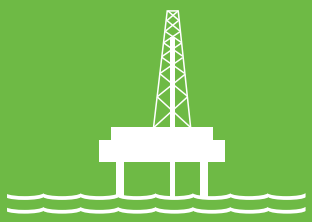
Environmental Impact of Business Activities

To deliver oil products that have minimum impact on the environment, the Cosmo Oil Group works to reduce the environmental load of oil throughout its lifecycle, including when used by customers. At every stage of the lifecycle, the Group assesses the environmental impact and makes continuous improvements.

TJ: Terajoule (10^{12} joules)

Crude Oil Extraction



INPUT

- **Energy**
  Fuel: 26,978 TJ

OUTPUT

- **Emissions into atmosphere**
  CO_2: 1,504 kilotonnes
  SOx: 20,737 tonnes
  NOx: 3,327 tonnes

Environmental measures

Air pollution control (Zero Flare Project)
Energy conservation

Crude Oil Transportation

INPUT

- **Energy**
  Fuel: 13,237 TJ

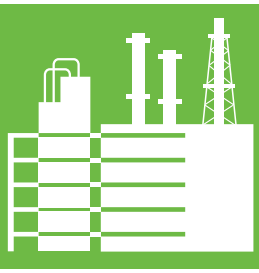
OUTPUT

- **Emissions into atmosphere**
  CO_2: 904 kilotonnes
  SOx: 19,704 tonnes
  NOx: 24,408 tonnes

Environmental measures

Energy conservation (increasing efficiency by joint distribution, increasing size of tankers)

Refining



INPUT

- **Raw materials**
  Crude oil: 27,999 Ml
  Others: 1,631 Ml
- **Energy**
  Purchased power: 3,757 TJ (389,726 MWh)
  Private-use fuel: 67,743 TJ (1,748 Ml crude oil)
- **Water**
  Industrial water: 44,483 kilotonnes
  Sea water: 372,091 kilotonnes

Total energy consumption	Unit: TJ
FY2006	70,913
FY2007	73,244
FY2008	71,499

OUTPUT

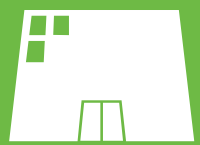
- **Emissions into atmosphere**
  CO_2: 4,917 kilotonnes
  Private-use fuel: 4,384 kilotonnes
  Purchased power: 158 kilotonnes
  Hydrogen production process: 375 kilotonnes
  SOx: 5,178 tonnes NOx: 3,194 tonnes
- **Wastewater**
  Wastewater: 381,758 kilotonnes
  (including 372,091 kilotonnes of sea water)
  Chemical oxygen demand (COD): 119 tonnes
  Nitrogen: 75 tonnes
  Phosphorus: 1 tonne
- **Industrial waste**
  Generated: 58,482 tonnes
  Recycled: 24,235 tonnes
  Final disposal: 601 tonnes
- **PRTR Law designated chemical substances**
  Released: 79 tonnes
  Transferred: 406 tonnes

CO_2 emissions	Unit: kilotonnes
FY2006	4,847
FY2007	5,063
FY2008	4,917

Environmental measures

Energy conservation
Resource conservation/recycling
Industrial waste management
Chemical substance control
Air pollution control Wastewater management
Soil preservation On-site tree planting

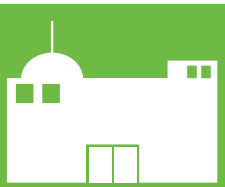
Offices



Environmental measures

Energy conservation
Resource conservation/recycling
Green purchasing

Research and Development Center



Environmental measures

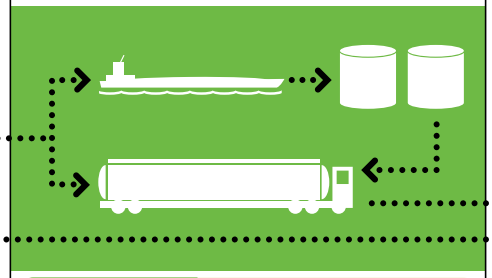
Energy conservation
Resource conservation/recycling
Industrial waste management
Chemical substance control
Wastewater management

