Environmental Technology Development

Products incorporating innovative energy conservation technologies are able to provide significant economic benefits to the Ricoh Group by attracting an increased number of customers and contribute to society thanks to their lower environmental impact. High-quality environmental technologies can be said to be key factors in realizing environmental management. The Ricoh Group develops environment-friendly products and innovative environmental conservation technologies to promote pollution prevention. Furthermore, the Ricoh Group studies LCA to grasp how much further environmental impact can be reduced.

Product Design Technologies

Developing "Copiers of the Future"

In November 1999, Ricoh won the International Energy Agency's (IEA's) Demand-Side Management (DSM) Award of Excellence in the Copier of the Future Division for its energy-conservation technology. The IEA is a sub-organization of the Organization for Economic Cooperation and Development and had just started this division. Ricoh was the first company to design a copier that achieved an electricity consumption of 10W or less while on standby in high-speed-copying mode (30–60 pages per minute) and a recovery time of 10 seconds or less from energy-conserving idling mode.

	Copier of the Future	International Energy Star Program (Complex machines)
Page/minute	30–60	21–44
Power consumption while on standby	10 W or less	174 W*
Time to recover from energy-conserving idling mode	10 seconds or less	30 seconds or less

* This value was calculated using 44 pages/minute. Standard value ≦3.85 × (page/minute) + 5 W.

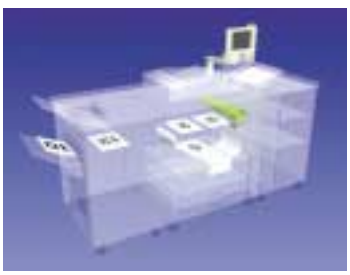
Copiers are often left idling for long periods of time. Therefore, reducing the amount of electricity consumed while idling mode significantly improves energy-conservation efficiency. Also, the less time a copier needs to recover from energy-conserving idling mode the more convenient it is.

Ricoh received "Copier of the Future" Award of IEA-DSM Program.

Duplex Copying and Paper Feeder Technology

Another IEA requirement for what are thought of as copiers of the future is a duplex copying function of at least 75% productivity*. Improvements in duplex copying speed will shorten copying time and reduce the amount of energy consumed. Because the energy consumption of copiers while in operation and while in idling mode is vastly different, higher processing speeds greatly help in energy conservation. Ricoh has developed a high-speed "switchback" system that speeds up processing and shortens the interval in which paper is fed into the copier. A paper-feeder simulator that eliminates nonfeasible feeding route designs has also been developed. The simulator utilizes data on various types of paper to check for possible problems in feeding thinner or lower-quality copier paper. It eliminates the need of making several prototypes at the design stage and, thus, resulting in less environmental impact. The imagio MF 8570 marketed in December 1999 incorporates the "nonstuck interleaf" duplex design to achieve nearly 100% duplex productivity while in continuous operation.

* Duplex productivity required by IEA: Duplex copying productivity (%) = (Time spent on simplex → duplex copying)/(Time spent for simplex → simplex copying) × 100. Time is measured from the moment the desired number of copies is entered and the "Copy" button is pressed to the moment the copier is ready for the next batch of copying. For example, if it takes the same amount of time to make 10 copiesof a 10-page document in simplex copying as it would to make 10 copies of a five-page document in duplex copying, duplex productivity would be 100%. (IEA specifies the method of measuring the performance of the ASTMF1318 in determining copiers of the future.)



Four-cycle duplex copying function with a "nonstuck interleaf" duplex design

Policy for Recyclable Designs

To improve the recyclability of products, Ricoh determined a policy for recyclable designs to improve the levels.

Recyclable Design Policy

Level 1 (1993)

- The use of insert molding prohibited
- The number of parts and screws to be removed when changing main components set
- The use of E-rings prohibited
- The adhesion of resin materials to different materials prohibited
- The amount of packaging reduced
- The use of heat crimping prohibited
- The use of toxic chemical substances prohibited

Level 2 (1994)

- Standards for outer packaging set
- Indicating material grades on labels made mandatory
- The use of resin that contains chlorine prohibited (dioxin prevention)
- The number of parts and screws to be removed when changing main components made stricter

Level 3 (1996)

- New provisions for recycling supplies added
- New provisions for harness layouts added
- New provisions for the restricted use of nitrous resin added
- The use of nylon clamps restricted
- Articles taking economic benefits into consideration revised

Level 4 (1999)

- Appropriate design items for process cartridges added
- New provisions for recyclable printed circuit board designs added
- The number of screw types reduced
- The use of nonhalogenous, fire-retardant resin introduced
- Overall set values for acceptable change in speed when machine is jarred revised

