

Promotion of Environmental Measures on Products

In order to provide eco-friendly products to customers, FDK Group emphasizes on designing eco-friendly products and developing products containing no hazardous chemical substances for reducing environmental burdens contained in products.

FDK Group is stressing on providing eco-friendly products that imposes little environmental burdens through the entire life cycle of products from development and design phases to disposal. For this purpose, FDK Group is addressing reduced volume of materials used, utilizing and applying materials with little environmental burdens, use of recycled materials and reducing energy consumption in manufacturing process. The efforts of providing small-in-size products with superior energy efficiency have resulted in development of multi-layer chip inductors.



Hiroshi Rikukawa
Corporate Vice President in charge of technological R&D and environmental affairs

Offering Super-Green Products with the Top Environmental Elements

In fiscal 2004, in addition to green products, FDK Group has been involved in development of Super-Green Products with Top Environmental Elements.

Targets of the Third Environmental Action Plan

Provision of Super-Green Products by the end of fiscal 2006

- "Super Green Products" are the advanced form of green products incorporating such properties as energy saving, 3R (Reduce, Reuse and Recycle)-based design, and elimination of hazardous chemical substances. They are forerunners having the "world's 1st" "world's smallest" "nation's first" "industry's first" "nation's smallest" and "industry's smallest" characteristics, which are intended to be released by the end of fiscal 2006.

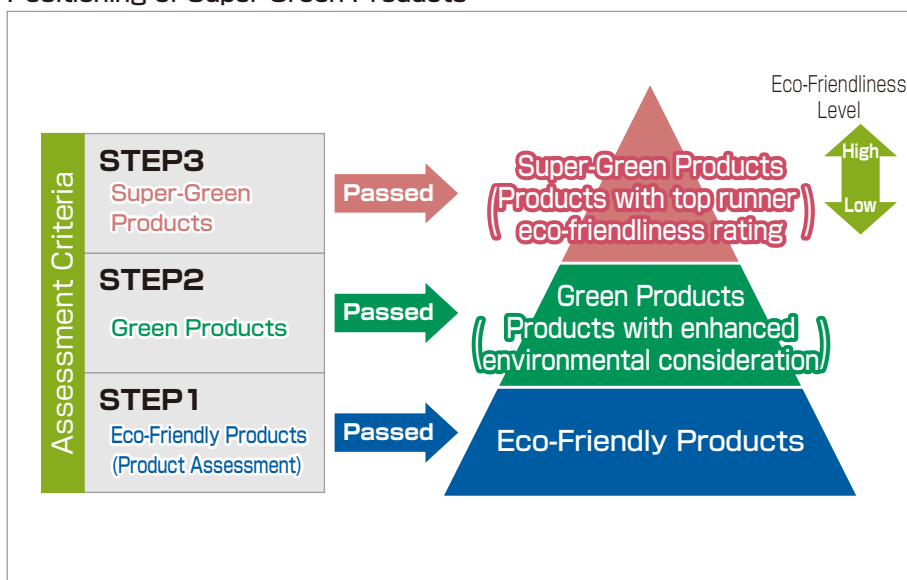
Development of Super-Green Products

Super-Green Products refer to products with top environmental elements clearing all the assessment criteria from Step 1 to 3 shown below. In fiscal 2004, a preliminary investigation was conducted on the Super-Green Products and 20 potential items were identified for development. FDK Group will further involve in study and development of the products so that, by the end of fiscal 2006, Super-Green Products will be provided to customers as many as possible from the 20 items identified.

Research and Development for Improving the Global Environment

The activities of FDK Group are not limited to R&D on electronic parts, but include R&D on improving the global environment. So far, the efforts have resulted in application of a recycled block, "Rictor Mat," for flooring purposes. The Rictor Mat, made of sludge, was originally developed aiming at combating with deterioration of the water quality of rivers and removing odors. FDK Group also researches and develops environmental purification filters utilizing photocatalyst. FDK Group continues its efforts for research and development to improve the global environment.

