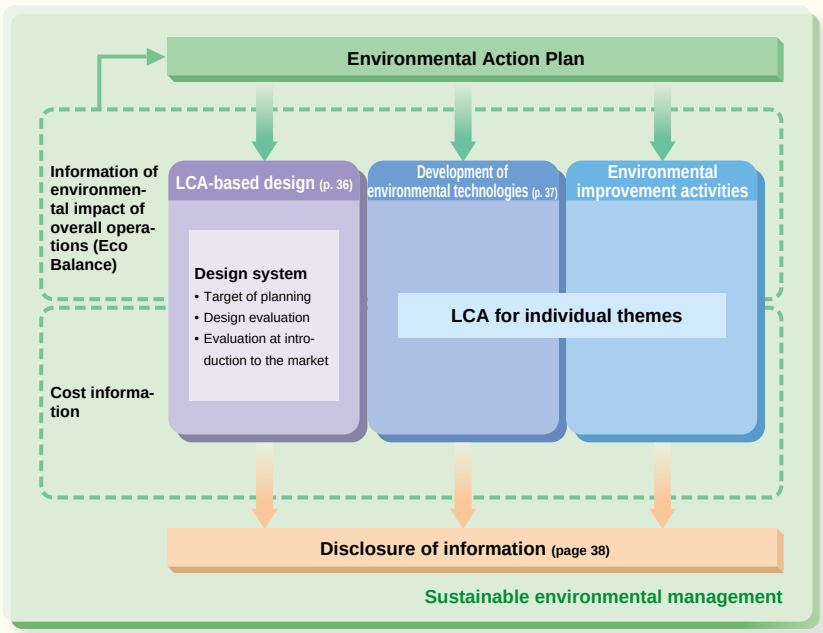
We promote LCA-based design and the development of environmental technologies to reduce the “integrated environmental impact” of all products during their life cycles.

● Concept of Product Development

The Ricoh Group’s approach to improving the environmental performance of its products has advanced from an approach to realize improvements under individual themes, such as energy conservation, resource conservation, or chemical substances, to an approach to reduce the “integrated environmental impact” of all products during their life cycles. Based on the concept of the “Comet Circle”[1], we now place a priority on LCA-based design[2] and the “development of environmental technologiesl,” with the target of keeping the integrated environmental impact of all products in their life cycles (exploitation of resources, manufacturing of parts by suppliers, manufacturing of products, transportation, sales, use by customers, and recycling) below the limit which global environment is sustainable.

1. See page 11.
2. See page right.

Position of LCA in Sustainable Environmental Management



● History of Improving the Environmental Performance of Products

In the 1980s, the Ricoh Group began to develop products to meet individual standards, such as noise, the chemicals contained in the products, and energy conservation. In 1990, various committees were established to reduce environmental impact through an integrated approach. These committees began studies to improve the environmental performance of all products throughout their life cycles. In 1994, the LCA study group was established. In 1998, the Ricoh Group began activities to identify the environmental impact of its overall operations using Eco Balance*, and to reduce the environmental impact of processes with larger environmental impacts on a priority basis. In 2002, the Ricoh Group established an environmental action plan based on the evaluation of integrated environmental impacts. In 2003, the Group began to further improve various tools to promote LCA-based design.

* See page 29.

	Activities
1980s–	• The Ricoh Group begins to establish individual criteria, such as those for noise, chemicals contained in its products, and energy conservation.
1990	• Product Design Committee, Environmental Technology Committee and Eco Mark Committee established.
1994	• The concept of the “Comet Circle” completed. • LCA Study Group established. • LCA activities under individual themes to reduce the environmental impact of each product and overall operations promoted.
1998	• The concept of Eco Balance[1] introduced. • Environmental Action Plan based on the Eco Balance prepared. • The Ricoh Group starts to build the Environmental Impact Information System.[2]
2000	• The Environmental Impact Information System completed. • The Ricoh Group begins to disclose information on environmental impact of products that was compiled based on the LCA (Type III Environmental Declaration). • The Ricoh Group begins to integrate data on environmental impacts caused by each product and by overall operations.
2002	• Environmental Action Plan prepared based on integrated environmental impacts.
2003	• The Ricoh Group clarifies the concept of LCA-based design, and begins to improve the system and tools to promote the concept.

