

Our activities for environmental accounting and future issues

The Cosmo Oil Group began compiling environmental accounts from FY 2000; so this is our 4th year. Our Group, which is striving to become an environmentally advanced company, aims to use environmental accounting for internal decision making and as an aid in carrying out our accountability for stakeholders. We can cite as hallmark concerns of the oil industry the need to provide countermeasures for environmental pollutants when customers use products and the need to produce petroleum products from Middle Eastern crude oil, which is high in sulfur content. From this environmental perspective, so far the Cosmo Oil Group has been investing a large amount (please see the graph "Movements in year-end acquisition costs"). In preparing environmental accounting, we use the "Environmental Accounting Guidelines 2002" and "Guidebook for Environmental Conservation Cost Classifications 2003" issued by the Ministry of the Environment as references to summarize environmental conservation costs and environmental conservation benefits*. In our accounting, as in the past, we covered all the accounting items used in financial accounting. Our group drew up the Mid-Term Environmental Plan "Blue Earth 21" in FY 2002 and since then, all of our companies have been working on environmental conservation as one. In response to this, we have introduced an environmental accounting system to improve transparency and comprehensiveness, added new websites and increased the number of

disclosed items. Moreover, we continuously calculate and disclose environmental indicators.

Measures taken and issues remaining for the future

The collection of environmental accounting data was conducted using an environmental accounting system that we independently developed starting in 2003. In collecting data, while taking issues from previous year into account, we aimed to improve the system's accuracy, transparency and comprehensiveness so that it would be helpful in carrying out our accountability.

Additionally, as for the use of collected data for making internal decisions, we used cost data as a contract related calculation base. In FY 2002, we positioned "Development and effective usage of environmental accounting system" in our medium-term environmental plan and continued its development. Data collection using the system was conducted at our four refineries starting in April 2003, and from July 2003 when Yokkaichi Kasumi Power Station began commercial operation. We achieved improved data accuracy and efficiency without sacrificing transparency and comprehensiveness. In future, we will aim at examining data collection using the corresponding items of the medium-term environmental plan and improving the comprehensiveness of disclosed items.

Period and scope of data collection (calculations)

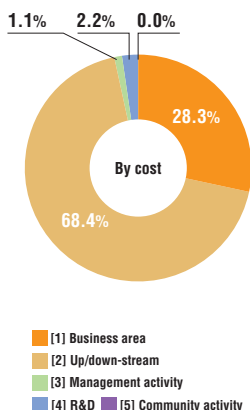
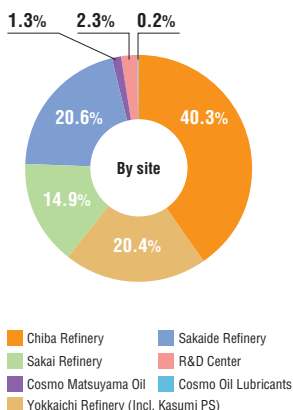
Calculation period: FY 2003 (April 1, 2003 to March 31, 2004)

Scope of calculation: 4 refineries owned by Cosmo Oil, Yokkaichi Kasumi Power Station, Head Office, branch offices, R&D Center, affiliate Cosmo Matsuyama Oil Co., Ltd. and Cosmo Oil Lubricants Co., Ltd. For affiliates, only those costs and benefits which are closely related to our refineries are extracted and collected.

