Transportation Business

We support railway transportation that connects people and cities with safety and trust through the technologies we have cultivated since our founding and through our environmentally friendly manufacturing.

Naoki Okuyama
Executive Officer, General Manager of Transportation Business Unit

Business environment and strategy

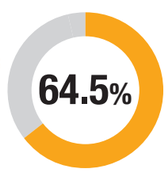
Socioeconomic activities regained momentum as corporate capital investment began to recover following the easing of behavioral restrictions as a result of the Japanese government shifting COVID-19 to a Category V disease. Railway operators are also enjoying this tailwind with their investment in rolling stock returning to pre-COVID-19 levels, and demand for the Company's products is on a recovery trend as well.

The Company's Transportation Business will seize this opportunity to take on the challenge of attracting new customers and expanding the market share of our products.

In the domestic market, investments to address sustainability are increasing, and the introduction of new rolling stock and the replacement of equipment is expected to reduce environmental impact. In overseas markets, starting with the order for electrical equipment for newly built railway vehicles for Indonesian commuter railways, which we received last year, there has been a continuing stream of inquiries for equipment renewal in the region, and we aim to win repeat orders. We will also keep a close eye on developments in China, Southeast Asian countries, and the North America region. Our factories and sales staff work closely to respond to the developments. Furthermore, as part of our efforts aimed at increasing corporate value, we have set out improvement in profitability of this business segment as a key issue, and will strive to thoroughly improve the earnings structures of existing businesses and earn appropriate profits.

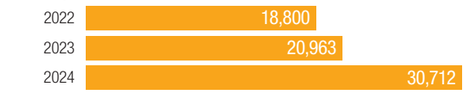
Results for FYE May 2024

Percentage of total consolidated net sales



Orders Received

30,712 million yen (**up 46.5%** year on year)



Net Sales

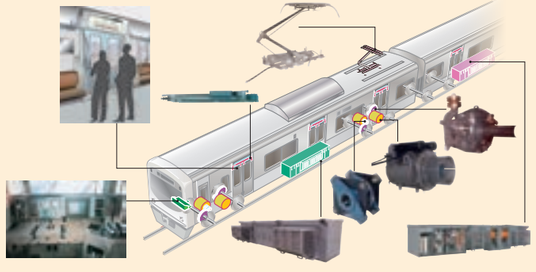
20,737 million yen (**up 4.4%** year on year)

Segment Income

2,387 million yen (**up 5.7%** year on year)

Main products

- **Electrical equipment for railway vehicles**
  Propulsion controller / auxiliary power supplies / traction motor / driving gear units / pantographs / train control and management systems / passenger information display systems / twin disk couplings / door operating equipment / high-speed circuit breakers, etc.
- **Railway energy storage system**
- **Door operating equipment for buses**



Main actions

Supply superior technologies as well as environmentally friendly products and services

We delivered electrical components for Hankyu Corporation's new rolling stock the Series 2300 and 2000, and the Series 2300 new limited express vehicles for the Kyoto Line have been in commercial operation since July 2024. The Propulsion controller adopted in the vehicles uses a low-loss semiconductor device to achieve a more compact size and reduce weight compared with conventional equipment. In addition, it is expected to reduce power consumption by approximately 60% compared with the existing vehicles, resulting in further energy-saving compared with conventional Si-IGBT devices used in the Kyoto Line Series 1300.

Through these efforts, we will work to lower environmental impact by reducing power consumption and the use of worn parts while also extending the replacement cycle, thus contributing to the realization of a sustainable society.