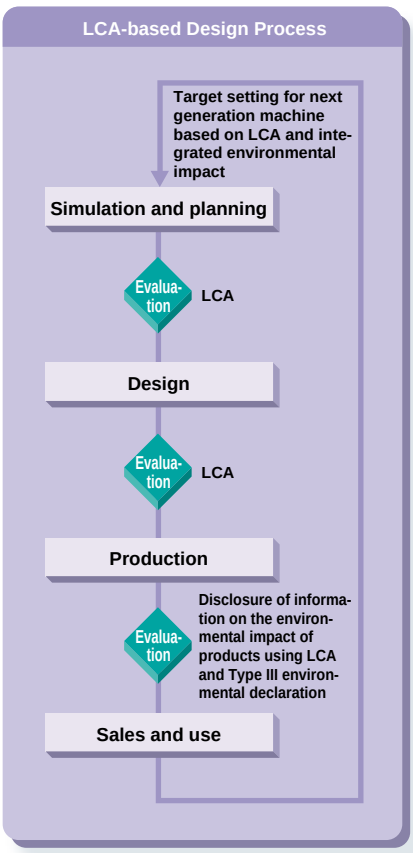
1. See page 29. 2. See page 27.

Life Cycle Assessment (LCA)

LCA means quantitatively identifying which and how much environmental impact exists in the life cycle of a product, from the gathering of resources for the production of raw materials to manufacturing, transportation, marketing, use, maintenance, collection, recycling, and disposal. LCA may also be applied to part of the above cycle.

Promotion of LCA-based Design

LCA-based design is not a simple process of designing from the viewpoint of LCA, but is a process where the LCA of a former machine is conducted and the results are utilized for setting targets to reduce the environmental impact for a next generation machine. Thus, LCA-based design is a process where environmental impacts are reduced based on PDCA. To effectively reduce the environmental impacts of all its products, the Ricoh Group places an importance on "the integrated environmental impact" of all products throughout their life cycles, and has established numerical targets for reduction. Thus, the Ricoh Group is making an effort to establish an LCA-based design process based on PDCA.



● Tool for LCA-based Design

The Design Division Utilizes the Database of Chemical Substances Common Database

The Ricoh Group maintains a database of environmentally sensitive chemical substances, which is shared by all employees. The database is a tool to support activities, on which the Ricoh Group concentrates its efforts, to totally eliminate environmentally sensitive chemical substances that were found to be contained in products through Eco Balance[1] evaluations. The database collectively maintains information on the activities of the Total Elimination Working Group.[2] including information on suppliers' plans to totally eliminate environmentally sensitive chemical substances, information on the progress and performances of responses within the Ricoh Group, and information on problems resolved during the design process. At various forums, the key persons in charge for total elimination (appointed for each specific component) exchange opinions. The database is jointly used by persons in charge of products, materials or design from various divisions in the Ricoh Group. Thus, the database contributes to the management of information on those environmentally sensitive chemical substances.

1. See page 29.
2. See page 49.

CAD System Linked to Information on Materials

In the case of parts for which the Ricoh Group designates the materials to be used, it is essential to submit precise information in the form of drawings to suppliers that process parts. For this purpose, a CAD system is operated to avoid the erroneous designations of materials the environmental safety of which has not been verified, or those materials that do not conform to the recycling plan, in a drawing prepared by a person in charge of design. The material selection standards are prepared by reflecting not only costs and quality but also information on environmental conservation, such as the results of evaluations on environmental safety (avoidance of substances that are prohibited by the Ricoh Group) and recyclability. Thus, the CAD system is an environmentally conscious design tool that is indispensable to persons with responsibilities for design.

Assessment of Recyclable Design

More efficient reuse and recycling can be realized by simplifying the disassembly and sorting of products collected after use and choosing materials that contain less chemical substances and are easily recyclable. In 1993, Ricoh announced its "policy on recyclable design" aimed at significantly reducing the time and cost of recycling (e.g., fewer screws used in machines and standardizing plastic materials). Ricoh also applied "recyclable design" and a "product assessment system" to its entire line of copiers, facsimiles, laser printers, and multifunctional copiers. In fiscal 2003, Ricoh established and implemented level 6 of its recyclable design policy.