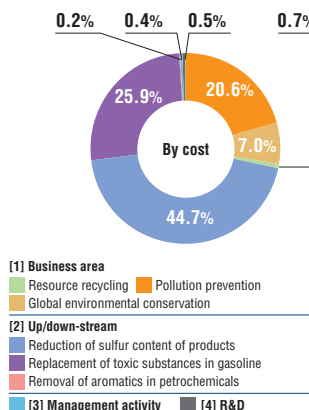
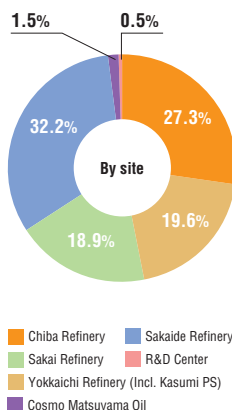
Counting by respective sites: Site-by-site data are shown on pages 19 through 30 for 4 refineries of Cosmo Oil, R&D Center, Head Office, branch offices, Cosmo Matsuyama Oil Co., Ltd. and Cosmo Oil Lubricants Co., Ltd. (Yokkaichi Refinery's data includes some data of Yokkaichi Kasumi Power Station.)

Subject companies and sites
Cosmo Oil Co., Ltd. Chiba Refinery; Yokkaichi Refinery: Sakai Refinery; Sakaide Refinery; Yokkaichi Kasumi PS*1: Head office; Branch offices*2; R&D Center*3 *1 Added starting with this calculation following new establishment in FY2003 *2 Recycled paper purchase only at some locations. *3 Invested amount and year-end acquisition cost have been newly added.
Cosmo Matsuyama Oil Co., Ltd.
Cosmo Oil Lubricants Co., Ltd. Chiba Plant; Yokkaichi Plant: Note: Green purchase cost of lubricant raw material (other than this are included in the figures of Cosmo Oil Chiba and Yokkaichi Refineries)

Environmental conservation cost (amount)



Year-end acquisition costs



- [1] Business area
 - Resource recycling
 - Pollution prevention
 - Global environmental conservation
- [2] Up/down-stream
 - Reduction of sulfur content of products
 - Replacement of toxic substances in gasoline
 - Removal of aromatics in petrochemicals
- [3] Management activity
- [4] R&D

▣ **Changes made since last year — Increase in counted items and sites**

Following the commencement of commercial operation of Yokkaichi Kasumi Power Station in July 2003, costs and benefits have been added as new activity areas within the scope of environmen-

tal accounting. Benefits of gypsum sales and the ammonia recycling facility establishment have been added to the economic benefits of the Kasumi Power Station.

▣ **Aggregate results**

The aggregate results of FY 2003 environmental accounting showed that as environmental conservation cost, 11,402 million yen was spent on investments and 47,005 million yen on expenditures. Compared to the previous fiscal year, there is an increase of 9,167 million yen in investments and 3,162 million yen in expenditures. Year-end acquisition amount was 148,006 million yen, which is an increase of 10,319 million yen over the previous fiscal year. These are due to capital investment for the installation of pollution prevention equipment in conjunction with the completion of construction of Yokkaichi Kasumi Power Station and its commencement of operation, together with the second cogeneration unit at Yokkaichi Refinery, an environmental conservation measure. As for the benefits within business area (physical bene-

fits), which records the aggregate benefits of environmental conservation benefits corresponding to the benefits within the business area, despite decreased demand for heating fuel due to the warm winter, there was an increased impact on the environment on account of the steady progress in demand for gasoline and heavy fuel oil C and the start-up of a new site (Yokkaichi Kasumi Power Station). On the other hand, in almost all items, environmental impact per processed crude oil equivalent has been reduced, bettering in benefits the previous year's reduction. Likewise, upstream/downstream benefits (physical benefits) show an increased environmental impact due to the steady demand noted above; however, the benefits for concentration/unit load show a reduction benefit better than that for the previous year for most items.

▣ **Integration of environmental indicators and environmental productivity**

To further improve our environmental accounting, we have been working on integration of environmental indicators and environmental productivity since FY 2001.

Integration of environmental indicators involves weighting coefficients established using the EPS system, which was developed by a Swedish research institution. In this procedure, a comprehensive assessment of total indicators is carried out by multiplying the environmental impact of each item and weighting coefficients. The CO₂ conversion value of the 2003 environmental indicator within business area increased by 329,000t-CO₂ compared to the previous year, due to the increase in processed crude oil equivalent, upgraded refining, addition of a new site (Yokkaichi Kasumi Power Station) and other contributing factors. As for products, because of the increase in heavy fuel oil C shipments, it recorded an increase of 3,972,000t - CO₂ overall.

