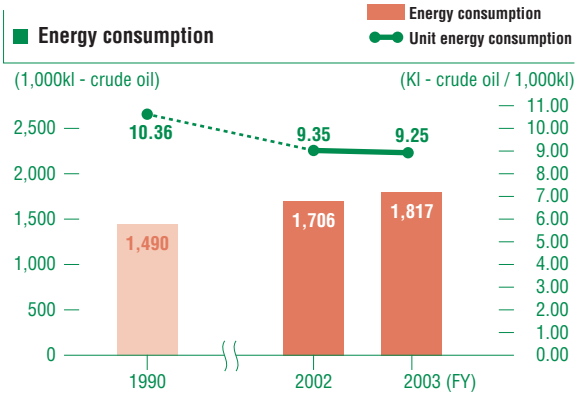
Refineries

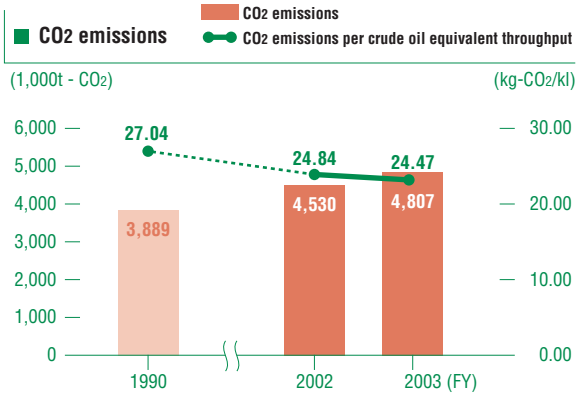
Climate change and energy conservation

We use energy efficiently by installing cogeneration systems.

Promoting efficient use of energy

At our refineries, we are committed to energy conservation through introduction of high-efficiency equipment and improvement of operational management systems. For example, we have installed cogeneration systems that utilize gas generated by the oil refining process or LP gas to promote efficient use of energy. In FY 2003, our fourth such system came on line. We also reinforced our control systems for steam power and fuel consumption in our daily operations and introduced energy-saving technologies such as high-efficiency heat exchangers and inverter controls for rotary machines. As a result of these efforts, we are able to achieve a reduction in per unit of energy consumption of 10.7% (9.25kl - crude oil/1,000kl) in FY 2003, exceeding our goal (reduction by 8.3% from the FY 1990 level).





Reference For details, please see p.10,19-26 of Data Book.

Efficient use of resources

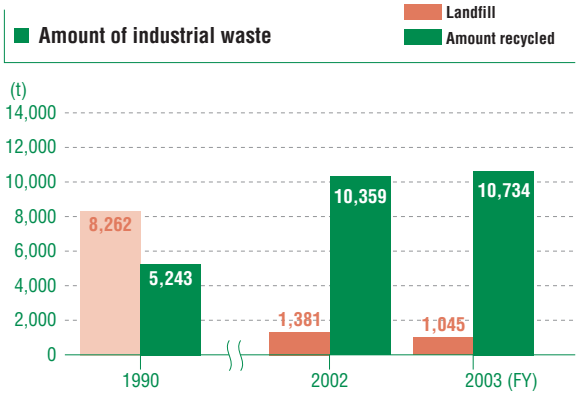
We endeavor to reduce industrial waste by employing the latest technologies and equipment.

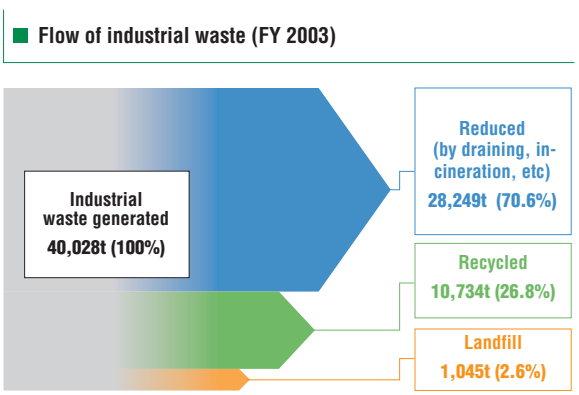
Reduction of industrial waste

Our refineries are endeavoring to reduce the landfill of industrial waste arising from the refinery process. Our efforts include reduction and separation of the waste generated. We also choose waste disposal methods that are conducive to recycling.