- SOx and NOx figures for "Crude Oil Extraction," "Crude Oil Transportation," and "Product Transportation and Storage at Oil Depots" are estimated based on *LCI for Petroleum Products by Fuel and Environmental Impact Assessment for Petroleum Products*, published in March 2000 by the Japan Petroleum Energy Center (JPEC).
- CO_2 emissions for "Refining" and "Product Transportation and Storage at Oil Depots" are calculated in accordance with the Guidelines for Accounting Greenhouse Gas Emissions from the Industry (Draft), published by the Ministry of the Environment and the Ministry of Economy, Trade and Industry.
- See the Cosmo Oil Group Web site for the methodology and basis of "Product Use" calculations.
  - Detailed information: Environmental accounting
    http://www.cosmo-oil.co.jp/eng/csr/accounting/ev_calculation.html
- Energy consumption is calculated in accordance with the stipulations regarding the rational use of energy in the Act on the Rational Use of Energy.
- "Refining" includes data from the Yokkaichi Kasumi Power Station and Cosmo Matsuyama Oil Co., Ltd.
- Electricity sold" refers to power sold by Chiba Refinery, Yokkaichi Kasumi Power Station, and Cosmo Matsuyama Oil Co., Ltd. CO_2 emissions for "Refining" were calculated after deducting the portion of CO_2 emissions that results from generating electricity sold. Conversely, the purchased power portion of CO_2 emissions is included in "Refining" data.
- "Steam sold" refers to steam sold by the Chiba Refinery and Cosmo Matsuyama Oil Co., Ltd. CO_2 emissions for "Refining" were calculated after deducting the portion of CO_2 emissions that results from generating steam sold.
- CO_2 emissions attributable to the construction of facilities are not included in calculations.
- SOx emissions for "Product Use" are included for reference, and were estimated from the sulfur content of products without accounting for sulfur reduction during use. Accordingly, actual SOx emissions are lower than the estimate.
- With regard to CO_2 for "Product Use," in addition to CO_2 emissions resulting from the use of products, CO_2 emissions attributable to generating electricity and steam sold are estimated separately.
- Naphtha used mainly as a petrochemical material does not directly emit CO_2 or SOx. However, naphtha is included with other petroleum products when calculating CO_2 and SOx emissions for "Product Use."
- "Industrial waste" refers to waste generated during business activities, which includes waste that could be sold.

Products

- **Production:**
  28,340 Ml
- **Sulfur recovered:**
  257 Ml
  (by-product)
- **Electricity sold:**
  1,533,679 MWh
  (14,969 TJ)
- **Steam sold:**
  1,800 TJ
- **CO_2 sold:**
  132 kilotonnes

Product Transportation and Storage at Oil Depots



INPUT

- **Energy**
  Fuel: 2,291 TJ

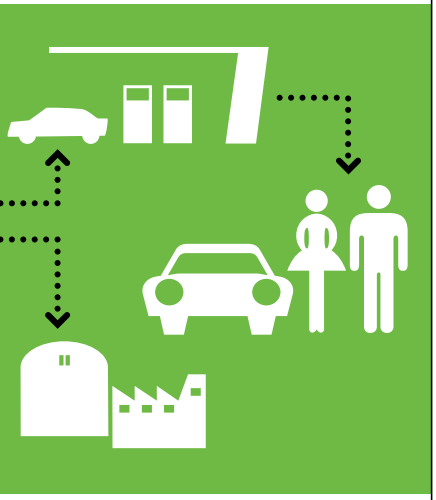
OUTPUT

- **Emissions into atmosphere**
  CO_2: 158 kilotonnes
  SOx: 1,785 tonnes
  NOx: 3,457 tonnes

Environmental measures

- **Maritime transportation**
  Oil spill prevention
  Energy conservation (increased efficiency through mutual accommodations, and use of larger tankers for coastal routes)
- **Ground transportation**
  Energy conservation (larger vehicles and high stowage rates)
- **Storage at oil depots**
  Energy conservation
  Resource conservation
  Chemical substance control
  Soil preservation
  Oil spill prevention

Product Use



OUTPUT

- **Emissions into atmosphere**
  CO_2: 70,736 kilotonnes
  (The figure above does not include CO_2 emissions of 1,048 kilotonnes attributable to generating electricity sold, and CO_2 emissions of 86 kilotonnes attributable to generating steam sold.)
  SOx: 141,811 tonnes

CO_2 emissions	Unit: kilotonnes
FY2006	68,253
FY2007	73,878
FY2008	70,736

Environmental measures

- **Service stations**
  Energy conservation
  Resource conservation/recycling
  Industrial waste management
  Chemical substance control
  Air pollution control
  Wastewater management
  Soil preservation

CO_2 Emissions throughout the Oil Lifecycle