



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.

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 2016 was the sixth year of this plan. In addition, in response to the interim results of fiscal 2015, we set the target value for fiscal 2020 to a more stringent level.

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

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

		Target value	Fiscal 2016 results	
Reducing Our Chemical Substance Footprint	VOC* ¹ Emissions	Under 42 tons	29.2 tons	Reduced by 41.7% compared to fiscal 2015. The drop is due to temporarily increased production of high-VOC products in Kashima plant in fiscal 2015.
	COD* ² Emissions	Under 150 tons	125.2 tons	Increased 9.6% compared to fiscal 2015. The difference is considered to fall within the allowable range
Prevention of Global Warming	Energy Derived CO ₂ Emission* ³ (Production Divisions+ Operation Divisions)	More than 3.8% reduction	72,100 tons	Increased 3.2% compared to fiscal 2015. This represents 12.7% reduction compared to fiscal 2005.
Reduction of Waste	Total Waste Produced	Under 23,500 tons	20,386 tons	Increased 2.6% compared to fiscal 2015.
	Recycling Rate	More than 80%	81.2%	Increased 1.3% compared to fiscal 2015.
	Zero Emission Rate* ⁴	Under 3%	4.8%	Greatly reduced by 4.2% compared to fiscal 2015. The drop is due to Fukuyama plant's ability to utilize their output landfill waste for recycling means.

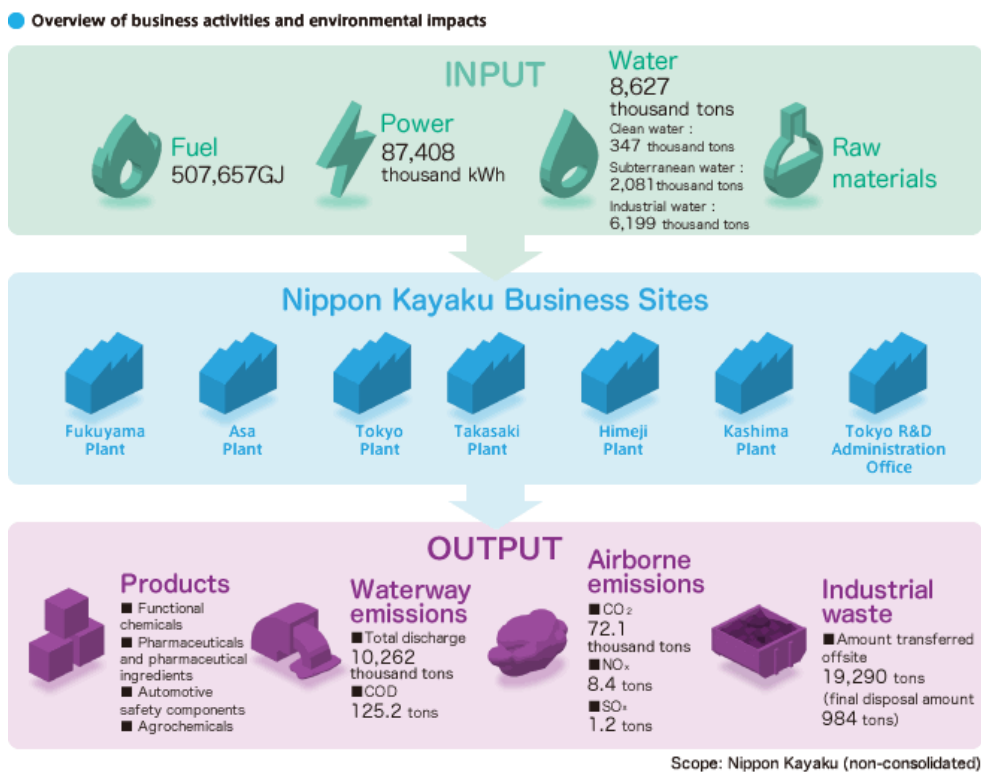
*1 VOC: Volatile Organic Compounds (VOCs). This tally includes all chemical substances of reporting regulation, emitted into the atmosphere.

