



## Management and Reduction of Chemical Substances

### Storing and Processing Waste

#### Management of PRTR-Designated Chemical Substances

Our refineries, petrochemical plants, oil depots and other facilities handle chemical substances subject to the Pollutant Release and Transfer Register (PRTR) Law.\*1 Among the PRTR-designated chemical substances found in petroleum and petroleum products are volatile organic compounds (VOCs), such as benzene, toluene xylene and normal hexane. Whenever oil is transferred into or removed from storage tanks as well as when it is loaded onto tanker trucks and ships, there will be some evaporation of the VOCs it contains and the resulting gas will attempt to escape into the atmosphere. To minimize such VOC emissions, Idemitsu has installed internal floating roofs in storage tanks that reduce evaporation and carries out measures aimed ensuring VOC recovery during transport.

Furthermore, following the suspension of certain equipment, since 2016 we have eliminated emissions of dichloromethane, a chemical used in petrochemical manufacturing processes. The portion transferred to locations outside Idemitsu business sites is disposed of in compliance with the Waste Management Law.

\*1 PRTR Law: The "Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof."

#### PRTR-Designated Chemical Substances Discharged and Transferred in FY2017 (tons)



CAS No.	Name	Discharged into atmosphere	Discharged into water	Discharged into soil	Transferred to locations outside business sites	Total
141-43-5	2-aminoethanol	0.0	0.0	0.0	63.0	63.0
1332-21-4	asbestos	0.0	0.0	0.0	58.1	58.1
80-05-7	4,4'-Isopropylidenediphenol (commonly known as bisphenol A)	0.0	0.0	0.0	3.8	3.8
100-41-4	ethylbenzene	6.5	0.0	0.0	1.4	7.9
1330-20-7	xylene	15.2	0.0	0.0	40.0	55.2
75-45-6	chlorodifluoromethane ; HCFC-22	0.3	0.0	0.0	0.0	0.3
75-09-2	dichloromethane ; methylene dichloride	0.5	0.0	0.0	11.9	12.4
77-73-6	dicyclopentadiene	0.3	0.0	0.0	0.0	0.3

68-12-2	N,N-dimethylformamide	0.0	0.0	0.0	7.2	7.2
100-42-5	styrene	28.6	0.0	0.0	0.4	29.0
127-18-4	tetrachloroethylene	0.0	0.0	0.0	1.4	1.4
95-63-6	1,2,4-trimethylbenzene	1.3	0.0	0.0	0.0	1.3
108-88-3	toluene	19.5	0.0	0.0	83.0	102.5
-	nickel compounds	0.0	0.0	0.0	1.8	1.8
-	vanadium compounds	0.0	0.0	0.0	5.2	5.2
108-95-2	phenol	0.2	0.0	0.0	4.2	4.4
112-02-7	hexadecyltrimethylammonium chloride	0.0	10.0	0.0	0.0	10.0
110-54-3	n-hexane	43.6	0.0	0.0	2.5	46.1
71-43-2	benzene	6.4	0.0	0.0	0.0	6.4
1336-36-3	polychlorinated biphenyls ; PCBs	0.0	0.0	0.0	5.9	5.9
-	manganese and its compounds	0.0	0.0	0.0	3.6	3.6
-	molybdenum and its compounds	0.0	0.0	0.0	1.1	1.1
Total		122.3	10.0	0.0	294.5	426.8

\* Scope of tabulation: the Hokkaido Refinery, Chiba Complex (Petroleum), Aichi Refinery, the Chiba Complex (Chemicals), the Tokuyama Complex, the Omaezaki Factory, the Advanced Technology Research Laboratories, the Technology & Engineering Center, Prime Polymer Co., Ltd.'s Anesaki Works, Cray Valley Idemitsu Corporation, and BASF Idemitsu Co., Ltd.

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.

\*\* Chemicals are not listed if the discharged and transferred amounts are less than 0.1 ton per year. Figures presented above may not be consistent with the totals since they are rounded off to the nearest whole number.



## Controlling PCBs\*2

In accordance with the Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes,\*3 at refineries and petrochemical plants, the Idemitsu Group appropriately stores and manages oil containing polychlorinated biphenyls (PCBs) as well as transformers or other equipment that contain these substances. Under the same law and the Basic Plan for PCB Waste Treatment, final deadlines\*4 have been set for the completion of the treatment of all PCB waste and, accordingly, the Group is steadily carrying out the processing of such waste. For electrical equipment containing low concentrations of PCBs, we have selected processing methods that include the energized natural circulation washing method\*5 specified by the Ministry of Economy, Trade and Industry, and are working to reduce the amount of waste. The results of our processing of waste with high concentrations of PCB are shown below.

\*2 Polychlorinated biphenyls  
 \*3 The Basic Plan for PCB Waste Treatment: A plan setting out the steps needed to comprehensively and strategically promote the effective and proper treatment of PCB waste.  
 \*4 The period for setting aside PCB waste:  
 • High concentrations of PCBs: processing completion deadlines spanning March 2019 through March 2024, and such waste must be set aside at least one year before the relevant deadline (dates differ by item and region).  
 • Low concentrations of PCBs: by the end of March 2027  
 \*5 A processing method that can be selected only for equipment that meets particular structural and PCB concentration requirements. The equipment in question is drained of contaminated insulating oil and filled with new oil. The equipment is then run normally for at least 90 days to ensure that the new oil has flushed out any lingering PCBs. This method allows us to dispose of PCBs without decommissioning equipment.

