

Special Edition on the Environment

Environmental Accounting at the Oki Group

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Abstract

Recently, interest in environmental accounting has increased dramatically, and many companies have begun including environmental accounting in the environmental reports which they publicly disclose.

Environmental accounting is a framework for quantitatively evaluating a company's work towards environmental protection. Consequently, for companies, etc., it becomes an analytical tool for management and administration, enabling each company's efforts towards environmental protection to be more efficient and effective. In addition, it becomes an effective information source enabling the public, investors, and other groups to understand the situation of a company's environmental efforts through a standardized framework.

According to a survey of the Ministry of the Environment (year 2000) of 1170 publicly traded companies in regard to environmental programs, 17% "had introduced" such programs, and 34% were "planning to introduce" them. In other words, more than half of the companies are addressing environmental issues. Moreover, because 160 companies are publicly disclosing environmental accounting information, the growing necessity of such information is clear.

At Oki Electric, we introduced environmental accounting in 1999 and publicly disclosed it in our Environmental Report 2000. In this paper, we introduce the Oki Group's thinking about environmental accounting and some actual cases.

Oki Group's environmental accounting

1. Background and current situation of our introduction of an environmental accounting system

For many years, Oki Electric has been gathering data on environmental burdens such as amount of energy consumed, waste generated, etc., and this data has been valuable internally for environmental protection activities. In 1999, with the issuing of "Guidelines for environmental accounting" from the Ministry of the Environment, activity in the business world for introduction of environmental accounting reached a higher pitch. At Oki Electric, a special committee was formed, centered on the environmental department and the accounting department and we tackled in earnest the work of creating an environmental accounting system to identify both the cost and effect of environmental protection efforts. Our plan is that, by the end of 2001, we will introduce such a system to Oki Electric and 22 consolidated subsidiaries [companies whose financial results are consolidated with Oki corporate each year] including overseas ones (manufacturing companies and major subsidiaries which impact the environment). In 2000, we completed analyzing environmental accounting data of Oki Electric and 13 consolidated subsidiaries (including 3 foreign ones.)

2. The structure and purpose of environmental data

The framework for environmental accounting consists of parts relating to financial performance and to environmental performance. Specifically, the configuration is as shown in Figure 1.

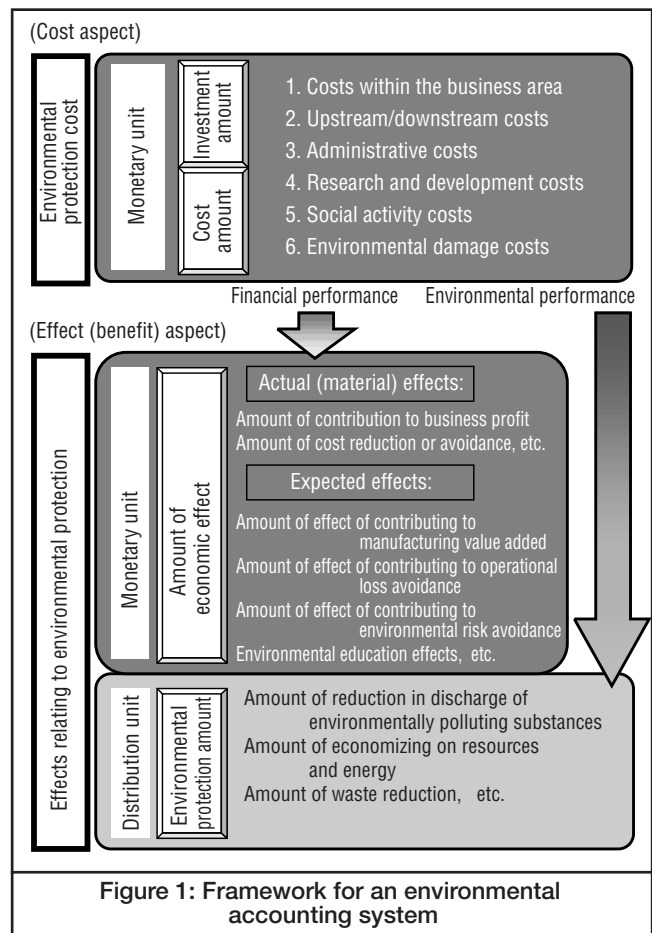


Figure 1: Framework for an environmental accounting system

In relation to "environmental protection cost," how much "beneficial effect from the environmental protection cost" was obtained is expressed in terms of the two aspects of financial and environmental performance. In

