# Achieving a Resource Efficient Society

## Efforts to Achieve a Resource Efficient Society

Policy

According to the *OECD Environmental Outlook to 2050* released by the Organization for Economic Cooperation and Development (OECD), global water demand in 2050 is expected to increase by about 55% compared to 2010, and consumption among manufacturers, in particular, is projected to jump by 400%. In the light of these trends, expanding supplies of water for agricultural use will prove very difficult. As access to freshwater sources becomes increasingly limited, farming and urban areas will face serious threats should groundwater dry up.

The 2017 edition of the UN *World Population Prospects* predicts that the world's population will increase from 7.6 billion in 2017 to 9.8 billion in 2050, resulting in a twofold rise in the consumption of material resources worldwide. The higher volumes of resources that are collected, extracted, used, and eventually emitted as waste are expected to have a severe impact on the economy, society, and the environment.

Hitachi's business operations will respond to these issues by working with our customers and society to help build a society that uses water and other resources efficiently. We have set a fiscal 2050 target of improving the usage efficiency of water and other resources by 50% compared to fiscal 2010 levels. We will create higher economic value using less water and other resources and pursue production activities with a low environmental burden.

**Initiatives to Achieve a Resource Efficient Society**


## Enhancing Efficiency of Water Usage

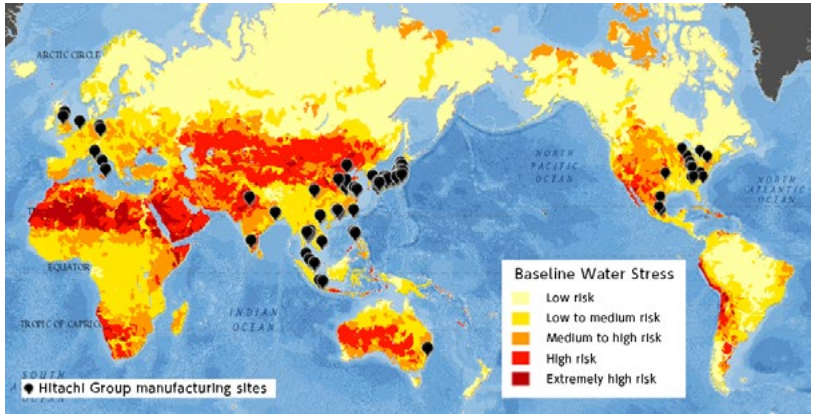
Objectives, Activities, and Achievements

### Initiatives to Build a Water Efficient Society

As a resource, water is unevenly distributed across the world, and wide gaps between supply and demand are sometimes found even in the same region or country. In addressing water problems, therefore, region-specific risk measures must be developed that take the respective water stress*1 levels into account.

We examined water risks at each of our major manufacturing sites around the world, of which there are approximately 200, by using our Environmental Data Collection System (Eco-DS) and such globally recognized tools for water risk assessment as the Aqueduct, developed by the World Resources Institute (WRI); the Water Risk Filter, developed by the World Wildlife Fund for

**Water Stress Levels at Hitachi Manufacturing Sites**




Created based on Aqueduct data.

WRI/Aqueduct

Nature (WWF) and the German development finance institution DEG; and the Flood Hazard Map of the World produced by the European Commission. We analyzed and evaluated water risks for each business unit and Group company, per country and region, and for the entire Group using approximately 50 risk assessment items, including physical risks like water stress, water pollution, and floods; regulatory risks leading to higher water and discharge costs or new taxes; and reputation risks that can negatively affect communication with stakeholders.

The results of the analysis and evaluation will be used to promote Group-wide activities to improve water use efficiency and to strengthen measures specific to the water risks of each manufacturing site.

