# Environmental Accounting

**Corporate Environmental Accounting of the Ricoh Group for Fiscal 2000**

| Item | Costs | | | Economic Benefits | | |
|---|---|---|---|---|---|---|
| | Environmental Investments | Environmental Costs | Main Costs | Monetary Effects | Category | Item |
| Business area costs | ¥1,100 million | ¥1,690 million | Pollution prevention cost ····· ¥499 million<br>Global environmental conservation cost ····· ¥257 million<br>Resource circulation cost····· ¥936 million | ¥1,710 million | a | Energy savings and improved waste processing efficiency |
| | | | | ¥5,910 million | b | Contribution to value-added production |
| | | | | ¥1,480 million | c | Avoidance of risk in restoring polluted environment and avoidance of lawsuits |
| Upstream/ Downstream costs | ¥50 million | ¥3,300 million | Cost for collection and reassembly and for recycling used products | ¥1,570 million | a | Sales of recycled products, etc. |
| | | | | [¥1,760 million] | S | Reduction in society's waste disposal cost |
| Managerial activity costs | ¥150 million | ¥3,140 million | Cost for the division in charge of environmental measures; cost to establish and maintain the environmental management system | ¥170 million | b | Improved efficiency in environmental education and establishment of the environmental management system |
| Research and development costs | ¥60 million | ¥1,550 million | Research and development costs for environmental impact reduction | ¥20 million | a | Cost reduction through eco-packaging |
| | | | | ¥2,100 million | b | Contribution to value-added research and development |
| | | | | [¥390 million] | S | Reduction in user's electricity expenses thanks to the improved energy saving function and performance of products |
| Social activity costs | ¥0 million | ¥470 million | Costs for preparation of environmental reports and advertisements | ¥200 million | b | Publicity from environmental advertisements, etc. |
| Environmental damage costs | ¥180 million | ¥160 million | Costs for restoration of soil pollution and for environment-related reconciliation | — | — | None |
| Other costs | ¥0 million | ¥30 million | Other costs for environmental conservation | | | |
| Total | ¥1,540 million | ¥10,340 million | | ¥13,160 million | Internal effects (within the Ricoh Group) | |
| Total capital investment | ¥32,130 million | | | [¥2,150 million] | Social effects (outside the Ricoh Group, i.e., society) | |

a = Substantial effect (actual gains from cost and energy reduction as well as sales of recycled products)

b = Expected effect (amount to which the environmental measures contributed)

c = Incidental effect (Pollution- and lawsuit-related costs avoided)

S = Social effect (Reduction in electricity expenses due to the use of energy-saving products or reduction in society's waste disposal cost; Japan only)

The Ricoh Group is establishing an environmental accounting system to be used as a management tool. The Group regards the following as essential to completing this task.

**Using Environmental Accounting as a Management Tool**

1. Overall/Individual areas targeted for environmental accounting should be set in compliance with corporate/segmental managerial decisions.
2. Environmental costs and economic benefits should be compared on a full scale.
3. Efficiency in environmental management should be specifically expressed in terms of investment efficiency in environmental impact reduction or management resulting in smaller environmental impact.

The Ricoh Group's environmental accounting system comprises corporate environmental accounting, to optimize environmental action plans, and segment environmental accounting, to measure the effects of action plans. Because these two are not yet at an acceptable level, the Ricoh Group will make every effort to improve them until the entire system works like an actual management system, e.g., financial accounting, and will provide relevant information to stakeholders.

## ■ Deepening Corporate Environmental Accounting

### Extending Coverage

The Ricoh Group extended the coverage of its environmental accounting system so that it can be used as a management tool for the entire Group. In fiscal 2000, Ricoh Group companies engaged in after-sales services (Parts Component System and Ricoh Techno Systems) and logistics (Ricoh Logistics) were included for environmental accounting. The system's coverage will be further extended to include the Group's sales companies.