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gathering the data, “environmental protection cost” is measured in monetary units of investment amount and cost amount, while “beneficial effect from the environmental protection cost” is measured in terms of the amount of economic effects (in monetary units) and the environmental protection results (in material units).

Specific objectives are, internally, to clearly grasp the cost and effect of environmental protection activities and work to promote effective environmental investments and environmental improvement activities. In addition, externally, the system enables the disclosure of the amount of improvement in environmental performance, etc. It shows to interested parties that management resources are being allocated to the environmental department, reflecting an environmentally conscious attitude, and tends to improve public understanding of the company’s dedication to environmental issues and thus enhance the corporate image.

3. Basic philosophy and system features

Our basic thinking is to build an environmental accounting system based on an environmental management system whose purpose is to elucidate environmental performance such as reduction of environmental burden, etc. With the Ministry of the Environment’s “Guidelines for environmental accounting” as a reference for information gathering standards, this system will clearly show us a cost-benefit relationship. Concerning this cost-benefit equation, our basic stance is that, instead of debating red ink vs. black ink, environmental protection benefits (material effects) are to be given top priority.

Concerning measurement of economic effects resulting from environmental protection countermeasures, we have adopted the Oki original methods described below.

- Besides the categories for data collection under “amount of economic effect,” as shown in Figure 1, we also implement detailed data collection for each of six classifications in the same areas as those addressed for the cost aspect.
- We gather data for “expected effects” based on calculation formulas uniquely defined by Oki.

It must be pointed out that these “expected effects” are based on hypothetical thinking. Here we introduce concrete examples of defining formulas.

Amount of effect of contributing to manufacturing value added

In the manufacturing value added obtained through production activity, the effect that, it can be supposed, is contributed by environmental protection:

value added amount: costs related to manufacturing (personnel costs, etc.) x (cost of environmental protection related to manufacturing / total manufacturing cost)

Amount of effect of contributing to operational loss avoidance

The contributory effect expected to come from being able to avoid operation losses at sites through activities

to conform to environmental laws and regulations: value added amount per day x number of “operational days” lost

Amount of effect of contributing to avoidance of environmental risks, such as cost of warranties or compensation for damages

The contributory effect expected to come from being able to avoid, through activities to conform to environmental laws and regulations, such things as the cost of countermeasures to deal with polluted soil and/or groundwater:

assumed amount (cost) of risk x (cost of reducing environmental burden / total manufacturing cost)

In addition, there are the effects of “environmental education,” “dealing with social issues,” “providing information,” etc. Because these defining formulas are different for each company, the amount of economic effect will depend on the actual equation and input values, and we may expect the range to be quite wide. For this reason, companies in general can make excellent external announcements of cost-benefit results, and, in fact, most of the other companies in our industry announce economic effect by adding “expected effects” to “actual effects.” At Oki, however, based on a fundamental philosophy that we should only report actual effects which are the true and concrete results, we utilize “expected effects” in our internal environmental management, but make public announcements without including them.

Concerning environmental protection effects (material effects), we at Oki select important substances that impact the environment, such as global warming substances, and waste materials, and gather data on them. Concerning material effects, our basic approach is to calculate and monitor the difference in total environmental burden (absolute value), compared to the previous year. However, to deal with changes in production volume, we also calculate material effects in basic units. In the same as “expected effects,” the environmental protection effects are utilized for internal environment management, but based on our concept that the total amount of environmental burden should be reduced, we use absolute values in public reporting.

