Results in Reduction of Environmental Impact

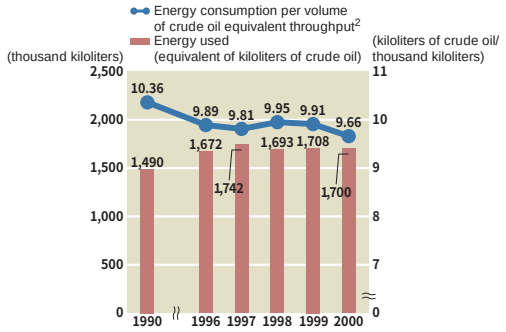
Prevention of Global Warming

Oil refineries use a great deal of energy and discharge large quantities of CO_2 in the process of refining crude oil; preventing global warming by reducing energy use is therefore one of Cosmo Oil's most important environmental protection activities.

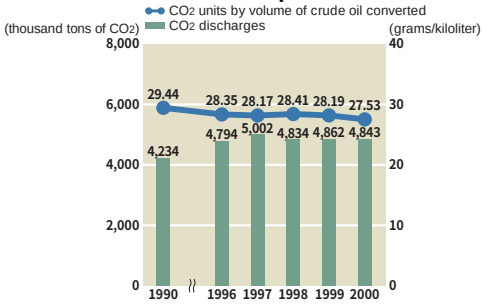
Goal: To reduce the crude oil energy consumption units for energy[1] in 2010 by 10 percent compared to 1990 levels.

Results: In the 1990s, increases in crude oil throughput, and actions on behalf of the environment such as the reduction of the sulfur content in kerosene and reduction of benzene in gasoline resulted in an increase of energy consumption at oil refineries. However, through the promotion of energy savings, 2000 levels of crude oil energy consumption units were already 6.7 percent below 1990 levels.

Energy quantities used/change of quantities of crude oil used for energy



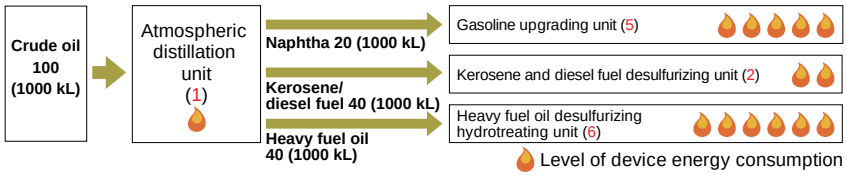
Changes of CO_2 discharges and units of crude oil equivalent



[1] **Crude oil energy consumption units**
The total amount of energy used at oil refineries is broken down into values for the amount of crude oil conversion equivalent (unit: thousands of kiloliters). The unit is shown in kiloliters of crude oil/thousand kiloliters. The total volume of energy used is the crude oil conversion value (unit: kiloliters of crude oil).

[2] **Crude oil equivalent throughput**
The throughput of each device is converted to the crude oil equivalent throughput at the atmospheric distillation column. At the atmospheric distillation column, the crude oil is separated into naphtha, kerosene, diesel fuel, heavy fuel oil, etc., and processed for sulfur reduction. Because the different units and their composition vary according to the oil refinery, the crude oil equivalent throughput, which reflects the operating conditions of each unit, can be used to calculate the crude oil energy consumption unit. With the energy consumption of the atmospheric distillation column as the base, the level of energy consumption for each device is also known and throughput can be converted. The total of the conversion throughput for the separate devices becomes the total crude oil equivalent throughput for the oil refinery.

- **Calculation** Total oil refinery energy use (equivalent of 5000 kL crude oil)

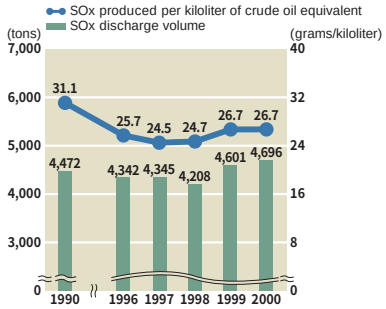


- **Crude oil equivalent throughput** (100x1) + (20x5) + (40X2) + (40x6) = 520
- **Crude oil energy consumption units** 5000/520 9.6 (kiloliters of crude oil/thousand kiloliters)

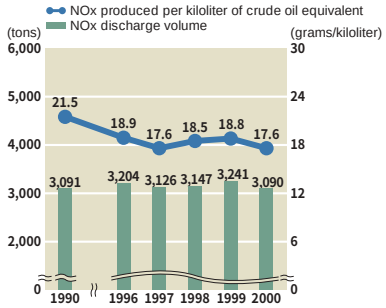
Prevention of Air Pollution

The heaters, boilers and other energy-consuming facilities used in the process of refining at the oil refineries discharge both SOx and NOx gases. However, through the use of low-sulfur fuels and countermeasures such as the denitration of flue gases and strict observance of regulations, we are working to further reduce these levels. In the area of hydrocarbon vapors, a cause of photochemical smog, actions have been taken to reduce their discharge from tanks and distribution facilities at oil refineries and oil storage depots. These countermeasures also contribute to the reduction of benzene discharges, also a damaging air pollutant.