### Identifying Social Effects

Companies, through their environmental conservation activities, contribute to restoring the environment. The effects of environmental conservation investments made by companies also include social effects, such as reductions in electricity expenses due to the use of energy-saving products by customers. Such social effects have not been much referred to in traditional environmental accounting, but identifying the effects that environment-friendly products can bring about would be useful in making managerial decisions regarding R&D investments in such products.

### Fiscal 2000 Environmental Accounting Results

According to the Ricoh Group's fiscal 2000 environmental accounting results, environmental conservation costs increased, and the eco-index (value-added through business/total environmental impact) doubled over the past three years. Judging by the value-added through the Group's business, which increased 1.2 times over the same period, the Group's environmental conservation activities were highly efficient.

Looking at individual cost items, more substantial effects were obtained from business area costs as a result of past capital investments, including increased energy

● Data collection points: Ricoh and 15 Ricoh Group manufacturing, after-sales service, and logistics companies in Japan and abroad (See page 4.)
● Data collection period: from April 1, 2000, to March 31, 2001 (for costs and total environmental impact)
* Environmental impact reduction shows the difference of the fiscal 2000 performance from the fiscal 1999 performance.

| Effect on Environmental Conservation | | | | Environmental Impact | | | |
|---|---|---|---|---|---|---|---|
| Environmental Impact Reduction (t) | Reduction Rate | EE Value[1] | Converted quantity of reduction | Total (t) | Eco-ratio[2] (¥100 million/t) | Converted value of reduction | Conversion Coefficient[3] |
| Environmental impact reduction at business sites | | | | | | | |
| $CO_2$ ····· 2,275.0 | 0.9% | 22.00 | 2,275 | $CO_2$ ····· 246,065 | 0.01 | 246,065 | 1.0 |
| $NO_x$ ····· 5.1 | 6.7% | 0.05 | 101 | $NO_x$ ····· 72 | 47.59 | 1,411 | 19.7 |
| $SO_x$ ····· 3.6 | 14.7% | 0.03 | 109 | $SO_x$ ····· 21 | 164.22 | 629 | 30.3 |
| BOD ····· -16.0 | -43.8% | -0.16 | -0 | BOD ····· 53 | 64.70 | 1 | 0.02 |
| Final waste disposal amount ····· 2,689.8 | 36.4% | 26.01 | 279,739 | Final waste disposal amount ···· 4,699 | 0.73 | 488,654 | 104.0 |
| PRTR substances (178 substances, including toluene and dichloromethane) | | | 42,413 | PRTR substances* (178 substances, including toluene and dichloromethane) * See page 31. | | 218,943 | (Ricoh standards per substance) |
| Environmental impact reduction through products<br>$CO_2$ ····· 6,026.0 (t)<br>$NO_x$ ····· 4.9 (t)<br>$SO_x$ ····· 3.9 (t)<br>Final waste disposal amount ····· 22,033.0 (t)<br>Calculation for companies in Japan only | | | | | | | |
| | | | 324,637 | | | 955,704 | |
| | | | 0.0314 | | | 356.6 | |
| | | | EE index[4] | | | Eco-index[5] | |

1. Eco-efficiency (EE) value (unit: ton/¥100 million) = Environmental impact reduction amount/total amount of environmental expenses
2. Eco-ratio (unit: ¥100 million/ton) = Gross profit/total environmental impact amount
3. Conversion coefficients are based upon literature related to LCA impact evaluations. (Fiscal 2000 coefficients are based on EPS Indicator Ver. 2000, and fiscal 1999 coefficients are based on EPS Indicator Ver. 1995.) Conversion coefficients for final waste disposal amounts and PRTR substances are set according to Ricoh's internal standards.
4. EE index (EEI) = Total environmental impact reduction in terms of $CO_2$/total environmental costs (thousands of yen)
5. Eco-index = Gross profit (thousands of yen)/total environmental impact in terms of $CO_2$

Note: Fiscal 2000 calculations are based on the Ministry of the Environment's *List of Emission Coefficients Defined in Enforcement Regulations*, published in September 2000.

