

## Pollution Prevention

### Atmospheric Pollution Measures

Air pollutants discharged from Group facilities include sulfur oxides (SOx), nitrogen oxides (NOx) and soot and dust emitted from boilers and furnaces as well as volatile organic compounds (VOCs) from crude oil or petroleum product storage tanks and tanker truck loading facilities. Our refineries and petrochemical plants carry out operational management to ensure compliance with emission standards under laws and regulations as well as with emission limits prescribed by regional pollution prevention agreements.\*1

\*1 Regional pollution prevention agreements: Agreements concluded between companies and local governments or local communities for promoting pollution prevention. Also called environmental conservation agreements in some regions.

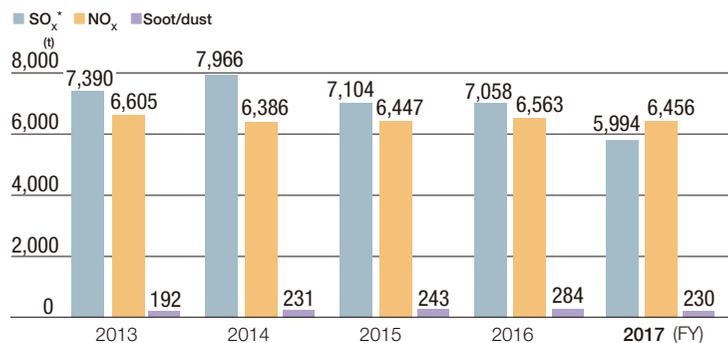
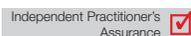
### Measures to Reduce SOx, NOx, Soot and Dust Emissions

To reduce SOx emissions, sulfur is removed from byproduct gases generated by various types of equipment and the sulfur-free gas is then used as fuel for other refinery processes, while emissions are scrubbed of SOx using exhaust gas desulfurizers. NOx emissions are reduced through the use of low-NOx burners and two-stage combustion to reduce NOx generation as well as exhaust gas denitrifiers to help eliminate the NOx that is generated, while soot and dust are captured by dust collectors. With regard to SOx discharged into the atmosphere, we pay a pollution load levy\*\*2 calculated using the emissions-based levy rate defined in each region in accordance with the Pollution-Related Health Damage Compensation System.

\*\*2 Pollution load levy: A levy imposed on operators of facilities that discharge SOx, requiring them to bear as an expense the amount necessary to swiftly and fairly provide compensation to ensure appropriate support for victims if pollution-related health damage should occur. The total amount paid by operators every year consists of a levy based on the volume of past emissions during the calculation basis period (from 1982 to 1986) and a levy on the volume of current emissions (for the previous year). The ratio between the two is stipulated under law to be 6:4.

[The Pollution-related Health Damage Compensation System \(Environmental Restoration and Conservation Agency's Website\)](#)

### Output of Air Pollutants



\* The tabulation period for SOx is January–December.

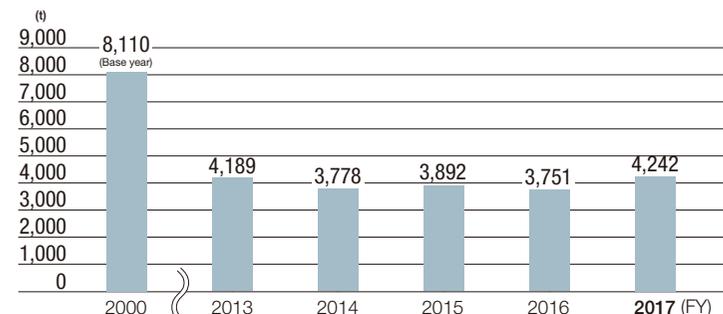
Scope of tabulation: Fiscal 2013: the Hokkaido, Chiba, Aichi and Tokuyama refineries, the Chiba and Tokuyama petrochemical plants, Prime Polymer Co., Ltd.'s Anesaki Works, and Cray Valley Idemitsu Corporation  
 Fiscal 2014–2017: Hokkaido Refinery, Chiba Complex (Petroleum), Aichi Refinery, Chiba Complex (Chemicals), Tokuyama Complex, Prime Polymer Co., Ltd.'s Anesaki Works, and Cray Valley Idemitsu Corporation  
 Note: As of October 2017, the Chiba Refinery and Chiba Petrochemical Plant have been integrated into the Chiba Complex. Within this report, "Chiba Complex" refers to the combined total of the previous Chiba Refinery and Chiba Petrochemical Plant; "Chiba Complex (Petroleum)" refers to the previous Chiba Refinery only; and "Chiba Complex (Chemicals)" refers to the previous Chiba Petrochemical Plant only.

