

# Industrial Products

## 1 Electrification of CO<sub>2</sub> Compressor Train for Urea Production



1 7,760 kW electric-motor driven CO<sub>2</sub> compressor (rear left: high pressure compressor, center: electric motor, front right: low pressure compressor)

Hitachi Industrial Products, Ltd. has delivered two electric-motor driven CO<sub>2</sub> compressors for Krishak Bharati Cooperative Limited (KRIBHCO), one of the largest urea producers in India.

This project is to support the electrification of plant equipment that is being promoted with the support of the Indian government for the purpose of energy saving of the entire fertilizer complex. By replacing the existing stream turbine driven CO<sub>2</sub> compressors, the customer could achieve highly efficient and reliable operation with new electric-motor driven CO<sub>2</sub> compressors. In this way, Hitachi Industrial Products is contributing to the long-term energy saving of its customer's plant.

In addition, the sound operation of these CO<sub>2</sub> compressors has been evaluated by KRIBHCO and the company was awarded another electric-motor driven air compressor in 2021. Hitachi Industrial Products will continue to provide electric-motor driven compressors to customers in various regions and fields and contribute to energy saving in its customers' plants. (Hitachi Industrial Products, Ltd.)

## 2 Increasing Capacity of Pump Equipment to Contribute to Flood Countermeasure Projects

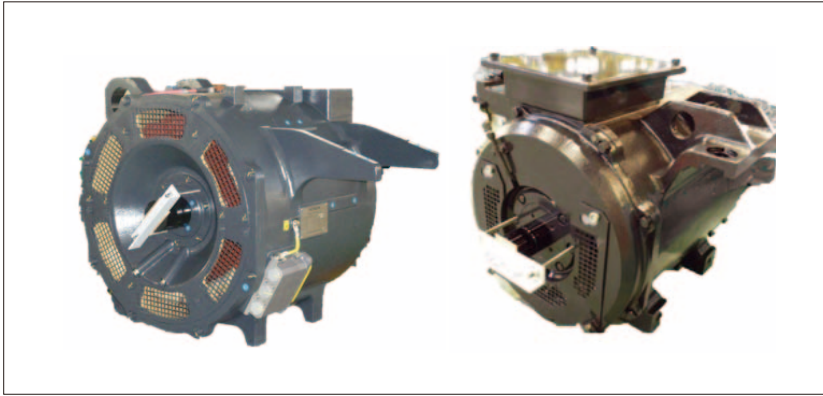
The Neyagawa Basin Sewer for Eastern Sewerage Works Office of Osaka Prefectural Government operates 17 pumping stations in order to remove rainwater within its jurisdiction. In response to the widespread damage caused by major typhoons and torrential rains during the rainy season in recent years, the office has considered comprehensive flood countermeasures to go along with an upgrade to the No. 3 rainwater pump in the Kuwazai pumping station and increased its drainage capacity. This pump system offers the following features:

- (1) Pump discharge volume was increased from 330 m<sup>3</sup>/min to 396 m<sup>3</sup>/min, for an improvement in rainwater drainage capacity of 20%.
- (2) Pump type was changed from horizontal axis mixed flow to vertical axis mixed flow. This removes the necessity of vacuum evacuation before the start of operation, thereby enabling a quicker start for pump operation and drainage.
- (3) Speed reducer type was changed from planetary gear to mounted (method incorporating in the bend after pump discharge, manufactured by Hitachi Nico Transmission Co., Ltd.).

In the past, changing a pump from horizontal to vertical axis would require the construction of a floor over the



2 Interior of space-saving engine housing



3 Main motors for Europe (left) and India (right)

top of the pump for placement of the speed reducer and engine. In this case, however, adoption of a speed reducer-mounted pump removed the necessity for constructing this installation floor, thereby reducing the amount of space required for the engine housing.  
(Hitachi Industrial Products, Ltd.)

### 3 Compliance with International Standards for Railway Vehicle Electric Motors

In order to strengthen the competitiveness of its main motors for railway vehicles, Hitachi focused its efforts on increasing efficiency, decreasing size and weight, and decreasing the need for maintenance, thereby achieving a commercial efficiency of 98% for permanent magnet motors and 97% for induction motors. Focusing on further global expansion, in addition to the previous projects centered on international yen loans and compliance with Japanese Industrial Standards (JIS) or International Electrotechnical Commission (IEC) standards, it will also be necessary to support projects that comply with other international standards as well (obtaining certification of compliance), mainly including welding and vibration standard compliance certification.

