

# Social Infrastructure & Industrial Systems

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Building Systems

Rail Systems

Construction Machinery

Public Facilities

Defense Systems

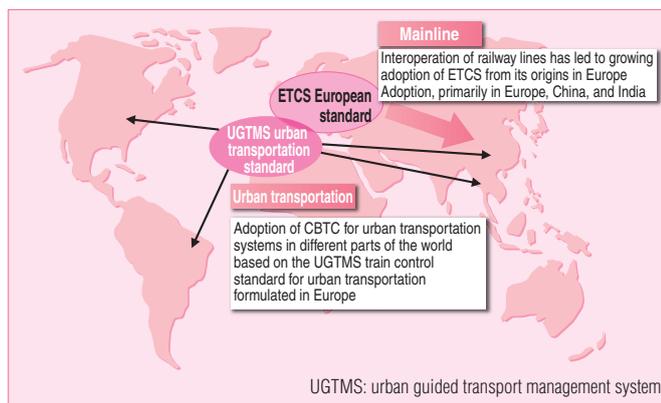
Industrial Systems

Production Plants



## Global Deployment of Train Control System Compatible with ETCS and CBTC

With people taking a fresh look at rail transportation because of its ability to reduce CO<sub>2</sub> emissions, progress is being made on the international standardization of signaling systems, particularly in Europe. In China, meanwhile, Hitachi has recently supplied a train control system compatible with the European ETCS standard to the Guangzhou-Shenzhen Passenger Dedicated Line and a CBTC control system incorporating wireless communications to the Chongqing Monorail Line 3. This article talks to the people involved in these projects about the development of these systems and their characteristics.



Developments in train control system field

### Practical Implementation of ETCS-compliant System

Progress is being made on the standardization of signaling systems against a background of improvements in the convenience of rail transportation and an international shift toward greater use of rail freight. In Europe in particular, the European Train Control System (ETCS) standard was formulated to satisfy the need for interoperation on long-distance cross-border intercity lines. Adoption of the standard is extending to all parts of the world, and it is currently used on more than 37,000 km of track.

The country that has adopted ETCS systems on the largest scale is China. One example is the Guangzhou-Shenzhen Passenger Dedicated Line, and Hitachi has developed and commissioned an ETCS-compliant train control system for China for use on this line. The onboard systems commenced operations in June 2011 and the ground systems in December 2011.

### Formulation of Specifications and Use of Testing to Resolve Numerous Issues

The train control system project required a coordinated interpretation of the standards right down to the smallest details. Detailed specifications that were both safe and practical were formulated by considering numerous different cases based on know-how built up through the development of railway signaling systems for Japan. This was followed by meetings with the customer to finalize the specifications, checking by a third-party agency, testing to verify the interoperation with other systems, and then

on-site testing. In particular, Hitachi (China) Ltd. played a major role in coordinating with the customer and Chinese companies.

Although many difficulties were faced, Hitachi succeeded in becoming the first supplier from outside Europe to commercially implement an ETCS system. As the project included interoperation with systems supplied by two different European suppliers, it also provided an opportunity for Hitachi to mark its presence in the international market.

### CBTC Control System with Wireless Communications

Elsewhere, Hitachi is also engaged in the development of communication-based train control (CBTC) systems, a type of system that is increasingly being adopted in subways and other new modes of transportation. These systems integrate equipment installed on the trains with land-based equipment, using wireless communications to collect position information from trains and send back control signals. This significantly reduces the amount of wayside equipment and facilitates benefits such as high traffic densities and the adoption of single-driver or unmanned trains. Another advantage of the system is its use of the general-purpose 2.4-GHz band, which makes it suitable for many different countries and regions. The system has also been made robust enough to prevent interference from other wireless users and allow its use in mission-critical situations. The CBTC system was selected for the Chongqing Monorail Line 3 in China, which commenced operation in September 2011 (operating on 17 km of the total 55.6-km line), and further installations are planned.

Hitachi plans to draw on this experience to accelerate its global business activities in the railway systems sector.



Xiang Haitao (left), Deputy General Manager, Transportation Systems Group, Hitachi (China) Ltd.; Masayasu Futakawa (middle), Chief Project Manager; Tomoaki Tasaki (right), Senior Engineer, Signalling Systems Integration Department, Transport Management & Control Systems Division, Rail Systems Company, Hitachi, Ltd.