### Measures to Reduce VOC Emissions



VOCs are substances thought to be the source of atmospheric photochemical oxidants. To reduce VOC emissions, Idemitsu is promoting such measures as shifting to the use of petroleum product tanks that have internal floating roofs and installing VOC recovery equipment in loading facilities. Through such measures, by fiscal 2007 Idemitsu achieved its target of reducing VOC emissions from refineries, petrochemical plants (two at that time) and oil depots by over 41% from 8,109 tons in fiscal 2000 to 4,792 tons. Since then, maintaining this level has been a management goal. In fiscal 2017, VOC emissions from refineries, petrochemical plants and oil depots amounted to 4,242 tons.

### VOC Emissions



Scope of tabulation: Fiscal 2013: the Hokkaido, Chiba and Aichi refineries, the Chiba petrochemical plants, Tokuyama Complex, Oil depots (Kushiro, Hakodate, Hachinohe, Akita, Shiogama, Hitachi, Oigawa, Tokyo, Niigata, Hachioji, Fushiki, Kishiwada, Takamatsu, Fukuoka, Kagoshima, Osaka, Hiroshima, Kochi, Nagasaki), Idemitsu Okinawa  
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 Fiscal 2016: the Hokkaido, Chiba and Aichi refineries, the Chiba petrochemical plants, Tokuyama Complex, Oil depots (Kushiro, Hakodate, Hachinohe, Akita, Shiogama, Hitachi, Oigawa, Tokyo, Niigata, Hachioji, Fushiki, Kishiwada, Takamatsu, Fukuoka, Kagoshima, Hiroshima, Kochi, Nagasaki), Idemitsu Okinawa  
 Fiscal 2017: the Hokkaido and Aichi refineries, Chiba and Tokuyama Complex, Oil depots (Kushiro, Hakodate, Hachinohe, Akita, Shiogama, Hitachi, Oigawa, Tokyo, Niigata, Hachioji, Fushiki, Kishiwada, Takamatsu, Fukuoka, Kagoshima, Hiroshima, Kochi, Nagasaki), Idemitsu Okinawa  
 Note: As of October 2017, the Chiba Refinery and Chiba Petrochemical Plant have been integrated into the Chiba Complex.

### Initiatives for areas other than refineries, petrochemical plants and oil depots

From January 2011, Idemitsu began to gradually switch from organic-based paints to water-soluble paints, which have little environmental impact, for painting its Idemitsu service stations. As a result, Idemitsu will be able to reduce VOC emissions. We estimate that by the end of fiscal 2017, we will have emitted 221 fewer tons in the course of repainting 4,834 service stations.

In addition, Idemitsu Engineering Co., Ltd. sells various types of VOC recovery equipment and proposes systems for use at the plants of corporate customers.



Exterior of IDESORB-B VOC processing equipment

## Using Water Resources

We use ocean water and industrial water in the cooling towers and boilers used in various processes, including oil refining. Ocean water for cooling accounts for around 95% of total water used. After being treated, almost all of the used industrial water, other than the portion lost through evaporation, is discharged. To reduce the use of water resources, we are working with neighboring industrial complexes to integrate facilities such as, for example, those producing chilled water.