When it comes to the quality management of welded structures, European customers have increasingly required compliance with EN15085 “Railway Applications — Welding of Railway Vehicles and Components.” EN15085 is a standard that brings together comprehensive requirements in areas including design, manufacturing, and inspection, and mandates certification by a specialized agency and the registration of welding coordinators. As a part of these efforts, Hitachi acquired certification from TÜV Rheinland Japan Ltd. Also, in terms of compliance with vibration standards, Indian customers require compliance with IEC61373 “Railway Applications — Rolling Stock Equipment — Shock and

Vibration Tests,” including test implementation using actual machinery. Although Hitachi had previously provided proof with analysis based on the finite element method (FEM), it has now conducted tests and achieved compliance by bringing in actual equipment to be tested by domestic test manufacturers.

Through these efforts, Hitachi has successfully established a foundation for further global expansion in the market for the main motors of railway vehicles.  
(Hitachi Industrial Products, Ltd.)

### 4 Network Expansion of IoT-ready Industrial Controller HF-W/IoT

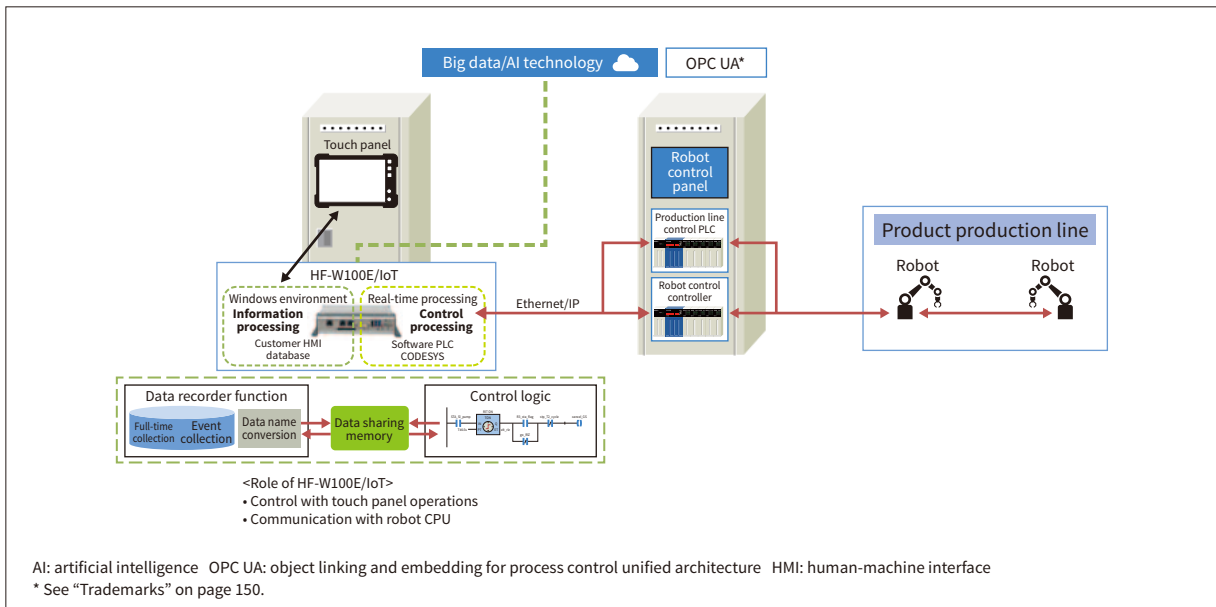
The HF-W/IoT series industrial controller that is compatible with the Internet of Things (IoT) is an edge computer for IoT systems in which Windows® coexists with a real-time control environment [software programmable logic controller (PLC): CODESYS®].

Hitachi has expanded its network support for operations in a real-time control environment by greatly expanding the range of data collection within a 1 ms high-speed control cycle. Supported real-time networks include the following:

- (1) EtherCAT®
- (2) Ethernet/IP® (newly supported)
- (3) Modbus® (newly supported)
- (4) FL-net® (complies with Ver. 3/Class 1) (newly supported)

This product stores data gathered in real-time in shared memory, and also includes a data recorder function that passes this data to Windows (the information system) without omission.