Environmental productivity is determined by calculating productivity per integrated environmental indicators and the bigger value indicates that higher production was made possible with less environmental impact.

$$\text{Environmental productivity} = \frac{\text{Production volume}}{\text{Integrated environmental indicators}}$$

FY 2003 environmental productivity decreased within business area in comparison to the previous year due to factors such as the upgrading of refining. On the other hand, as environmental productivity of products with a higher environmental impact within the business area remained the same as the previous year, environmental productivity overall remained of a par with the previous year.

■ **Integrated environmental indicators**

Unit: 1,000t-CO₂ equiv.

Item (weighting coefficient)	CO ₂ conversion by EPS		
	FY2003 result	Year-on-year comparison	
Business area	SOx (30.3)	192	-10
	NOx (19.7)	65	-1
	Benzene (33.8)	0	0
	COD (0.00935)	0	0
	CO ₂ (1)	4,997	-318
	Subtotal	5,254	-329
Product use	Potential SOx (30.3)	5,524	-134
	CO ₂ emissions (1)	75,170	-3,509
	Subtotal	80,694	-3,643
Total	85,948	-3,972	

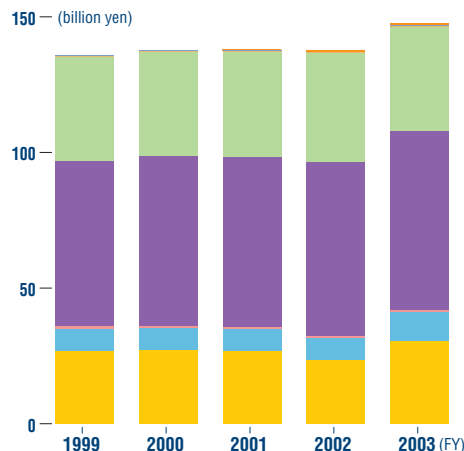
■ **Environmental productivity**

Unit: kt/CO₂ equiv.

Item	Productivity per integrated environmental indicators	
	FY2003 result	Year-on-year comparison
Business area	5.735	-0.096
Product use	0.373	0.001
Total	0.351	0.000

- [1] Business area costs
 - Pollution prevention
 - Global environmental conservation
 - Resource recycling
- [2] Up/down-stream costs
 - Reduction of sulfur content of products
 - Replacement of hazardous substances in gasoline
 - Removal of aromatics from petrochemicals
- [3] Management activity costs
- [4] Research and Development costs

■ **Movements in year-end acquisition costs**



Definitions of terms used in accounting

Methods of compiling environmental costs

Investments: Capital investment for depreciable assets acquired for the purpose of environmental conservation

Expenditures: Expenditures during the period associated with environmental conservation activities (includes depreciation)

1 Business area

Pollution prevention costs

- Air pollution prevention costs (Sulfur recovery equipment, nitrogen oxide control equipment, etc.)
- Water pollution prevention costs (Wastewater treatment equipment, sour water treatment equipment, etc.)
- Levies under the Law Concerning Pollution-Related Health Damage Compensation and Other Measures

Global environmental conservation costs

Costs associated with establishment of energy conservation equipment such as cogeneration facilities

Resource recycling costs

Costs associated with waste treatment and recycling

3 Management activity

Costs associated with environmental education for employees, management and maintenance of the environment management system, plant maintenance and beautification of offices and monitoring and assessment of environmental impact.

Note: Following the integration of data compilation method among refineries, management activity costs for FY 2002 has been modified from 432 million yen to 436 million yen.

5 Community activity

Costs associated with non-business activities, such as afforestation.

2 Up/Down-stream

Costs associated with the provision of products with low environmental impact to customers.