## Water Resource Use Independent Practitioner's Assurance

		FY2013	FY2014	FY2015	FY2016	FY2017
Industrial water	kt	62,745	59,921	60,526	58,113	58,055
Ocean water	kt	1,281,823	1,199,226	1,205,868	1,231,103	1,257,447
Total used	kt	1,344,568	1,259,147	1,266,394	1,289,215	1,315,502

Scope of tabulation: Fiscal 2013: the Hokkaido, Chiba, Aichi and Tokuyama refineries, the Chiba and Tokuyama petrochemical plants, Prime Polymer Co., Ltd.'s Anesaki Works, and Cray Valley Idemitsu Corporation  
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## Measures to Prevent Water Contamination

The Water Pollution Control Law and other regulations, as well as regional agreements on pollution prevention, stipulate emission standards for pH\*3 as well as standards for chemical oxygen demand (COD) and suspended substances in effluent wastewater and for nitrogen and phosphorus emissions discharged into closed water bodies. Idemitsu's refineries and petrochemical plants deploy integrated wastewater treatment systems equipped with activated sludge processors and activated carbon absorption units and carry out strict monitoring to ensure that these emissions standard levels are not exceeded. Wastewater discharge volume and emissions of COD and total nitrogen and total phosphorus for the past five years are shown in the chart below.



Activated sludge processor

\*3 pH: A measure of hydrogen ion activity. Shows the degree of acidity or alkalinity of a solution.

## Wastewater Discharge and Water Pollution Indices Independent Practitioner's Assurance

		FY2013	FY2014	FY2015	FY2016	FY2017
Discharge	kt	1,342,697	1,257,192	1,264,511	1,287,195	1,313,741
COD	t	105	86	94	96	104
Nitrogen	t	105	100	81	91	93
Phosphorus	t	1.4	1.6	1.1	1.1	1.2

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## Ground and Groundwater Pollution Prevention

Since fiscal 2002, the Idemitsu Group has been implementing autonomous surveys of ground and groundwater pollution and undertaking purification measures. By fiscal 2009, the Group completed on-schedule surveys at about 1,300 sites, including refineries, petrochemical plants, oil depots, Idemitsu-owned service stations and idle land. At those locations where we discover contamination, we place priority on preventing the impact of this contamination from spreading beyond the business site and make ongoing efforts for the remediation of contaminated soil or groundwater.

When construction or other operations cause changes in the character of the land, the Group implements proper management to prevent pollution in compliance with the Soil Contamination Countermeasures Law

**In fiscal 2017, there were no oil spills.**

## Preventing Marine Pollution

In petroleum development operations, effluent water containing oil generated during test drilling and development is treated using a separator. The oil is transported to land-based facilities for processing and the water is returned to the sea after being processed to meet effluent water standards. In addition, we always consult an expert to conduct an environmental impact assessment prior to test drilling and production to ensure that the impact is at an acceptable level. In the eventuality of a marine oil spillage, we deploy an oil containment boom\*4 to restrict its spread and recover the spilled oil in accordance with our Oil Pollution Contingency Plan. During transport by ocean-going tankers, we make various efforts to maintain a record of zero oil spillage. In the area of equipment, each of our very large crude carriers (VLCC) in operation is double-hulled, thereby reducing the risk of oil spills. In terms of personnel, we provide regular training and education, including on-board emergency response drills and safety and environmental education, for all crew members.

**In fiscal 2017, there were no oil spills involving oceangoing tankers or marine oil field development.**

\*4 Oil containment boom: A floating barrier temporarily placed in a body of water for the purpose of containing or removing an oil spill from refineries, oil depots and other oil storage facilities as well as from marine oilfield facilities, tankers, tanker berthing facilities, and other facilities. Always installed when unloading crude oil from a tanker to a ground facility.