

### Research and Development

Minebea manufactures and sells a wide range of products around the world. These include ball bearings and other precision components that apply its expertise in ball bearings; aircraft components, notably rod-end bearings and high-end fasteners; and electronic components used in state-of-the-art electronics equipment. Minebea and the companies of the Minebea Group also cooperate closely to conduct R&D in each of these fields. Furthermore, the Minebea Group is dedicated to the development of hybrid component products that integrate the element technologies from Machined Components and Electronic Devices and Components. In March 2010, Minebea released “COOL LEAF,” a next generation input device produced through combining technologies cultivated in the process of design and development of keyboards (input devices), lighting devices (backlight module including light guide plate) 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 strive to leverage their particular expertise and promote complementary R&D with the aim of accelerating the development of products that will lead to the creation of new businesses. Our facilities in Karuizawa, Thailand and China have acquired accreditation for the ISO17025 standard and are stepping up efforts within the Minebea Group with regard to 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 current fiscal year, R&D costs for the Minebea Group amounted to ¥8,410 million. This included ¥271 million allocated to basic research at material science laboratories in Thailand and China, such as basic materials analysis, and other research that cannot be apportioned to individual business segments.

R&D activities in our two segments in the current fiscal year are outlined below.

#### Machined Components

R&D in this segment focused on mainstay bearings, that is, on developing basic tribological technologies for materials and lubricants, among others, and on oil fill, electromechanical machining (ECM), diamond-like carbon (DLC) and other processes. Efforts are also emphasized on responding to the requirements of manufacturers in new areas in the IT, home electrical appliances, automobiles and aerospace industries through reliability engineering—aimed at, for example, minimizing particle generation, extending product life and enhancing electroconductivity—and applied engineering.

We are also working 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.

In the area of bearings for the aerospace industry, we have completed development of and received approval for tie-rod mechanical assemblies, trunnion bearings for main landing gear and a wide range of bearings for flight control systems for new models released by U.S. and European aircraft manufacturers, by applying technology used in our rod-end bearings.

The majority of HDDs now use perpendicular magnetic recording to achieve higher recording densities, and thus ensuring the cleanliness of components has become a crucial consideration. To offer a high level of cleanliness in our mainstay HDD-related products, which include bearing unit, spindle motors and base plates, we have actively developed clean manufacturing technologies.

The R&D cost in the Machined Components segment in the current fiscal year amounted to ¥2,287 million.

#### Electronic Devices and Components

Mainstay motors in this segment include fan motors, stepping motors, brush DC motors, brushless DC motors and HDD spindle motors. We are working to enhance our various core analysis technologies, control technologies and materials technologies, with the aim of being the first to launch advanced products that respond to customer requirements for compact size, high efficiency (low energy consumption), quietness and reliability, which vary depending on type of motor and application. In the area of stepping motors, we succeed in developing a unit with an external diameter of just 3.2mm—smaller than any other stepping motor in the world. This unit is currently undergoing assessment for a variety of applications. For magnetic application products, our R&D efforts emphasize materials technology, core technologies and product-related technologies. These efforts continue to yield such outstanding products as rare earth bond magnets and heat-resistant magnets for use in high-performance motors. We have successfully developed heat management system modules (HMSMs) by conducting R&D combining our motor, fan, electronics and other technologies.

In the area of display-related products, we developed a new high-brightness, high-efficiency LED backlight for LCDs, which we will market to manufacturers of cellular telephones and digital cameras. In addition to our noted ultra precision machining, mold production and molding technologies, we succeeded in developing plastics molding technologies capable of accommodating larger, thinner optical devices and increasingly fine optical patterns. This has positioned us to expand our focus to include LED backlights for notebook and desktop PC monitors, for which LCDs have become the preferred type of display.

In electronics-related products, we are developing backlight driving circuits for large-sized LCD TVs. Moreover, by shifting from analog to digital control circuits, we have succeeded in significantly reducing the number of parts used, as well as in improving control precision, thereby enabling us to reduce engineering lead times.

In the current fiscal year, R&D costs in the Electronic Devices and Components segment totaled ¥5,852 million.