

# Environmental Accounting

## Introduction of Environmental Accounting

Cosmo Oil has for the first time adopted environmental accounting. The costs of environmental preservation have been calculated, and the effects of these activities gathered in a way which reflects the unique factors of the petroleum industry.

In introducing environmental accounting, our aim is to use it both for the internal statement of our goals and intentions, and to help us meet our responsibilities in communicating with our stakeholders.

The structure of environmental accounting is outlined in the guidelines of the Ministry of the Environment; a number of domestic industries make their official announcements of environmental accounting in accordance with these guidelines. The petroleum industry also applies the guidelines specified in the Investigation Report on the Introduction of Environmental Accounting in the Petroleum Industry by the Petroleum Energy Center (PEC).

Since environmental accounting has just begun, however, these guidelines will continue to change and be updated to better correspond to the differences in various industries, and to the unique needs of every company.

Cosmo Oil undertook this environmental accounting by referring to the guidelines of the Ministry of the Environment and the Petroleum Energy Center and conducted an environmental accounting which is related to environmental protection activities. Total expenditures for environmental costs are calculated to cover the costs stated in financial accounting.

## Applicable Report Scope and Period

### Report period

Fiscal year 2000 (April 1, 2000 to March 31, 2001)

### Report scope

This report covers Cosmo Oil's four oil refineries; the total figures reflected only the directly related activities of the oil refineries, with the costs and effects of closely-related companies included.

### Cosmo Oil Co., Ltd.

Chiba Oil Refinery, Yokkaichi Oil Refinery, Sakai Oil Refinery, Sakaide Oil Refinery

### Cosmo Oil Lubricants, Co., Ltd.

Chiba Factory, Yokkaichi Factory (the environmental costs and effects of these two factories are included with those of Cosmo Oil's Chiba Oil Refinery and Yokkaichi Oil Refinery), purchase costs for environmentally friendly lubricating oil raw materials

### Cosmo Matsuyama Oil Co., Ltd.

Costs concerned with the reduction of benzene in gasoline (product environmental impact decrease cost) and costs for the after-treatment of crude benzene.

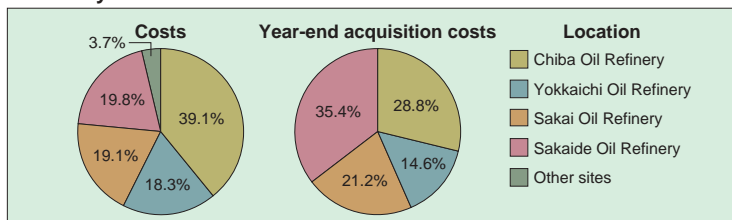
### Cosmo Research Institute

Costs and effects of research and development concerned with environmental preservation.

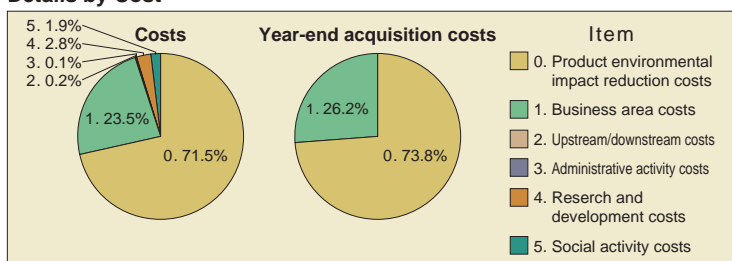
## Environmental Accounting by Site

Environmental accounting is totaled after separating the four oil refineries and other sites; separate data on each site is provided from pages 41 to 45.