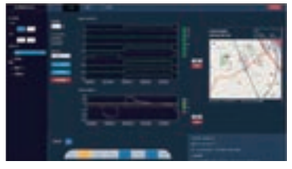
Exterior of Hankyu Series 2300

Exterior of the Propulsion controller (VVVF inverter) (photo provided by Hankyu Corporation)

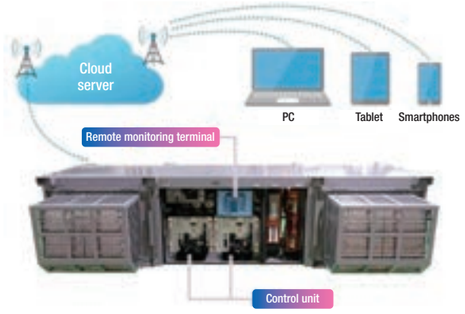
Real-time vehicle condition monitoring system for railways

We have built a system that enables real-time monitoring of operational status and behavior via a public cloud, by adding communication devices to the Propulsion controller of a railway vehicle. This system enables the IoT for equipment mounted on railway vehicles with simple modifications.

We will proactively leverage digital technology in order to expand the range of equipment that can be monitored and enable maintenance to be performed more efficiently and thus accommodate the labor shortages that are expected to occur from a shrinking population, thereby contributing to safe transportation.



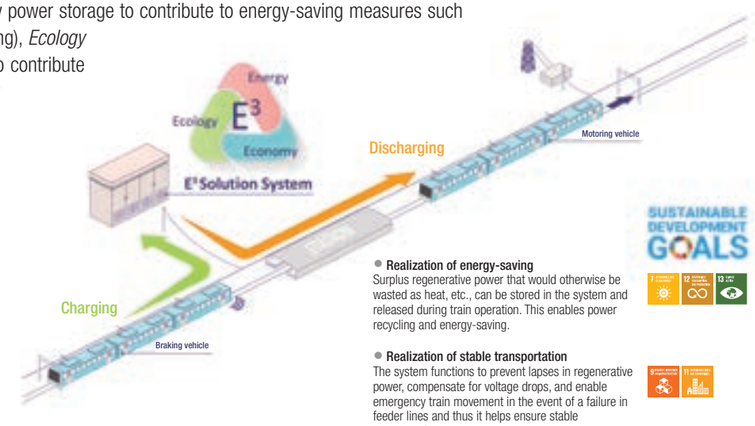
Example of the browser screen



E³ Solution System

The E³ Solution System is a Railway energy storage system developed for a low-carbon society and recycling-based society.

E³ stands for *Energy* (large-capacity power storage to contribute to energy-saving measures such as disaster prevention and peak shaving), *Ecology* (effective use of regenerative power to contribute to CO_2 reduction), and *Economy* (contributing to suppressing additional investment in substation facilities to respond to increasing power demand). It helps to save energy and realize stable transportation through the effective use of electric power, contributing to the realization of stable transportation.



- **Realization of energy-saving**
  Surplus regenerative power that would otherwise be wasted as heat, etc., can be stored in the system and released during train operation. This enables power recycling and energy-saving.
- **Realization of stable transportation**
  The system functions to prevent lapses in regenerative power, compensate for voltage drops, and enable emergency train movement in the event of a failure in feeder lines and thus it helps ensure stable transportation.

Industry Business

We deliver social and industrial infrastructure equipment that contributes to a sustainable society with our advanced power electronics technology.

Toshihito Nakanishi
Executive Officer, General Manager of Industry Business Unit

Business environment and strategy

Demand for automotive testing systems that respond to the electrification of automobiles is on the rise. Vehicle testing systems that leverage the Company's proprietary in-wheel-well dynamo, and space-saving drive testing systems that apply the dynamo have attracted attention, and we are receiving an increasing number of orders and inquiries, including those for additional power supply units to simulate batteries installed in electric vehicles.

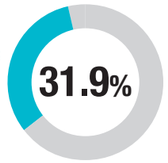
There is a growing need for energy saving, reduced maintenance requirements, and improvement of the working environment at production sites in the manufacturing industry, and we will propose the renewal of equipment using our motors, which are highly efficient, low-noise, and have excellent maintainability.