savings and a reduction in waste disposal cost. Upstream/Downstream costs (product recycling costs) are still a minus factor for business, although some improvements have been made. There should be more improvements in costs over the long term. Collecting used products contributes to society, and a cost-effectiveness analysis, taking the social effects of such collection into consideration, revealed that cost and effectiveness are in balance. As for managerial activity costs, no direct effects have been identified because managerial activity costs include the personnel cost of all cost items. It can be assumed that such cost has indirectly contributed to the effects of other cost items. Regarding social activity costs, focus was on the social responsibilities actually fulfilled by the Ricoh Group, namely, the Group's social contributions and accountability. The effects of these costs have yet to be calculated.

Concerning the specific results of the Ricoh Group's environmental conservation activities, $CO_2$ emissions were greatly reduced at all business sites in fiscal 2000, as in fiscal 1999, in terms of emission per sales unit. However, due to an increase in energy consumption that resulted from expanding production, total $CO_2$ emissions were only slightly reduced. The final waste disposal amount decreased as much as 36% compared with that in the previous fiscal year. On the other hand, there are some quantitative objectives for which no further improvements were made, and the Group must invest more effort into ensuring that ongoing improvements are made as a whole.

The Ricoh Group will continue striving towards controlling waste at its business sites and further promote the development of environment-friendly products to increase the effectiveness of its environmental conservation activities both for itself and for society.

## Evaluation of the Environmental Accounting System in Fiscal 2000

The Ricoh Group's framework for environmental accounting was evaluated highly enough to be adopted as a benchmark by other companies. Within the Group, the introduction of environmental accounting made more employees aware of the importance of understanding the cost efficiency (for both environmental and economic improvements) of their environmental conservation activities. At two of the Group's business sites, the criteria for calculating the efficiency of environmental investments is already established. In addition, new environmental accounting methods are being developed. Although it has been traditionally difficult to calculate the effectiveness of research and development costs, it might be possible if the calculation is based on the conjoint analysis used in segment environmental accounting* for the development of energy-saving products. The Group will further improve its environmental accounting system, making it more accurate through the development of new methods, etc.

* See page 67.

## ■ Implementation of Segment Environmental Accounting

**Corporate environmental accounting targets corporate environmental activities as a whole but can be used in decision making only in limited cases. However, segment environmental accounting, in which corporate environmental activities are examined by segment, can be used in decision making in many cases. Segment environmental accounting is especially useful in predicting the effects of environmental activities. The following shows a few examples of segment environmental accounting the Ricoh Group companies carried out in fiscal 2000 to predict the effects of their environmental measures. In all examples, the measures were predicted to be sufficiently effective both in terms of economic benefits and environmental impact reduction and would contribute to the implementation of environmental management.**

### Business Area Costs

#### ● Estimating the Effects of Environmental Conservation Costs for an Energy-Saving Manufacturing Line

Ricoh Unitechno, faced with the need to manufacture a wider variety of products in small quantities, developed a manufacturing line consisting of carts joined together and pulled by a chain* to replace its traditional conveyor belt-type lines. Although the capital required for its development was only about one-twentieth the amount invested in traditional conveyor belt-type lines, the new cart line was more energy efficient and used only one-eightieth of the power used before. The company estimated that this reduction would, in turn, lead to a considerable reduction in $CO_2$ emissions.

Ricoh Unitechno was also successful in improving its utilization of space by promoting more space-saving manufacturing methods and increasing productivity by simplifying the process of rearranging the manufacturing operation.

* See page 29.

### Research and Development Costs

#### ● Estimating the Effects of Environmental Conservation Costs by an Energy-Saving Product

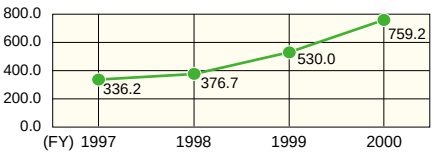
In February 2001, Ricoh released the Aficio 1035/1045 (imagio Neo 350/450), a more energy-efficient digital copier. Research and development costs for this new product were divided into the cost of developing the energy-saving toner fixing unit (QSU technology*) that is to be incorporated into the Aficio 1035/1045 (imagio Neo 350/450) and other costs required to develop the product. The effects of these costs were then estimated. The company paid considerable environmental conservation costs for developing the product, and both corporate effects and social effects of the spending were estimated.