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

*3 Energy-derived CO₂ emissions: Fiscal 2005 has been set as the benchmark (82,600 tons)

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

Energy and Material Balance



Results of Our Efforts to Reduce Environmental Impacts

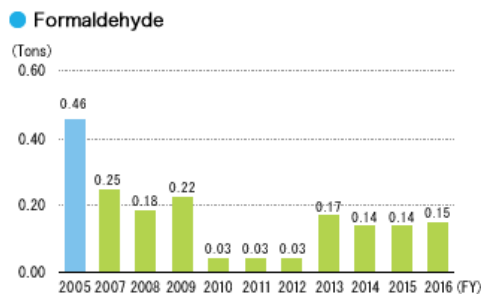
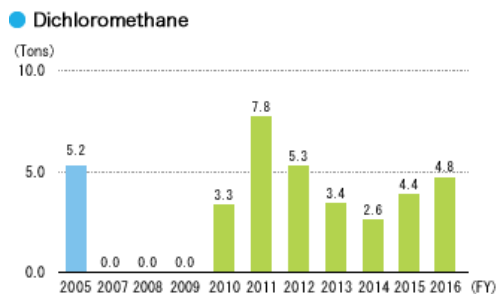
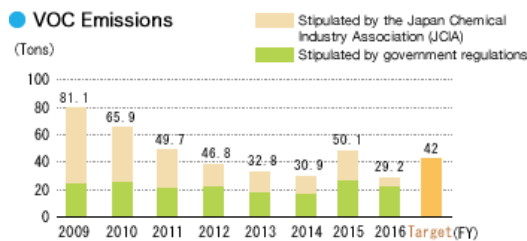
As part of its effort to reduce environmental impacts, Nippon Kayaku focuses on preventing air, water and noise and odor pollution as well as stopping global warming and reducing waste.

Preventing Air Pollution

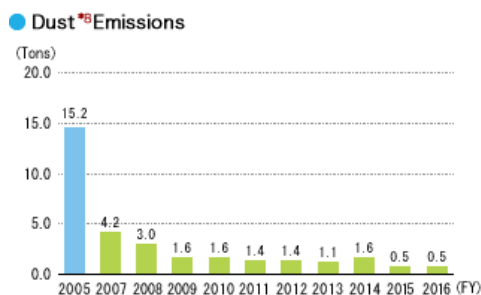
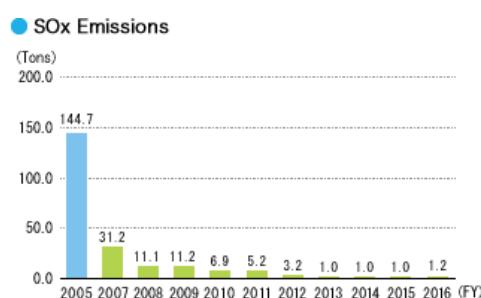
To help prevent air pollution, we carefully manage substances subject to Japan's Air Pollution Control Act, hazardous substances released into the air and other air pollutants.

Under the initiative of the Japan Chemical Industry Association, the industry is taking action to voluntarily manage and reduce emissions of 12 control substances*5 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 (SO_x)*6 and nitrogen oxide (NO_x)*7 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 SO_x 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.



*5 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.



*6 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.

*7 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.

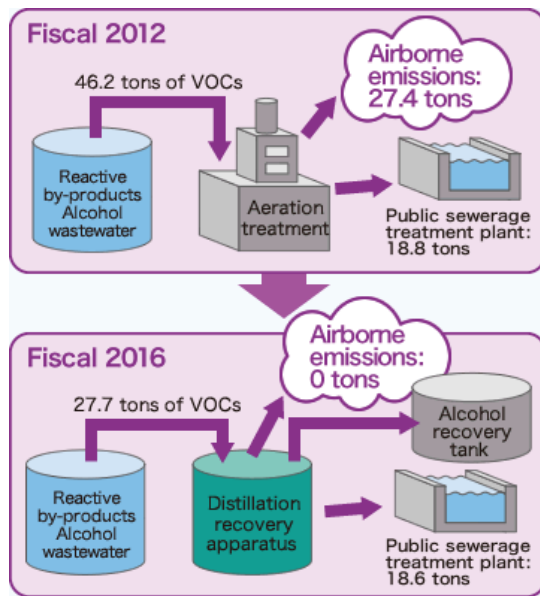
*8 Dust: Dust mainly refers to fine particulate soot found in dust smoke produced when burning fossil fuels. In addition to a major cause of air pollution, humans can contract pneumoconiosis or other harmful health conditions when breathing dust in high concentrations.

