We are working to enhance our environmental accounting system, an important tool for management decision-making and information disclosure.

Environmental accounting at the Cosmo Oil Group

The Cosmo Oil Group started environmental accounting in fiscal 2001, making this the third year of using the system. To put our commitment to environmental excellence into action, we are using the system as a tool for internal decision-making and for accountability to the public. In preparing this environmental accounting report, we made an effort to determine both the costs and benefits of efforts to protect the environment, keeping in mind the unique characteristics of the petroleum industry. One characteristic is that substances causing environmental impacts are generated by combustion when the product is used by customers. The other is that huge investments have been made over many years to mitigate environmental impacts, because we produce petroleum products from Middle East crude oil, which is high in sulfur content (see graph of "Costs of environmental equipment acquisitions (at year end)"). In preparing this report, we referred to the *Environmental Accounting Guidelines* (2002) from Japan's Ministry of the Environment and the same ministry's 2003 *Guide to Environmental Protection Cost Classifications* (March 2003).

As in the past, environmental costs were calculated in a way that covers all the categories stated in our financial accounting.

This year, the Cosmo Oil Group created the *Blue Earth 21* Medium-Term Environmental Plan. Through it, all group companies are working together to tackle environmental issues. To improve our transparency and breadth of coverage, in our environmental accounting this year we have added such costs as the purchase of recycled paper.

In addition, we continue to include environmental indicators this year.

Period and scope of environmental accounting report

◎Period

Fiscal year 2002 (April 1, 2002 to March 31, 2003)

◎Scope

The report covers the four oil refineries owned by Cosmo Oil Co., as well as the corporate head office and branch offices, the Research and Development Center, Cosmo Matsuyama Oil Co., and Cosmo Oil Lubricants Co.

Cosmo Oil Co., Ltd.

Chiba Oil Refinery, Yokkaichi Oil Refinery, Sakai Oil Refinery, Sakaide Oil Refinery, Corporate head office, some branch offices (only the purchases of recycled paper), the Research and Development Center (only the costs and benefits of research and development in the area of environmental protection)

Cosmo Matsuyama Oil Co., Ltd.

Cosmo Oil Lubricants, Co., Ltd.

Chiba Factory, Yokkaichi Factory (environmental costs and benefits for these two are included with Cosmo Oil's refineries in Chiba and Yokkaichi). Green purchasing costs for raw materials to produce lubricating oils are covered.

Environmental accounting by site

Environmental accounting is prepared separately for Cosmo Oil Co.'s four refineries, Cosmo Matsuyama Oil Co., and other sites. The data is available at the following website:
www.cosmo-oil.co.jp/eng/envi/2003/index.html

Changes from previous year

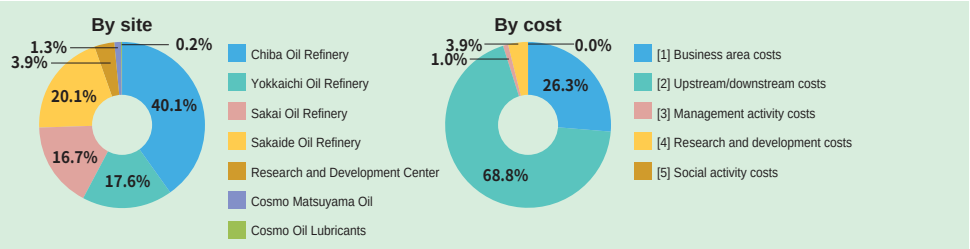
Major changes in environmental accounting from the previous year are described below.

◎Expansion of data categories and sites covered

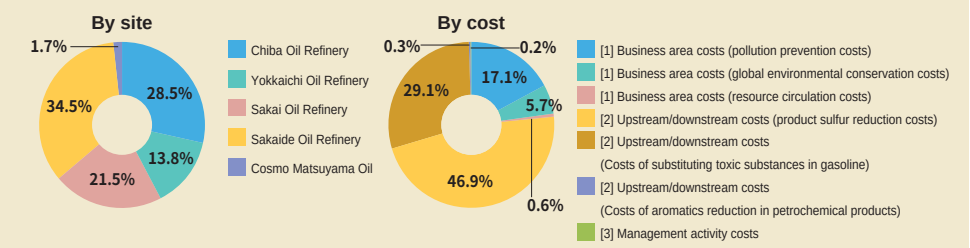
To increase transparency and coverage this fiscal year, we collected data and report on the following categories:

1. Environmental protection costs
   (Cosmo Oil Co., Ltd., entire company)
   a. Cost of purchasing recycled paper
   b. Donations relating to the environment
   c. Cost of preparing environmental reports
2. Economic benefits (Cosmo Oil Co., Ltd. head office)
   Electricity costs of the offices of the corporate head office.