Hitachi is also addressing water shortages at the society level through its global business operations by creating new sources of water supply. We provide customers in and outside Japan with a wide range of water-related products and services, such as wastewater recycling systems and seawater desalination systems. We also provide machinery, electrical equipment, and services for water infrastructure. To date, we have installed approximately 700 water purification plants and 900 sewage treatment plants in Japan, as well as over 200 plants in some 40 countries and regions around the world. In addition, we offer comprehensive digital solutions for water and sewage treatment operators by drawing on our experience and know-how of Operational Technology (OT), IT, and products that have been cultivated over the course of many years as a comprehensive water service provider.

In fiscal 2019, we will conduct a study on applying big data to forecast water demand in collaboration with the city of Osaka. And we plan to start providing water suppliers with a system capable of instantly and accurately detecting leaks in water pipes in fiscal 2020.

Going forward, we will continue to help build a society that uses water efficiently by supporting the effective maintenance and management of social infrastructure, the optimum utilization of finite resources, and the provision of water environment solutions to enhance people's quality of life.

*1 Water stress occurs when demand for water outpaces availability. The maximum volume of available water supply per capita is used as an index to measure levels of scarcity. The minimum volume of water required for living, agriculture, industry, energy, and the environment is considered to be 1,700 cubic meters per person per year, and regions below this level are said to experience water stress. According to the WRI Aqueduct risk analysis, when the ratio of total annual water withdrawn to average annual water supply within an area is 80% or more, it is defined as extremely high risk.

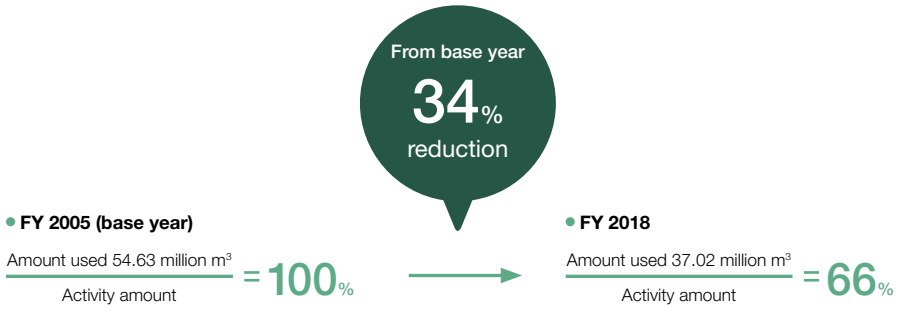
Collecting and Monitoring Environmental Performance Data to Improve Environmental Practices

## Actions and Achievements

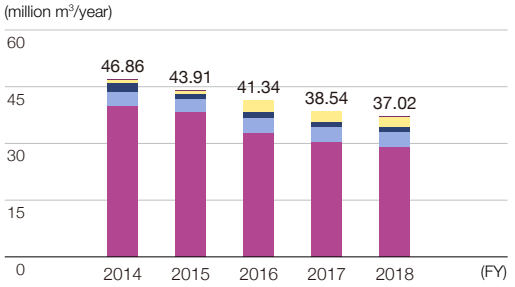
In fiscal 2018, we set a target of a 27% reduction (over the base year of fiscal 2005) for water usage per unit at our 208 global manufacturing sites and achieved a 34% reduction. The volume of water used declined by 17.61 million cubic meters, or 32%.

### Key Indicators

- Reduction in Water Usage per Unit (Hitachi Group)




- Water Usage (Hitachi Group)




Breakdown by Region (million m³/year)

| | 2014 | 2015 | 2016 | 2017 | 2018 (FY) |
|---|---|---|---|---|---|
| Europe | 0.02 | 0.01 | 0.02 | 0.04 | 0.04 |
| Americas | 0.98 | 0.89 | 3.09*1 | 2.78*1 | 2.71*1 |
| China | 2.32 | 1.22 | 1.51 | 1.51 | 1.34 |
| Rest of Asia | 3.85 | 3.56 | 4.00 | 4.04 | 3.93 |
| Japan | 39.69 | 38.23 | 32.72 | 30.17 | 29.00 |
| Total | 46.86 | 43.91 | 41.34 | 38.54 | 37.02 |

*1 Includes water used by a materials company that became a consolidated member of the Hitachi Group in fiscal 2016 (2.12 million m³/year in fiscal 2016, 1.91 million m³/year in fiscal 2017, and 1.92 million m³/year in fiscal 2018).