Initiatives to Reduce VOCs at the Kashima Plant

The Kashima Plant released alcohol produced in large quantities from the agricultural manufacturing processes into the air, but in order to become an eco-friendlier plant, it decided to launch an initiative to examine ways to recover alcohol produced during the manufacturing process based on theme reducing the amount of VOCs released into the air. Specifically, existing facilities were switched for use as alcohol distillation recovery apparatuses, which involves transforming alcohol in a gaseous state into a liquid for recovery in a tank. This method greatly reduces the amount of alcohol released into the air.

In fiscal 2012 we released 27.4 tons into the atmosphere. As a result of the above-mentioned, we completely eliminated our emissions of alcohol gas into the atmosphere since fiscal 2013.

We stand firmly committed to actively helping improve the environment with the goal of reduced impacts on the environment in the future.



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.

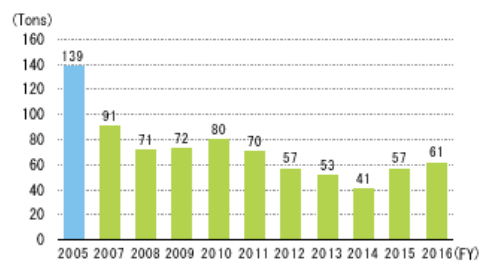
PRTR ^{*9} Initiatives

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 2016, our emissions of PRTR controlled substances totaled 25.9 tons which marked about 12% decrease from 29.4 tons in fiscal 2015. This was caused in fiscal 2015 by production volume at the Kashima Plant increased. Although toluene continues to represent the largest source of PRTR controlled emissions, toluene emissions totaled 9.7 tons in fiscal 2016. This was about 38% of all emissions of compounds identified in the PRTR regulation.

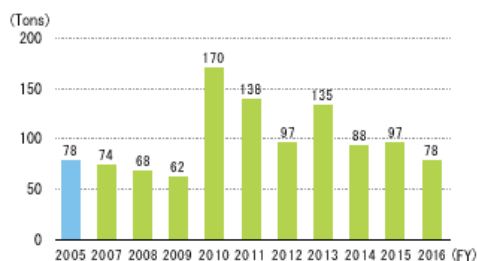
● COD Emissions



● SS ^{*10} Emissions



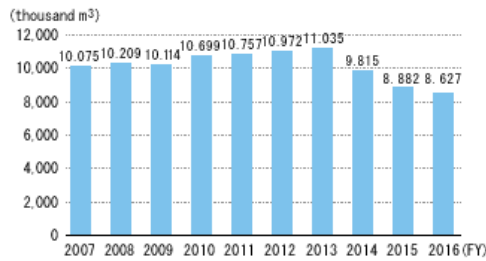
● Nitrogen Emissions



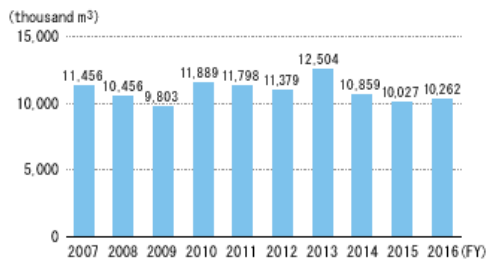
● Phosphorus Emissions



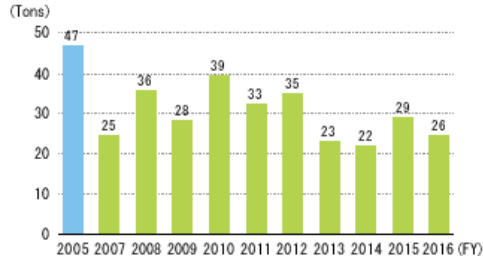
Water Consumption



Drainage



Emissions of PRTR Controlled Substances



*9 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.