Levels of Eco-Friendly Products and Positioning of Super-Green Products



Eco-Friendly Product Assessment Category (Large Category)

Products

- Hazardousness (including hazardous chemical substances)
- Resource-saving and recycle-oriented design
- Reusability as resources
- Easiness for decomposition
- Energy-saving
- Easiness for disposal by disassembly

Packaging Materials

- Resource-saving and recycle-oriented design
- Reusability
- Using materials

Others

- Disclosure of information
- Eco-friendliness

Eco-Friendly Products Developed in fiscal 2004



Application:

Power inductors used for DC-DC converter circuits of small electronic products such as mobile phone, PDA and digital camera

Multi-layer power inductor (MIPF2520D Series)

Product characteristics

This is a power inductor applying the multi-layer technology. Compared with the conventional coils, it is smaller in size with enhanced performance. It contributes to realize smaller and thinner electronic products such as mobile phones.

Eco-Friendliness

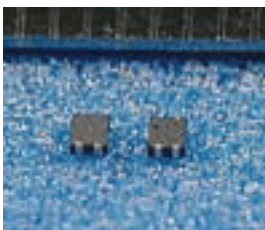
Compared with the similar products of FDK Group, the product is smaller in size by 40%. Application of this product to a converter circuit reduces power consumption due to its high conversion efficiency. The product is free of lead and can be mounted using lead-free solder.

From the developer

In order to decrease the size while maintaining the performance level, the internal structure of the conventional products was changed. Based on the design of the conventional ones, shortened development time was realized by selecting the optimum internal pattern structure by fully utilizing computer simulation (CAE technology).

Makoto Kawaguchi

Multi-Layer Inductor Section
Ceramic Component Div.
Component Business Department



Application:

Removal of noise for high-speed differential interface
①IEEE 1394a interface
②USB2.0 interface
③HDMI/DVI interface

Common-Mode Choke Coil

Product characteristics

This is a small-in-size and low serial current resistance choke coil utilizing low temperature ferrite sintering technology, high resolution multi-layer printing technology and CAE. The size is 1.20×1.00×0.50mm. It has a superior compatibility with various interfaces having differential impedance characteristics. Realization of high common mode impedance has enabled sufficient level of reducing EMI*.

* EMI refers to electromagnetic interference which prevents normal operation of electronic equipment.

Eco-Friendliness

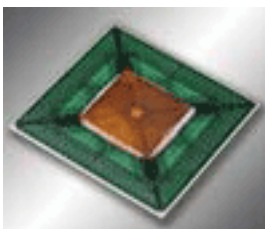
The small-in-size product reduces the volume of materials used. Lead-free plating is employed to its outer electrode, and lead-free solder can be used for mounting it.

From the developer

Miniaturization and high-speed orientation of electronic devices such as a notebook PC requires a small-in-size and high-speed noise removal part. High EMI reduction requires high common mode impedance. The challenge in developing this product is to prevent decrease of common mode impedance due to the downsized product and of ferrite magnetic permeability due to the higher frequency.

Yuji Goto

Electronic Materials Research Section
Advanced Technology Lab.
Technology R&D Div.



Application:

Optical information processing equipment for the next generation ultra high capacity optical disc system (hologram memory devices)

Magneto-Optic Spatial Light Modulator

Product characteristics

This is an ultra high speed special light modulator with the picture cell response time of several tens of a nano second, which is developed jointly with Professor Mitsuteru Inoue of Toyohashi University of Technology based on FDK's magneto-optic material technology. The product enables to make a high speed data access to a large capacity optical disc.

Eco-Friendliness

The combination of a magneto-optic garnet film, epoch-making cell formation method and driving mechanism have realized a decrease in driving current and energy saving. No hazardous chemical substances such as lead are used from the formation of the film to mounting of a flip chip.

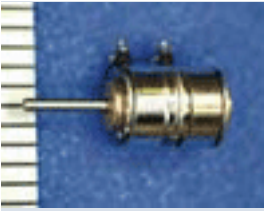
From the developer

In order to develop this product, a series of technology was developed including functional design using a simulation method, comparison of the design and prototype experiments, manufacturing process development and assessment method. Starting from processing of substrate board to running the finished device, there was a process of repeated trials and errors by fully using our research facilities. In the future, we will further challenge to make the device more energy-saving and eco-friendly.

Katsuhiro Iwasaki Kazuma Takahashi

Project S Dept.
Technology R&D Div.





