



Hydrogen refueling station

Natural gas

Cosmo Oil holds an interest in the LNG Chubu Corporation, a liquefied natural gas provider set up by Chubu Electric Power Co., and other companies, and began to supply LNG to city gas utilities at the end of 2001. During fiscal 2002 the company reached the first agreement in Japan for LNG tanker truck deliveries to the industrial sector. Meanwhile, Sakai LNG Co., a joint venture we formed with Kansai Electric Power Co. and other companies, plans to construct an LNG shipping pier and facilities adjacent to our Sakai Oil Refinery for receipt, storage, and vaporization of LNG, and delivery of vaporized LNG.

Natural gas has the merit of creating relatively lower environmental impacts than other fuels during use, but to supply this fuel as LNG (i.e., in liquid form) huge amounts of energy are needed to liquefy and store it at extremely low temperatures (minus 162°C). Also, to supply natural gas in gaseous form, pipelines must carry it from the gas field to the market. To overcome such limitations, Cosmo Oil is working to develop gas to liquid (GTL) technologies*1 to convert natural gas to liquid fuel using chemical reactions. We are participating with other companies in Japan National Oil Corporation projects to develop catalysts for the production of liquid fuels from synthetic gases. Cosmo Oil succeeded with Japan's first-ever GTL oil production during testing in fiscal 2002 at a pilot plant in Hokkaido. We are also investigating DME*2 synthesis technologies.

Enhancing our environmental accounting system

The Cosmo Oil Group started collecting environmental accounting*3 data in 2001 to use in internal decision-making and as a tool for fulfilling our accountability to the public. To be effective in our efforts to protect the environment, it is

essential to know clearly the environmental and economic costs and benefits. From this it is possible to measure costs versus benefits of each activity area, from both the environmental and economic perspectives. The ideal approach would be to ascertain these over the entire life cycle, but life cycle assessments in the petroleum industry are still at the developmental stage worldwide. Under these circumstances, the Cosmo Oil Group is implementing environmental accounting that includes not only the environmental impact of our actual business activities, but also the impacts of our products, and is attempting to calculate integrated environmental indicators and environmental productivity, using the EPS** approach. In addition, we have completed computerization of our environmental accounting system, and started its full operation during fiscal 2003. Below is a summary of our environmental accounting results for fiscal 2002. We are looking into ways to improve data accuracy and considering expanding the number of sites covered by data collection, and will continue working to improve on the categories covered in our reporting.

Summary of the environmental accounting results for fiscal 2002.

Environmental protection costs: Include costs associated with pollution prevention, reducing sulfur content of products, environmental research and development, etc. Investments of fiscal 2002 amounted to 2.16 billion yen, and the expenses to 44.54 billion yen.

Environmental protection benefits:

Environmental impacts arising from business operations, calculated by the EPS method, rose by 84,000 tons, to 5,176,000 tons (CO₂ equivalent), due to increased environmental impacts from the increase in the amount of crude oil processed and more intensive refining. Also, the environmental impacts during product use increased by 2,365,000 tons, to 77,114,000 tons (CO₂ equivalent), due to increased production volumes.

Economic benefits: The total economic benefits amounted to 2.3 billion yen, including 2.18 billion yen from the energy conserving effects of cogeneration equipment, the reduction in waste treatment costs (thanks to the recycling of used catalyst), and revenue from patents arising from research and development, etc.

*1. GTL (Gas to Liquid)

Kerosene or diesel are produced by Fischer Tropsch (FT) synthesis after converting methane (the main constituent of natural gas) into synthetic gas (a mixture of hydrogen and carbon monoxide). Dimethyl ether is produced from synthetic gas by DME synthesis. Because liquid fuels produced by GTL technology contain no sulfur or aromatics they are being seen as the next generation of clean fuels.

*2. DME (CH₃OCH₃)

Dimethyl ether is mainly used as an aerosol propellant. A chemically stable, colorless gas that is easily liquefied under pressure at room temperature, it is being seen as a clean alternative fuel for diesel engines.

*3. See pages 47–50.

*4. See page 48.