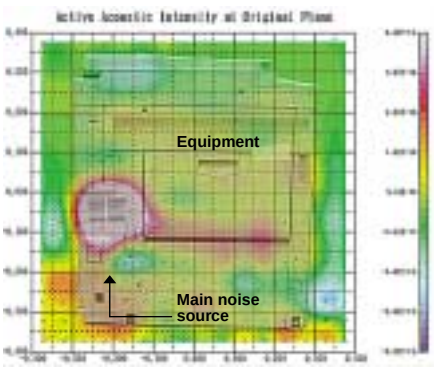
Pollution Prevention Technologies

Design Technology and Visible Air Current

Since setting standards on the noise level of our products in 1979, Ricoh has been raising those standards and improving the technology of noise reduction. The reduction in the noise level of fans had been a particularly important issue since fans are a major source of noise while in standby mode. But reducing fan speed will increase the temperature inside the equipment and also affect the performance of the filters used to limit ozone and dust emissions. Ricoh has therefore developed a technology to make invisible air visible inside the equipment to help reduce heat, noise, and ozone emissions. By using this technology, we can design products for optimum layout for ventilation and use ventilation more efficiently.

Noise Reduction Technology

The noise visualization system developed by the Ricoh Central Research Center measures and displays how much noise is emitted by which part of a product. Using this system, changes in design to reduce noise emissions can be made much faster.



Noise from the sides of a copier made visible

LCA Study

Qualitatively identifying the environmental impact made by products and parts throughout their life cycles is important in developing products with less environmental impact and in supporting their claims of superiority to customers. For this reason, Ricoh established the LCA Study Group in 1994 to deal with the practical applications of product LCA and to show a number of case studies. The study group discovered that when conducting LCA, collecting data becomes difficult—results may vary dramatically according to set conditions—and each step needs to be taken carefully. One LCA case took two years to complete. From the Group's experiences, we realized that LCA and Eco Balance[1] need to be used together in order for us to better identify environmental impact. Then, in 1998, we started the process of establishing an environmental impact information system[2] based on the idea of Eco Balance. Moreover, to help improve LCA through further studies, we cooperate with scholars and company leaders as well as participate in a number of organizations, including government committees.

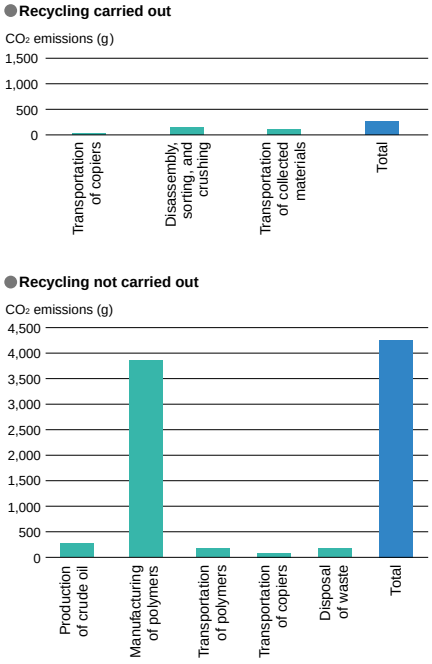
1. See page 11 for more information on LCA and Eco Balance.
2. See pages 17–18.

Product LCA of the spirio 5000 (new) and spirio 5000RM (remanufactured)

Ricoh, Tohoku Ricoh, and Fuji Research Institute Corporation worked together to conduct an LCA of RM copiers. To improve the reliability of the study results, we obtained an objective certification by Ecobilan Inc. in France.

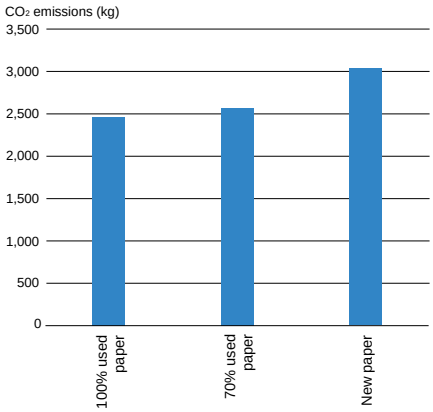
LCA of Resin Recycling for Copier Casing

Reported at the Eco Balance International Symposium in November 1998



LCA of Copier Paper (CO_2 Emissions per Ton)

Presented at the Japan Hard Copy '97 Fall (November 1997) organized by the Society of Electrophotography of Japan



LCA of New and RM Machines

To compare the LCA of new machines to that of RM machines, the total CO_2 emission of two new machines and the total CO_2 emission of a single machine before and after being remanufactured are compared.