Reducing sulfur content of products

Costs associated with reducing sulfur content in products to reduce sulfur oxide emitted when products are in use.

Replacement of toxic substances in gasoline

Costs associated with reduction and refinery of toxic substances in gasoline such as benzene and lead.

Reduction of aromatic substances of petrochemical products

Costs associated with removal of aromatics and olefins from raw materials used in petrochemical products

4 Research and development

Costs associated with environment conservation R&D activities.

Notes: From FY 2003, we have partially modified R&D related accounting method.

- Expenditures: As we place importance on the counting credibility, we decided that expenses such as management department expense which have been included within indirect cost and calculated as cost should not be calculated as cost and modified the record from previous FY year accordingly.
- Investments: We decided to include investment within the scope of accounting and modified the results from past years (including year-end acquisition costs).

As a result, research and development costs for FY 2002 is changed from 1,751 million yen to 1,050 million yen.

In addition, investment amount is changed from 0 to 76 million yen.

Environmental conservation costs (reference)

Item	Costs (million yen)	
	FY 2003	Change
Purchase cost of recycled paper (whole amount booked)	13	-1
Environment related donations	34	2
Environmental report production costs	45	8

Note: Regarding the environment related donations, counting method of FY 2002 has been integrated with that of FY 2003 and costs have been modified from 31 million yen to 32 million yen.

Environmental accounting

Item	Environmental costs (million yen)			
	Investments		Expenditures	
	FY 2003	Change	FY 2003	Change
[1] Business area costs				
Pollution prevention costs	7,119	7,095	5,015	911
Global environmental conservation costs	2,555	2,555	7,598	654
Resource recycling costs	19	19	700	55
[2] Upstream/downstream costs				
Green purchasing	0	0	77	-15
Reducing environmental impact of products	1,520	-616	32,057	1,487
Reducing sulfur content of products	1,272	-633	23,418	1,551
Replacement of toxic substances in gasoline	248	25	8,527	-60
Reduction of aromatics in petrochemical product	0	-8	112	-4
[3] Management activity costs	135	135	497	61
[4] Research and development costs	54	-22	1,060	10
[5] Community activity costs	0	0	1	-1
Total	11,402	9,166	47,005	3,162

Counting method of environmental benefits

Amounts and benefits of reduction: Value in FY 2002 - Value in FY 2003

1 Business area benefits

Concentration/unit values

Environmental impact per crude oil equivalent throughput.

Environmental impact

Environmental impact originated from business area.

Note: Yokkaichi Kasumi Power Station and Cosmo Matsuyama Oil Co., Ltd. are excluded from concentration/unit values calculation of environmental conservation benefits, as crude-based processing volume estimation is impossible with these facilities where crude process is not carried out.

Environmental impact

- Potential environmental impact expected to occur from product use.
- Low-sulfur products: environmental impact value obtained by multiplying average sulfur content of products with production volume.
- Replacement of hazardous substances in gasoline (low-benzene): value obtained by multiplying average benzene concentration of gasoline with production volume.
- Reduction of aromatics in petrochemical products: volume of aromatics in petrochemical products eliminated in business area.
- CO2 emissions from product use: value obtained by multiplying per unit CO2 emissions of each product with production volume.

2 Up/Down-stream benefits

Benefits through technological upgrading of refining process.

Concentration/unit

- Low-sulfur products: sulfur contents in products.
- Replacement of toxic substances in gasoline (low-benzene): benzene concentration in gasoline.
- CO2 emissions from product use: value obtained by dividing the environmental impact (see below) by petrochemical product volume.