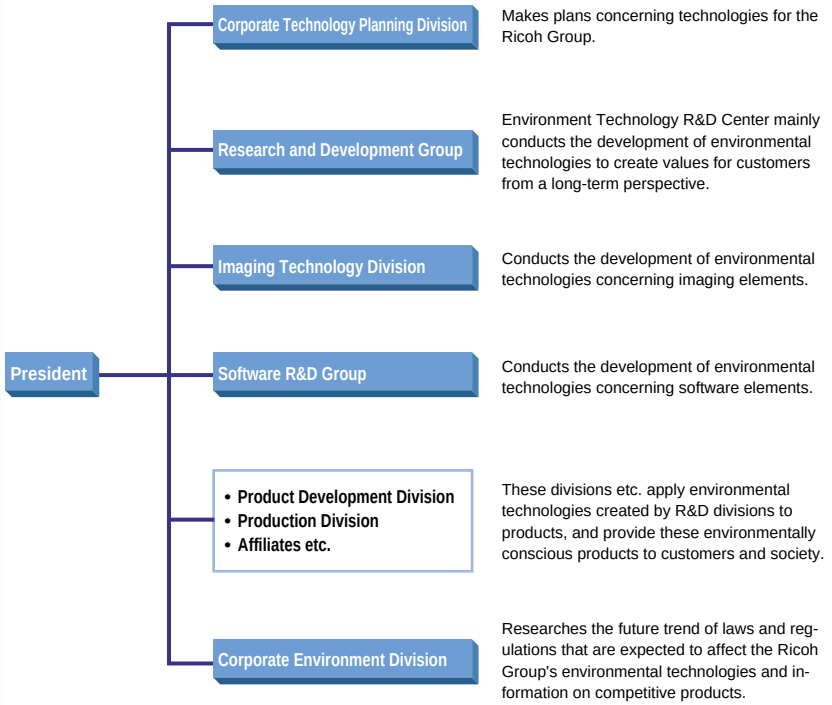
Assessment Tool for LCA-based Design

Ricoh has established an operational system/tool for implementing LCA by compiling life cycle data on products that are collected by the sustainable environmental management information system. At present, the operation system/tool is used for preparing EcoLeaf environmental labels to disclose LCA information, and for environmental impact assessments by unit and by part. We are making efforts to further improve the accuracy of the operation system/tool to enable simulations from the stage of design, and to achieve the reduction target for the environmental impact of each product.

Promotion of Development of Environmental Technologies

The development of environmental technologies is one of the most important efforts to realize sustainable environmental management. It is the basis for providing customers with "products that contribute to a reduction in environmental impact while customers use them without paying attention to environmental conservation," and for simultaneously realizing both a reduction in environmental impact and the creation of economic value. The Ricoh Group has established mid- and long-term plans for the four fields, namely, "energy conservation," "resource conservation and recycling," "pollution prevention," and "reduction in paper use in printing/ copying." Not only the R&D Division but also all Business Divisions and related companies are engaged in developing environmental technologies and products. In 2002, Ricoh established the Environment Technology R&D Center that works as technological driving force for realizing sustainable environmental management.

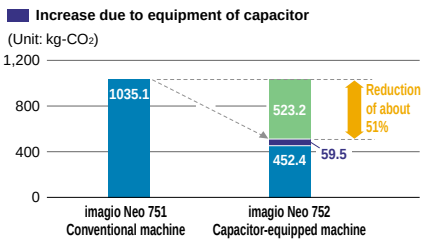
Structure to Develop Environmental Technologies



LCA of Capacitor-Equipped Machines

High-speed multifunctional digital copiers (imagio Neo 752 series*) that are equipped with a new generation electrical storage device, a Capacitor, have significantly improved their energy conservation performance. According to LCA, the capacitor will itself create a new environmental impact. However, it was found that the amount of reduction in environmental impact by the improvement of energy conservation performance greatly exceeds the amount of environmental impact that is newly caused by the capacitor. * See pages 40 and 41.

LCA Comparison of Capacitor-equipped Machine and Conventional Machine (CO_2 emissions)



Scope of LCA: Environmental impact of materials used in capacitor, "manufacturing" and "transportation" is converted into CO_2 emissions.