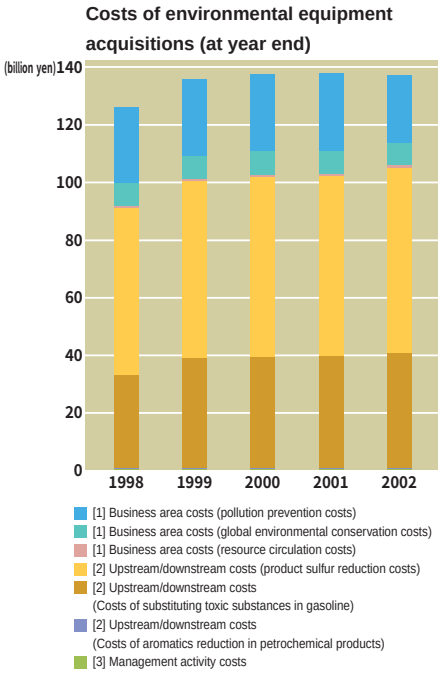
Environmental cost



Year-end acquisition costs



Costs of environmental equipment acquisitions (at year end)



Environmental accounting results

For fiscal year 2002, on the environmental cost side, investments amounted to 2.160 billion yen and expenses 44.54 billion. Compared with the previous year, investments increased by 1.098 billion yen, and expenses decreased by 2.651 billion. Year-end acquisition costs of environmental equipment were 137.109 billion yen, a decrease of 695 million from the previous year.

With regard to environmental benefits, the absolute figures for environmental impacts rose due to increased demand for fuels for heating and electricity generation in the cold winter, as well as the effects of responding to tougher 50 ppm standards for diesel. But the environmental impacts per crude oil equivalent throughput was lower than last year in almost all categories. In addition, for upstream and downstream benefits, as a result of the increased demand, the environmental impacts increased in absolute figures, but the concentrations and amounts per unit were lower than last year for many categories.

Future issues

We are now in our third year of our environmental accounting system. For calculations, we made an effort to keep in mind the issues raised last year, and to improve the transparency and coverage, in order to be more accountable to the outside. Internally, the data has been helpful with decision-making, as we used plant-specific cost data as a basis for calculations of values in connection with various company contracts.

Cosmo Oil Co. created the *Blue Earth 21* Medium-Term Environmental Plan in fiscal 2002. The computerization of environmental accounting systems is a part of this plan and we have been working to implement it. Development of the computer system was completed at the end of fiscal 2002, and actual implementation started in April 2003, covering Cosmo Oil Co.'s four refineries, and the Yokkaichi Kasumi power generation plant, which started commercial operation in July.

In the future, we will consider ways to improve data accuracy and expand the sites covered, and to improve the range of coverage in reporting.

Integrated environmental indicators and environmental productivity

Since last fiscal year the Cosmo Oil Group has been calculating integrated environmental indicators and environmental productivity on a trial basis—as a part of environmental accounting.

The environmental impacts in the business area (calculated based on EPS methods) increased in fiscal 2002 because of a greater volume of crude oil processed and more sophisticated refining. Because the production volume has increased, the environmental burden of products also increased, and this resulted in an increase in the totals.

Environmental productivity improved in the business area, but declined in the product area, with the outcome being a net decline. A major reason for this was that, while the sulfur content of products declined, the proportion of heavy fuel oil C production (which has high CO_2 emissions per unit) increased due to an increase in demand for this fuel for electricity generation.

■ Integrated environmental Indicators

Item		CO_2 equivalent using EPS	
		FY 2002	Reduction (compared with FY 2001)
Business area	SOx	182	–16
	NOx	64	0
	Benzene	0	0
	COD	0	0
	CO_2	4,930	–68
Business area total		5,176	–84
Product use: potential SOx emissions		5,390	4
CO_2 emissions from product use		71,724	–2,369
Product use total		77,114	–2,365
Business area total + Product use total		82,290	–2,449

(Unit: thousand t-CO_2 equivalent)

*Calculated using EPS methods.
Weighting coefficients (CO_2=1): SOx=30.3, NOx=19.7, benzene=33.8, COD=0.00935.
Note: EPS stands for "Environmental Priority Strategies in Product Design" (Version 2000), by the Centre for Environmental Assessment of Products and Material Systems, Sweden.

■ Environmental productivity

Item	Production volume per unit of integrated environmental impacts	
	FY 2002	Improvement (compared with FY 2001)
Business area total	5.469	0.012
Product use total	0.367	–0.005
Business area total + Product use total	0.344	–0.004

(Unit: kl/t-CO_2 equivalent)

Methods of compiling environmental accounting data

■ **Measurement of Environmental Costs**

Investments: Capital investment for depreciable assets acquired for the purpose of environmental protection
Expenses: Expenses during the period associated with environmental protection activities (includes depreciation)

[1] Business area costs

Global environmental conservation costs: Costs associated with energy conservation equipment (for co-generation, etc.)