# Hitachi Group Supervisory Control Elevator with Destination Floor Reservation System (DFRS)



(a)



(c)



(b)



(d)

Passengers in a lobby without DFRS (a), passengers in a lobby with DFRS (b), touch screen (c), reservation system (d)

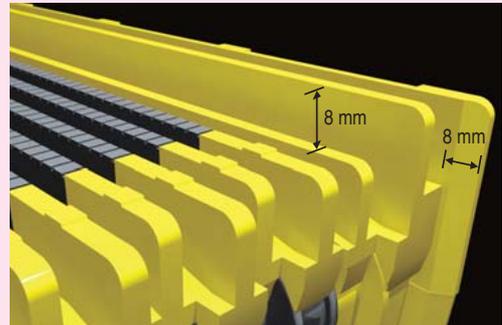
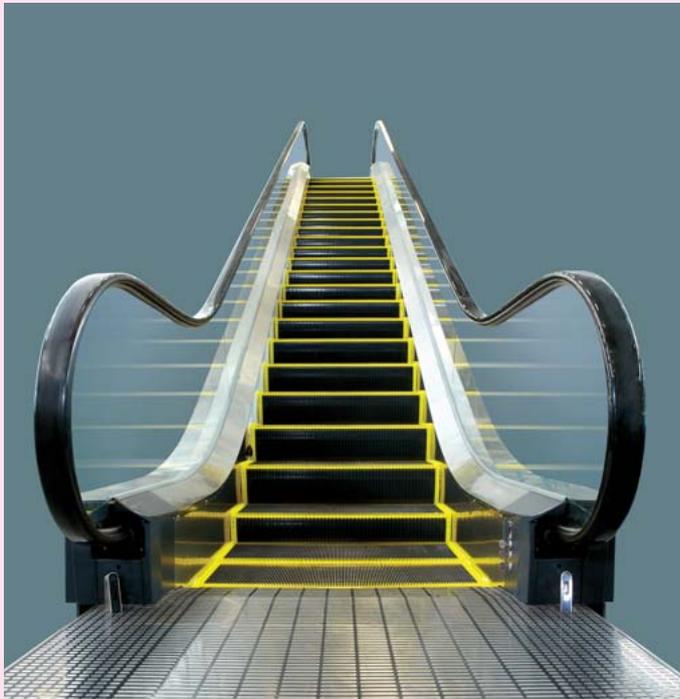
Elevator group control systems that manage multiple elevators as a group are commonly employed in high-rise and other large buildings to minimize waiting times and balance the use of elevator cars. Hitachi has released a series of advanced elevator group control systems since it introduced the world's first instantaneous call allocation system in 1972. Hitachi's current model is the FI-600 series. It incorporates advanced trajectory forecasting technology and seeks to operate elevator cars at equal time intervals.

The FI-600 series has now been augmented by the addition of

the optional destination floor reservation system (DFRS) function. This function automatically allocates a car in response to a user indicating their destination floor using a device in the elevator lobby. The allocated car number is displayed on a screen. The function reduces congestion in the lobby and rationalizes elevator operation by directing passengers going to the same floor to use the same elevator.

Hitachi intends to continue developing systems and functions that make elevators more comfortable.

## SX Series Escalator with Improved Safety and Energy Efficiency



SX series escalator (left), skirt-guard safety boundary (upper right), and LED footlight (lower right)

As devices designed to carry large numbers of people, escalators have always been required to operate safely. Recently, energy efficiency has also become increasingly important.

Hitachi introduced the new SX series of escalators in August 2011. Standard features on the SX series include the use of light-emitting diode (LED) handrail lighting and a new step design that helps prevent passengers' shoes from getting caught in the skirt-guard.

Another safety feature is a sensor that triggers an announce-

ment to warn users if it detects a passenger leaning out over the handrail. A standard green technology feature of the SX series is dual-speed operation whereby the escalator switches to a slower speed after a period of time if there are no users. For the Chinese market, Hitachi has also commercialized a regenerative function that feeds electric power back to the building during downward operation.

Hitachi intends to continue expanding its global market share through the development of safe and energy efficient products.

## East Japan Railway Company Series E657 AC/DC Express Train and Electrical System

Hitachi has delivered the Series E657 of alternating current/direct current (AC/DC) express trains to the East Japan Railway Company, supplying the rolling stock system, main motors, and rolling stock electrical systems, including the main converter/inverter transformer system for the traction power supply. The Series E657 is a new type of express train developed to replace the rolling stock (Series 651 and E653) currently used on the Joban Line.

