Innovation

Building World-Class *Monozukuri* Skills

Drastic reforms for the future

Seeking to expand organic growth, we are engaging in GEMBA (workplace) and manufacturing technology innovations based on cross-organizational and medium- to long-term perspectives. The aim is to solidify our foundation as a manufacturer and reinforce our potential for sustained growth. Our goal is to build *monozukuri* skills that are among the best in the world by actively introducing advanced technologies in segments such as process technologies, CAE*, and IoT.

* CAE (computer-aided engineering): Using computer-based simulations to verify whether or not a designed structure would meet performance requirements, even before it is built.

Deploying IoT technologies at business locations

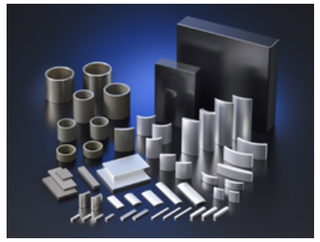
As the name ("Internet of things") implies, IoT enables huge volumes of information to be collected from Internet-connected devices and converted to "big data," then analyzed to create new knowledge and value. Even in the manufacturing sector, more and more companies are introducing IoT technologies to improve production efficiency. While Hitachi Metals is mainly involved in materials-based *monozukuri*, the adoption of technologies allowing real-time information visualization and traceability can lead to more stable manufacturing and improved product quality. Accordingly, we are actively adopting IoT technologies at each of our business locations.

Using sensors to visualize information enables data on the status of a device and processing conditions to be accumulated when a malfunction occurs, allowing the source of the problem to be identified and measures to be taken. For this reason, we are installing sensors in our equipment and introducing smart devices, while swiftly establishing an environment for acquiring and analyzing big data. Moreover, by deploying big data to develop our advanced *monozukuri* technologies globally, we will create systems allowing each location of business to mobilize IoT technologies at a high level, in our quest to become the world's leading high-performance materials company.

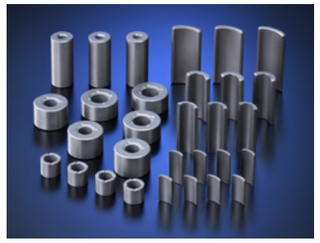
Initiatives

Location	Objectives	Methods
Kyushu Works	Improve product quality, pass rate, and traceability	Big data analysis
Ibaraki Works	Improve production efficiency	Big data analysis
Kumagaya Works	Improve product quality and pass rate	Sensing technologies; big data analysis
Yasugi Works	Eliminate waste; visualize work-in-process, lead time, product quality, and operational status	Use of smart devices (handsets, etc.); big data analysis

Innovative production line for neodymium magnets and ferrite magnets introduced



Neodymium magnets "NEOMAX®"



Ferrite magnets "NMF™"

To address the flourishing demand for drive motors for plug-in hybrid and electric vehicle motors, as well as other electric motors, we are building an innovative production line for neodymium magnets and ferrite magnets at the Kumagaya Works, with operation scheduled to begin in fiscal 2018.

The new production line is planned for installation in a new facility to be constructed within the Kumagaya Works. In addition to IoT technologies, it will feature new production technologies designed to optimize the magnet production process, enabling product quality and productivity to be maximized simultaneously. We will also use IoT technologies to share data on manufacturing quality globally.

At the same time, we will relocate the Magnetic Materials Research Laboratory to the Kumagaya district, bringing it together with the information system component business of the Magnetic Materials Company at the Kumagaya district.

Through these measures, we have positioned the Kumagaya Works as a "mother plant" where control of the neodymium magnet and ferrite magnet businesses is centralized. By bringing together the research laboratory and the plant, we will accelerate technological development and production to reflect customer needs.

Image of completed new magnetic materials facility at the Kumagaya Works

Develop innovative, environment-friendly, hot-processing techniques

At the Yasugi Works, we introduced new equipment after conducting a major review of hot-processing techniques used in forging mill production. Hot processing refers to the rolling of iron ingots taken from a heating furnace. Since it is an important process for delivering materials to the entire Yasugi Works, we revamped our large-scale facilities while operating existing equipment.

In addition to improving productivity, we paid attention to material flows and energy costs from this revamp, reducing CO_2 emissions and significantly improving yield. Specifically, the use of a new type of gas fuel in the heating furnace allowed materials to be heated uniformly, resulting in lower energy costs and CO_2 emissions. In the rectangular steel material manufacturing process, we improved product quality and shortened the processing time by optimizing the anvil shape and reviewing the manufacturing process. Furthermore, we made it possible to manufacture circular billets using a forging mill, leading to an improved working environment and more effective collection and recycling of waste material. In addition, we deployed IoT technologies to visualize shape measurement of hot steel and other factors, and used the resulting data to perform online automatic control and raise the level of quality control.

Three positive outcomes

1 Renewal of heating furnaces

Our heating furnaces used heavy oil, which emits large amounts of CO_2, and the furnaces themselves were aging, having been in operation for 30 years. For these reasons, we introduced a new type of furnace and changed the fuel to gas.

Achieved lower energy costs, significant reduction of CO_2 emissions, and uniform heating of materials.

2 Enhanced efficiency of rectangular steel processing

In the rectangular steel manufacturing process, we optimized the anvil shape and otherwise reviewed our manufacturing procedures. We also made our production line compatible with SLD-i™, a new steel type that is expected to be mass-produced in the future.

Achieved improved quality and shorter processing time, in addition to more uniform distortion.

3 Circular billet production

Conventional rectangular billets are ground with a grindstone, which is bad for the workplace environment and wasteful. For these reasons, we used a forging mill, which allows surface cutting, to make circular billets.

Improved working environment and more effective collection and recycling of waste material.