With an increasing emphasis on being prepared for disasters and other emergencies, there are growing expectations for our Emergency power generators and distributed power supply systems, such as the addition of emergency power generation equipment, and small hydroelectric power generation systems, which can be used as an emergency power source even in times of disaster.

In this business environment, we will continue to supply environmentally friendly social and industrial infrastructure equipment that contributes to the realization of a sustainable society.

Results for FYE May 2024

Percentage of total consolidated net sales



Orders Received

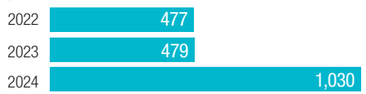
12,083 million yen (**up 11.3%** year on year)

Net Sales

10,257 million yen (**up 3.6%** year on year)

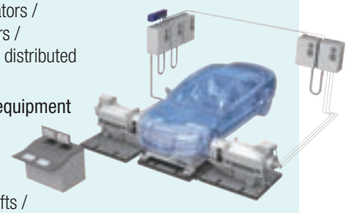
Segment Income

1,030 million yen (**up 115.2%** year on year)



Main products

- **Automobile testing systems**
  Various testing devices (durability, vibration, noise, etc.) for automobile components (engine, transmission, differential gear, etc.)
- **Vehicle testing systems (efficiency, driver-assistance systems, etc.)**
- **Production and processing equipment drive systems**
  For printing machinery / tire and rubber processing machinery / paper manufacturing machinery / films processing machinery, etc.
- **Power generation and power supply systems**
  Emergency power generators / continuous-use generators / generating equipment for distributed power sources, etc.
- **Car-mounted electrical equipment**
  For automobile / construction machinery
- **Others**
  Electrical equipment for lifts / water supply and sewage equipment systems, etc.



Main actions

Adaption of automotive testing systems for electric vehicle drive components

With the shift to electrification of automobiles, testing systems for drive components that are assumed to be driven by an engine are being adapted for electric vehicle drive components. To adapt to electric vehicle drive components, it is necessary to modify the testing system and add power supply equipment for the simulation of a battery that replaces a car-mounted battery. Car-mounted batteries are becoming increasingly high-capacity and high-voltage ones due to challenges such as vehicle cruising range and charging. We have responded to these requirements by developing and commercializing a battery simulator model whose direct current power source supports a high output and voltage of up to 300 kW/1,000 V. Through these efforts, we supply automobile testing systems that can also be used for testing e-Axles and other electric vehicle drive components.

Vehicle testing system using in-wheel-well dynamo (ITHD)

As the development of electric vehicles accelerates, there is a need for additional test benches to perform an evaluation test for those vehicles, and the vehicle testing system using our proprietary ITHD is attracting attention. ITHD is directly connected to the hub at the tire house of a vehicle and applies load directly to the vehicle, which saves space and minimizes installation costs compared with a conventional chassis dynamometer, which requires a pit, etc. on the building side. In addition, it can be used in driving conditions that are difficult for a chassis dynamometer, such as sudden starts and braking. In addition, as the increase in vehicle weight resulting from the installation of batteries increases the required driving power, we are developing a product with a higher output of 160 kW in addition to the conventional 94 kW. Further, ITHD's steering capability has the potential for use in advanced driver-assistance system (ADAS) testing and others, and we are cooperating with the Development Center on the development.

Expanding the line-up of production equipment drive systems that help save energy and reduce maintenance

We supply production equipment drive systems that leverage our high-efficiency Eco-Drive (ED) Motors that incorporate permanent magnets and our high-precision controllable inverters, in response to the need for energy saving and lower maintenance requirements at production sites in the manufacturing industry.

ED motors can now be applied to a broader range of equipment through conformity with EU directives and the expansion of the series to include large-capacity water- and dust-proof models. Moreover, the cooling of the motors can be changed from air to water cooling, which reduces the noise of cooling fans and thus can help improve working environments.

We will continue to supply products that contribute to energy saving and reduced maintenance requirements of production equipment, with the aim of realizing a sustainable society through manufacturing.

