–FY2019



Kayaku Safety Systems de Mexico, S.A. de C.V. (KSM)

Waste management: an approach to life cycle

KSM works to recycle solid waste, such as wood, cardboard, ferrous metals, aluminum and plastics by finding external suppliers which can re-use those wastes. After collecting those wastes from production sites, we store them in the plant until the certified waste collect suppliers to come pick them up. Those suppliers use woods to manufacture wood pallets, cardboard and plastic are recycled, aluminum and ferrous metals are used to generate new raw materials. This program extends to the non-productive areas such as rest areas, our collaborators classify waste like aluminum cans and plastic bottles for recycling, and we also classify organic and inorganic waste for proper disposal.



Noise and Odor Prevention

We conduct our business with a conscious effort toward minimizing noise and odor pollution in the areas surrounding our factories. We regularly measure noise levels around our factories, making every effort to be a positive members of the local community or odor-monitor-system. As such, any feedback or requests that we receive from local residents at company-sponsored events such as community round-tables are treated with the utmost priority. We also conduct regular work environment measurements in the factory to protect our employees from excessive noise and other hazardous chemicals.

Environmental Accounting

Nippon Kayaku has tracked and shared all cost data associated with its environmental protection initiatives since fiscal 2000. Also, from fiscal 2003, we began calculating the returns from our environmental protection initiatives. Calculation of environmental costs and returns are made according to Environmental Accounting Guidelines (2005 Version) published by the Ministry of the Environment of Japan, and Environmental Accounting Guidelines for Chemical Companies published by the Japan Chemical Industry Association.

● Environmental Protection Costs (Fiscal 2019)

(Millions of yen)

Category		Investment	Total	Main Activities	
Cost Incurred in the Workplace	Pollution Prevention Cost	Air Pollution Prevention	40.2	83.9	Upgraded dust collection facilities, boilers, etc.
		Water Pollution Prevention	70.5	148.0	Expanded waste liquid treatment facilities and upgraded equipment, etc.
		Underground seepage prevention	13.4	10.0	Moved pits and pipelines above ground, etc.
		Noise and Vibration Prevention	2.4	1.8	Noise abatement measures for scrubber towers, etc.
		Other		386.0	Disposal costs of facilities and pollution charges
	Global Environment Cost	Global Warming Prevention and Energy Conservation	40.3	20.1	Remodeled high-efficiency equipment and pumps, improved A/C energy usage, etc.
	Resource Recycling Cost	Waste treatment	30.9	576.7	In-house processing costs and processing outsourcing costs
Up- / Down-Stream Cost	Container Recycling Outsourcing		-	1.0	Outsourcing costs for repackaging products
	Sewage Processing Cost		-	90.3	Sewerage treatment costs Tank dredging costs
Management Activity Cost	System Maintenance and Operation		-	87.4	Internal auditor development cost and ISO14001 renewal costs
	Environmental Stress Monitoring		-	38.5	Analysis costs and outsourcing costs
	Information Disclosure		-	5.6	Outsourcing costs for preparing information disclosure documents on the environment
	Education, Training and Other		-	80.1	Outside lectures, workplace training, etc.
	Greening		1.0	58.0	Added plants and improved some greenery along the roadway Outsourcing costs
R&D Cost				81.7	Environmentally friendly R&D costs and wastewater treatment technology development costs
Social Activity Cost			-	9.7	Plant tours, community event sponsorship, responsible care, ICCA special committee, LRI research meeting costs
Environmental Damage Cost			-	0.0	
Total			198.7	1,678.9	

● Return from Environmental Protection Initiatives

(Millions of yen)

