Environmental activities with the printer

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Sales and installed units of printers continue to expand as their networking, color implementation and high-speed printing are realized, interlocking with the fact that personal computers become more compact, low-priced and high-performance.

The expansion of the printer's use, along with its related consumables (such as ink ribbons, toner cartridges and image drum cartridges), could present a significant impact on the global environment. To prevent damage before it occurs, Oki Data has been engaging in activities with "consideration for the global environment and superior environmental performances" throughout each stage of printer development, manufacture, customer use and disposal.

Environmental regulations for output devices in various countries

(1) Activities in European countries

Europe, one of the major sales destinations of Oki Data Corporation, has been progressively involved with environmental activities, including a household appliance recycling law (a common legislation for 15 EU countries). Of these, Germany is the country spearheading a central role with the ecological label of "Blue Angel".

The printer standard of Blue Angel was established by RAL-UZ85 in July 1996. The concept of this standard is such that the equipment should be: (1) easily upgraded, (2) possible to extend the life of the products, (3) energy conserving, (4) easily disassembled for disposal, and (5) of a construction which minimizes its impact on the environment. Further, the discharge of toxic substances, harmful to living organisms, must be kept at a low level during use, when incinerated or buried as disposal.

Likewise, the NITO (Nordic Information Technology Organization), an information equipment-related association for Scandinavian countries, has also established a standard, which is on a similar level to that of the German standard. Their standard is in the form of an ecological declaration (ECO Declaration), which requires that individual equipment satisfy the standard based on the voluntary declaration of individual manufacturers.

Others base their certification on evaluations by a third party. TUV Rheinland (Germany), for example, has established the ECO Circle certification, a requirement standard prepared and based on the Blue Angel standard with additional evaluation items, such as ergonomics, or ease of use. Based on this standard the environmental performance of individual equipment is analyzed and the environmental consideration of the product is assessed, before the ECO Circle certification is granted. Our products were the first in the world to be granted the ECO Circle certification label issued for printer standards, an addition to the standard since 2000. The ECO Circle certification label is shown in Fig. 1 while the certified printer products are listed below:

Monochrome printers include the OP10ex, OP12i, OP14ex, OP20, OP24
(Domestic models such as ML14/14n 24dx).

Color printers include the OPC7200 /7400 /9200 /9400
(Domestic models include the ML3010C/3020C/3050C).

Fig. 1 ECO Circle certification label

(2) Activities in the United States

To reduce energy consumption during the standby mode of equipment the Environmental Protection Agency in the United States was engaged in these activities early on, through the launch of their "International Energy Star Program". With a consensus between the United States and European governments this program has been in effect since October 1995 as an energy conservation standard for office automation equipment intended to protect the abundant global environment. Not only is the use of the International Energy Star logo permitted for products that achieve a specific energy conservation standard, but the standard is also being referenced in Blue Angel and other standards from various countries.

Further, they are engaging the information disclosure issue in order to protect the laborers' health from the chemicals like toners and so on, and some strict regulations are also being established that may equal those of European regulations, such as the responsibility to disclose the MSDS (Material Safety Data Sheet).

(3) Activities in Japan

In Japan, the Japan Environment Association is playing a central role in preparing a certification standard that reflects the opinions of representatives from government agencies, corporations and consumer associations. Through evaluations conducted with the Japan Environment Association (as the certifying organization), an ECO Mark is issued to products that

have been evaluated for incorporating superior characteristics.

The organization has completed certifications for over 5,300 model types from over 120 product groups.

Although the previous standard for printers was limited to a narrow scope, this has been made to cover a wider range to form a new standard since October 1,2001. This change was made based on the ECO Mark copying machine standard as well as the Blue Angel standard of Germany.

(4) Green Procurement Network (GPN)

The GPN is an internationally unique organization - a foundation made up of personnel from government agencies, corporations, academic institutions and consumer associations - with personnel across a wide range of fields, such as manufacturers and users.