## High-Concentration PCB Waste Processing Results Independent Practitioner's Assurance

Beginning storage volume (March 31, 2008): 871 tons  
 Volume reduced through treating and sorting in fiscal 2017: 86 tons  
 Storage volume as of March 2018: 41 tons  
 Note: The period for setting aside PCB waste is as described in note \*\* above.

## Managing CFCs

In accordance with the Act for Rationalized Use and Proper Management of Fluorocarbons, which came into effect on April 1, 2015, the Idemitsu Group has been implementing steps to prevent the leakage of fluorocarbons. The Safety, Environment & Quality Assurance Department undertakes annual inspections on the progress of changeover to non-fluorocarbon coolants at Idemitsu facilities. Although our oil refineries and petrochemical plants house a significant portion of the Group's large-scale processing equipment containing CFCs and HCFCs, which damage the ozone layer, this equipment can be upgraded only during the performance of major shutdown maintenance. With this in mind, we put priority on replacing all the more harmful ozone-damaging CFCs with alternative coolants, completing this task by fiscal 2016. In addition, we plan to systematically replace all large equipment using HCFCs with those using non-fluorocarbon coolants by fiscal 2025.

## Amount of CFCs and HCFCs Used by Large-Scale Processing Equipment at the Idemitsu Group's Two Refineries and Two Complexes (tons) Independent Practitioner's Assurance

	August 2002 <sup>Note</sup>	March 2018	March 2019 (Planned)	March 2026 (Planned)
CFC (t)	79.8	0.0	0.0	0.0
HCFC (t)	58.8	42.9	42.9	0.0

Note: At August 2002, there were six refineries and two petrochemical plants (As of October 2017, the Chiba Refinery and Chiba Petrochemical Plant have been reorganized into the Chiba Complex.)

Idemitsu's estimated CFC leakage for fiscal 2017, calculated based on the Act for Rationalized Use and Proper Management of Fluorocarbons, is as shown below. Until this equipment is changed over to non-CFC coolants, we will take such preventive measures as setting up a temporary vacuum pump to capture CFCs before opening the processor and opening it less frequently.

## Estimated Fiscal 2017 CFC Leakage\*6 Independent Practitioner's Assurance

Equipment	Estimated leakage (t-CO <sub>2</sub> equivalent)
Large processors	277.8
Air conditioners	422.2
Others	6.1
<b>Total</b>	<b>706.1</b>

Scope of tabulation: Hokkaido and Aichi refineries, Chiba and Tokuyama complexes, Prime Polymer Co., Ltd.'s Anesaki Works, Cray Valley Idemitsu Corporation, BASF Idemitsu Co., Ltd., Idemitsu Unitech Co., Ltd., Advanced Technology Research Laboratories, and Performance Materials Laboratories  
 (As of October 2017, the Chiba Refinery & Petrochemical Plant has been reorganized into the Chiba Complex.)  
 \*6 Leakage amount (t-CO<sub>2</sub> equivalent) = Σ[Each refrigerant number group for {(Amount filled (kg) – Amount recovered during maintenance (kg)) × global warming factor}] ÷ 1,000

## 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.

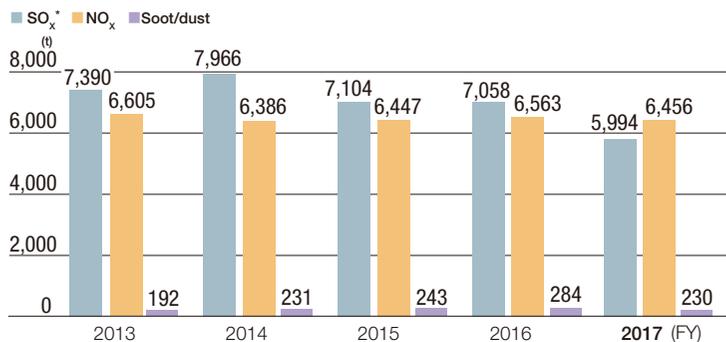
### Measures to Reduce SOx, NOx, Soot and Dust Emissions

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.

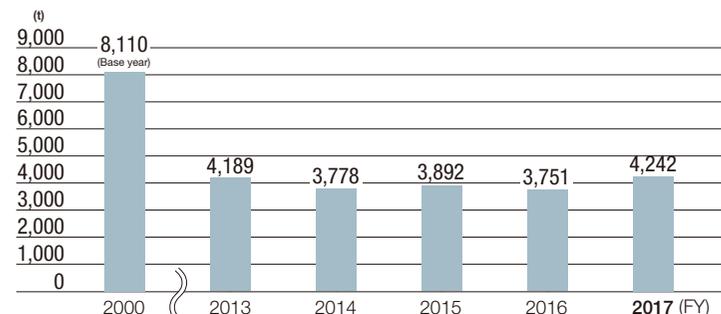
### Measures to Reduce VOC Emissions

Independent Practitioner's Assurance

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

Independent Practitioner's Assurance



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  
 Fiscal 2014: 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 2015: 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 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  
 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  
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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

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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## 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.