For example, we recycle and reuse catalysts used in the refining process and recover metals from catalysts and use it as a raw material for cement. We also endeavor to decrease the surplus sludge arising from the wastewater process by draining or incineration and keep down the volume of such sludge by introducing new technologies. At our Sakaide Refinery, we have introduced a surplus sludge reduction system and achieved a 50% reduction of surplus sludge.

As a result of these efforts, the total amount of landfill from all of our four oil refineries for FY 2003 was 1,045 tons, an 87.4% reduction from the 1990 level, over the target of an 81% reduction for the second year in a row.





Reference For details, please see p. 11, 19-26 of Data Book.

Management of chemical substances

We manage chemical substances appropriately.

Management in accordance with the PRTR law

Chemical substances used in our oil refineries include benzene and toluene in petroleum products and cobalt in catalysts used in the refining process.

We reported the amount of releases and transfers of these chemical substances for FY 2003 to the government in accordance with the PRTR Law.

Releases and transfers of the substances specified by PRTR law (FY 2003)

(Data includes Yokkaichi Kasumi Power Station)

Substance specified by PRTR law	Amount released				Amount transferred
	Air	Water	Soil	Total	
Ethyl benzene (kg/year)	1,340	0	0	1,340	0
Xylene (kg/year)	5,720	0	0	5,720	0
Cobalt and its compounds (kg/year)	0	0	0	0	3,800
1,3,5-Trimethylbenzene (kg/year)	28	0	0	28	0
Toluene (kg/year)	20,200	0	0	20,200	0
Nickel compounds (kg/year)	0	0	0	0	120,300
Benzene (kg/year)	5,320	0	0	5,320	0
Molybdenum and its compounds (kg/year)	0	0	0	0	132,000
Zinc compounds (Water soluble) (kg/year)	0	2,900	0	2,900	0
Antimony and its compounds (kg/year)	0	0	0	0	1,200
Dioxins (mg-TEQ/year)	0	29	0	29	0

Storage/management of PCB

We store PCB appropriately and report on the details to the government.

Reference For details, please see p. 19-26 of the Data Book.

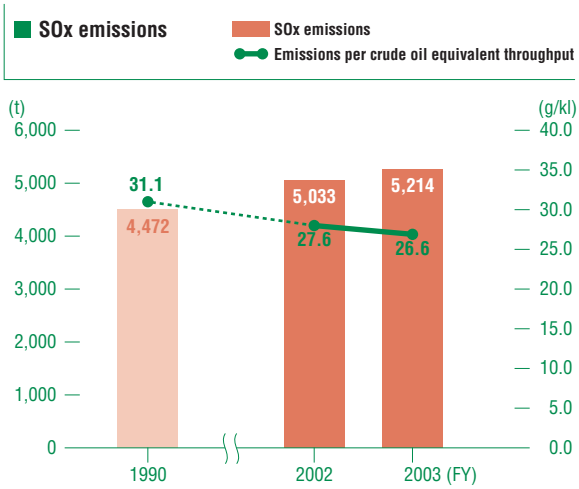
Prevention of air and water pollution

We pay constant attention to air and water, implementing emission-reducing systems for SOx and NOx, activated sludge process, etc