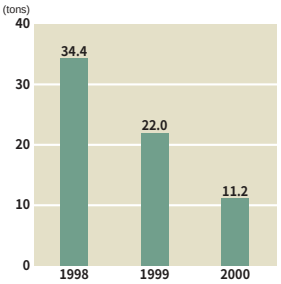
Changes in Sulfur Oxide (SOx) Discharges



Changes in Nitrogen Oxide (NOx) Discharges



Changes in Discharges of Harmful Air Pollution Material (Benzene)

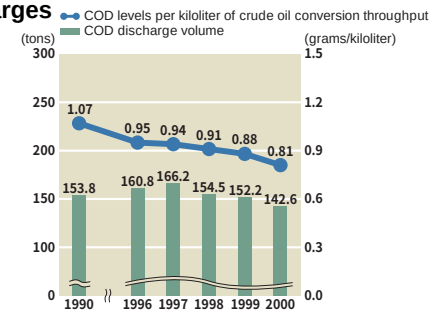


*Including discharge volume from oil storage depots.

Prevention of Water Pollution

Because wastewater becomes intermixed with oil at oil refineries, process wastewater treatment facilities are established to purify the water and make it as environmentally friendly as possible before disposal.

Changes in Water Pollution Materials (COD)[1] Discharges



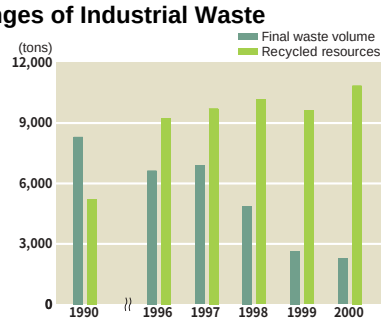
Reduction of Industrial Waste

Cosmo Oil is working aggressively to reduce the amount of industrial waste discharged from its oil refineries—one of its most important environmental protection activities.

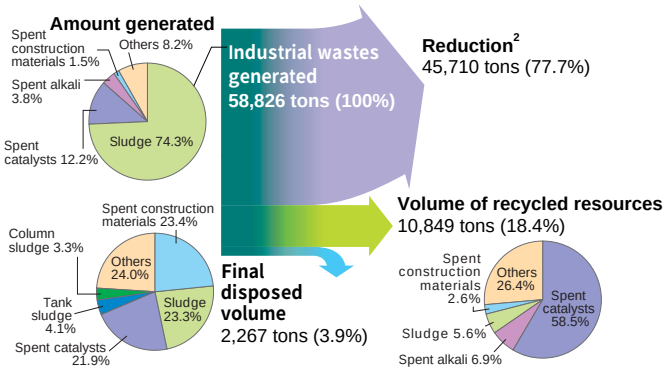
Goal: To make a 67 percent reduction in final amounts disposed in 2010, compared to 1990 figures.

Actual results: Through the separation of industrial wastes, recycling of materials and reduction of amounts, Cosmo Oil's four refineries accomplished a reduction of approximately 72.6 percent.

Changes of Industrial Waste



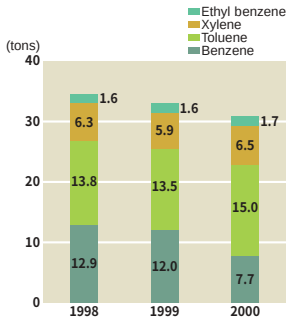
Flow of Industrial Waste Materials



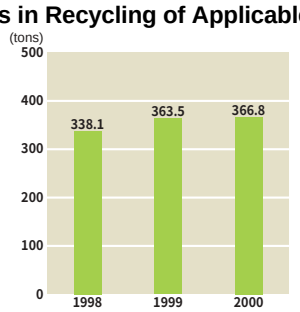
Volume of PRTR Target Materials

Cosmo Oil has been cooperating in putting into force the Pollutant Release and Transfer Registers (PRTR) law[3], with a PRTR pilot investigation undertaken by Japan's Federation of Economic Organizations in 1999, in which discharges from oil refineries were calculated. Based on PRTR, which goes into force in 2001, the control of chemical materials will be strengthened.

Changes in Pollution Exhaust Discharges



Changes in Recycling of Applicable Materials*



*Materials such as molybdenum, cobalt, etc. recycled from spent catalysts.

Soil Environmental Protection

In the daily environmental management activities at Cosmo Oil, we investigate the soil at our business areas and make the appropriate responses. Soil analysis is also conducted at oil storage depots, on service station lands and on unused properties being sold as well, and any necessary countermeasures made.

[1] COD
Chemical Oxygen Demand. One of the indexes of water pollution, it indicates the amount of oxygen consumed in the oxidization of materials including organic matter in water.

[2] Reduction
To reduce the amount of waste materials discharged from oil refineries, wastes are reduced through the dehydration and incineration of sludge.

[3] PRTR Law
Pollutant Release and Transfer Registers law. A system of notification to national authorities by company representatives of the discharge amount of listed chemical materials and wastes into the air, water and earth, to understand the amount of change outside the business location.