# Improving Water Use Efficiency

### Reducing Water Use with a Closed-Loop Water Cooling System (Waupaca Foundry, Inc.)

Plant 1 of Waupaca Foundry (WFI) in the United States produces more than 3,000 types of castings, mainly automotive parts. At casting plants, water is required in large quantities to cool running machinery and cupola furnaces used in the melting process. After introducing a closed-loop water cooling system, the amount of water intake in 2018 was reduced by approximately 454,000 cubic meters compared to 2015.

Prior to the initiative, cooling water flowed through industrial equipment only once before being discharged. The new closed-loop system reuses non-contact cooling water, leading to significant improvements in water use efficiency. The system is capable of reducing water intake by more than 80% and may, under certain conditions, virtually eliminate any water discharges.

WFI is aiming to reduce water intake by 72% compared to 2010 levels on a company-wide basis by fiscal 2021. It achieved a 52% reduction in 2018.

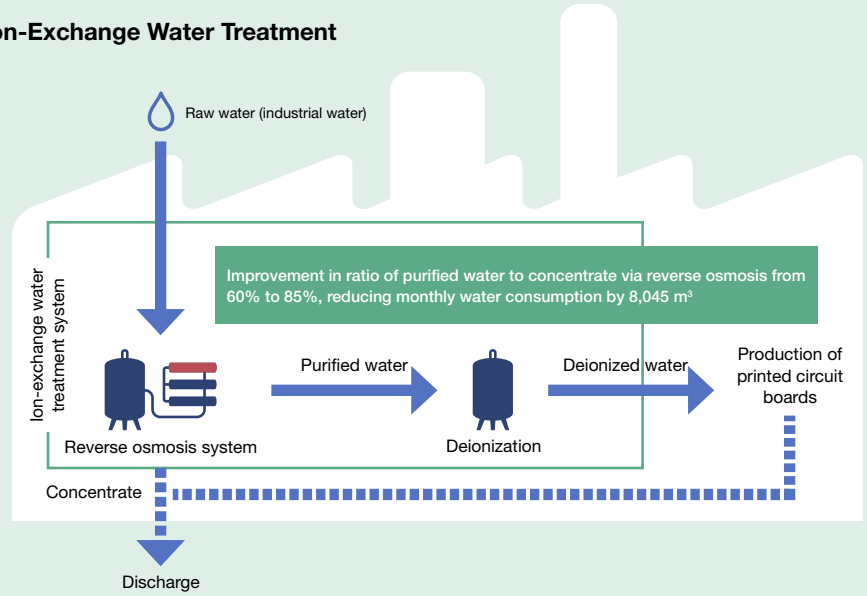
WFI's closed-loop water cooling system.

### Reducing Water Use by Optimizing Ion-Exchange Water Treatment (Hitachi Chemical [Singapore] Pte. Ltd.)

Hitachi Chemical (Singapore) manufactures printed circuit boards for electronic devices and uses large volumes of deionized water to rinse the boards during the production process. Such water is generated by first purifying industrial water through a process of reverse osmosis, separating purified water from concentrate, and then removing unwanted ions from the purified water through ion exchange. The concentrate is not utilized in the manufacture of printed circuit boards but can be used for other cleaning purposes and then discharged.

By optimizing the filters, sealants, and additional tanks used in reverse osmosis, water consumption has been reduced, with the ratio of purified water to concentrate rising from 60% to 85%, leading to greater efficiencies in the generation of deionized water. In fiscal 2018, the company was able to reduce water consumption by 8,045 cubic meters per month.

