The Production of Products with Less Environmental Impacts Through the Efficient Use of Energy

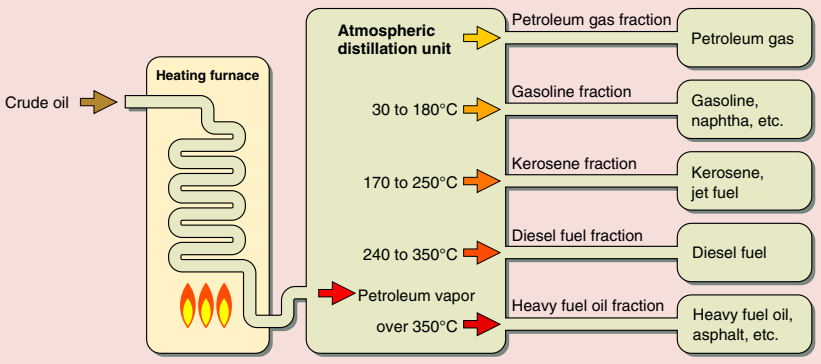
The crude oil transported from the Middle East and other areas is refined in oil refineries in order to produce petroleum products including gasoline, kerosene, and diesel fuel.

The oil refineries are equipped with heaters, boilers, and other facilities. When these facilities burn fuel oil and petroleum gas, a byproduct of refining, to obtain energy required in the refining processes, CO_2, SOx (sulfur oxides), NOx (nitrogen oxides), and other gases are released. Cosmo Oil is working to use energy efficiently to reduce CO_2 emissions, and to reduce SOx and NOx emissions*1. We are also working on the reduction of water use during the refining process, the appropriate treatment of wastewater, and the reduction of industrial wastes*2.

Cosmo Oil strives to reduce the environmental impacts occurring throughout the life cycle of our products not only by reducing the impacts from the refining processes themselves but also by employing advanced refining processes to reduce the environmental impacts from product use*3.

*1 See pages 19 and 20.
*2 See page 21.
*3 See pages 22, 27 and 28.
*4 **Flue gas denitration unit**
A unit that removes NOx from exhaust gases. Ammonia and a catalyst are used to reduce the gas, or absorption solutions are used to absorb the gas.

Mechanism of Atmospheric Distillation Unit



Petroleum Refining Process

1. Crude oil is heated to the boiling point of the various desired materials and divided into fractions.
   ⇨ Distillation (atmospheric distillation, vacuum distillation, etc.)
2. Fractions are purified by eliminating sulfur, nitrogen and metals.
   ⇨ Desulfurization (hydrodesulfurization unit)
3. The purified fractions are processed to provide added value.
   ⇨ Conversion (catalytic reforming)
   ⇨ Cracking (catalytic cracking)
4. The fractions (base materials) are mixed according to market needs.
   ⇨ Blending (gasoline mixing unit, fuel oil blending unit, lubricating oil mixing unit)

Promotion of Efficient Energy Use to Prevent Global Warming

Cosmo Oil set up energy conservation task teams at the headquarters and at four oil refineries in 1997 and has been developing and implementing effective measures to save energy.

One of such measures taken so far is the introduction of cogeneration systems. With cogeneration systems, electricity is generated at each oil refinery, thereby reducing energy loss in transmission and enabling the efficient use of energy by producing steam using the exhaust heat from power generation. The amount of power provided by the cogenerators operating at our refineries is 39,500 kW at Chiba Oil Refinery, 17,500 kW at Yokkaichi Oil Refinery, and 17,000 kW at Sakai Oil Refinery.

By improving existing facilities and by precisely controlling their operations, a further reduction in CO_2 emissions can be achieved. Cosmo Oil is promoting the horizontal implementation of energy conservation activities at our refineries. The achievements in our activities in FY 2001 include the following: Efficient use of the off-gas from the naphtha hydrodesulfurization unit (Chiba Oil Refinery); Modification of the heat exchanger installed in the atmospheric distillation unit resulting in a reduction in the heat load on the heating furnace (Yokkaichi Oil Refinery); and Improvement in the efficiency of the rotating machine resulting in a reduction in the power required (Sakaide Oil Refinery). We are planning future capital investments in facilities such as the installation of the second cogenerator at Yokkaichi Oil Refinery.