To improve the ride comfort of the new rolling stock, full-active suspension is fitted to the front and rear cars and Green cars, and dampers are fitted between each car to reduce lateral vibration. Other features include aluminum double-skin construction to reduce internal noise in the train and an onboard Internet service.

The main converter/inverter transformer system uses low-loss insulated gate bipolar transistors (IGBTs) as the key circuit devices and features a reduced component count and improved cooling performance. The units have also been made smaller and lighter



East Japan Railway Company Series E657 AC/DC express train in commercial operation (left), prior to delivery from Kasado Works (top right), and the main converter/inverter transformer system (bottom right)

than the main converter/inverter transformer system used on the existing rolling stock, while also being strengthened to protect from snow damage.

The Joban Line express service will standardize on the Series E657 in the fall of 2012, with a total of 16 train sets. (Date of commencement of commercial operation: spring of 2012)

## East Japan Railway Company Hybrid Drive System for Series HB-E300

Hitachi has supplied a hybrid drive system for the Series HB-E300 of resort trains to the East Japan Railway Company.

The Series HB-E300 started commercial operation in October 2010 and are operating as resort trains in Aomori Prefecture

(Tsugaru and Ominato Lines), Akita Prefecture (Gono Line), and Nagano Prefecture (Shinonoi and Oito Lines). The hybrid drive systems of the train reduce noise and energy consumption to decrease the impact on the environment.

The system uses the same series hybrid concept already proven on the Koumi Line Series Kiha E200, but with specifications suitable for use in resort trains, including an auxiliary power supply as backup (with a larger capacity and support for power supply induction), strengthened construction to protect from snow damage and cold weather, and added traction performance.

Hitachi intends to adopt environmentally conscious hybrid drive systems by making them smaller, lighter, and less expensive.

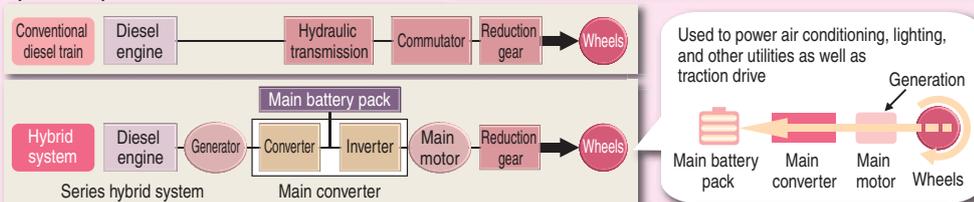


Train fitted with environmentally conscious hybrid drive system

- Lower fuel consumption
- Lower harmful emissions (NO<sub>x</sub>, etc.)
- Quieter operation (when halted at station)



Hybrid drive system



NO<sub>x</sub>: nitrogen oxides

East Japan Railway Company Series HB-E300 hybrid railcar and configuration of hybrid drive system

## East Japan Railway Company Digital Signage for Hitachi Station

Digital signage for the Hitachi Station supplied to the East Japan Railway Company commenced operation in April 2011. The signage was supplied in conjunction with the construction of a new access way and the conversion of the station building into an overbridge-style structure, two key projects in the redevelopment of the Hitachi Station in Hitachi City, Ibaraki Prefecture, Japan.



Digital signage at East Japan Railway Company's Hitachi Station

In addition to operational information, the Hitachi Station digital signage also displays guidance information during emergencies, with a liquid crystal display screen used to display both status information for the Joban Line and emergency guidance for local lines in the Mito area. The display of operational information for the Joban Line presents information from the existing traffic management system in realtime.

A high standard of design was demanded for the presentation and appearance of the digital signage for the new station building (the design of which was supervised by an internationally renowned architect) and comprehensive studies were undertaken involving the design group at Hitachi. The construction of a new access way for the Hitachi Station and the conversion of the station building into an overbridge-style structure represent a new start for Hitachi City, and the successful installation of the digital signage system in conjunction with this work was well received by the customer.

In the future, Hitachi intends to improve customer service further by proceeding with the installation of digital signage at other railway stations.