The organization established a unique environmental conservation guideline, disclosing comparisons of environmental conservation activities and products of manufacturers, as well as preparing and publishing guidebooks, which makes it easier for users to make decisions when purchasing products. The organization promotes the prioritized purchase of products and services that present a lesser environmental impact, they continue to provide information concerning the Green Procurement Law and contribute towards reducing impacts to the environment.

Environmental labels, ECO marks and ECO product standards

Specific environmental labels have been established to make it easier for users to recognize environmental regulations.

Three types of environmental labels, as defined by the ISO14000 series standards, are specified for use as environmental labels and categorized depending on the purpose.

Type I labels are certification labels granted by third party organizations. The ECO Mark of Japan and the ECO Circle certification label of TUV Rheinland belong to this Type I label category.

Type II labels are voluntarily set up by corporations and categorized according to their individual standards to ascertain the environmental consideration of products. The following examples belong to this label category:

The Oki Electric Group of companies established their Oki ECO Product ® *1) Registration Program in December 2000 [1] to make the environmental features of their products known to users. This registration standard is divided into two: A corporate standard and individual product group standards.

The Oki ECO Product ® symbol mark and product group standard for printers are shown in Fig. 2.

Type III labels disclose quantitative information concerning the environmental characteristics of a product, based on the LCA (Life Cycle Assessment) methodology. Trial LCA evaluations for color printers are conducted at Oki Data and expansion of this to all products is under consideration.

Fig. 2 Oki ECO Product ® symbol mark and printer standard

Product environmental assessment and environmental technology

(1) Product environmental assessment

As mentioned in the special issue on printers of May 1998, recycling design [2] is a part of our design philosophy. In general, recycling deals with the collection and reuse of waste materials. Our concept of recycling differs, however, as the reduction of waste materials itself, is the backbone of our design philosophy.

Specific examples include the re-inking technology of ink ribbons for impact printers and the toner recycling technology of image drum cartridges for non-impact printers, both having been developed in the early stages [3].

The ink ribbon length was shortened for the re-inking method and now only the ink is replenished. The toner recycling of the image drum cartridge, utilizes a method for replenishing toner only, by collecting the toner residue on the photosensitive medium for reuse in a developer unit. By replenishing minimally required amounts of ink and toner in this manner, it is possible to minimize the disposal and recycling of materials, thereby reducing the amount of energy consumed for recycling and, as a result, yielding a product that is friendly to the environment.

In order to ensure that the development of products suitable for the environment could be conducted on a continuous basis, by fully utilizing this type of advanced technology we established in 1997 an environmental policy based on environmental compatibility reviews. These reviews are held during the product development stage with compatibility verifications against environmental targets conducted during the upstream merchandising processes of products, as shown in Fig. 3. The sales companies of Europe, the leading region for environmental conservation, submit their requests for product environmental consideration during the specification fixing stage of products.

*1) Oki ECO Product (name and mark) are registered trademarks of Oki Electric Industry Co., Ltd.