*10 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.

Preventing Global Warming

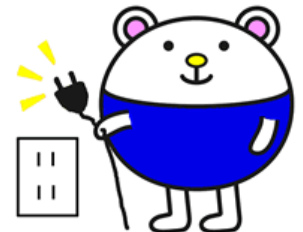
Each of our business sites has implemented various energy conservation activities that have helped to reduce our total energy consumption annually. In fiscal 2013, total energy usage declined, but as the conversion coefficient for CO₂ emissions revision, CO₂ emissions were temporarily worsening, in fiscal 2016, CO₂ emissions were 65,600 tons, which was 3.2% more than fiscal 2015.

This is caused by increasing produced volume at Takasaki plant and Himeji plant.

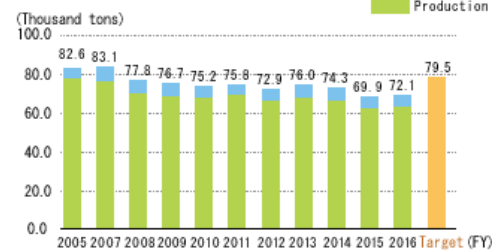
As part of its efforts to help reduce CO₂ emissions from homes, the Nippon Kayaku Group has established the program to encourage employees to conserve energy at home called "My Home is Currently Conserving Electricity", which focuses exclusively on electricity usage.

In 2015, we created new version of Kayakuma the Bear with the phrase "I'm currently conserving electricity" to raise greater awareness of this campaign.

ただいま節電中!



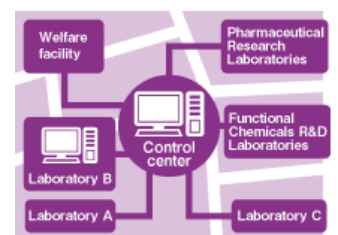
Energy Derived CO₂ Emissions



FY2016 Energy saving activity summary sheet of Nippon Kayaku Group

Energy Conservation Activities at the Tokyo R&D Administration* Office

The Tokyo R&D Administration Office represents the largest R&D hub of the Nippon Kayaku Group. In fiscal 2016, this facility introduced a central control system that helps to increase the energy efficiency of air conditioning facilities, which account for between 40 and 60% of the area's energy usage, in order to establish the good practice of streamlining energy usage from the research stage. This facilitates the visualization of air conditioning usage, while the data obtained from the system is being utilized in various other initiatives. After meeting with persons in charge of the air conditioning, the system is now programmed to provide the optimal controls for each room of the facility, which is greatly reducing energy usage. Aggregated data is also used in monthly meeting documents that are shared throughout the facility in an effort to involve everyone working there.



*Tokyo R&D Administration Office : Comprises the Functional Chemicals R&D Laboratories, Pharmaceuticals

Research Laboratories and indirect departments all in a single facility located in Kita-ku, Tokyo.

Introduction of a Photovoltaic System at the Himeji Plant

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.

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.

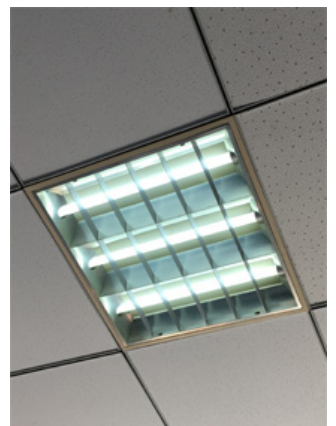
In fiscal 2016, KSM replaced its exterior lighting facilities on the western side of its property. Until then, it had used 400 watt bulbs for exterior lighting, but KSM replaced all of these bulbs with ten 32 watt and twelve 57 watt photovoltaic lights.

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

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.