Pollution prevention costs:

Costs to prevent air pollution (sulfur recovery equipment, nitrogen oxides control equipment, etc.)

Costs to prevent water pollution (wastewater treatment equipment, sour water treatment equipment, etc.)

Compensation fund under the Pollution-related Health Damage Compensation Law

Resource circulation costs: Costs related to waste treatment and recycling

[2] Upstream/downstream costs

Product environmental impact reduction costs: Costs associated with providing customers products that have lower environmental impacts

Product sulfur reduction costs: Costs associated with reducing SOx emissions generated during product use by lowering the sulfur content in products

Costs of substituting toxic substances in gasoline (benzene, etc.): Costs associated with the reduction and substitution of toxic substances in gasoline such as benzene and lead

Costs of aromatics reduction in petrochemical products: Costs associated with the reduction of aromatics and olefins in the raw materials of petrochemical products

[3] Management activity costs:

Costs incurred for employees' environmental education; for operating and maintaining the environmental management system; for maintaining green spaces at business establishments; and for monitoring and measuring environmental impacts

[4] Research and development costs:

Costs incurred for research and development related to environmental protection

[5] Social activity costs:

Costs related to greening and other activities that are not related to business activities

∗ The classification of funds levied under the Pollution Related Health Damage Compensation Law was changed from last fiscal year's classification as "social activity costs" to "pollution prevention costs" in the "business area cost" category in accordance with the 2003 Guide to Environmental Protection Cost Classification (Japan's Ministry of the Environment, March 2003). As a result, the fiscal 2001 social activity cost category dropped from 820 million yen to 6 million, and the pollution prevention cost category rose from 3.794 billion yen to 4.608 billion.

■ **Measurement of Environmental Benefits**

"Reduction benefits" and "reduction": the fiscal 2001 figure minus the 2002 figure

[1] Business area benefits

Concentrations/unit values: Environmental impacts per unit of crude oil equivalent throughput

Environmental impacts: Environmental impacts generated through business activities

∗ Concentrations/unit values of "business area" benefits do not include figures for Cosmo Matsuyama Oil Co. (crude oil equivalent throughput is not a relevant measure, as no crude oil is processed there).

[2]Upstream/downstream benefits

Reduction effect of environmental impact of products due to improvements in refining processes at refineries

● **Concentrations/unit values:**

Products sulfur reduction: Sulfur content of products

Benefits of substituting toxic substances in gasoline (reducing benzene content): Benzene concentration in gasoline

CO_2 emissions from product use: Number calculated from impacts stated below divided by the volume of petroleum products produced

● **Environmental impacts:** Potential environmental impact expected when the product is used, after the reduction of product environmental impacts at the oil refinery level

Products sulfur reduction: Amount of target substance calculated by multiplying the average sulfur content in our products by production volume

Benefits of substituting toxic substances in gasoline (benzene): Amount of potential benzene emissions, calculated by multiplying the average benzene concentration in gasoline by production volume

■ Environmental accounting

Item	Environmental cost (million yen)			
	Investment amount		Expenses amount	
	FY 2002	Changes	FY 2002	Changes
1 Business area costs	**24**	**−179**	**11,693**	**−32**
Global environmental conservation costs	**0**	**−1**	**6,944**	**450**
Pollution prevention costs	**24**	**−161**	**4,104**	**−504**
Resource circulation costs	**0**	**−17**	**645**	**22**
2 Upstream/downstream costs	**2,136**	**1,277**	**30,662**	**−2,884**
Product environmental impact reduction costs	**2,136**	**1,277**	**30,570**	**−2,876**
Product sulfur reduction costs	**1,905**	**1,436**	**21,867**	**−1,950**
Gasoline	**556**	**423**	**5,810**	**−687**
Naphtha	**121**	**92**	**1,525**	**−72**
Jet fuel oil	**34**	**18**	**1,332**	**35**
Kerosene	**317**	**235**	**3,542**	**−574**
Diesel fuel	**451**	**335**	**5,249**	**−686**
Heavy fuel oil A	**339**	**273**	**2,457**	**−247**
Heavy fuel oil C	**10**	**2**	**1,216**	**436**
LPG	**77**	**58**	**736**	**−155**
Costs of substituting toxic substances in gasoline (benzene, etc.)	**223**	**−166**	**8,587**	**−927**
Costs of aromatics reduction in petrochemical products	**8**	**7**	**116**	**1**
Green purchasing costs	**0**	**0**	**92**	**−8**
3 Management activity costs	**0**	**0**	**432**	**−20**
4 Research and development costs	**0**	**0**	**1,751**	**289**
5 Social activity costs	**0**	**0**	**2**	**−4**
Total	**2,160**	**1,098**	**44,540**	**−2,651**

Benefits of aromatics reduction in petrochemical products: Amount of aromatics in raw materials of petrochemical products reduced at business establishments

CO_2 emissions from product use: CO_2 emissions calculated by multiplying the CO_2 emission factor set by the Petroleum Association of Japan for each product by the corresponding production volume

∗ Actual SOx emissions will be less than the potential emissions, as reductions in SOx emissions by desulfurization units at the time of customer use are not accounted for here.