Notes:

- We do not take into account SOx reduction obtained by desulfurization equipment during customers' use; therefore actual SOx emissions of heavy oils, etc. is lower than potential SOx.
- As we select the optimum production method based on the relationship between cost and environmental conservation, the sulfur content value in each product is lower than JIS specification.
- Naphtha is used as petrochemical raw material and fertilizer raw material and does not emit SOx or CO2 directly; however it is included in the value.
- We have modified our method of calculating CO2 emissions, including the values for the preceding fiscal year, in accordance with the "Guidelines for calculation of green house gas emitted by business (draft)" published by the Ministry of the Environment in July 2003.
- There was a discrepancy in the counting of reduction benefits of aromatics in petrochemical products; therefore value for FY 2002 has been changed from 3,468kl to 4,500kl.

■ Economic benefits

Energy conservation	2,571	Savings by cogeneration = Savings by steam generation + savings in electricity – fuel costs (LPG, heavy fuel oil, etc.)
Catalyst recycling	0	Purchase cost of new catalysts saved by recycled catalysts in oil refining, plus disposal costs of waste catalysts.
Gypsum sales	117	Sales proceeds of gypsum, a by-product of fuel-gas desulfurization at Yokkaichi Kasumi Power Station.
Ammonia recycling	76	Purchase price of ammonia saved by recycled ammonia at Yokkaichi Kasumi Power Station plus disposal costs of waste alkali.
R&D	49	Income received for royalty, and cost savings realized through R&D activities.
Electricity conservation	3	Savings, in year-on-year change, at the head office and other facilities.
Total	2,816	(million yen)

	Item	Environmental benefits			
		Investments		Expenditures	
		FY 2003	Change	FY 2003	Change
[1] Business area benefits					
Resources input into business activities					
Energy input	0.10 (kl•crude/1,000kl)	9.25 (kl•crude/1,000kl)	-4,933 (TJ)	73,292 (TJ)	
Water input	1 (kg/kl)	188 (kg/kl)	-5,240 (1,000t)	42,148 (1,000t)	
Reduction in emissions and waste generation					
Emission to air: CO2	0.37 (kg-CO2/kl)	24.47 (kg-CO2/kl)	-318 (1,000t-CO2)	4,997 (1,000t-CO2)	
SOx	1.0 (g/kl)	26.6 (g/kl)	-346 (t)	6,343 (t)	
NOx	1.2 (g/kl)	15.5 (g/kl)	-68 (t)	3,292 (t)	
Benzene	0.00 (g/kl)	0.03 (g/kl)	0.17 (t)	10.02 (t)	
Emission to water: COD	-0.02 (g/kl)	0.73 (g/kl)	-15.2 (t)	146.3 (t)	
Industrial waste: Generated	23 (g/kl)	204 (g/kl)	-1,278 (t)	43,237 (t)	
Recycled	2 (g/kl)	55 (g/kl)	-3,023 (t)	13,899 (t)	
Landfill	3 (g/kl)	5 (g/kl)	354 (t)	1,069 (t)	
[2] Up/Down-stream benefits					
Reducing sulfur content of products	(sulfur: mass %)	(sulfur: mass %)	(potential SOx emissions: t)	(potential SOx emissions: t)	
High octane gasoline	0.0000	0.0005	2	8	
Regular gasoline	-0.0001	0.0031	-14	245	
Naphtha	-0.0060	0.0344	-57	880	
Jet fuel oil	0.0106	0.0107	157	308	
Kerosene	0.0007	0.0021	38	119	
Diesel fuel	0.0204	0.0030	1,675	256	
Heavy fuel oil A	0.0185	0.4318	494	28,178	
Heavy fuel oil C	0.0731	1.5443	-6,719	152,321	
LPG	0.0001	0.0004	1	4	
Total	0.0068	0.3882	-4,423	182,319	
Low-benzene gasoline	0.0587 (vol %)	0.4969 (vol %)	2,713 (t)	29,476 (t)	
Reduction of aromatics in petrochemical products			-390 (kl)	4,890 (kl)	
Reduction of CO2 emission from products in use	-0.0089 (t-CO2/kl)	2,5495 (t-CO2/kl)	-3,509 (1,000t-CO2)	75,170 (1,000t-CO2)	