**Ion-Exchange Water Treatment**



# Improving Efficiency in the Use of Resources

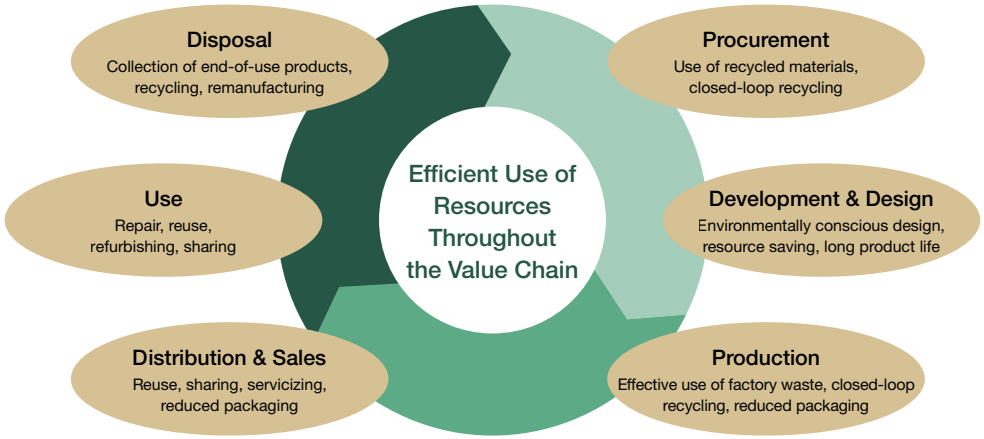
Objectives, Activities, and Achievements

## Initiatives to Build a Society that Uses Resource Efficiently

To help build a recycling-oriented society, Hitachi is advancing measures at its business sites to improve resource use efficiency by 50% compared to fiscal 2010 by fiscal 2050. We are contributing to the solution of resource-related problems by promoting the utilization of recycled materials, manufacturing that is oriented to resource saving and long product life, reduction and recycling of factory waste, refurbishing*1 and remanufacturing,*2 and recycling of end-of-life products. These are advanced at each stage of the value chain, namely, procurement, development and design, production, distribution and sales, use, and disposal. Our Environmental Action Plan contains detailed three-year activity targets for improvements in the waste and valuables generation per unit and the achievement of zero waste to landfill. We have established indicators to measure our progress and are promoting activities throughout the Group to achieve these goals. In recent years, we have also been addressing the global problem of plastic waste, such as by finding efficient uses for the plastic waste generated in our business activities and by replacing one-way (disposable) plastic containers and packaging with paper. We will further strengthen our efforts to reduce our plastic waste.

*1 Refurbishing: Servicing end-of-use products to a condition conforming to new-product standards.
*2 Remanufacturing: Restoring end-of-use products through disassembly, washing, component replacement, and other work to a condition equivalent to new products.

**Efficient Use of Resources Throughout the Value Chain**




## Promoting Product Collection and Recycling and the Efficient Use of Resources

In response to the 2001 Home Appliance Recycling Law, Hitachi is taking part in a cooperative effort among five companies*1 in the same industry to recycle air conditioners, television sets, refrigerators, and washing machines at 19 recycling plants nationwide. In fiscal 2018, we recycled around 72 kt of the roughly 81 kt of end-of-life home appliances we collected.

Hitachi has built its own recycling network providing services near our customers to collect and recycle such end-of-life products as supercomputers, mainframes, and other computing machines; communication equipment like network devices and telephone switchboards; and information equipment like ATMs. In fiscal 2018, efforts by Hitachi Industrial Equipment Nakajo Engineering and Tokyo Eco Recycle Co., Ltd. to recycle the base and rare earth metals of information

and communication equipment in Japan received the METI Minister's Prize at the 3Rs (Reduce, Reuse, and Recycle) Promotion Merit Awards, sponsored by the 3Rs Promotion Council.