4. Oki Group year 2000 results of environmental accounting data collection

Table 1 and Table 2 show the data gathering results of Oki Group classified as to cost and effect (benefit)

The increase in investment amount and cost amount can be attributed to the expansion of environmental facilities to handle increased production mainly in the semiconductor sector. On the results side, the total economic effect from various environmental activities was ¥540 million higher than the previous year. Environmental protection results also were good, with the amount of waste sent for final processing 5.8% less than in the previous year. Our CO₂ discharge quantity showed

◇ Investment amount: ¥750 million (previous year: ¥280million)
 ◇ Cost amount: ¥3.07billion (previous year: ¥2.73billion)

Categories	Content of major programs	Cost amount
Business area costs	Facilities maintenance and control costs, depreciation expense, etc. related to the environment	¥2.44 billion
Upstream / downstream cost	Cost for collecting and recycling used products, etc.	¥70 million
Management activity cost	Cost for our "environmental management" program, etc.	¥490 million
Research and development cost	R & D cost for reducing the environmental burden of products and manufacturing processes	¥40 million
Social activity cost	Cost for environmental improvement, such as "greening" programs, regional activities, etc., cost for creating environmental reports, etc.	¥30 million

Table 1: Environmental protection costs

a slight increase of 0.6% compared to the previous year, but this was due to an increase in production volume. However, calculated on a "per product basis"—i.e. dividing the total by production volume—a 7.2% reduction was achieved.

We have not broken out the results of data gathering by sector, but that would show the Semiconductor Sector as accounting for almost 60% of the Oki Group total in each category—investment amount, cost amount, and amount of economic effect. For that reason, here we will introduce the actual environmental accounting results of the Semiconductor Sector.

Environmental Accounting of the Semiconductor Sector

The Semiconductor Sector primarily produces the IC (integrated circuit) chips which are called the "main food" of the high tech industry. The Semiconductor Sector has a "clean" image, but in fact in the production processes it uses huge amounts of energy and resources, requires many hazardous chemicals and gases, and places a large burden on the environment. For this reason, large investments and costs are required for the purpose of reducing the environmental burden, preventing pollution, etc.

Because of this situation, Oki has put significant effort into programs for achieving "environmental management" which uses environmental accounting as a tool.

1. Environmental protection cost

For the Semiconductor Sector, among its environmental protection costs, those within its business area are the major costs. These "costs within its business area" are the costs generated in order to control or reduce the environmental burden caused by the sector's business activity. "Business activity" is everything the enterprise is directly involved in through

◇ Environmental protection effects (material effects)

Environmental burden index	Content of major programs	Burden (total)	Relative to previous year
CO ₂ discharge quantity (t-c)*	Reduce amount of energy used, etc.	71,913	increase of 404
Final waste disposal amounts (t)	Reduce waste materials, etc.	912	reduction of 56

*(t-c) equivalent carbon weight

◇ Economic effect amount: ¥1.01 billion (previous year: ¥407 million)

Category of actual effect	Content of major programs	Amount of effect
Cost-reduction effect	Reduction in usage of electrical power, etc.; Reduction in waste processing costs, through recycling; reduction in resource use, etc.	¥930 million
Actual income effect	Sale of usable materials, etc.	¥80 million

Table 2: Effects from environmental protection countermeasures

its manufacturing and service activities. "These "costs within its business area" can be further classified into the three categories of pollution preventing cost, earth environment protection cost, and resource recycling cost.

Figure 2 shows the environmental protection costs of the Semiconductor Sector for 2000, in terms of the % spent for each type of environmental action. As shown here, the results are that three "costs within its business area"—namely, pollution prevention, earth environment protection cost, and resource recycling cost — account for 92% of the total.

The Semiconductor Sector uses many hazardous materials, so it is always facing pollution problems. As a result, costs for pollution prevention alone account for 71% of total costs, and this is a unique feature of this business.

