

Research and Development

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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. 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 elemental technologies that go into making its machined components, electronic devices and components. In March 2010, Minebea released "COOL LEAF," a next generation input device combining various technologies cultivated in the process of design and development of keyboards (input devices), lighting devices (backlight modules employing light guide plates) and measuring components (force sensors).

Minebea has development bases in Japan (Karuizawa Plant and Hamamatsu Plant), Thailand, China, the United States, and Europe. These bases leverage their individual expertises and the synergy between them to quickly move products through the R&D pipeline and bring new business opportunities to light. 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.

R&D expenses for the Minebea Group amounted to ¥7,895 million. This included ¥1,639 million allocated to general basic research at material science laboratories in Thailand and China, which could not be apportioned to any individual segment.

R&D activities for each segment include:

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, electromechanical 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, automobiles and aerospace industries. Reliability engineering aimed at minimizing particle generation, extending product life, enhancing electroconductivity, etc. as well as applied engineering is at the heart of our work in this area.

Work is also moving ahead to develop ever-smaller miniature ball bearings. We succeeded in developing the world's smallest miniature ball bearings, boasting an outer ring diameter of 1.5 mm and an inner ring diameter of just 0.5 mm.

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.

R&D expenses for the machined components segment totaled ¥1,265 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 basic technologies such as various core analysis technologies, control technologies and materials technologies, as well as to enhance our product development. 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.

We developed a stepping motor unit whose external diameter of just 3.2 mm makes it the smallest stepping motor in the world. This unit is currently undergoing assessment for a variety 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.

The majority of HDDs now use perpendicular magnetic recording to achieve higher recording densities. This means we have to be more careful than ever in ensuring that every component is perfectly clean. That is why we have put so much effort into developing clean manufacturing technologies that ensure a high level of cleanliness in our mainstay HDD-related products, including our bearing units, spindle motors and base plates.

Another success involves R&D combining our motor, fan, electronics and other technologies that has produced the innovative heat management system module (HMSM).

R&D expenses in the rotary components segment totaled ¥3,178 million.

Electronic Devices and Components

Progress in the area of display-related products includes the development of a new high-brightness, high-efficiency LED backlight for LCDs targeting the cellular phone, smartphone, tablet PC, handheld game console, and digital still camera markets. After developing a plastic molding technology capable of accommodating larger, thinner optical devices and increasingly fine optical patterns we have one more development to add to our list of outstanding technological achievements that includes ultra precision machining, mold production and molding technologies. This development gives us the technological foundation needed to expand into the area of LED backlights for notebook and desktop PC monitors, for which LCDs have become the preferred type of display.

Advances in electronics-related products includes state-of-the-art LED backlight driver circuits for large-sized LCD TVs and driver circuits for LED lighting applications. Our shift from analog to digital control circuits will significantly reduce the number of parts used as well as improve control precision, enabling us to reduce engineering lead time.

R&D expenses in the electronic devices and components segment totaled ¥1,259 million.

Other

Our main products in the other businesses are PC keyboards, speakers and defense related products.

R&D expenses in this segment totaled ¥554 million.