In making the estimates, product development costs and costs for producing and marketing the number of units expected to be sold were regarded as environmental conservation costs. For economic benefits, the social effects of reduced electricity consumption due to the use of the product and internal effects for Ricoh were estimated. Internal effects were estimated using a marketing method called conjoint analysis, which is typically used in market research. As a result, the development of an environment friendly product was confirmed to generate considerable both internal and social effects.

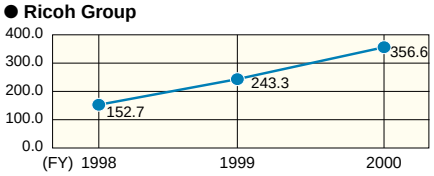
* See page 36.

**Changes in the Eco-Index***

● Ricoh




● Ricoh Group




* Eco-indexes in fiscal 1999 and earlier were revised following a revision to conversion coefficients.

**Penalties and Fines for Noncompliance with Environmental Laws and Regulations* (Ricoh Group)**

| | FY 1998 | FY 1999 | FY 2000 |
|---|---|---|---|
| Number of cases | 0 | 0 | 0 |
| Amount | 0 | 0 | 0 |

* A detailed review of Chinese laws and regulations revealed that costs recorded as penalties in the past were actually processing costs. Therefore, such costs were not recorded as penalties and fines in fiscal 2000, and related data in previous fiscal years were revised accordingly.

**Estimated Costs and Effects of Introducing a Cart Line**

| Costs* | | | Effects* | |
|---|---|---|---|---|
| Item | Main costs | Amount | Economic benefits | Effect on environmental conservation |
| Business area costs | Facility investment, facility cost, etc. | ¥9.25 million | Reduced heat and light expenses ——— ¥4.04 million<br>Reduced personnel and maintenance costs — ¥15.50 million<br>Improved productivity– ¥89.55 million | Reduced $CO_2$ emissions 108.7 t |

* Calculated using the statutory depreciation period for equipment

**Estimated Costs and Effects of Developing an Energy-Saving Machine**

| Costs[1] | | | Effects[2] | | |
|---|---|---|---|---|---|
| Item | Main costs | Amount | Economic benefits | | Effect on environmental conservation |
| | | | Corporate effects | Social effects | |
| Research and development costs | Costs for developing an energy-saving unit | ¥400 million | Total amount to be paid by customers ¥2,683 million | Reduced electricity expenses ¥2,544 million | Reduced $CO_2$ emissions 39,481 t |
| | Cost of dies, jigs, parts, etc. | ¥205 million | | | |

1. Estimated based on a specific number of units to be marketed in Japan
2. Estimated based on the number of units expected to be sold and on the assumption that the units sold would be used for five years

**Estimated Costs and Effects of Building an Environmental Impact Information System**

| Costs* | | | Effects* | |
|---|---|---|---|---|
| Item | Main costs | Amount | Economic benefits | Effect on environmental conservation |
| Managerial activity costs | System investment | ¥196 million | Reduced personnel costs for data collecting, analysis, etc. — ¥1,550 million<br>Reduced electricity expense thanks to a power monitoring system ——— ¥25.6 million | Reduced $CO_2$ emissions 655.6 t |
| | Personnel, maintenance, etc. | ¥361 million | | |

* Estimated based on the assumption that the system's depreciation period would be five years

## Managerial Activity Costs

### ● Estimating the Effects of Environmental Conservation Costs by Building an Environmental Impact Information System

Because of the importance it places on eco-balance, the Ricoh Group built an environmental impact information system to be used as a tool to recognize the environmental impact of its business activities and reduce environmental impact efficiently. The system allows the environmental impact of each business activity process to be controlled centrally on a global scale and is indispensable in the collection of information required for environmental accounting.