## East Japan Railway Company—Train Supervisory Control and Data Acquisition System for the Tokyo Metropolitan Area (Control Sub-system)

The control sub-system of the East Japan Railway Company's train supervisory control and data acquisition system for the Tokyo metropolitan area is a large integrated electric power management system for electric power conversion and supply. It is used for monitoring and remote control of equipment at substations, alternating current conversion stations, and power plants in a 100-km region centered on Tokyo. The system performs automatic control of more than 160 power plants and railway substations, and has coped with numerous equipment upgrades, both small and large, since it was first commissioned.

In the latest upgrade, the servers at the heart of the system have been replaced with blade servers designed for control applications to ensure that the electric power management system achieves a high level of reliability and responsiveness. By taking advantage of the characteristics of blade servers, the system has also been configured to allow server shut-downs, such as those that occur when making system enhancements, to be made without interfering with the operation of the supervisory system (power system and power supply). The development work is currently at

the phase in which the focus is on replacing the existing system hardware, with the power system supervisory sub-system having commenced operation in October 2011 and the power supply supervisory sub-system in November.

The next phase will involve the development of additional functions to assist the activities of the system operators and to provide for better education and training.



Power system supervision using East Japan Railway Company's train supervisory control and data acquisition system for the Tokyo metropolitan area (control sub-system) and blade servers designed for control applications

## Hybrid Hydraulic Excavator



ZH200 hybrid hydraulic excavator (operating mass: 20,100 kg)

Hitachi has launched the ZH200 hybrid hydraulic excavator, which was developed from a concept for a utilitarian hybrid excavator that offers more practical value while reducing environmental load. In the ZH200, Hitachi achieved excellent fuel economy and cost performance by combining an energy-saving

hydraulic system with a hybrid system that stores the energy from rotational deceleration in a capacitor for use in rotational acceleration. This has been combined with an enlarged operator's cab, bigger multi-monitor screens, and a 4-dB reduction in cabin noise levels to provide an attractive, comfortable working environment for the operator.

[Key features]

(1) Fuel economy that provides a return on investment, with a 20% reduction in fuel consumption compared to the previous model (the ZX200-3), equating to a 20% reduction in carbon dioxide (CO<sub>2</sub>) emissions (results from Hitachi's tests).

(2) Attachment piping and small mobile crane configurations are also available, making the ZH200 suitable for a range of tasks.

(3) Certified by the Ministry of Land, Infrastructure, Transport and Tourism, Government of Japan as a low-carbon emission construction equipment. Compatible with the Ministry of Land, Infrastructure, Transport and Tourism's ultra-low noise specification standards, and with Ministry of the Environment, Government of Japan technical standards for emissions from non-road special motor vehicles.

Hitachi intends to expand sales of the ZH200 globally to locations such as China and Europe, and to develop the series further. (Hitachi Construction Machinery Co., Ltd.) (Japan release: July 2011)

## Double Arm Working Machine

Although hydraulic shovels originally got their start as excavators, in recent years they have won praise for their versatility, and are also being used for complicated tasks such as demolition. To improve the ability of such equipment to deal with this complex work, Hitachi fitted it with two arms like those of a human being, developing machinery equipped with double arms in front. The main features of these machines are as follows:

(1) The ability to use double arms to perform complex tasks such as cutting objects while holding them, and bending long objects

(2) The ability to operate both arms simultaneously using hydraulic systems capable of driving multiple actuators powered with a single pump

(3) The ability to operate both arms simultaneously, using the right hand for the right front arm, and the left hand for the left front arm

(4) Utilization of a kinetic single-lever system for control, providing intuitive operation and reducing fatigue

(5) The positioning of the front arms is calculated in three dimensions to prevent the left and right arms coming into contact