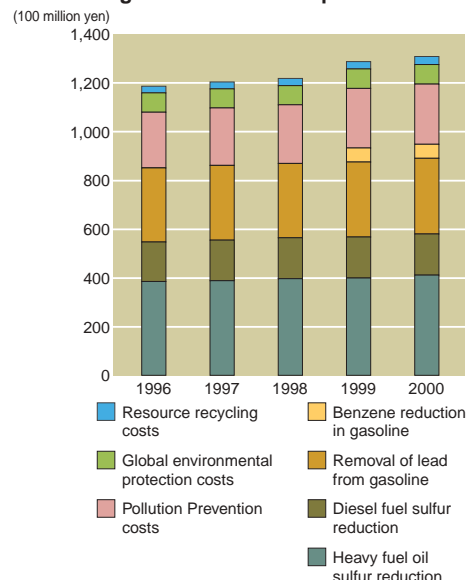
### Details by Site



### Details by Cost



### Changes in Year-End Acquisition Costs



## Characteristics of the Petroleum Industry

Because Japan's petroleum products are largely produced from high-sulfur Middle East oil, highly advanced purification infrastructure for environmental protection has been a necessity, with massive investment made over many years. For the future, even stricter quality regulations aimed at environmental protection are expected, so that additional and increased environmental protection investments by industry are anticipated.

Because the main products of the petroleum industry—gasoline, kerosene, diesel fuel and heavy fuel oil—will be burned at the end-user stage, there are three environmental impact factors:

### Characteristics of the Environmental Impact of Petroleum Products

1. Because use of these products means combustion, processes such as recycling, recovery or re-merchandising, all feasible with durable goods, are not possible.
2. Recycling, recovery or re-merchandising of containers and packaging material is not possible. For example, gasoline is supplied directly to the vehicle, so the delivery of the product is to the customer's "container."
3. As stated in 1., use of these products takes the form of combustion; this results in the release of materials with environmental impact, including pollutants such as sulfur oxide and nitrogen oxide, as well as CO<sub>2</sub>.

## Departures from Ministry of the Environment Guidelines

Because of the unique conditions of the petroleum industry already mentioned, in making our environmental accounting some points differ from the Ministry of the Environment guidelines:

1. The Investigation Report on the Introduction of Environmental Accounting in the Petroleum Industry by the Petroleum Energy Center was used as the reference in adding the following cost classifications:

### 0. Product environmental impact reduction costs

1. Heavy fuel oil sulfur reduction
  2. Diesel fuel sulfur reduction
  3. Removal of lead from gasoline
  4. Benzene reduction in gasoline
2. The year-end acquisition costs are shown to understand the amount of investment on environmental protection equipment and the changes in accumulated investment during the year.
3. The items regarding environmental effects include the environmental load discharged from

business areas, as well as a calculation of the environmental impact occurring when products are used; the reduction in the environmental impact volume during refining process at oil refineries; and the potential environmental impact volume related to products.

## Environmental Cost Classification

Costs and investments are classified according to six categories developed by referring to the guidelines of the Ministry of the Environment and the Petroleum Energy Center.

### 0.\*Product environmental impact reduction costs:

The costs associated with quality improvement to reduce environmental impact at the product consumption stage.

Heavy fuel oil sulfur reduction: Costs related to reducing the release of sulfur oxide which occurs in the use of heavy fuel oil by the reduction of sulfur content.

Diesel fuel sulfur reduction: Costs related to the reduction of release of nitrogen oxide and particulate materials in diesel vehicle exhaust gases through the reduction of sulfur content to less than 0.05 percent.

Removal of lead from gasoline: Costs related to discontinuing the use of 4 alkyl lead additive as an octane number booster and producing other base materials for high-octane gasoline.

Benzene reduction in gasoline: Costs related to the reduction of benzene, a material of concern due to possible effects on the human body, to one percent or less.

### 1. Business area costs

Pollution prevention costs

Air pollution prevention costs (sulfur recovery facilities, nitrogen oxide control facilities, etc.)

Water pollution prevention costs (wastewater processing facilities, sour water processing facilities, etc.)

Global environment protection costs: Costs associated with energy-saving facilities such as cogeneration facilities.

Resource recycling costs: Costs related to waste processing and recycling.

**2. Upstream/downstream costs:** Cost differential between the purchase of low environmental impact and general raw materials.