The economic benefits gained from investing in the building of the system, including personnel costs, were estimated based on the assumption that personnel costs for collecting data for Type III Environmental Impact Disclosure and for managing the environmental performance of the manufacturing process would be reduced over five consecutive years with the introduction of the system. Environmental conservation effects were estimated based on improvements that would be achieved through the use of the system, such as improvements in the operation of air compressors thanks to the environmental performance management under the system.

### Future Tasks and Challenges

To use environmental accounting as a management tool, the Ricoh Group needs a better environmental accounting system not only to disclose corporate environmental activities to the public (external use) but also to promote environmental management (internal use). In fact, for product recycling, internal environmental accounting revealed that environmental considerations at the product planning and designing stages would considerably reduce environmental impact and costs. Accordingly, an environmental cost management system is currently under development. In the near future, the Group will look into introducing life cycle costing (LCC) into cost planning and improving resource productivity at the manufacturing stage. Ultimately, the Ricoh Group will incorporate environmental accounting into its divisional performance evaluations* under the Strategic Management by Objectives (SMO).

* See page 16.

## ■ Investors' Evaluation of Ricoh's Environmental Conservation Activities

**According to a survey of personal investors, the effects of Ricoh's environmental conservation activities were estimated to total ¥6.6 billion, against the Company's environmental costs of ¥5.9 billion[1]. Through corporate environmental conservation activities, the environmental impact caused by a company's business activities is reduced, which, in turn, reduces the environmental impact on society. It is therefore important for a company to not only estimate the effects of its environmental conservation activities but also have the effects evaluated by external stakeholders. According to a questionnaire the Ricoh Group sent out to private investors, the Group's environmental conservation activities was evaluated as having profound social effects.**

### Survey Method

Ricoh's efforts to establish environmental accounting as a management tool for the entire Ricoh Group included research[2] in a method that would have the Company's environmental conservation activities evaluated by investors and the evaluation results analyzed. Based on the research results, a conjoint analysis of the questionnaire mentioned above was decided, using the hypothetical estimation method often used in surveys for public works. (For example, residents are sent a questionnaire asking how much money they think the city should be allowed to spend to increase the greenery in the city, and their opinions are taken into considerations when determining the investment amount.) At the end of January 2001, Ricoh sent a questionnaire by e-mail to 1,000 personal investors and analyzed the answers of the 368 that were returned.

### Analysis Results

Based on the results of the questionnaire, the maximum amount of money that investors will pay per share for each of the following four items was calculated: reduction of greenhouse gases, reduction of air pollution, reduction of water pollution, and reduction of waste. By multiplying the results of the calculation by actual reduction amounts and the number of stocks issued, the total effect of Ricoh's environmental conservation activities was approximately ¥6.6 billion.

### Evaluation of Social Effects

The calculated effects were subdivided into corporate effects that were estimated by investors to have directly contributed to the profits of the Company and into social effects that were estimated to not have directly contributed to the profits of the Company but to have contributed to society. As a result, the total amount of social effects was calculated to be ¥3.8 billion or more of the ¥6.6 billion, showing that personal investors expect companies to conduct activities not only for their own profit but also for the benefit of society.

1. Ricoh'Ricohs total environmental conservation costs in fiscal 1999
2. The research was conducted jointly with Assistant Professor Koichi Kuriyama of Waseda University as part of an Environmental Accounting Committee activity managed by the Japan Environmental Management Association for Industry and entrusted by the Ministry of Economy, Trade and Industry.

| Effects of Ricoh's Environmental Conservation Activities | Total Effects (¥100 million) | Percentage (%) of Social Effects |
|---|---|---|
| Reduction of greenhouse gases | 5.72 | 86 |
| Reduction of air pollution | 10.81 | 55 |
| Reduction of water pollution | 6.72 | 61 |
| Reduction of waste | 42.73 | 55 |