Paper Feed Simulation Technology

The Eco Balance evaluation shows that papers used by customers cause the largest environmental impact during the life cycle of products. Paper Feed Simulation Technology is a technology to simulate how paper moves within a designed product. With this technology, Ricoh has developed the duplex copying function that can realize fewer paper jams and use paper more economically. Since problems can be detected and solved even before making a test model, this technology contributes to a reduction in environmental impact during the design/experimental production process.

Studies on Fuel Cells

As new business, Ricoh promotes the development of new energy technologies, such as "fuel cells, jointly working with Tohoku University and Nagaoka University of Technology." Ricoh is engaged in R&D on fuel cells that do not use fossil fuels but use ethanol, which can be manufactured from a biomass.

Disclosure of Environmental Information of Products

The main purpose of disclosing environmental information of products is to inform customers of the excellent environmental performance of Ricoh's products. In addition, it is also important to inform society of Ricoh's environmental conservation activities and their results, and disclose environmental information in a positive manner. For this purpose, Ricoh is firmly committed to publicizing the results of LCA studies, technology development, and evaluation methods at academic societies and conferences. Furthermore, Ricoh is contributing to the formation of various environmental labeling in the world, and is making an effort to acquire various certifications.

● Publication of Information at Academic Societies and Conferences

Method to Identify the Contribution of Environmentally Conscious Products to Corporate Profit

To promote sustainable environmental management, it is essential to quantitatively identify how R&D efforts to reduce environmental impact can contribute to an increase in corporate profit. Ricoh has studied methods to calculate the amount of contribution made by an improvement in environmental performance of products to corporate profit based on LCA data on products and the results of questionnaire surveys on customers' buying motives. This study showed that an effort to reduce environmental impact of a product by 1% would increase profit of the product by about 0.29%. This result is close to the result of the joint analysis that was made earlier and the result of the trial calculation made based on customer satisfaction surveys. Thus, it can be determined that these figures are reasonable.

Method to Inspect Used Roller Parts

It is clear from LCA that the "reuse" of used parts of products will more greatly contribute to a reduction in environmental impact than the case of material recycling. Before reusing the roller parts from copiers or printers, however, it is necessary to inspect these parts in a proper manner. Ricoh has developed a method to detect defects in used rollers using light reflected by the used rollers. We will continue studies to put this method to practical use.

● Disclosure of Information using Environmental Labels

Type I Environmental Labels

Type I environmental labels have been established in countries and regions pursuant to ISO 14024 standards. These labels, which are placed on products and shown in brochures, help customers decide which products to buy. Ricoh's criteria for product design used to promote global green marketing are actually more severe than those set by the international Type I environmental label. Moreover, Ricoh actively contributes to establishing Type I environmental labeling criteria in many countries. In fiscal 2003, Ricoh Hungary contributed to the establishment of Environmentally Friendly Label Standards in Hungary, and acquired a certification for the first time for OA equipment.

Type II Environmental Labels

Type II environmental labels are given to products that satisfy standards independently set by each company. The Ricoh Group has defined the Recycle Label, and has set its own standards for recyclable designs, reuse rate of parts, and environmental safety.

Recycle

* For details, refer to the following Web site.
http://www.ricoh.com/environment/label/type2/index.html

Type III Environmental Declaration

As green purchasing is increasingly popular at present, the timely and global disclosure of information is increasingly important, not only for the selection of products by customers but also for sustainable environmental management by the Ricoh Group. The Ricoh Group, following the Type III Environmental Declaration, continuously endeavors to quantify the environmental impact of products using LCA and disclose this information. In addition, the Ricoh Group is making efforts to promote the Type III Environmental Declaration.

* For details, refer to the following Web site.
http://www.ricoh.com/environment/label/type3/index.html

International Environmental Labels for which the Ricoh Group Qualifies

http://www.ricoh.com/environment/label/type1/index.html

* Type I Environmental Labels

● Eco Mark*/Japan

An example of the Eco Mark on an imagio Neo 752 series model (certification no. 01117032)

● Green Label*/Thailand

● International Energy Star Mark/Japan, the United States, Europe, etc.

● Blue Angel Mark* (BAM)/Germany

● Environmental Choice Program (ECP) Mark*/Canada

● Environmentally Friendly Label*/Hungary

● Energy Efficiency Labeling Scheme (EELS)/Hong Kong