Stepper Motor (M4.3 Series)

Product characteristics

Applying our unique coil design technology and magnetic circuit design technology as well as magnet manufactured consistently from powder molding, the world's smallest and high-output torque stepper motors are developed. The size is as small as 0.074cc with the diameter of 4.3mm. The torque is higher than conventional stepper motors. Though small in size, decrease in torque is contained to a minimum. Use of this stepper motor enables to realize further miniaturization both in size and weight and saving power consumption for applicable equipments.

Eco-Friendliness

Compared with SM5 series products, the smallest of its kind in FDK, the size and use of resources have been reduced by approx. 30%. Lead-free solder is used for soldering of coil terminals where ultra fine magnet wire is used, making the product in compliance with the RoHS Directive.

Application:

Auto focusing and zooming of a digital camera and a built-in camera of a mobile phone

From the developer

The basic structure of the product series basically employs the same as that of our conventional product series in order to maintain its superior performances. The appearance, therefore, is quite similar with the conventional products of its kind. However, within a small body, various element technologies and know-how is filled, such as molding of small magnets, magnetization and magnet circuit parts processing. This product is realized by integrating and arranging these technologies in a well-managed way.

Nobuyuki Sueyoshi, Yuuji Murata, Yosuke Takahashi, Mitsuo Kinoshita, Hideki Takeuchi, Isao Kojima, Shohei Sawada, Naoya Ova, Hiroki Tatara, Kazuhiko Nakayama and Kyoko Nishio

1st. Engineering Dept.
 FDK Mechatronics Co., Ltd.



New Generation Alkaline Battery "G Plus"

Product characteristics

A new conductive material is used to reduce significantly the internal resistance of cathode mix. At the same time, use of a new separator has improved its discharge efficiency. All of this has enabled the battery to increase the power by approx. 20%* compared to a conventional AA and AAA batteries, making it the highest performances in alkaline batteries. This product is suitable to digital cameras, remote controllers of electric devices and any other electric products.

* Compared to the conventional alkaline batteries of FDK (AA battery: 2,000mA, 0.5S/300mA 59.5S when used, AAA battery: 600mA when used continually)

Eco-Friendliness

The uplifted durability of this product (by approx. 20%*) has enabled the cycle of replacing batteries longer, and resources can be used efficiently. The packaging materials (blister pack) is made of recycled PET bottles and the inner boxes and the label of multiple pack are printed using soybean ink, thus the product considers eco-friendliness.

Application:

This is a high power and highly durable alkaline battery. This is the most fit for application to the devices requiring high current such as digital cameras and PDAs, as well as video games and portable AV equipments.

From the developer

The key points in developing this battery are to uplift the stable performance, to secure product safety during the life of the product. Batteries have recently been applied to digital cameras and other devices requiring high current. Therefore, the aim of developing the new generation alkaline batteries is placed on high performance and widened application. At the same time, upgrading customer satisfaction is also included in the development objectives, by the use of a special gasket to prevent leakage of electrolyte, new type of surface treated steel to reduce contact resistance with the devices, and employment of universal design.

Yuji Tsuchida
 1st technical section
 Technology Div.
 FDK Energy Co., Ltd.



Non -contact Magnetic Polishing System

Product characteristics

Unlike conventional polishers, the non-contact magnetic polishing system employs a polishing bite that does not contact with the item for polishing. Therefore, no stress is imposed on the item (maximum distance from the bite and the item: 5mm). Due to this, items of irregular surface can be polished such as thin films and soft materials of irregular shape that has conventionally been unable to be polished. These features have reduced the cost for mirror polishing of nano-level that was only done by a large-sized and expensive polisher in the past.

Eco-Friendliness

Compared with the conventional system, the power consumption is significantly reduced. The waste liquid containing magnetic body can be recycled for other applications as EMC* materials after removing water. This is a wet type polishing machine that polishes a vessel by putting polishing liquid of a certain volume, no chips and particles are scattered.

* EMC refers to electromagnetic compatibility, which is to reduce the impact by electromagnetic noise.

Application:

Precision polishing and processing of precision machines, electronic and optical parts

From the developer

The system currently uses magnetic polishing solvents, but we are in the process of developing water solution type magnetic polishing liquid using the FDK's ferrite materials and recycled Mn-Zn sludge. The polishing liquid of this type will greatly contribute to reduce environmental burdens from the view point of working environment and effluent treatment.

Keita Yamamoto
 Rei Hanamura
 Advanced Technology Lab.
 Technology R&D Div.