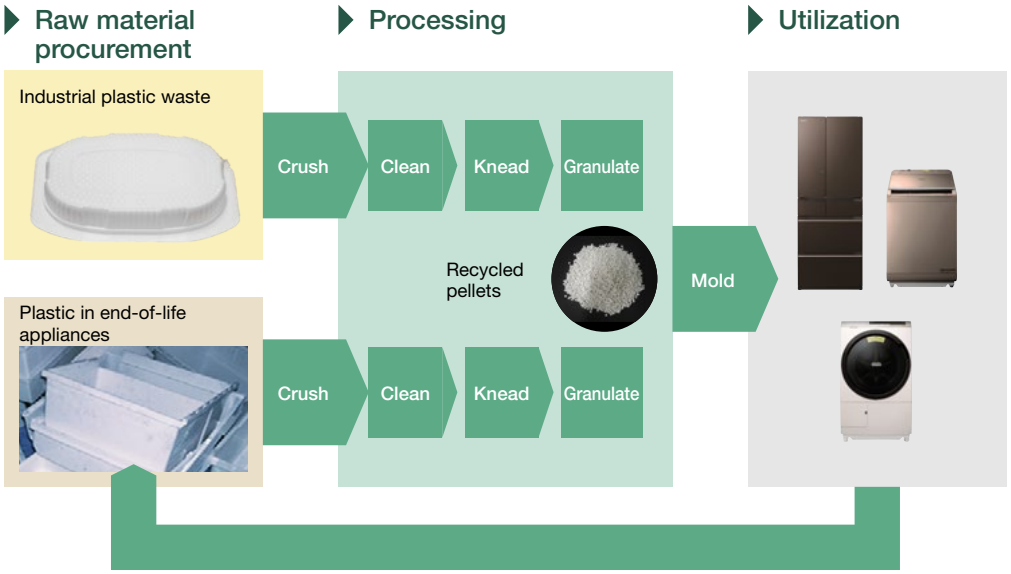
We are also promoting the refurbishing and remanufacturing of collected used products. In the United States, when a customer replaces a large-capacity storage unit with a new model, parts of the end-of-use device are cleaned, inspected, and refurbished as warranty-backed Hitachi components, used in servicing older units. After collecting malfunctioning electric components from automobile dealers and repair shops, we disassemble, check, clean and restore, reassemble, and inspect those components, remanufacturing and marketing them as equipment featuring the same performance as new products. Used construction machinery like large hydraulic excavators and dump trucks are similarly remanufactured so they function like new and offered as high-function, reasonably priced products. We also collect end-of-use medical and industrial equipment (such as pumps, motors, distribution boards, transformers, refrigeration equipment, and air conditioners) and promote activities to reuse them as resources.

In an effort to use resources more efficiently, we also promote the use of recycled materials. In fiscal 2018, recycled materials accounted for 2,415 kt (55%) of our total raw materials input of 4,403 kt. The share of recycled plastic used for the plastic parts of Hitachi appliances was 7%.

In addition to purchasing materials from manufacturers of recycled plastic, Hitachi Global Life Solutions assigns a group company to process the plastic materials of end-of-life home appliances and plastic containers, reusing them as parts for washing machines and refrigerators and as packaging materials for ceiling lights. As a result of these efforts, it manufactured or used 926 tons of recycled materials in fiscal 2018.

*1 Hitachi Global Life Solutions; Sharp Corp.; Sony Corp.; Fujitsu General Ltd.; and Mitsubishi Electric Corp.