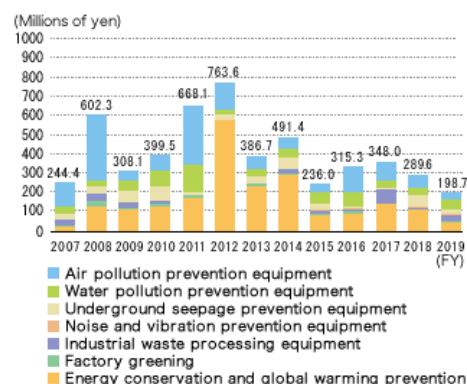
Sources of Return		Cost Reduction Return	Main Activities	
Workplace	Pollution Prevention Return	Air Pollution Prevention	0.0	Replacement of Nox decomposition facilities and boilers
		Water Pollution Prevention	0.0	Raising of drainage bits above the ground and replacement of dikes
		Pollution Load Levy Reduction	0.4	
		Noise and Vibration Prevention	0.0	Installation of sound-proof covers
	Global Environment Return	Global Warming Prevention and Energy Conservation	55.9	Made our pumps more energy-efficient, updated lighting to LED lighting, suspended use of air conditioners with ventilators, installed a central surveillance system
	Resource recycling return	Reduction of Waste	9.5	Solvent recovery
		Sale of Recycled Resources	12.9	Collected valuables, metals, sold paper products outside the group, and sold plastics outside the group
Other		0.0	Made changes to in-house recycling and the waste processing provider	
Up- / Down-Stream	Container Recycling		62.6	Reuse of plastic drums, stainless steel drums, etc.
Others			0.0	Implemented greening activities
Total			141.3	

- Scope: Nippon Kayaku (non-consolidated)
- Investments: Aggregate of all orders placed in fiscal year 2019(April 2019 to March 2020) Capital expenditure: Compilation of capital appropriated for orders in April 2018 to March 2019
- Management cost: Any cost increase resulting from change in fuel type or change in waste processing method that are deemed appropriate from an environmental perspective are recorded under this category each year for a period of five years from the date the change is first administered.
- From a financial accounting standpoint, earnings realized from environmental protection initiatives are recorded in the fiscal year in which such earnings are realized.
- Earnings such as expense reduction and environmental impact reduction that are not considered from a financial accounting standpoint are reported for five years from the date it is first realized.

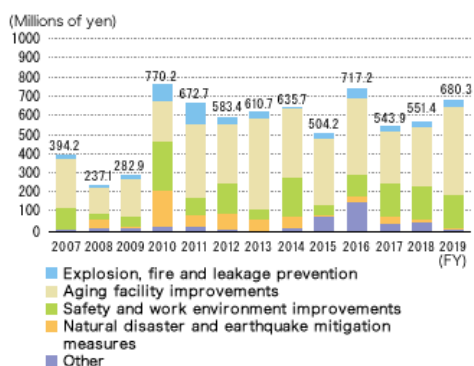
The Nippon Kayaku Group makes well planned and continual investments in environment, safety and health related projects. In fiscal 2019, investments related to the environment totaled at 199 million yen, which is a decrease of about 31% compared to fiscal 2018.

Investments related to health and safety totaled at 680 million yen in fiscal 2019, which is an increase of about 23% compared to fiscal 2018. Out of that, investments in equipment renewals accounted for 69% of the total.

● Environment Related Capital Investments



● Safety and Health Related Investments



Environment related data list

fiscal	Nippon Kayaku (Non-Consolidated)		Domestic group		Overseas group		Total	
	2018	2019	2018	2019	2018	2019	2018	2019
Global warming								
Energy input (Crude oil equivalent)	33,669	34,939	5,132	4,721	20,453	19,618	59,254	59,278
CO ₂ (ton)	69,731	69,241	10,380	9,557	49,701	47,156	129,812	125,954
Non-energy origin CO ₂ (ton)	2,202	2,371	10	0	1,108	12	3,321	2,383
GHG : Green house gas (ton) Other GHG (ton)	973	520	0	38	2,273	206	3,246	764
Emission to air								
NO _x (ton)	8.2	9.1	0.0	0.0	0.1	0.9	8.3	10.0
SO _x (ton)	1.4	1.3	0.0	0.0	0.0	0.0	1.4	1.3
Dish dust (ton)	0.6	0.9	0.0	0.0	3.1	3.3	3.7	4.2
PRTR substance (Emission to air; ton)	17.1	18.9	0.2	0.1			17.3	19.0
Emission to water area								
Water resource input (thousand m ³)	8,505	10,160	259	216	3,483	2,506	12,247	12,882
Amount of drainage (thousand m ³)	9,585	10,577	255	213	3,954	1,513	13,794	12,303
COD (ton)	133.7	145.2	2.9	0.0	57.4	62.2	194.0	207.4
Nitrogen (ton)	93.2	72.0					93.2	72.0
Phosphorus (ton)	1.6	4.1					1.6	4.1
PRTR substance (Emission to water area; ton)	11.4	13.3	1.2	0.8			12.6	14.1

