Research and Development

Minebea manufactures and sells a wide range of products around the world. These include ball bearings, precision machinery components that incorporate ball bearings, aircraft components such as rod-end bearings and high-end fasteners, as well as electronic components used in state-of-the-art electronics equipment such as HDD spindle motors. Minebea and Minebea Group companies work closely together on R&D in each of these areas.

The Minebea Group is also dedicated to the development of hybrid component products that integrate the basic technologies that go into making its machined components, rotary components, electronic devices and other components.

Minebea has development bases in Japan (Karuizawa Plant and Hamamatsu Plant), Thailand, China, the United States, and Europe. These bases leverage their individual expertise and supplement each other to speed up the development of new products in new business opportunities. Our facilities in Karuizawa, Thailand and China have all been ISO17025 certified and are moving the entire Minebea Group forward in analyzing and reducing emissions of hazardous substances targeted by environmental regulations, including those banned by the European Union's Restriction of Hazardous Substances (RoHS) directive.

In the year under review, our group-wide research and development expenses totaled ¥7,743 million. This amount includes ¥1,782 million in basic research expenses that cannot be allocated to any particular segment, such as business support and analysis conducted at materials science labs in Thailand and China.

What follows is an overview of the R&D activities conducted in each segment during the year under review.

Machined Components

R&D in this segment remained geared toward our mainstay bearing products (i.e. ball and rod-end bearings) with a focus on developing basic tribological technologies for materials and lubricants, etc., as well as on oil fill, electrochemical machining (ECM), diamond-like carbon (DLC) and other processes. We are working with a keen eye to responding to the needs of manufacturers in emerging areas of the IT, home electrical appliance, automobile and aerospace industries. Reliability engineering aimed at minimizing particle generation, resisting high temperature, extending product life, enhancing/reducing electro conductivity, etc. as well as applied engineering are at the heart of our work in this area.

In the miniature ball bearing that is the essence of precision processing technology, we have made efforts to produce smaller products. Pivot assembly is one of the applications of miniature ball bearings. We have developed new pivot assembly products for growing segments of the HDD market such as slimmer 2.5 inch HDDs (7mm/5mm height) and ones for servers.

Recent progress in the area of aerospace industry bearings includes the development and approval of tie-rod mechanical assemblies, trunnion bearings for main landing gear and a wide range of bearings that will go into flight control systems for new models released by U.S. and European aircraft manufacturers. These R&D successes are built on the same technology used in our rod-end bearings.

For the automobile industry we have developed high-heat-resistant ball bearing units for turbochargers jointly with myonic, our consolidated subsidiaries. Turbochargers allow engines to be downsized and fuel efficiency to be improved while maintaining engine power by using exhaust gas to supercharge the engine, and the market for these devices is expected to triple to 60 million units by 2020. By combining our own excellent precision machining technology with myonic's powerful technology development capabilities, we have developed a high value-added high-heat-resistant ball bearing unit for turbochargers.

R&D expenses in this segment totaled ¥1,154 million.

Rotary Components

Our mainstay motor products in this segment include information motors (fan motors, stepping motors, brushless DC motors, vibration motors, and brush DC motors) and HDD spindle motors. We are working to enhance our various core analysis technologies, control technologies and materials technologies. Our aim is to be the first to launch a range of state-of-the-art products that respond to growing customer requirements for compact, highly efficient (low energy consumption), quiet, and reliable components designed for various types of motors and applications.

R&D work on magnetic application products harnesses our expertise in materials technology, core technologies and product-related technologies. Ongoing work in this area continues to yield such outstanding products as rare earth bond magnets and heat-resistant magnets for use in high-performance motors. In the year under review we developed a hybrid stepping motor that replaces expensive rare earth magnets with inexpensive ferrite magnets but maintains the characteristics of rare earth magnets.

In HDD spindle motors, we have developed motors with a new structure that is optimal for high-end applications where a high level of reliability is required such as the enterprise and nearline devices mainly used in data centers, and we have expanded the market share in this area. Finally, we have developed ultra-slim motors in anticipation of the market shift in 2.5-inch hard disk drives from a 9.5mm height to 7mm or even 5mm.

R&D expenses in this segment totaled ¥3,200 million.

Electronic Devices and Components

In the area of display-related products, we are developing ultra-thin LED backlight units for smartphones that are becoming larger and thinner. In addition to the ultra-precision machining technologies and mold-design technologies that define the Minebea group, we are also improving our injection molding technology for transparent resin allowing fine optical patterns to be swiftly and precisely transferred to LED backlight guide plates. Using this, we have developed ultra-thin guide plates for the world's thinnest (less than 0.3mm) 5-inch wide class smartphones. We are also using the optical technologies that we developed in backlight products to develop lighting modules that combine an LED lighting circuit with a thin lens for LED lighting. These lighting modules are thinner and use less electricity than conventional products because they operate more efficiently.

In electronics-related products, we are developing LED backlight driver circuits, which is a growing market. Shifting from conventional analog to digital control circuits will help shorten design lead times by significantly reducing the number of parts and allowing a higher level of control.

R&D expenses in this segment totaled ¥1,196 million.

Other

Our other segment mainly includes speakers and special devices.

R&D expenses in this segment totaled ¥411 million.