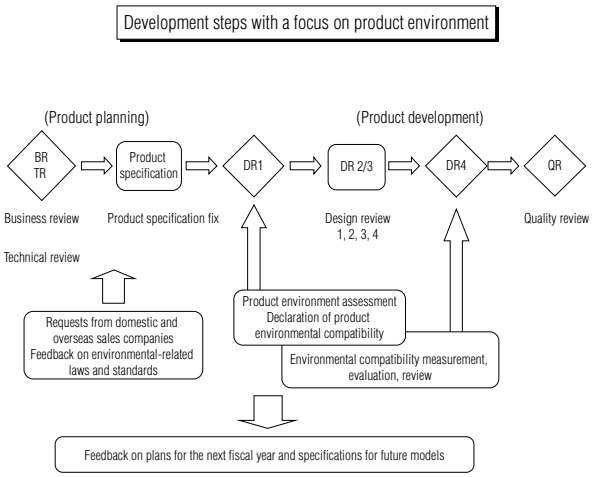

Fig. 3 Environmental compatibility review during the product development stage

(2) Environmental technology

Since the early stages we have been using LED print heads, which is our unique technology for the light source of electrophotographic printers. The LED print head is an array of LEDs in a single line, with as many dots as needed for a line and, unlike the laser method, mirrors are not required for scanning with a beam, therefore, a rotating mechanism for such a mirror is not required either. Further, when compared with the laser method, the LED print head makes it possible to miniaturize the printer and keep power consumption at a low level, resulting in a contribution to the resource conservation.

On the rise lately is the rate at which the LED light source is being adopted, even with other manufacturers. This is because it is compact, highly efficient and easy for color electrophotographic printers to control using the Single Pass Color® *2) method. The luminous efficiency of the LED has improved in leaps and bounds, as much as ten times more than previous rates, with the implementation of the double-hetero structure. This, combined with the connection of the LED light source and driver IC in a matrix structure, resulted in a reduction in the number of wire bondings, thus enabling the miniaturization of the product as well as a reduction in materials.

Further, the polymer toners being used by us, have characteristics that allow them to be easily recycled, making it possible to realize high-speed printing at a low cost. The shell structure is easily created for polymer toners and a low temperature fusion is conducted through the combination of the resin that melts at a lower temperature inside the shell and the shell made of a resin that does not melt until a high temperature is reached.

A comparison of fusion characteristics, between the dual polymer structure toner and the conventional toner for printers that output approximately 20 pages per minute, is shown in Fig. 4.

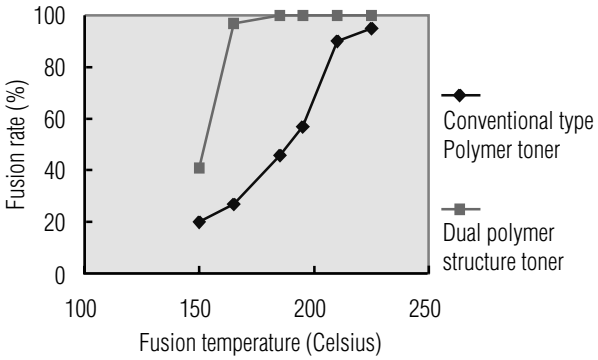

Fig. 4 Comparison of polymer toner fusion characteristics

Recycling cartridges and printer main units

We collect free of charge, all consumables, including all ink ribbons, toner cartridges, image drum (ID) cartridges, etc., for our MICROLINE™ *3) printers. In the past we performed collections for a fee with the users carrying the burden of paying for the shipping charges, but we changed this to a free collection around the middle of the year 2000, in consideration for the raised level of consciousness for global environmental protection.

Descriptions of the collections, as well as the processing of consumables and main units, are provided next.

(1) Collection of used consumables

To inform users that we are now collecting consumables free of charge, we have been placing flyers inside the package boxes of consumables and we also disclose the information on our web site. We have established a system, whereby the flyers can be used by users as collection request forms, to be completed and faxed to the “Oki Data Collection Center”. Alternatively, users may enter a collection request on the web site for a courier service, contracted by us, to collect the consumables. All collected articles are then taken to the Recycling Center at the Fukushima Plant. During the first half of FY2002, when the free collection service was in full operation, the number of collections amounted to 15,900 items (13,000 toner cartridges, 2,900 image drums or ID cartridges). The number increased 3.6 fold when compared to the period prior to the start of the free collection and the number is expected to rise even further in the future.

Semi-annual trends from FY2000 to FY2002 are shown in Fig. 5.

*2) Single Pass Color is a registered trademark of Oki Data Corporation.
*3) MICROLINE is a trademark of Oki Data Corporation.