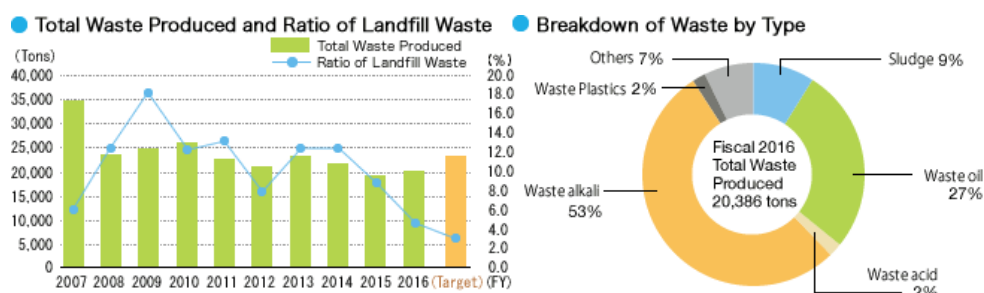
Rolling Out Eco-friendly Sales Vehicles

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.

Waste Reduction

In fiscal 2016, the Nippon Kayaku Group generated 20,386 tons of waste, which represents 2.6% increase compared to fiscal 2015. Landfill waste in fiscal 2016 amounted to 984 tons, and Zero Emissions rate of 4.8%, which represents a major reduction of 4.2% compared to fiscal 2015. The drop is due to Fukuyama plant's ability to utilize their output landfill waste for recycling means.



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 2016)

(Millions of yen)

Category			Investment	Total	Main Activities
Cost Incurred in the Workplace	Pollution Prevention Cost	Air Pollution Prevention	137.3	107.2	Installed exhaust gas treatment system, installed gas absorption system, and replaced pretreatment tower
		Water Pollution Prevention	80.4	279.8	Replaced leakage containment barrier and wastewater pit, improved oil separation tank, and replaced wastewater pump
		Underground seepage prevention	3.0	9.6	Brought drainage piping above ground, brought the walls of the drain pit, dirt floor lining
		Noise and Vibration Prevention	0.9	0.9	Installed silencer on isolation tower
		Other		243.8	Disposal costs of facilities and pollution charges
	Global Environment Cost	Global Warming Prevention and Energy Conservation	76.7	14.3	Upgraded blowers/pumps, heat insulation coating for roof, switched mercury bulbs to LED
Resource Recycling Cost	Waste treatment	6.6	471.2	In-house processing costs and processing outsourcing costs	
Up- / Down-Stream Cost	Container Recycling Outsourcing		-	0.3	Outsourcing costs for repackaging products and cleaned and recycled product containers
	Sewerage Processing Cost		-	74.5	Sewerage treatment costs Tank dredging costs
Management Activity Cost	System Maintenance and Operation		-	121.1	Internal auditor development cost and ISO14001 renewal costs
	Environmental Stress Monitoring		-	41.7	Analysis costs and outsourcing costs
	Information Disclosure		-	8.6	Outsourcing costs for preparing information disclosure documents on the environment
	Education, Training and Other		-	55.6	Outside lectures, workplace training, etc.
	Greening		10.5	203.9	Added plants and improved some greenery along the roadway Outsourcing costs
R&D Cost				309.6	Environmentally friendly R&D costs and wastewater treatment technology development costs
Social Activity Cost			-	9.0	Plant tours, community event sponsorship, responsible care, ICCA special committee, LRI research meeting costs
Environmental Damage Cost			-	0.0	
Total			315.3	1,951.1	

● 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	Upgrades and improvements to ventilation facilities, replaced activated carbon pretreatment tower, and recovered alcohol
		Water Pollution Prevention	0.0	Improvements to effluent treatment facilities, Changes in agglomeration method for treating
		Pollution Load Levy Reduction	0.2	
		Noise and Vibration Prevention	0.0	
	Global Environment Return	Global Warming Prevention and Energy Conservation	89.3	Reduced cost by using gas cogeneration system, cut off steam system, and introduced energy-efficient equipment
	Resource recycling return	Reduction of Waste	4.0	Recovered valuables from waste, and recycled waste oil as auxiliary fuel
		Sale of Recycled Resources	13.8	Collected valuables, metals, sold paper products outside the group, and sold plastics outside the group
Other		0.7	Made changes to in-house recycling and the waste processing provider	
Up- / Down-Stream	Container Recycling	0.0	Reused plastic drums	
Others		0.0	Implemented greening activities	
Total		107.9		