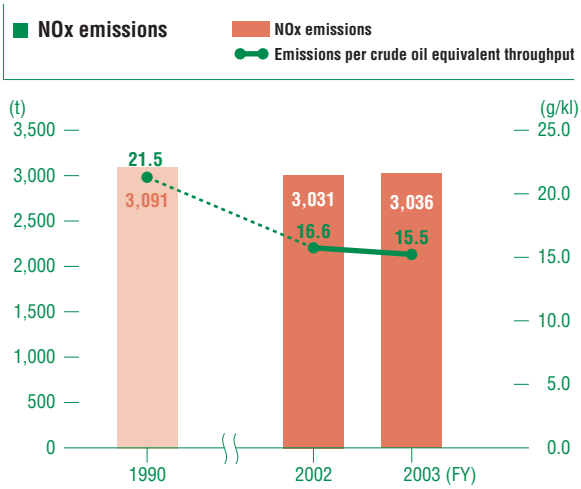
Prevention of air pollution [sulfur oxides (SOx) / nitrogen oxides (NOx)]

The refining process involves emissions such as SOx and NOx from heating furnaces and boilers.
Our refineries are endeavoring to choose fuels with lower sulfur and nitrogen levels for heating furnaces and boilers. We introduce low NOx burners to reduce the generation of thermal NOx, a substance generated when nitrogen reacts with oxygen at combustion. We also introduce flue gas desulfurization and denitrification equipment to remove generated SOx or NOx from exhaust gas. In addition, we remove small particles in exhaust fumes using electrostatic electrostatic precipitators.
As a result of these efforts, all of our four oil refineries' emission levels are under the local legal limits.

SOx emissions



NOx emissions



Reference For details, please see p. 12, 19-26 of the Data Book.

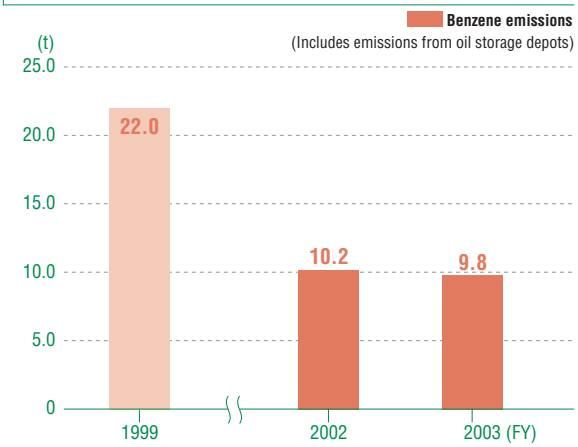
Hydrocarbons and benzene

Some petroleum products such as gasoline contain volatile components. To handle such products, we traditionally store them in a floating roof tank in order to control evaporation, and have also installed equipment that collects the hydrocarbons that evaporate when we ship the products.
Benzene, specified as a hazardous air pollution substance, is a hydrocarbon. Through the measures described above, we endeavor to reduce the benzene content in gasoline as well as to control its emissions.

Hydrocarbon vapor recovery unit

Floating roof tank

Hazardous Air Pollution Substance Emissions (Benzene)



Reference For details, please see p. 12 of the Data Book.

Dioxin emission control at waste incineration facilities

Strict controls are in place at those of our refineries that have waste incineration facilities, and as a result, the emission levels are under the limit.

Preventing water pollution and effective use of water resources

Seawater or industrial water is used in the oil refining process at our refineries. As oil content, etc may mix into wastewater that was used in the cleaning process in refining, we endeavor to prevent water contamination by removing oil content using an oil-water separation unit and other appropriate treatment such as activated sludge treatment. As a result of these efforts, all of our 4 refineries' wastewater levels are under the limits set by their respective regions. Nitrogen and phosphorous, in addition to the current COD, are now subject to total volume control since the coming into effect of the fifth water quality total pollutant control. In response to this, we have installed continuous automatic measuring equipment for nitrogen and phosphorous to measure the pollution of wastewater.
We are also committed to water conservation by recycling industrial water used in cooling systems.

Reference For details, please see p. 11,19-26 of the Data Book.

COD discharge