**3. Administration activity costs:** Costs incurred through employee environmental education, employment and maintenance related to the environment management system, and the observation and measurement of environmental impacts.

**4. Research and development costs:** Costs incurred through research and development related to environmental protection.

**5. Social activity costs:** Costs incurred through afforestation, beautification, and compensation levied by the Pollution-Related Health Damage Compensation Law.

\*Please note that the outline format used here is in keeping with the format of the Japanese guidelines used.

# Environmental Accounting

## Total Results of Environmental Accounting

Total environmental costs for 2000 were 47,128 million yen; investment totaled 2,417 million yen; fiscal year-end acquisition costs were 128,469 million yen. These all indicate that product environmental impact reduction costs account for a major share of 70 percent or more of total costs.

The cost of environmental protection in all oil refinery activities accounts for 50 percent of expenses, 40 percent of investment, and 25 percent of fiscal year-end acquisition costs.

### Method of calculating environmental protection effect

As the guidelines for the calculation of the results of environmental protection activities are still in the development stage, there is still much room for review.

For Cosmo Oil, we believe that while proper calculation of total effect and value has been made in our environmental accounting, and that we will continue to consider examination methods in the future, the following should be considered as a trial calculation.

### 0. Effectiveness of Reduction of Product Environmental Impact

**1. Reduction of Environmental Impact:** The level of reduction of environmental impact through advanced refinery technology at our oil refineries.

**Decrease of Environmental Impact:** Calculated by taking the difference between the standard value and average concentration for Cosmo Oil in 2000, multiplied by production quantity, converted to give environmental impact materials.

**Concentration/Basic Unit:** The difference between the base value and the average concentration for the company during 2000.

Item	Standard	Content
Gasoline sulfur content	0.01%	JIS automotive gasoline quality standard
Kerosene sulfur content	0.008%	JIS No. 1 kerosene quality standard
Diesel fuel sulfur content	0.2%	Prior to 1997 revision to JIS diesel fuel quality standard. Following the revision, the current standard is for sulfur content of less than 0.05%.
Gasoline benzene content	5%	Prior to 2000 revision to JIS automotive gasoline quality standard. Following the revision, the current standard is for less than 1%.

**2. Environmental Impact Level:** The potential environmental impact expected when the product is used, after the reduction of product environmental impact at the oil refinery level.

\*Considering the relationship between cost and environmental protection, the most suitable method of production is established, with product sulfur levels well below the numerical values set by standards.

\*Because SOx reduction accomplished by sulfur reduction

## Environmental Accounting

Item	Environmental Protection Cost (unit: million yen)		
	Cost	Investment	Fiscal year-end acquisition costs
<b>0 Product environmental impact reduction costs</b>			
Heavy fuel oil sulfur reduction	18,701	1,416	41,116
Diesel fuel sulfur reduction	4,938	85	16,876
Removal of lead from gasoline	7,979	328	31,044
Benzene reduction in gasoline	2,056		5,753
<b>1 Business area costs</b>	<b>11,097</b>	<b>588</b>	<b>33,680</b>
Pollution prevention costs	3,899	403	24,693
Global environmental protection costs	6,487	27	8,018
Resource recycling costs	711	158	969
<b>2 Upstream/downstream costs</b>	<b>82</b>		
<b>3 Administration activity costs</b>	<b>64</b>		
<b>4 Research and development costs</b>	<b>1,331</b>		
<b>5 Social activity costs</b>	<b>880</b>		
<b>Total</b>	<b>47,128</b>	<b>2,417</b>	<b>128,469</b>

equipment at the time of customer use is not taken into consideration, the actual SOx emission volume is smaller than the latent SOx quantity.

\*Although figures for naphtha are contained, it is used as a raw material in petrochemical applications and fertilizers, so SOx and CO2 are not directly discharged.

**Impact Level:** Product sulfur reduction = average sulfur content in company products multiplied by production volume, converted to the environmental impact for the given material.

Gasoline benzene reduction = average benzene concentration in gasoline multiplied by production quantity.