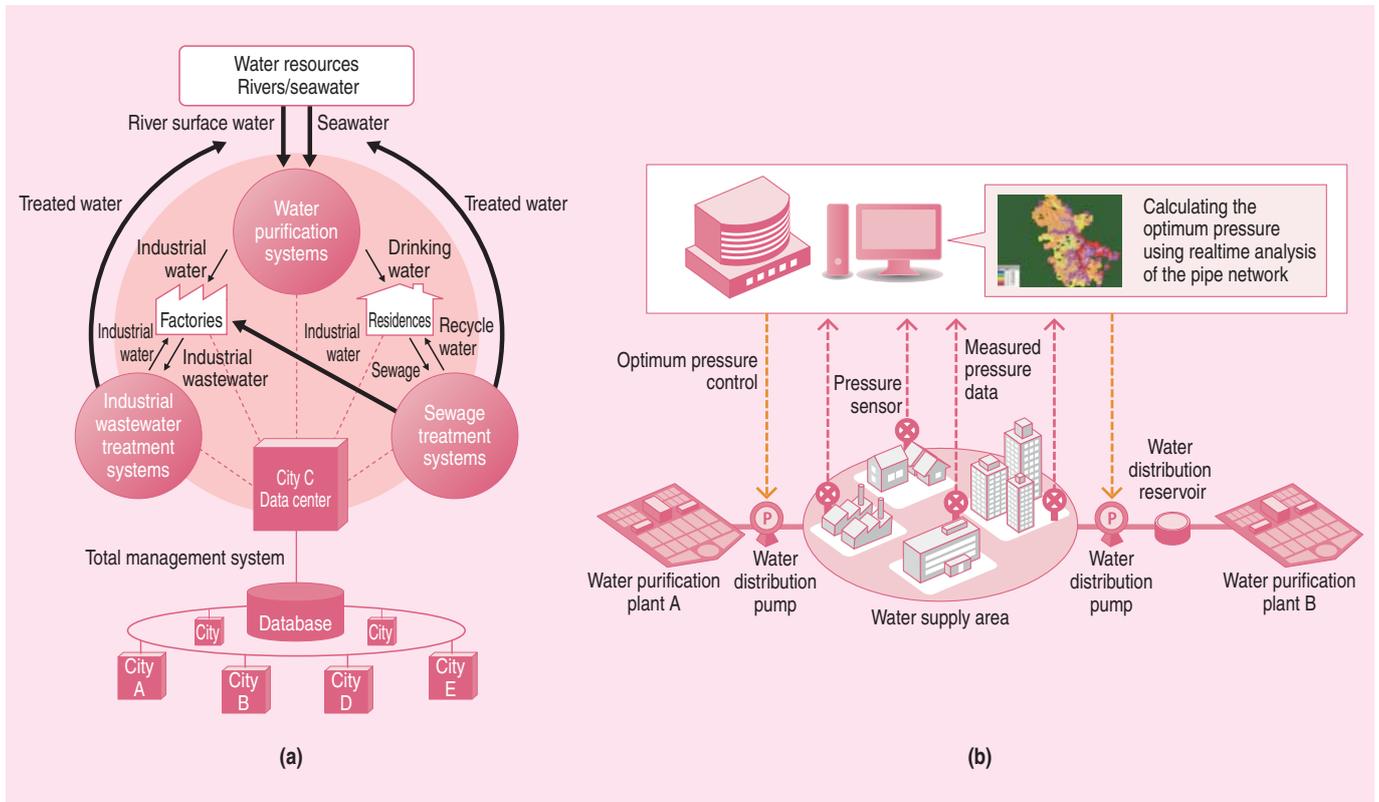
In October 2008 a 7-t test machine began trials with a fire brigade for rescue use in disaster situations. As a result of this

evaluation, two later-generation machines fitted with specialized equipment were formally accepted for use in March 2011. (Hitachi Construction Machinery Co., Ltd.)



7-t double arm working machine

## Intelligent Water Systems for Water Supply Management



Overview of intelligent water systems (a) and water distribution control system (b)

Water is indispensable to our way of life. It is particularly important in various social infrastructure. Therefore, Hitachi has proposed the concept of intelligent water systems, which aims to raise the reliability of the entire water cycle of cities or regions, and to manage it effectively. Hitachi is planning to solve problems by unifying its various products and systems using information technology.

Hitachi proposes optimization of water supply management by using the following systems, for example: (1) a water supply control & management system, (2) a water supply facilities information management system, and (3) a water distribution control system.

The water supply control & management system (1) is a system for the total management of multiple facilities related to the water cycle, from water source to water distribution. Daily forecasts of water demand are made based on weather and other parameters, and from the analysis of historical data. Using this forecast demand, optimization techniques are used to plan water management and estimates are made of the environmental impact. Water management involves planning water intake and distribution as well as the operation of purification plants and reservoir management.

The water supply facilities information management system (2)

utilizes electronic data in a geographical information system (GIS) to provide effective management of the water supply pipe network. It also provides simulation functions that assist with planning of pipe-laying work, including display of areas where water will be cut off during maintenance work and forecasts of where rusty water will occur. Other functions that can be added to the system include management of equipment records and analysis of the pipe network.