HF-W100E/IoT was adopted for use in a certain product production line, and as an example of its adoption, achieved communication between touch panels with its PLC functions, as well as Ethernet/IP communication



4 Block diagram of production robot using the HF-W/loT-ready industrial controller

between central processing units (CPUs) used for operating information and for robots as well as high-speed and real-time data communication. In the future, there is potential for connecting this controller to the cloud in order to expand it to a total system with both integrated management and operation monitoring functions. (Hitachi Industrial Products, Ltd.)

\* See "Trademarks" on page 150.

its space-saving, highly efficient UPS UP2001i series for large-scale data centers in December 2020, and started shipping a 1,000-kVA UPS model in September 2021. The major features offered by the UP2001i series are shown on the right side of the figure. (Hitachi Industrial Products, Ltd.)

5 Release of UPS Series 1,000-kVA Model

Hitachi offers a lineup of uninterruptible power supply (UPS) systems that support each customer's needs with low to high-capacity models, and has deployed its UPS series of models supporting system redundancy configurations while saving space in a high-efficiency, high-reliability design. As AI, IoT, and other digital technologies have evolved in recent years, and the use of remote work and e-commerce has increased, demand has also shot up for the large-scale data centers that serve a vital infrastructure role in this area. Hitachi began selling



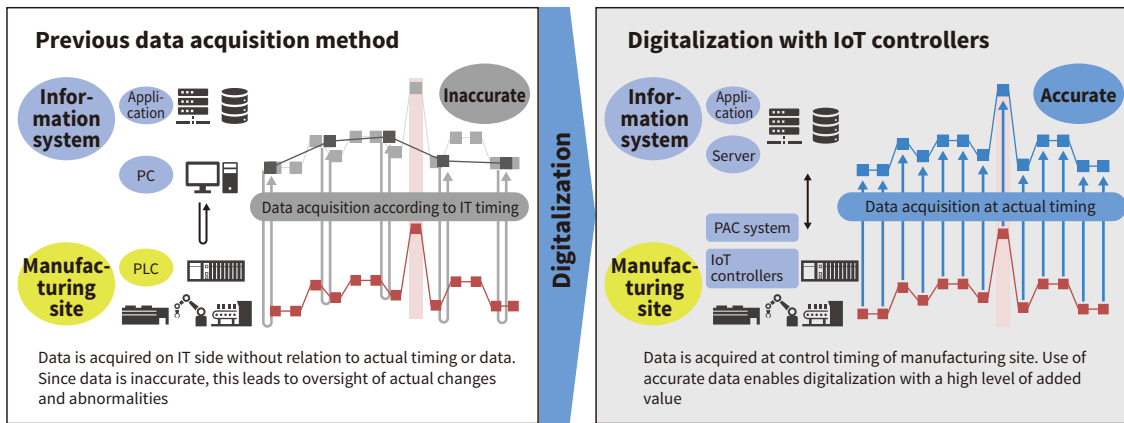
5 UP2001i series 1,000-kVA high-capacity UPS (left) and major features (right)

6 Utilization and Application of Control Data from Industrial IoT Controller at Manufacturing Site

The HX hybrid model IoT-ready industrial controller is a hybrid controller that links the information systems necessary for promoting digital transformation (DX) such as automation of the manufacturing site, or the shift to smart factories or cyber-physical systems (CPSs). There are many of these controllers for automation on the manufacturing site with operational technology (OT) data that can be used in promoting DX, and although there has been a focus on the OT data utilization, there were challenges in the creation of programs to link information systems. To overcome these challenges, the HX

Capacity	1,000 kVA	2,000 kVA	Note
Power supply specifications	Supports global standard power specifications with three-phase, four-wire plug		
Installation area	15% reduction	40% reduction	Three-phase, four-wire; compared with previous Hitachi Industrial Products model
Efficiency	96.7%	97.0%	Three-phase, four-wire, maximum efficiency*
Battery	Supports both lithium ion and lead batteries		

\* Maximum efficiency: Measured at 75% output with a power factor of 1.0. Efficiency tolerance based on JEC-2410-2010.



