

Leveraging its advanced technology capabilities in specialty steel, the Daido Steel Group has declared its management philosophy of “pursuing the potential of materials to support our future,” and conducts a proactive program of research and development (R&D) to expand new products and businesses and strengthen the foundations for existing businesses.

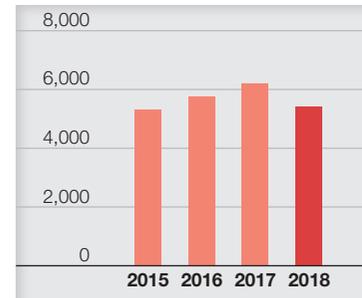
We are pursuing R&D for new products, materials and technologies, primarily through the Daido Corporate Research & Development Center. We employ a total of 286 researchers throughout the Daido Steel Group.

R&D expenses for the Daido Steel Group during the fiscal year under review amounted to ¥5,419 million. An explanation of our R&D efforts by segment, including purpose, major achievements, and expenditures follows.

R&D EXPENDITURES

Years ended March 31

(millions of yen)



(1) Specialty Steel

In this segment, R&D includes basic material development, such as automotive structural materials and tool steel, and process innovations ranging from steelmaking, refining and solidification to quality assurance.

R&D costs for the fiscal year under review in this segment totaled ¥1,300 million. The following is one of our major achievements in this area.

- **1600 MPa class ultra-high-strength quenched and tempered bolts**

Daido Steel has developed 1600 MPa class quenched and tempered steel for bolts tightened in plastic regions, a first for the automotive field. Japanese automakers have adopted the material for use in engine parts, and we have begun mass producing it. We tackled the issue of increased susceptibility to delayed fractures caused by hydrogen when making steel stronger by adding an appropriate amount of alloying additives and establishing the proper processing conditions to spherically disperse carbides, which have a detrimental effect. In addition, we have secured stable, mass production quality capable of preventing quench cracking, which is a problem during manufacturing.

- **RPD815 steel for plastic molds**

Daido Steel has developed material for molds suitable for forming plastic optical products. By getting the composition just right, the material reduces rust formation on the mold while maintaining machinability. Having gained recognition for enabling detailed shape machining while reducing defects from optical products becoming contaminated by rust that forms on molds, the material has been selected for use in molds for LED light guide plates, which are increasingly being used in automotive lamps.

- **Phased array ultrasonic testing technology for high-attenuation steel billets**

Daido Steel uses ultrasonic testing to assure the internal quality of specialty steel products. To meet customer requests for strict quality control, Daido Steel has developed even more precise testing technologies for use in the manufacturing process. For steel billets, for which it had been difficult to conduct ultrasonic testing due to impact from the coarse crystalline structures, we have enhanced our quality assurance capabilities by introducing high-precision flaw inspection equipment.

(2) High Performance Materials and Magnetic Materials

In this segment, the Daido Steel Group conducts R&D focusing on developing materials that resist corrosion and heat, high-grade strip steel, welding materials, magnetic materials and electronic devices.

R&D costs for the fiscal year under review in this segment totaled ¥2,653 million. The following are some of our major achievements in this area.

- **World-leading soft magnetic materials with high magnetic permeability: MENPC2-S and MENPB-S**

Daido Steel has developed world-class soft magnetic materials with high magnetic permeability, which can be used in increasingly sensitive sensors for which demand is growing as the electrification of automobiles and automated driving advance. We will take this opportunity to expand our lineup of soft magnetic materials with high magnetic permeability and sell them for use in various automotive sensors.

- **Heavy rare earth-free magnets for HEVs win Minister's Prize in the Monodzukuri Nippon Grand Awards**

The neodymium magnets that Daido Electronics Co., Ltd., a member of the Daido Steel Group, manufactures using its proprietary hot deformation method earned it the Ministry of Economy, Trade and Industry (METI) Minister's Prize in the Seventh Monodzukuri Nippon Grand Awards together with a Japanese automaker. The number of vehicle models using the magnets has been gradually expanding since the magnets were brought into use in September 2016, and we aim to further enhance performance to bring the magnets into even wider use.

(3) Parts for Automobile and Industrial Equipment

R&D in this segment concentrates on development of turbochargers, engine valves and other automotive parts, as well as parts for various types of industrial machinery.

R&D costs for the fiscal year under review in this segment totaled ¥1,334 million. The following is one of our major achievements in this area.

- **Heat-resistant titanium alloy DAT54 achieves AMS certification**

The heat-resistant titanium alloy DAT54 developed by Daido Steel passed inspections by the U.S. Aerospace Material Specifications (AMS) organization, and was issued the specification AMS6952 to cover the UNS R56643 titanium alloy sheet on March 3, 2018. DAT54's outstanding heat resistance enables its use in rotors, an especially important aircraft engine part. It is the first heat-resistant titanium alloy developed in Japan to earn the AMS certification. Moving ahead, we will work to expand its use in the aircraft field.

(4) Engineering

Engineering R&D focuses on the development of environmental conservation and recycling equipment, and a variety of energy-saving industrial furnaces.

R&D costs for the fiscal year under review in this segment totaled ¥130 million.