Cogeneration facility at the Chiba Oil Refinery

Preventing Air Pollution with Flue Gas Desulfurization and Vapor Recovery

We are reducing emissions of SOx and NOx gases by using fuels that are low in sulfur and nitrogen for our oil refineries' heaters and boilers. In addition, low-NOx burners are used to reduce the thermal NOx formed when atmospheric nitrogen and oxygen react during combustion, and flue gas desulfurization and denitration units*4 have been installed to remove SOx and NOx from flue gases. Electric precipitators are also used to eliminate fine particles from exhaust gases.


Fuel gas denitration unit which removes NOx from exhaust gases

Through these actions, the levels of SOx and NOx emissions from Cosmo Oil's four oil refineries have all met the local emissions control standards*1.

For gasoline tanker trucks, the release of hydrocarbon vapors*2 into the atmosphere during loading is prevented through the installation of vapor recovery units.

Vapor recovery unit that prevents the release of hydrocarbon vapors into the atmosphere

Effective Use of Water Resources and Prevention of Water Pollution

Seawater and industrial water are used in the oil refining processes. After being used for washing and other refining processes, the resulting process wastewater*3 is processed in the oil-water separation unit to remove oil, and then undergoes active sludge treatment and other processes to prevent water pollution. Cosmo Oil conserves water by recirculating industrial water for cooling.

Wastewater treatment unit

Promotion of Waste Reduction through Volume Reduction and Recycling

The major industrial wastes generated at oil refineries are the spent catalysts from the refining process and the sludge from the wastewater treatment process.

Spent catalysts are reactivated for reuse or processed for metal recovery. Otherwise, they are recycled as a raw material for cement. This reduces both the amount of waste and the costs for new catalyst purchases.

To reduce the volume, sludge is first dehydrated and then incinerated in incinerators that meet the dioxin emission regulations before disposal.

Safety and Emergency Measures

Oil refineries handle large quantities of combustible materials. Therefore, the head of the refinery serves as the chairman of the safety and health committee, which plans preventive safety measures for transportation, the construction of facilities, and general operations and administration. Our ongoing systematic safety control efforts help us meet the targets set for each year. We are making further efforts in voluntary safety measures by strengthening safety management at our oil refineries that have been in place since January 2001.

Detection of problems at an early stage is crucial to prevent accidents and disasters. Along with the installation of fire alarms and gas detection units, careful patrols are carried out at our oil refineries to immediately detect unusual conditions.

In preparation for any fire emergencies within our oil refineries, heavy-duty chemical fire engines are on standby and an internal fire brigade has been established, with ongoing comprehensive disaster drills and reporting training being carried out. We also strengthen local protection against disasters by establishing joint emergency systems with neighboring industrial complexes and by conducting joint training with public organizations.

Company fire brigade at oil refinery

Comprehensive emergency drill

To take precautions against oil spills from tankers, oil booms*4 are laid on the surface of the sea during shipping operations.

Other preparations against widespread ocean pollution that may be caused by large-scale oil spills include participation in the Petroleum Association of Japan's Oil Spill Cooperative Organization (POSCO). We bear partial responsibility in its mutual support system by setting up and maintaining a base for oil spill prevention materials and facilities at the Yokkaichi Oil Refinery.

Oil boom (in stored position)

*1 See pages 45-50.

***2 Hydrocarbon vapor**
The gasified form of light hydrocarbons.

***3 Process wastewater**
Wastewater containing oil discharged from refining facilities.

***4 Oil boom**
A boom that rides on the surface of the ocean, preventing the spread of spilled oil. It is towed into place by a tugboat or other vessel.