CO2 emission volume during product use = the figure derived from multiplying the basic unit for CO2 discharge for various products used by the Petroleum Association of Japan by the production figure for Cosmo Oil, added to all petroleum products.

**Concentration/Basic Unit:** Product sulfur reduction = quantity of sulfur in products.

Gasoline benzene reduction = benzene concentration in gasoline.

CO2 volume discharge in product use = environmental impact mentioned above divided by petroleum product production figure.

Item	Environmental Protection Effect			
	Reduction of Environmental Impact		Environmental Impact Level	
	Decrease of Environmental Impact	Concentration/Basic Unit	Impact Level	Concentration/Basic Unit
<b>0 Effectiveness of Reduction of Product Environmental Impact</b>				
Product sulfur reduction	(Latent SOx quantity: tons)	(Sulfur content: %)	(Latent SOx quantity: tons)	(Sulfur content: %)
• Gasoline	662	0.0072	257	0.0028
• Kerosene	282	0.0047	194	0.0033
• Diesel fuel	13,560	0.1588	3,520	0.0412
• Heavy fuel oil			203,655	1.0431
Total			207,626	
Benzene reduction in gasoline	(kiloliter)	(%)	(kiloliter)	(%)
	275,466	4.3816	38,879	0.6184
CO2 released during product use			(CO2, thousand tons)	(CO2 kilograms/kiloliter)
			69,136	2,560.02
<b>1 Effect within business areas</b>	(tons)	(grams/kiloliter)	(tons)	(grams/kiloliter)
SOx emissions	95	0.02	4,696	26.69
NOx emissions	151	1.23	3,090	17.56
Benzene emissions	4.3	0.03	7.7	0.04
COD displacement	9.6	0.07	142.6	0.81
CO2 emissions	(CO2, thousand tons)	(CO2 kilograms/kiloliter)	(CO2, thousand tons)	(CO2 kilograms/kiloliter)
	18.98	0.66	4,843	27.53
Basic unit of energy consumption		0.25		9.66
Industrial waste generated	(tons)		(tons)	
	5,837		58,826	
Reused industrial waste			10,849	
Industrial waste disposed			2,267	

### Economic Effect

Item	Amount (unit: million yen)
Savings through energy reduction (savings through cogeneration)	3,614
Cost reduction through reduced handling of industrial waste (savings through catalyst recycling)	131
Effects of research and development (income through royalties, etc.)	50
Total	3,795

#### 1. Effect within business areas

**1. Reduction of Environmental Impact:** The decrease in environmental impact in 2000 compared to the previous year (where environmental impact has increased, a minus mark is indicated).

**Impact Level:** The absolute level of environmental impact.

**Concentration/basic unit:** The reduction in environmental impact per the quantity of crude oil converted.

\*For crude oil conversion treatment quantity and basic units of energy consumption, please see page 15.

**2. Environmental impact level:** The environmental impact quantity discharged from within business areas in 2000.

**Impact Level:** The absolute level of environmental impact.

**Concentration/basic unit:** The environmental impact level per the quantity of crude oil converted.

**Method for calculating economic effect:** Although Cosmo Oil has not yet established a definitive method for totaling the economic effects, the following numerical values are provided for reference.

#### Savings through energy reduction:

Estimation of the amount of savings made by the introduction of cogeneration equipment.

**Cost reduction through reduced handling of industrial waste (savings through catalyst recycling):** Savings achieved through the recycling of catalysts used in oil refining, compared to the costs for the purchase of new and disposal of used catalysts.

**Effects of research and development (income through royalties, etc.):** Royalty income, actual receipts and cost-savings achieved through research and development.

### Subjects for the Future

Cosmo Oil's environmental accounting process is only at the starting point. Our goal for the future is environmental accounting which is useful for internal management decisions, and which provides accountability to society as well.

We hope to continue by taking in opinions and requests from outside the company, more thoroughly examining our internal operations, continuing research, and expanding the area of coverage, the items covered and the evaluation indexes.