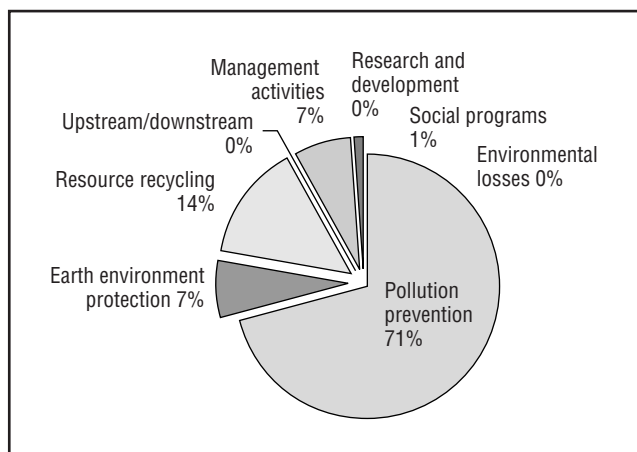


Figure 2: Share of environmental protection costs accounted for by each area of activity

The environmental activities within the business area of the Semiconductor Sector, and the subjects that they address, are as follows.

① Pollution prevention cost

With the objective of preventing generation of pollution by factories, the pollution prevention cost covers various kinds of environment-related facilities and equipment placed “downstream” of manufacturing equipment for controlling / reducing the environmental burden. The main kinds of environmental facilities related to pollution prevention in the Semiconductor Sector are: [i] equipment for treating exhausted gases to prevent atmospheric pollution by those gases, [ii] discharge fluid processing equipment to prevent sewage discharged by the factory from degrading water quality in rivers and streams, and [iii] other.

② Earth environment protection cost

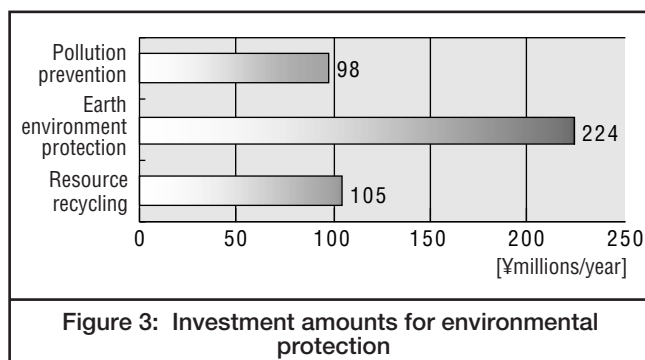
The subjects covered by the earth environment protection cost are facilities, equipment and programs for the purpose of preserving the earth’s environment, such as prevention of global warming, protection of the ozone layer, etc.

To prevent global warming, use of energy from CO₂ gas releasing sources, such as fuel oil and electrical power generated by fossil fuel combustion must be reduced. Likewise, discharge quantities of the greenhouse gases used in semiconductor manufacturing, such as perfluorocompound (PFC)-type gases, must be reduced. Consequently, global warming prevention costs apply to facilities and programs for reducing energy usage and decomposing PFC’s. Likewise, in regard to protecting the ozone layer, we included the costs required for conversion/upgrading to equipment which uses dechlorinized refrigerants (to enable discontinuing the use of specific freon) and the costs of maintaining/controlling facilities which still use specific freon.

③ Resource recycling cost

The resource recycling cost covers maintenance/control of facilities and equipment for achieving a sustainable resource recycling to conserve resources such as service water, chemicals, gases, and other materials. Specifically, it applies to programs for water conservation, for example programs whereby water used and discharged by a factory is treated within the factory, and then is reused as a source of service water. In addition, in regard to waste materials, it applies to maintenance/control of facilities and equipment for re-conversion of waste to reusable resources within the factory or by an outside operator.

As shown in Figure 3, a feature of recent investments in the Semiconductor Sector is that they have moved away from projects related to pollution prevention, which had been the focus until recently. Instead, (human and financial) resources, which are



limited, are being applied to environmental and reutilization programs dealing with earth-level environmental problems, such as prevention of ozone-layer destruction and global warming, and countermeasures against resource depletion, etc.