Approaches to power generation systems using renewable energy

We supply a distributed power supply system for small hydroelectric power generation as a power generation system that uses renewable energy. We are also exploring new ways to utilize renewable power, including biomass and marine energy power generation.

Further, our distributed power supply system is powered by our standard ED motor that incorporates a permanent magnet, and this feature is leveraged to support a variety of applications, such as generation and sale of electricity to commercial power grids, and, with the addition of stand-alone functionality enabling operation during grid outages, service as an emergency power source.

ICT Solution Business

We combine advanced telecommunication technologies with mechatronics to enhance customers' operational efficiency, convenience, and added value.

Katsuya Nakashima
General Manager of ICT Solution Business Unit

Business environment and strategy

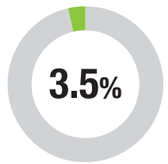
With the Japanese government reclassifying COVID-19 to a Category V disease resulting in a recovery in human traffic and an increase in inbound demand, capital investment in railway station operating equipment systems is also showing signs of rebounding. As transportation service operators seek to improve user convenience with contactless payment, and cashless and ticketless operations, and other solutions, we are proactively developing systems that support such needs so that we can propose solutions that meet customer expectations.

In the IoT market, increased operational efficiency and sophistication of services through the introduction of IoT are expected, especially in logistics, manufacturing and government offices. This is the result of the dramatic development of the cloud, communication, data analysis, AI and other technologies and the increasing shortage of labor due to a shortfall in the working population and stricter labor regulations. We will leverage cloud services and systems/services utilizing IoT terminals and mobile communication to develop solutions that enable customers to monitor and control mobile entities and remote equipment so that they can improve operational efficiency, optimize maintenance, and carry out preventive and condition-based maintenance.

We will expand our business range as we strive to provide our customers with solutions that help to add value.

Results for FYE May 2024

Percentage of total consolidated net sales

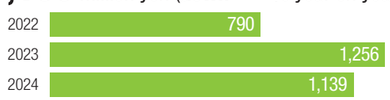


Orders Received

1,217 million yen (**down 14.3%** year on year)

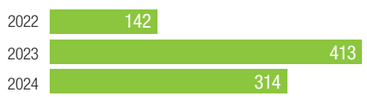
Net Sales

1,139 million yen (**down 9.3%** year on year)



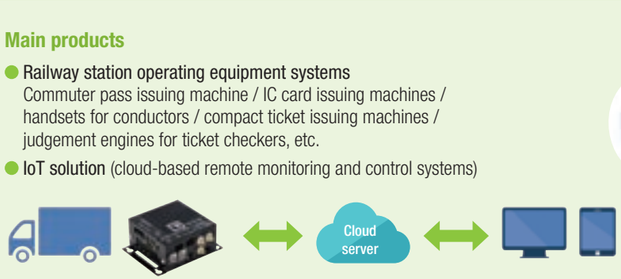
Segment Income

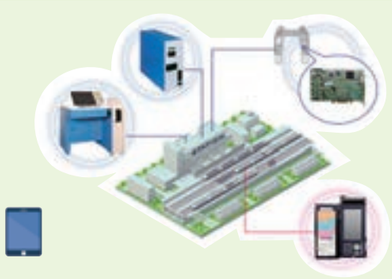
314 million yen (**down 23.9%** year on year)



Main products

- **Railway station operating equipment systems**
  Commuter pass issuing machine / IC card issuing machines / handsets for conductors / compact ticket issuing machines / judgement engines for ticket checkers, etc.
- **IoT solution** (cloud-based remote monitoring and control systems)