**Flow Chart for the Recycling of Plastic in Home Appliances**




## Using IT to Manage Waste

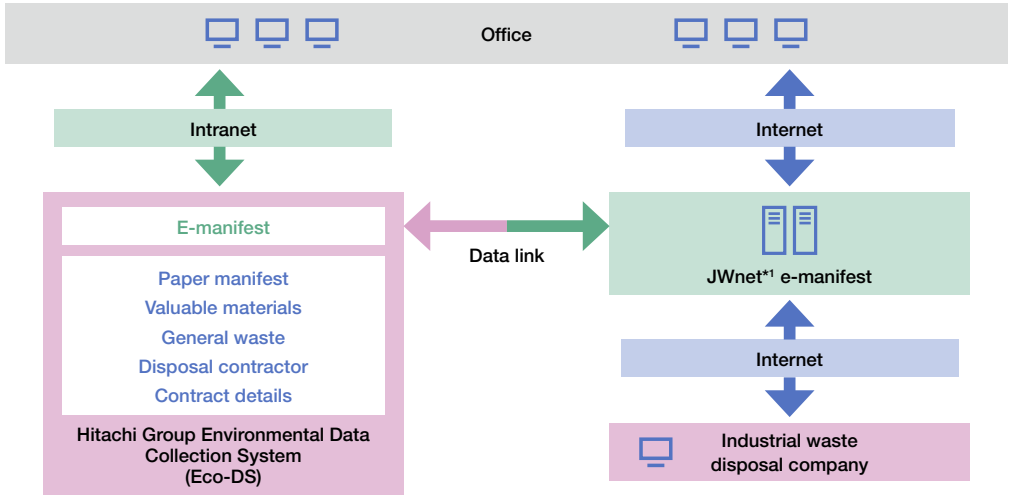
Hitachi has developed and operates a waste management system aimed at efficient management and reduced compliance risk.

The generation and disposal of waste produced not only at our factories and offices but also during our contract operations are visualized and centrally managed. The information is added to our environmental performance data and linked to the Environmental Data Collection System (Eco-DS). In fiscal 2018, entries were made to the system regarding waste produced at approximately 1,500 business and construction work sites in Japan and at approximately 600 business sites in 41 countries. For waste generated at our 200 major business sites, information is sorted into three categories—hazardous, solid, and domestic—and data on disposal method, disposal contractors, recycling rates, and export status is collected and analyzed. This information is utilized to strengthen and promote measures aimed at reducing waste volume and improving

recycling rates. In Japan, we established a target of raising the e-manifest*1 system registration rate to at least 90% by fiscal 2015. While this was achieved in fiscal 2014, we still continued with our efforts in fiscal 2018.

*1 The e-manifest is a document that waste generators must issue when commissioning a disposal company to handle waste disposal.

### Waste Management System




*1 JWnet: The Japan Waste Network is an electronic manifest system operated by the Japan Industrial Waste Information Center under the auspices of Japan's Ministry of the Environment.

## Actions and Achievements

For fiscal 2018, we set a target of a 14% reduction (from a base year of fiscal 2005) for waste and valuables generated per unit, bettering this by achieving a 16% reduction.

We endeavored to reduce waste through closed-loop recycling, whereby the byproducts and scrap from the production process are reused as resources by other business sites, and through the repeated use of packing and cushioning materials during transport. Under the Zero Emission initiative,*1 which seeks to minimize landfill disposal, 95 business sites achieved their zero waste emissions goal*2 as of fiscal 2018.

*1 Zero emissions: The principles and methods advanced by United Nations University in 1994 aimed at eliminating waste from human activity as much as possible while maximizing the use of resources and achieving sustainable economic and manufacturing activities.
*2 Defined as a final disposal rate (landfill disposal/waste and valuables) of less than 0.5% in any given fiscal year.

Zero Emission Sites

### Key Indicators

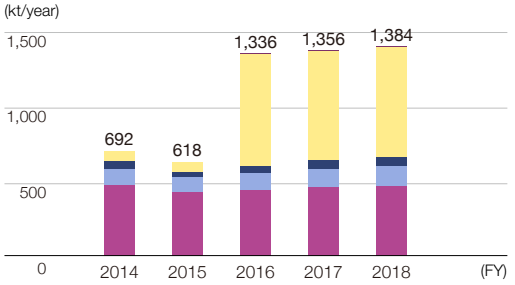
- Reduction in Waste and Valuables Generation per Unit (Hitachi Group)

From base year 16% reduction

**FY 2005 (base year)**
Amount generated 1,510 kt / Activity amount = 100%

**FY 2018**
Amount generated 1,384 kt / Activity amount = 84%

- Waste and Valuables Generation (Hitachi Group)




