Aiming to Be a "Genuinely Development-Driven Company"

In April 2017, the Hitachi Metals Group opened the Global Research & Innovative Technology center (GRIT), reflecting its principle to "promote research, development, and innovation for the future, to become a genuinely development-driven company." In April 2018, we opened a new facility within GRIT consisting of a research building and an experimental building. Through collaboration between GRIT and the research facilities of our business divisions, we promote cross-departmental projects and open innovation in our quest to create new levels of value.

Main R&D achievements in fiscal 2018

In fiscal 2018, the Group made investments in R&D totaling ¥18.6 billion and achieved the following results.

Specialty Steel Products — Contributing to xEV popularization with motor components and lithium-ion battery components and materials

To improve the efficiency of motors, we have developed a motor core consisting of amorphous metals. We will forge ahead with R&D aimed at applying this technology to xEV drive motors (see page on right for details).

In addition, we developed a lithium-ion battery clad terminal, processed from aluminum and copper clad materials*1, with the aim of improving the connection reliability of automotive lithium-ion batteries used in harsh conditions, such as high- and low-temperature environments. We expect this to help reduce battery weight and assembly time.

In addition, we started mass production of soft ferrite core materials with excellent high-frequency characteristics, to foster advances in miniaturization and energy efficiency of network devices, automobiles, and smartphone components.

Magnetic Materials and Applications — Contributing to downsizing and cost reduction of power module cooling mechanisms

Power modules are used in such fields as industrial equipment, automobiles, rolling stock, and new energy. To reduce the size and cost of power module cooling mechanisms, we developed a silicon nitride substrate with high thermal conductivity (130W/m-K) and mechanical properties. It can also handle high-temperature environments, in which silicon carbide (SiC) semiconductors are generally used.

Functional Components and Equipment — Contributing to reductions in seawater desalination costs

We have developed a ceramic adsorption filter that minimizes fouling of RO*2 membranes used in seawater desalination. This is expected to reduce the cost of producing freshwater. Going forward, we will accelerate efforts toward commercialization and expand the business in Singapore, a major center of the water treatment industry.

Wires, Cables, and Related Products — Addressing need for higher-performance rolling stock

Utilizing our unique fire safety design technology for rolling stock wires and cables, we developed a LAN cable for rolling stock that complies with the European railway fire safety standard. By adding this product to our lineup, we will meet demand for high-performance rolling stock in Europe and Asia.

*1 Clad material: A material in which two or more different metals are bonded together, giving it composite properties that cannot be obtained with a single material.
*2 RO: An abbreviation for Reverse Osmosis. Two bodies of water of different salinity are placed adjacent to each other via a membrane that allows only water molecules to permeate; if the high salinity side is pressurized, the water molecules move to the low salinity side.

Groupwide technological development to enhance motor efficiency

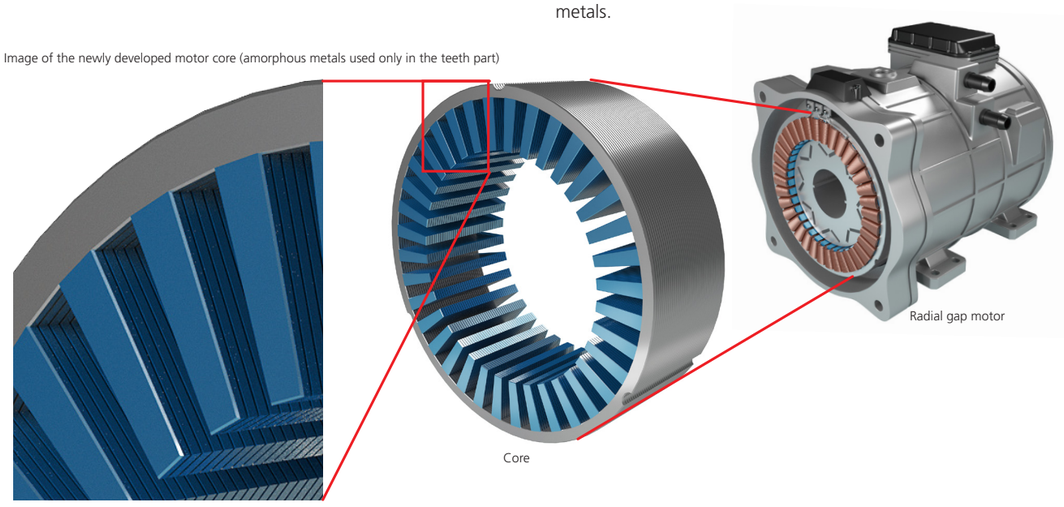
By establishing GRIT, we have put in place a system for pursuing medium- and long-term research themes across the Group. Our aim is to create new businesses and products by organically combining technologies and information to drive innovation. Here, we introduce our development of a motor core structure using amorphous metals.

Developers gather at GRIT to create a new structure

Using our Metglas® amorphous metals, we have developed technology to improve the efficiency of motors. This is in response to calls from various sectors—including those related to automobiles, industrial infrastructure, and electronics—for motors that are smaller, lighter, and more efficient. It is the result of R&D on using amorphous metals for motor cores, because core loss from amorphous metal cores is 10% or less than for cores using magnetic steel sheets.

Due to the thinness of amorphous metal, a higher number of sheets to be processed is required. Moreover, the post-pressing assembly process is difficult and reduces the life of the press mold. Therefore, amorphous metals are more difficult than magnetic steel sheets to process, and transforming it into complex shapes comes with many challenges. Through open innovation by internal and external development teams centered on GRIT, we solved the problem by creating a structure in which amorphous metals are used only for the teeth part, rather than making the entire core from amorphous metals.

Image of the newly developed motor core (amorphous metals used only in the teeth part)



Teeth part
Core
Radial gap motor

Prototype motor combining multiple Group technologies

We have made a prototype motor that incorporates multiple materials possessed by the Hitachi Metals Group. These include Metglas® amorphous metals (used in the motor core), HIDENSE™ ultrahigh-density bonded magnets, and enamel wires. Reflecting its high energy efficiency, this prototype motor achieved an IE5*3 rating, the highest in the world for motor energy efficiency.

The aim of making the prototype was to demonstrate the superiority of amorphous metal as a motor material. Looking ahead, we will proceed with R&D to find applications in xEV drive motors and the like, while proposing new application methods for motor materials backed by demonstration data.

*3 The highest level in the guideline for motor energy efficiency under IEC60034-30-2, currently being discussed and formulated by the International Electrotechnical Commission (IEC).

Prototype motor