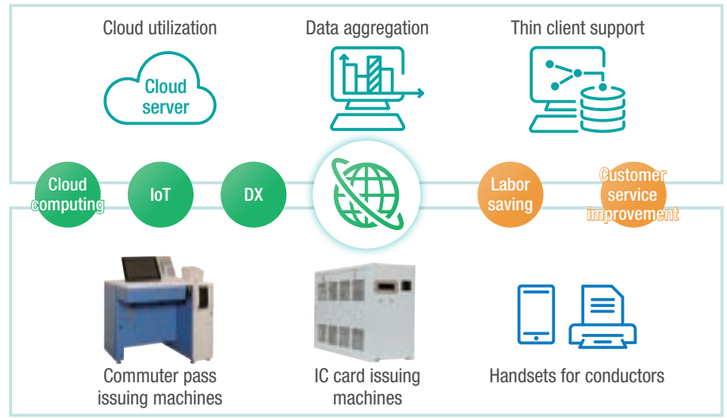


Main actions

Railway station operating equipment systems

We combine our deep insights, reliable technologies, and extensive experience in the rail transport sector with advanced ICT to provide railway station operating equipment systems that improve passenger convenience and reduce the workload of railway operators.

Leveraging cutting-edge cloud computing and IoT technologies to respond to needs ranging from diverse station equipment to host systems and applications that run on smartphones already in use, we will continue supplying transport service operators with systems that help them to build their foundation for DX, improve operational efficiency, reduce workloads, and improve customer satisfaction.



In-train ticket issuing system using cashless payment terminals

We developed an in-train ticket issuing app that is used on portable general-purpose cashless payment terminals with a built-in printer function, as well as a sales data aggregation system that uses a cloud server, and they have been delivered to multiple railway operators.

This use of general-purpose terminals lowers costs, making it easier for customers to adopt the system, and thus helps to create a cashless society.

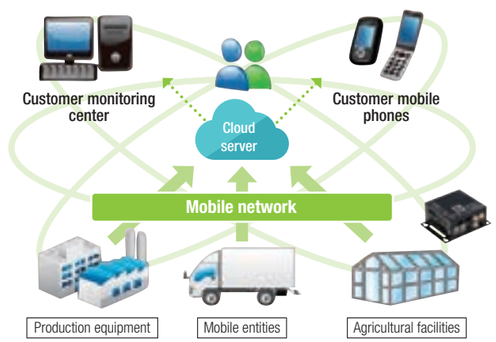
We will develop business processing applications tailored to customer needs so that the terminals can also be used for purposes other than in-train ticket issuing.

Smartphone-compatible, general-purpose ticket issuing system

We worked with the Development Center to develop a ticket issuing system. It helps save labor in issuance and aggregation work for crews and staff, facilitate work, and enhance services for transportation users.

IoT solution

We offer diverse services with systems that utilize IoT terminals, mobile networks, and cloud servers. In doing so, we provide solutions that enable customers to monitor and control mobile entities and remote equipment so that they can improve operational efficiency, optimize maintenance, and carry out preventive and condition-based maintenance.



Development Center

For initiatives aimed at expanding new businesses and products through collaboration with business units

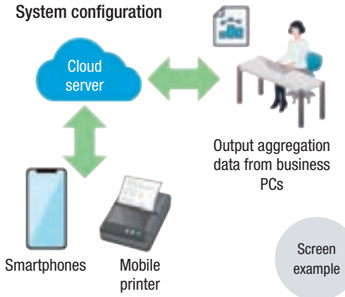
We will proactively explore and propose new business areas and develop new products by making full use of “power electronics” and “motors,” our core technologies, and also utilizing technologies that contribute to the development of monitoring systems that use information equipment and sensors that incorporate sophisticated communication technology as well as AI technology, and autonomous Propulsion systems for vehicles.

Takuya Hatakeyama
Executive Officer, Center Manager of Development Center

Development of smartphone-compatible, general-purpose issuing system for tickets, etc.

In collaboration with the ICT Solution Business Unit, we developed a general-purpose system that enables the issuance of tickets, etc. at a reasonable cost by limiting the system to contain general-purpose hardware and simple ticketing and aggregation functions, and delivered it to Minami-aso Railway Co., Ltd. The system consists of a business application for smartphones, a mobile printer and a cloud server-based system, and enables issuing and aggregation of tickets, etc. with simple operations.