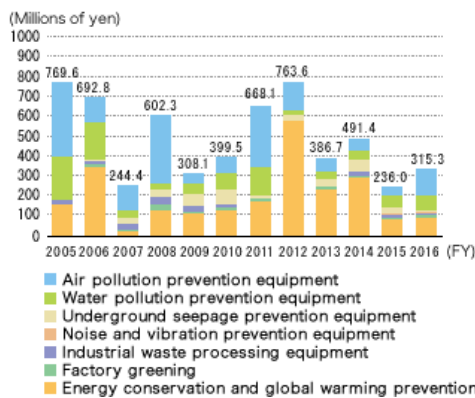
- Scope: Nippon Kayaku (non-consolidated)
- Investments: Aggregate of all orders placed in fiscal year 2016 (April 2016 to March 2017) Capital expenditure: Compilation of capital appropriated for orders in April 2016 to March 2017
- Management cost: Any cost increase resulting from change in fuel type 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.

Investments Related to the Environment, Health and Safety

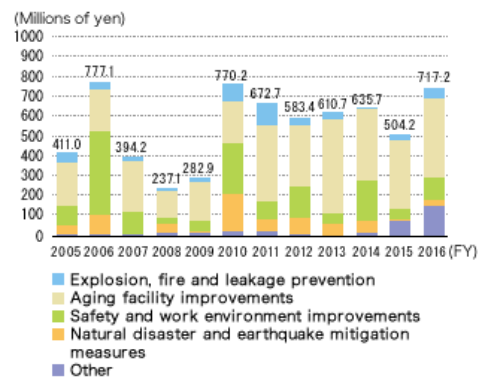
The Nippon Kayaku Group makes well planned and continual investments in environment, safety and health related projects. In fiscal 2016, investments related to the environment totalled at 315 million yen, which is an increase of about 34% compared to fiscal 2015.

Investments related to health and safety totalled at 717.2 million yen in fiscal 2016, which is a major increase of about 42% compared to fiscal 2015. Out of that, investments in equipment renewals accounted for 54% of the total.

● Environment Related Capital Investments



● Safety and Health Related Investments



FY2016 Energy saving activity summary sheet of Nippon Kayaku Group

☀ : Solar panel installation ☒ : Unrealized due to lease limitaions — : 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 dispersement
Head Office, NIPPON KAYAKU CO., LTD.	●	●	●	—	—
Fukuyama Plant/ NIPPONKAYAKU FUKUYAMA CO., LTD.	●	●	●	●	●
Asa Plant ☀	●	●	●	●	●
Tokyo Plant/ NIPPON KAYAKU TOKYO CO., LTD.	●	●	●	●	●
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	●	●	/	—	●
NIKKA FINE TECHNO CO., LTD.	●	●	●	—	/
Nippon Kayaku Korea Co., Ltd.	●	●	/	—	/
NIPPON KAYAKU AMERICA, INC.	●	●	/	—	●
Euro Nippon Kayaku GmbH	—	●	×	—	/
KAYAKU CHEMICAL (WUXI) CO., LTD.	●	●	●	●	●
MicroChem Corp.	●	●	●	●	—
Wuxi Advanced Kayaku Chemical Co., Ltd.	●	●	●	●	●
Shanghai KAYAKU International Trading Co., Ltd.	●	●	—	—	—
NIPPON KAYAKU FOOD TECHNO CO., LTD.	●	●	●	—	●
Tumor Diagnosis Support Co., Ltd.	●	●	●	—	●
NAC Co., Ltd.	●	●	●	—	—
Taiwan Nippon Kayaku Co., Ltd.	●	●	—	—	—
INDET SAFETY SYSTEMS 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	●	●	●	—	—
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	●	●	●	●	●
Sanko Kagaku Kogyo Co., Ltd.	●	●	●	●	●
Head Office, KAYAKU AKZO CORPORATION	●	●	●	—	/
Asa Plant, KAYAKU AKZO CORPORATION	●	●	●	—	×