Research and Development

Minebea Group makes and sells precision machinery components like ball bearings and components incorporating ball bearings; aircraft parts such as rod-end bearings and high-end fasteners; motors and pivot products used in state-of-the-art hard disk drives, and various types of electronic components including motors used in electronic devices and LED backlights. Minebea and its group companies throughout the world work closely together on R&D in each of these areas.

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

Minebea has research and development facilities at its Tokyo Head Office, Karuizawa Plant, Hamamatsu Plant, Fujisawa Plant, and Yonago Plant as well as in the United States, Europe, Thailand and China. These bases leverage their individual expertise and work together to speed up the development of new products and pave the way to new business opportunities. The Tokyo Research & Development Center was set up at our Tokyo Head Office in April 2013. Taking full advantage of its prime location in Tokyo, a dynamic hub for human resources and information, the center is working to develop hybrid products for medical and automobile applications. Our facilities in Karuizawa, Hamamatsu, Thailand and China have all been ISO17025 certified and are moving the entire Minebea Group forward in analyzing emissions of hazardous substances targeted by environmental regulations, including those banned by the European Union's Restriction of Hazardous Substances (RoHS) directive as well as conducting product certification tests for electronic components.

In the year under review, our group-wide research and development expenses totaled ¥8,561 million. This amount includes ¥1,853 million in basic research expenses that cannot be allocated to any particular segment, such as 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 bearings, rod-end bearings, and fluid dynamic 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 appliances, automobile and aerospace industries. Reliability engineering aimed at minimizing particle generation, increasing heat resistance, extending product life, enhancing electroconductivity, etc. as well as applied engineering are at the heart of our work in this area.

We are also working to make the miniature ball bearings that are the essence of precision machining technology even smaller. HDD pivot assemblies are one of the main applications where these precision ball bearings are used. As a leading manufacturer, we are developing new products for a wide range of applications for the growing data center server and mobile device segments of the HDD market, including everything from large capacity 3.5 inch HDDs to slimmer 2.5 inch HDDs (7 mm/5 mm height).

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 auto industry we developed high-heat-resistant ball bearing units for turbochargers jointly with myonic GmbH, a foreign consolidated subsidiary. The market for turbochargers, which use exhaust gas to supercharge an engine and allow for smaller engines and greater fuel efficiency without compromising power, is expected to reach 60 million units by 2020.

In July 2013, we acquired all shares in CEROBEAR GmbH, a German company boasting more than 20 years of experience in the design, manufacturing and marketing of ceramic bearings as well as hybrid bearings employing high performance steel materials. CEROBEAR GmbH's technological capability, combined with myonic GmbH's technological edge in providing special bearings used in dental and medical equipment as well as the aerospace industry, enables us to develop new products for the aerospace industry that is expected to see booming demand in the near future.

R&D expenses in this segment totaled ¥1,538 million.

Electronic Devices and Components

Motors, one of the principal products of the electronic devices and components business, include information motors (stepping motors, brushless DC motors, brush DC motors, and fan motors) as well as HDD spindle motors. We are enhancing basic technological capabilities including various simulation, analysis, control, and material technologies as well as product development capability so that we can be the first in the market to supply advanced products that meet customer needs for smaller, more efficient (energy-saving), quiet and reliable products required for a wide range of 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. We developed a hybrid stepping motor that does not use expensive rare earth magnets but works just as well as those that do.

We improved the performance of our HDD spindle motors featuring Minebea's proprietary design, which are optimally engineered for data center applications where high reliability is a must. We also developed ultra-slim motors for mobile devices in anticipation of the market shift for 2.5-inch hard drives from a height of 9.5 mm to 7 mm or even 5 mm.

In the area of optical products, we are developing ultra-thin LED backlight units for mobile devices to support increasingly larger and thinner smartphones. In addition to the ultra-precision machining technologies and precision mold technologies that define the Minebea group, we are also improving our technology for injection molding transparent resin which allows fine optical patterns to be swiftly and precisely transferred to LED backlight guide plates. Using this technology, we have developed ultra-thin guide plates for the world's thinnest (less than 0.3 mm) 5-inch class smartphones. On the manufacturing side, we introduced an ultra-thin light guide plate molding machine, automated backlight assembly machine, appearance tester, etc., which gave us a competitive advantage in mass production. We are also using the optical technologies that we developed in backlights 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 energy 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. In February 2014, we signed a memorandum of understanding with Iwasaki Electric Co., Ltd., a leading player in the outdoor lighting market, and Koizumi Lighting Technology Corp., a leading manufacturer of indoor lighting fixtures, to establish a joint venture. The joint venture will focus on developing highly efficient wirelessly controlled lighting devices for smart buildings and smart cities by incorporating the wireless technology of Paradox Engineering SA, in which we acquired a stake in January 2014.

R&D expenses in this segment totaled ¥4,823 million.

Other

Our other segment mainly includes dies and parts produced in-house.

R&D expenses in this segment totaled ¥347 million.