System configuration



Screen example

Development of vehicle testing devices that leverage an in-wheel-well dynamo adapted to advanced driver-assistance systems (ADAS)

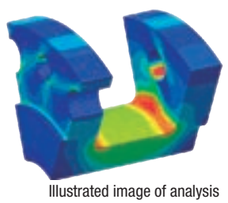
Validation of cognition, judgment and operation is required in the development of ADAS. Validating the operation is currently done through on-road driving using actual vehicles; however, this gives rise to a reproducibility issue and the risk of a major accident resulting from errors in the judgment system.

We are working on the development by fusing *physical* (actual vehicles) and *virtual* (tires and road surface) with an in-wheel-well dynamo, with the aim of realizing ADAS testing that does not involve on-road driving.

Support for product development making full use of analytical technology

The Center inherits company-wide fundamental technologies that have been cultivated over the years and functions as a “company-wide technical support division.”

We conduct preliminary studies, evaluations, and validations for development, design, and manufacturing through fluid analysis and electromagnetic field analysis using the finite element method (FEM) and other computer-based methods.

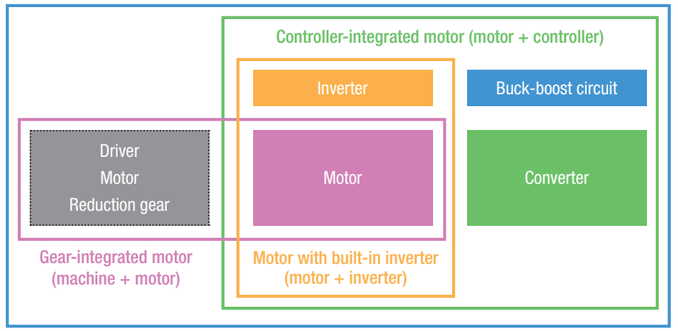


Illustrated image of analysis

On-demand motors/inverters

Capitalizing on our fundamental technologies in power electronics and manufacturing, we supply motors and inverters optimally tailored to the customer’s needs (on-demand products).

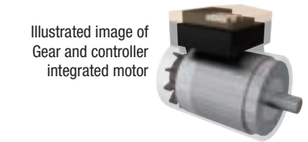
We have provided flat large-torque motors to replace engines in electrification efforts and compact high-speed motors, but we will now develop on-demand products such as built-in electricals for motors (a key technology going forward) and motors with built-in inverters.



Gear and controller integrated motor (e Axel) (machine + motor + controller)

Example of system development

Illustrated image of Gear and controller integrated motor

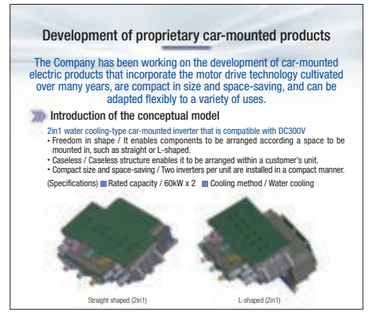


Illustrated image of application

Through collaboration between the Development Center and the Industry Business Unit, we were contracted to manufacture motors and develop new motors/inverters (built-in type).

In May 2024, we exhibited a mock-up of a caseless inverter at Automotive Engineering Exposition 2024 held at PACIFICO Yokohama to conduct market research. (The figure on the right is an excerpt from the exhibition panel.)

We are working on dedicated development projects and customization projects for motors and inverters with the aim of winning more orders in the 164th fiscal term and beyond.



Intellectual Property

Our intellectual property is placed as a key corporate resource. Our intellectual property department is responsible for the management of intellectual property and the development divisions in each business unit and the Development Center actively apply for patents and utility models.

In overseas markets where we aim to further expand our business in the future, we are stepping up our efforts to protect our technologies and brands.

Patent applications granted