∗ Because we employ the most suitable production methods to strike a balance between costs and environmental protection, the sulfur content of each product is well below the levels set by JIS.

∗ Naphtha is used as an ingredient in petrochemicals and fertilizers. Although they do not directly emit SOx and CO_2, we include them in figures here.

∗ To increase transparency and coverage, starting with fiscal 2002, we report high octane and regular gasoline separately.

Item	Environmental benefits			
	Concentrations/unit value		Environmental impacts	
	Reduction benefit	FY 2002	Reduction	FY 2002
1 Business area benefits				
Benefits of reduction in resource input	(kL-crude oil/thousand kl)	(kL-crude oil/thousand kl)	(TJ)	(TJ)
• Energy input	0.07	9.35	–1,586	68,310
	(kg/kl)	(kg/kl)	(thousand t)	(thousand t)
• Water input	1	189	14	36,908
Benefits of reduction in emissions and waste generation				
Release to atmosphere	(kg-CO_2/kl)	(kg-CO_2/kl)	(thousand t-CO_2)	(thousand t-CO_2)
• **CO_2**	0.38	26.24	–68	4,930
	(g/kl)	(g/kl)	(t)	(t)
• SOx	–2.2	27.6	–520	5,998
• NOx	0.7	16.6	32	3,224
• Benzene	0.00	0.03	3.35	10.19
Release to water	(g/kl)	(g/kl)	(t)	(t)
• COD	0.01	0.71	–0.5	131.1
Industrial waste emissions	(g/kl)	(g/kl)	(t)	(t)
• generated	74	227	11,625	41,959
• recycled	6	57	328	10,876
• landfill	2	8	458	1,423
2 Upstream/downstream benefits				
Benefits of product environmental impact reduction				
Product sulfur reduction	(sulfur: mass %)	(sulfur: mass %)	(potential SOx emissions: t-SO_2)	(potential SOx emissions: t-SO_2)
Total	0.0133	0.3950	126	177,896
High octane gasoline	0.0000	0.0005	0	10
Regular gasoline	0.0000	0.0030	–4	231
Naphtha	–0.0013	0.0284	–66	823
Jet fuel oil	0.0042	0.0213	36	465
Kerosene	0.0011	0.0028	68	157
Diesel fuel	0.0175	0.0234	1,502	1,931
Heavy fuel oil A	0.0162	0.4503	–1,615	28,672
Heavy fuel oil C	0.1372	1.6174	209	145,602
LPG	–0.0002	0.0005	–2	5
Benefits of substituting toxic substances in gasoline (reducing benzen in gasoline)	(vol %)	(vol %)	(t)	(t)
	–0.0155	0.5556	–1,594	32,189
Benefits of aromatics reduction in petrochemical products			(kl)	(kl)
			184	3,468
CO_2 Emissions from Product Use	(t-CO_2/kl)	(t-CO_2/kl)	(thousand t-CO_2)	(thousand t-CO_2)
	–0.0063	2.5428	–2,369	71,724

■Environmental protection costs (Cosmo Oil Co., Ltd, entire company)

(million yen)

Item	FY 2002	Change
Cost of purchasing recycled paper (full price)	14	–1
Donations for environmental causes	31	25
Costs of preparing environmental reports	37	12

■Economic benefits (summary)

(million yen)

Item	Amount
Cost savings through energy conservation (cogeneration)	2,181
Cost savings from recycling of catalyst (reduction in disposal costs)	33
Benefits of R&D (royalty revenues, etc.)	81
Electrical cost savings at headquarters	3
Total	2,298

● Notes on calculation of economic benefits

1. Savings achieved through cogeneration = savings from steam generation + reduction of electricity costs – cost of fuels (LPG, heavy fuel oil, etc.).
2. Calculated as costs avoided through recycling of catalyst (including cost of purchasing new catalyst and cost of disposing of used catalyst).
3. Income from royalties is the actual amount received. Savings from research and development include costs avoided through R&D achievements.
4. Reduction of electricity costs: the FY2001 cost minus the FY2002 cost.