Breakdown by Region (kt/year)

| | 2014 | 2015 | 2016 | 2017 | (FY) 2018 |
|---|---|---|---|---|---|
| Europe | 2 | 1 | 2 | 4 | 4 |
| Americas | 67 | 63 | 744*1 | 725*1 | 734*1 |
| China | 54 | 36 | 48 | 55 | 55 |
| Rest of Asia | 106 | 98 | 107 | 117 | 130 |
| Japan | 463 | 420 | 435 | 455 | 461 |
| Total | 692 | 618 | 1,336 | 1,356 | 1,384 |

*1 Includes 675 kt (fiscal 2016), 675 kt (fiscal 2017), and 689 kt (fiscal 2018) of a materials company that became a consolidated member of the Hitachi Group in fiscal 2016.

# Efficient Use of Resources

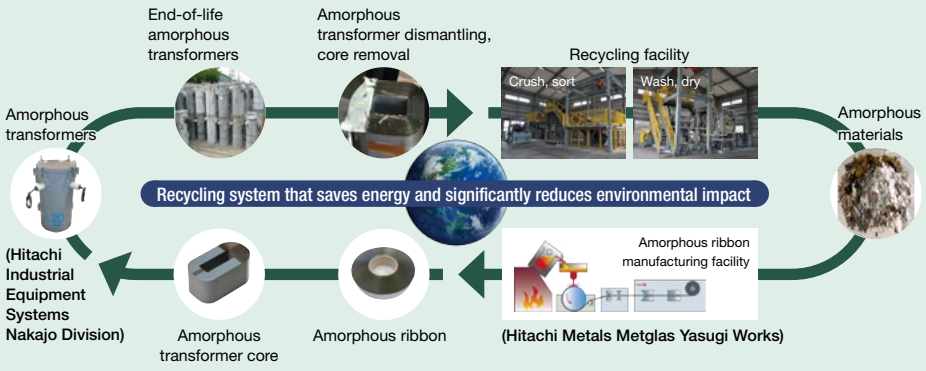
### Recycling of Amorphous Metal Materials (Hitachi Metals, Ltd., Hitachi Industrial Equipment Systems Co., Ltd.)

Hitachi Industrial Equipment Systems Nakajo Division manufactures amorphous transformers using amorphous metals to improve the electrical properties of the iron core, thereby greatly reducing energy loss.

Amorphous metals are high functional materials manufactured by Hitachi Metals. Unlike normal metals and alloys, they inhibit power conversion loss because of their random atomic structure, and the no-load loss of the core is approximately one-fifth of conventional materials, such as silicon steel plates. Transformers are used over long hours, for many years, and in large quantities, so the adoption of the amorphous core, which inhibits per-transformer electrical conversion loss, can significantly reduce energy consumption.

To promote the efficient use of resources, the amorphous metal scrap generated in the transformer manufacturing process at Hitachi Industrial Equipment Systems Nakajo Division and the amorphous cores taken from end-of-life transformers are collected and recycled by Hitachi Metals Metglas Yasugi Works. In fiscal 2018, about 120 tons of amorphous metal waste were used to manufacture amorphous metal materials.

#### Recycling Scheme for Amorphous Metal Materials




### Reducing Landfill Waste and Increasing Recycling Through Sand Recycling (Waupaca Foundry, Inc.)

Waupaca Foundry (WFI) of the United States produces castings that are mainly used as automotive parts. Large volumes of spent green sand*1 is generated in the casting process. In order to reduce landfill waste disposal and increase recycling, the company installed a sand recycling system at Plant 5 in September 2016. In 2018, about 75% of some 26,000 tons of spent green sand generated was recaptured and reused. Moving forward, WFI plans to reuse 55,000 tons of sand annually.

The sand that can no longer be reused finds new life in applications in construction and agriculture and as fill material. WFI recycles some 460,000 tons of sand in such ways on a company-wide basis. Aiming to achieve zero landfill disposal, it has set a goal of reducing spent green sand by 30% in 2020 compared to 2010 levels. The company regards these initiatives as valuable opportunities to partner with the local community.

*1 Spent green sand: Sand used to make molds for casting.

Sand recycling system.