fiscal	Nippon Kayaku (Non-Consolidated)		Domestic group		Overseas group		Total	
	2018	2019	2018	2019	2018	2019	2018	2019
Waste								
Amount of waste (ton)	21,491	23,204	4,150	3,240	1,005	1,043	26,646	27,487
Landfill waste (ton)	870	844	38	34	30	115	937	993
Zero emission (%)	4.0	3.6	0.9	1.0	2.9	11.1	3.5	3.6
Recycle rate (%)	81.4	84.4						

※ The energy input and CO₂ emission items were reviewed along with the conversion factors for the values announced last year.

※ Blank items do not have corresponding facilities or have no obligation to acquire data

FY2019 Energy saving activity summary sheet of Nippon Kayaku Group

☀ : Solar panel installation ☑ : Unrealized due to lease limitations — : Non-applicable ※High-load machinery: refrigerators/freezers, blowers, air compressors, steam boilers

Business site/Company name	Management of thermostat settings	electricity/water saving and conservation awareness	Reduction of fluorescent lighting ; Switch to LED lighting.	Controlled operation of high - load machinery*	Heat barrier film/paint, water disperement
Head Office, NIPPON KAYAKU CO., LTD.	●	●	●	—	—
Asa Plant ☀	●	●	●	●	●
Takasaki Plant	●	●	●	●	●
Himeji Plant ☀	●	●	●	●	●
Kashima Plant	●	●	●	●	●
Tokyo business CENTER/ Tokyo P&D Administration Office	●	●	●	●	●
POLATECHNO CO., LTD.	●	●	●	●	×
MOXTEC, INC.	●	●	●	—	●
WUXI POLATECHNO OPTICS CO., LTD.	●	●	●	—	—
Dejima Tech B.V.	●	●	●	●	×
POLATECHNO (HONG KONG) CO., LIMITED	●	●	/	—	●
Pict Leap co.,Ltd.	●	●	/	—	—
NIKKA FINE TECHNO CO., LTD.	●	●	●	—	/
Nippon Kayaku Korea Co., Ltd.	●	●	/	—	/
NIPPON KAYAKU AMERICA, INC.	●	●	/	—	●
Euro Nippon Kayaku GmbH	—	●	●	—	/
KAYAKU CHEMICAL (WUXI) CO., LTD.	●	●	●	●	●
KAYAKU Advanced Materials Inc.	●	●	●	●	—
Wuxi Advanced Kayaku Chemical Co., Ltd.	●	●	●	●	●
Shanghai KAYAKU International Trading Co., Ltd.	●	●	—	—	—
NIPPON KAYAKU FOOD TECHNO CO., LTD.	●	●	●	—	●
Tumor Diagnosis Support Co., Ltd.	●	●	●	—	●
Taiwan Nippon Kayaku Co., Ltd.	●	●	—	—	—
Kayaku Safety Systems Europe a.s.	●	●	●	●	—
Kayaku Safety Systems (Huzhou) Co., Ltd.	●	●	●	●	●
Kayaku Safety Systems de Mexico, S.A. de C.V. ☀	●	●	●	●	●
Kayaku Safety Systems Malaysia Sdn.Bhd.	●	●	●	—	●
Nishiminato Driving School Corporation	●	●	●	—	●
Okiura Golf Center Co., Ltd.	●	●	●	—	●
Kayaky (Shanghai) Co., Ltd.	●	●	—	—	—
JHMS Co., Ltd	●	●	●	—	—
NAC Co., Ltd.	●	●	●	—	—
Wako Toshi Kaihatsu Co., Ltd.	●	●	●	—	—
Kouwa Sangyo Co., Ltd.	●	●	●	—	●
Gunnan Sangyo Co., Ltd.	●	●	●	—	●
Head Office, Kayaku Japan Co., Ltd.	●	●	●	—	/
Asa Plant, Kayaku Japan Co., Ltd	●	●	●	●	●