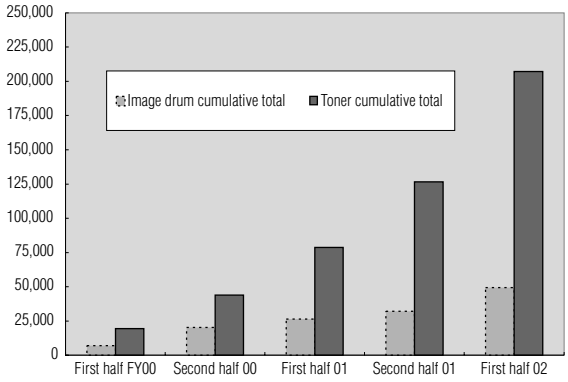

Fig. 5 Number of toner cartridges and image drum cartridges collected (trends for years 2000 to 2002)

(2) Recycling toner cartridges

Basically all collected toner cartridges are reused, therefore, since April 2001 these have been sent to our affiliated MICROLINE supplier (recycling is currently limited to only monochrome type printer supplies). Cartridges, scratched during transportation or older products for which there is no longer any demand, are removed during the initial process. Currently, approximately 10 to 20% of the collected items fall into these categories.

The recycling process is centered around the cleaning, parts replacement and refilling of toner powder. By limiting the number of times a product may be recycled, the level of quality is guaranteed to be at a level identical to that of new products. The method for recycling toner cartridges involves marking the cartridges with the number of times they have been recycled. This is done in such a manner that can be solely determined by us. Cartridges with markings indicating that they have been recycled the number of times stipulated as the limit, are prevented from being recycled again. The current monthly average number of recycled products actually shipped is 3,700. Recycling for color type toners is scheduled to start in the current fiscal year, with a consideration for "environmental problems".

(3) Recycling image drum cartridges

We have implemented "separated type" toner cartridges and image drum cartridges, so that an image drum cartridge may be used until it reaches its life end by replacing toner cartridges. We can say that since the frequency of disposal of our drum cartridges is less than those manufactured by other companies, we have been making a contribution to the protection of the environment. Although this benefit makes the work more complex and varied, from a recycling perspective, the recycling, which includes color types, is scheduled to start.

(4) Recycling of other items

Items that were damaged during their transportation after collection or older products for which no demand of recycled products is expected, including ink ribbons, are first sorted and then handed over to contracted intermediate disposal processors for disposal processes. The processors separate these items into individual recycling categories and then perform resource recycling by reusing them in material recycling, as fuel additives or road materials.

(5) Recycling of the printer main units

The Law for the Promotion of Effective Utilization of Resources made it mandatory for manufacturers to collect and recycle materials related to office personal computers. Promotion for the collection and recycling of personal computers in private use is also under consideration. With the cooperation of our customers we have started operating a system, whereby used printer main units are handed in for recycle processing at the time our customers purchase new printer main units.

Future activities

The era in which ordinary consumers selected products merely for their performance, is coming to an end. This is due to the aforementioned environmental regulations and environmental protection activities as well as the Household Appliance Recycling Law, the Container and Packaging Recycling Law, and amendment and execution of the Effective Resources Utilization Promotion Law in Japan.

The scope of laws and regulations is increasingly expanding for the purpose of effective use of resources and it is certain that this effect will be felt in the areas of personal computers and printers for home use, especially because of their large numbers. Therefore, manufacturers will be required to produce products that have a longer life, designed for easier reuse and more convenient for recycling through easier disassembly and sorting. We believe that the experience we have obtained, through the recycling efforts of consumables and printer main units, will be beneficial in designing products with an even better environmental performance.

By adhering to the slogan, "Be considerate of mankind and cherish nature", as designated by the basic environmental policy of our company, we shall continue to provide products that are environmentally friendly, while we also promote recycling processing with a consideration for the protection of the global environment.

References

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3) Katsuyuki Ito: "Environmental protection activities for printers", OKI Technical Review 1994, Issue 163 Vol. 61 No. 3, pp.51-54

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