

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.

Minebea has established six R&D bases, two in Japan (Karuizawa and Hamamatsu plants) and one each in Thailand, Singapore, 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.

In fiscal 2007, R&D costs for the Minebea Group amounted to ¥9,000 million. This included ¥309 million allocated to basic research at R&D centers in Thailand, Singapore and China, such as basic materials analysis, and other research that cannot be apportioned to individual business.

R&D activities in each of our business segments in fiscal 2007 are outlined below.

### **Machined Components**

R&D in this segment focused on mainstay bearings, that is, on developing materials, lubricants, machining and other processes, and tribology for ball bearings, sliding bearings and fluid dynamic bearings. Efforts also focus on responding to rising demand for all types of bearings, buoyed by robust operating conditions, from the information equipment, home electrical appliance, automobile and aerospace industries, and on responding to the requirements of manufacturers in new areas, through optimized and applied engineering. With manufacturers of HDDs beginning to adopt perpendicular magnetic recording to achieve higher recording densities, the precision of key components is becoming an increasingly crucial consideration. The ball bearings used in Minebea's pivot assemblies were developed to realize extremely low dust scattering and gas contamination. We have helped manufacturers of printers and copiers respond to demand for higher-quality output, which has risen in recent years, by developing and manufacturing a highly conductive proprietary bearing grease that resolves the problem of electric charge transfer inside printers and copiers—the key to output quality. In the area of lubricant development, we have also succeeded in developing a low-viscosity lubricant for fluid dynamic bearings used in HDD spindle motors, thereby reinforcing the technological foundation that will facilitate the development of increasingly compact HDD spindle motors. In the area of bearings for the aerospace industry, we have completed development of trunnion bearings and spherical bearings for use in tierod mechanical assemblies and main landing gear by applying the sliding bearing technology used in our rod-end bearings.

R&D costs in the machined components segment in fiscal 2007 amounted to ¥2,082 million.

### **Electronic Devices and Components**

Mainstay motors in this segment include fan motors, stepping motors, 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. For magnetic application products, our R&D efforts emphasize materials technologies, core technologies and product-related technologies. These efforts continue to yield such outstanding products as rare earth bond magnets for high-performance motors and transformers for inverters. In the area of display-related products, we focused on advanced condensed matter physics and materials and core technologies, and the development of high-performance LCD backlight assemblies for LEDs, medium-sized LCD backlight assemblies for car navigation systems and optical components for projectors. We are also combining our noted ultraprecision machining, mold production and molding technologies with CAD/CAE engineering, optical engineering, thin film-formation and photolithographic technologies to develop compact and medium-sized LCD backlight assemblies for next-generation mobile devices, optical components for projectors, and LED modules and other components for flat-panel displays.

In electronics-related products, we are targeting the display market by promoting the development of advanced circuits for, among others, inverters used in high-efficiency, large-screen televisions and high-pressure mercury lamps used in projectors. We are also engaged in the development of drive circuits that will optimize the efficiency and power-smart performance of our high-efficiency motors, underscoring our desire to contribute to the prevention of global warming from the product development stage. On another front, we are conducting research in the area of wireless transmission technology, an area that we believe will grow in importance as demand grows for wirelessly connected OA equipment and home electrical appliances.

In fiscal 2007, R&D costs in the electronic devices and components segment totaled ¥6,609 million.