2. Effects from environmental protection countermeasures
Economic effects relating to the Semiconductor Sector are calculated according to the reduction in environmental burden generated within the business area wherein environmental impact can be directly controlled. These effects include cost reductions obtained by cutting down (through programs for energy conservation and resource conservation) the amount of electrical power, fuel oil, etc. consumed by the Semiconductor Sector. In addition, the economic effect of waste processing cost reduction and the actually benefit from sale of reusable materials are included. Table 3 shows the actual results as to the amount of economic effects achieved in the Semiconductor Sector.

Economic effect amounts appear in the table as negative results. This is because the last year was a time of prosperity for the semiconductor industry, resulting in a major increase in production which caused greater usage of energy and resources. Evaluated in terms of total cost of energy and resources actually used, there was an increase of 2% over the previous year. However, if these results are expressed as a % of production volume (i.e. on a “per product” basis), the actual results for energy use and resource use show a 20% reduction. Thus it is clear that our programs were very effective.

Table 4 shows the “environmental burden results” for substances for which material effects were measured and the corresponding environmental problem in the

Environmental protection category		Cost reduction effects		Actual income effects	Total
		Energy conservation/resource conservation	Processing cost		
Costs within business area	Prevention of pollution	0	0	0	0
	Earth environment protection	-87	0	0	-87
	Resource recycling	0	-30	24	-6
Totals		-87	-30	24	-93

Table 3: Amount of economic effects within the business area (units: ¥ millions)

Environmental burden items		Unit	Burden (total); absolute value	Environmental problem
CO ₂ discharge quantity		Ton -C	64,309	Global warming
PFC discharge quantity		GWP-Kt	158	Global warming
Ozone layer destroying substances	Amount of CFC/HCFC used	Ton	9	Destruction of the ozone layer
	Amount of CFC/HCFC discharged	Ton	0	
Acid gas discharge	Amount of NOx discharged	Ton	59.9	Air pollution
	Amount of SOx discharged	Ton	231.7	
Waste materials, etc.	Amount generated	Ton	8,680	Overloading of waste processing plants; Limited resources
	Amount re-converted to resources	Ton	6,568	
	Amount requiring final processing	Ton	408	
Water resources	Amount of city water used	Ton	59,868	Land subsidence; Limited resources
	Amount of well water used	Ton	1,766,620	
	Amount of industrial-use water used	Ton	2,035,173	
PRTR	Amount used	Ton	242	Management of chemical substances
Table 4: Substances for which material effects were measured and environmental burden				

Semiconductor Sector. Comparing the results to our company-wide environmental load results, as shown in Table 2, CO₂ discharge amount is 89.4% of the total, waste materials sent to final processing is 44.7%, so the portion of total company-wide environmental load accounted for by the sector is quite large.

Thus, as is clear from the results of environmental accounting, among the companies of the Oki Group, the Semiconductor Sector is the most important one in terms of environmental burden. In the future, within the Semiconductor Sector, we will create an effective environmental management system, and promote efficient ongoing improvements through environmental protection activities. Our goal is to achieve “recycling factories” and “zero-emission factories.”

Environmental Accounting at Oki Group in the Future

As the step 1, our objective is to establish an environmental accounting system which can be utilized in making appropriate management judgments regarding internal management objectives, actively putting to use the actual results of

each program for reducing environmental burden. Specifically, the system will be of use in facilities investment planning, reducing costs and investments in environmental protection activities, and improving the accuracy of product cost calculations.

Step 2 will be an effort to create an environmental accounting system which adequately incorporates LCA (life cycle assessment) related factors. We will consider linking to our environmental accounting system a philosophy about environmental burden that extends across all stages, from “upstream, such as purchasing parts and materials used in product manufacturing,” to “downstream, wherein the customer ultimately disposes of the used product.”

In Step 3 we will strive to build an environmental accounting system which will enable continual monitoring of overall environment-related costs and environmental performance within areas where direct management of environmental burdens can be done by a factory itself.

The final step will be to build and have the company adopt an environmental management system which, through effective use of the environmental accounting system, will promote effective investment and environmental improvement activities.