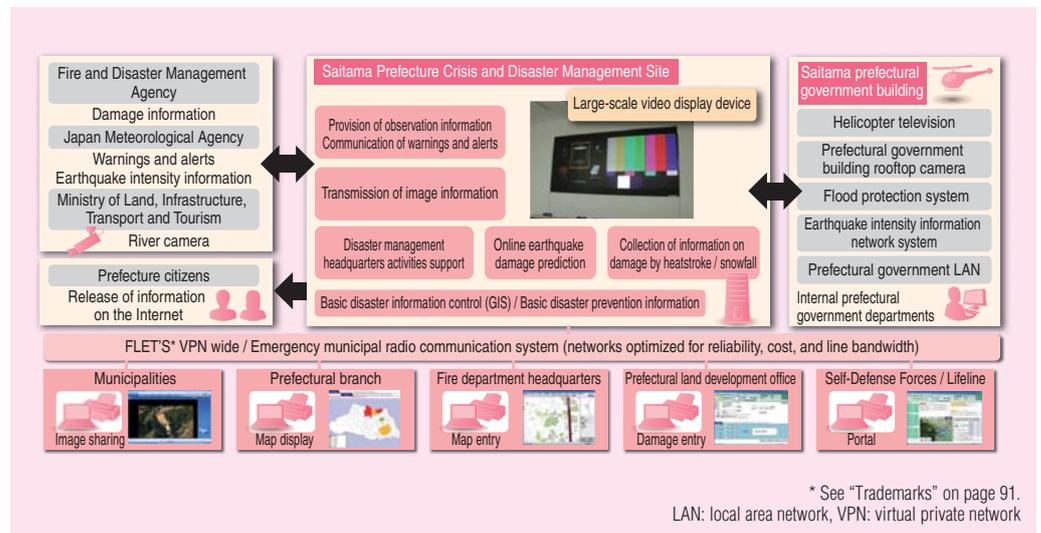
The water distribution control system (3) manages the water pressure across the entire network, from the water purification plant to end-users. It uses data collected from pressure and flow meters installed in the network to perform realtime pipe network analysis and calculate the optimum discharge pressure for water distribution pumps. By controlling pumps and valves, it can optimize the water pressure across the entire network, helping conserve energy and reduce water leaks. This control system has been used in Japan for more than 10 years.

Hitachi is building up its expertise in the operation and management of water supply and sewage systems with the aim of operating its water supply and sewage services business on a global scale. This will allow Hitachi to expand into comprehensive water services from its prior focus on engineering, procurement, and construction (EPC) business.

## Saitama Prefecture Disaster Information System

In March 2011, a large-scale video installation consisting of eight 67-inch large-scale multi-displays was delivered to Saitama Prefecture, Japan, which had established its Crisis and Disaster Management Site and was improving its response to disasters. In October of the same year, the Saitama Prefecture disaster information system, which had been in development for two years, began full-scale operation.

This system has 11 sub-functions, including communication of warnings and alerts to branches and municipalities in the prefecture, and collection of damage information using the geographic information system (WebGIS). Compared to previous systems, this system has been well-received by Saitama Prefecture for its additional functions, which include the provision of image information from river cameras, predictions of earthquake damage linked to earthquake bulletins, and



Saitama Prefecture disaster information system

collection of information on subjects such as damages by heatstroke and snowfall. The information collected by this system is displayed on the large-scale video device, which allows disaster management personnel to comprehend situations quickly and supports their disaster planning decisions.

## Fire Fighting / Emergency Digital Radio

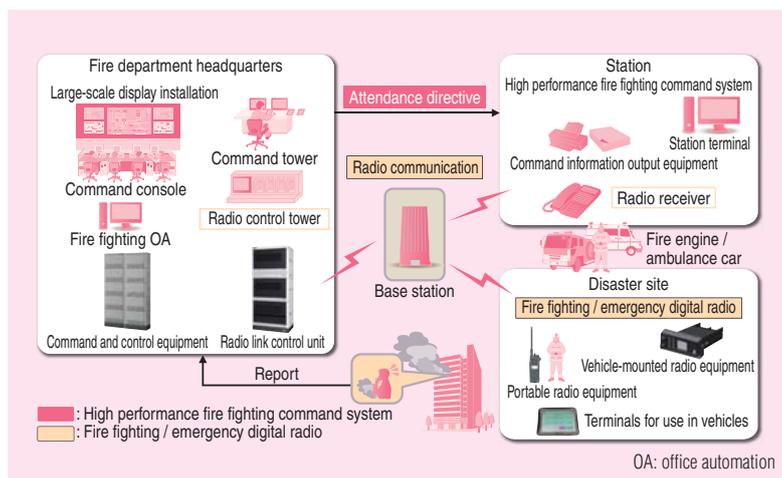
The fire fighting / emergency radios utilized by fire departments throughout Japan are used for communication between disaster sites and headquarters. The need to improve radio use and efficiency in using radio waves has prompted the move to end the use of these radios by the end of May 2016, when it has been decided

that radio use will shift from the current analog (150-MHz band) to a digital (260-MHz band) system.