PAC: programmable automation controller

**6** Digitalization by IoT controllers that achieve accurate and quick time-series data acquisition at each control timing

hybrid model provides a series of programs that can easily link OT data with information systems in an “HX data utilization framework.”

By using this framework, it is possible to acquire time-series data accurately and quickly at the control timing of the manufacturing site, which was difficult to achieve using previous systems that combined a personal computer with a PLC. Furthermore, data changes stemming from progress in DX can be handled with setting changes, and it is possible to implement a system that continuously operates in a stable fashion on the manufacturing site with operations that do not require program modifications.

(Hitachi Industrial Equipment Systems Co., Ltd.)

that requires grease lubrication to ensure the stable operation of the complicated operating mechanism. However, the oil content in grease can dry up or change its characteristics over the years, losing its lubricating function and, in some reported cases, interfere with operation.

In response to recent requests by users for a greaseless product, Hitachi has developed its new low-maintenance C series. By applying a special surface treatment to the two metal sliding parts of the operating mechanism, stable sliding is ensured, and the need for applying lubricant or regularly adding oil to the mechanism has been removed. Also, in order to prevent degradation in the phase-to-phase insulation due to adhesion of dust, a structure was adopted that reduces the risk of surface discharge by adding space to ensure that no dust will collect between phases. These improvements make it possible to double the length of the inspection period, and reduce running costs for the VCB.

(Hitachi Industrial Equipment Systems Co., Ltd.)

**7** Model Change of Vacuum Circuit Breaker “New Low-Maintenance C Series”

Hitachi has developed a fixed manual operation type vacuum circuit breaker (VCB) as a new low-maintenance C series. Mainstream VCBs use a spring operation method



**7** New low-maintenance C series vacuum circuit breaker

**8** HS910 Regenerative Converter

Along with the push for saving energy with a goal of carbon neutrality, there is a need for improved resilience in a drive system for use during disasters. A regenerative converter is a key component that contributes to the additional saving of energy in a drive system. Hitachi Industrial Equipment Systems has released the HS910, which is a new type of regenerative converter.

The HS910 is capable of stable operation even when the supply voltage is unbalanced, or in a state that includes harmonic distortion, due to the adoption of a





8 HS910 regenerative converter (HS910-220LF)

dual second-order generalized integrator phase-locked loop (DSOGI-PLL) for the phase synchronization process. Also, since generator switching is possible by selecting parameters corresponding to the generator using external input, this improves the converter's resilience for use when there is a power supply disturbance or as an emergency power supply.

Furthermore, support for communication over RS485 or Ethernet makes it possible to convert a system to IoT. Various life assessment functions are also supported, in particular the real-time evaluation of damage to both insulated-gate bipolar transistor/flywheel diode (IGBT/FWD) elements in the power module. This enables accurate preventive maintenance even in cases where it is difficult to predict the load status during actual operation, such as for cranes or machine tools.

In addition, the layout is flexible with peripheral circuits stored in an attached box, and the converter has

been designed with various different improvements to increase convenience.

(Hitachi Industrial Equipment Systems Co., Ltd.)

## 9 Expansion of Industrial Inkjet Printer Ink to which the Organic Solvent Ordinance Does Not Apply

Ink is comprised of coloring agents, resins, solvents, and auxiliary agents. The ink used in industrial inkjet printers must dry within several seconds after printing, and so it uses extremely quick-drying organic solvents.

In consideration of the safety of users, and from the perspective of preventing health hazards due to the chemical substances used as organic solvents, there has been a demand in recent years for the appropriate management of these substances based on legislation.

Hitachi Industrial Equipment Systems is expanding its lineup of ink for industrial inkjet printers to which the Industrial Safety and Health Act Ordinance on the Prevention of Organic Solvent Poisoning (Organic Solvent Ordinance) does not apply by keeping the use of ingredients targeted by this law to a minimum.

To this end, it has released the following four new ink products to which the Organic Solvent Ordinance does not apply in addition to the currently available six:

- (1) 4137W: highly concealing white ink
- (2) 4143K: alkali-soluble ink
- (3) 4144K: retort pouch ink
- (4) 4146K: ink for glass/flexible film

(Hitachi Industrial Equipment Systems Co., Ltd.)



9 New lineup of ink to which the Organic Solvent Ordinance does not apply