Hitachi Kokusai Electric Inc. took part in a proof of concept trial held by the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications, Japan at the fire department headquarters in Tamano City, Okayama Prefecture, in fiscal 2010, where it gained a track record in the development and construction of digital radio systems for fire fighting and emergencies. These digital radios are used to establish close connections with fire department command systems through radio control towers, and since improvements to these command systems are needed for such installations, it is predicted that there will be an increasing number of cases in which the command systems and radios will be updated at the same time.

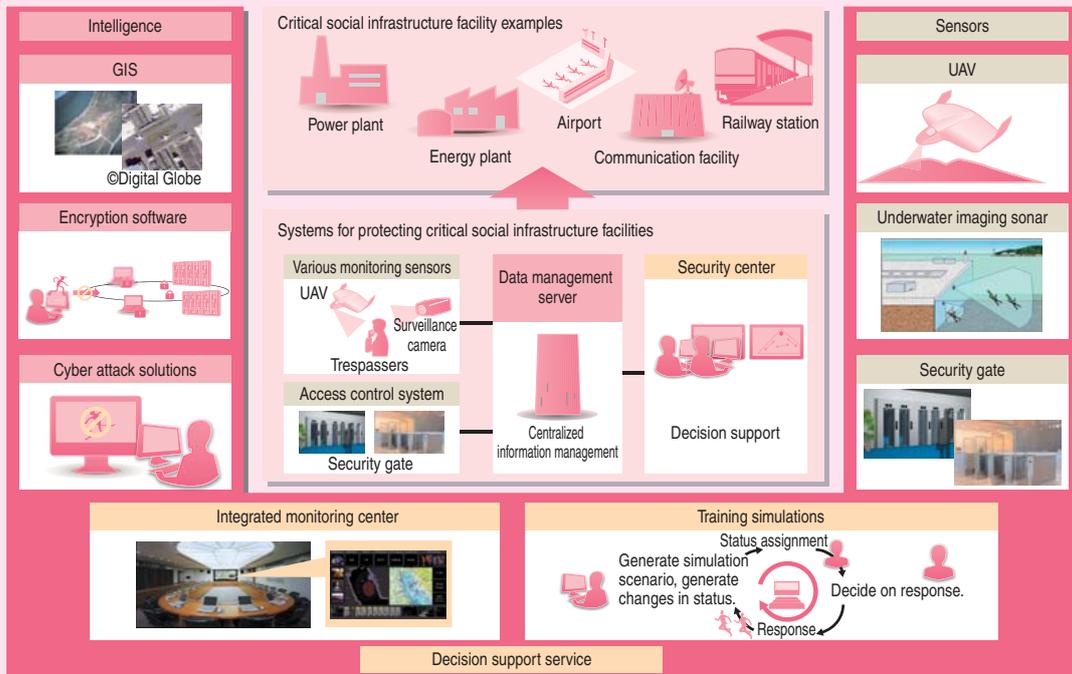
Among these market trends, in fiscal 2011 Hitachi, Ltd. received an order for the first bulk update at the Hitachi City Fire Department, the first such order in Japan, through its connections with Hitachi Kokusai Electric (delivery planned for March 2013).

Hitachi intends to build on the know-how accumulated through construction of these systems to develop them at fire department headquarters across Japan.



Fire fighting command systems and fire fighting / emergency digital radio for fire department headquarters

## Solution for Security of Critical Facilities Systems



GIS: geospatial information system, UAV: unmanned aerial vehicle

System solutions for protecting critical social infrastructure facilities

Ensuring the security of social infrastructure facilities, such as energy, transportation, and communications, is essential for a safe and comfortable society.

Hitachi utilizes the risk management technologies and know-how it has gained through its experience working for the Japan Ministry of Defense and Japan Self-Defense Forces to supply solu-

tions that satisfy diverse security needs.

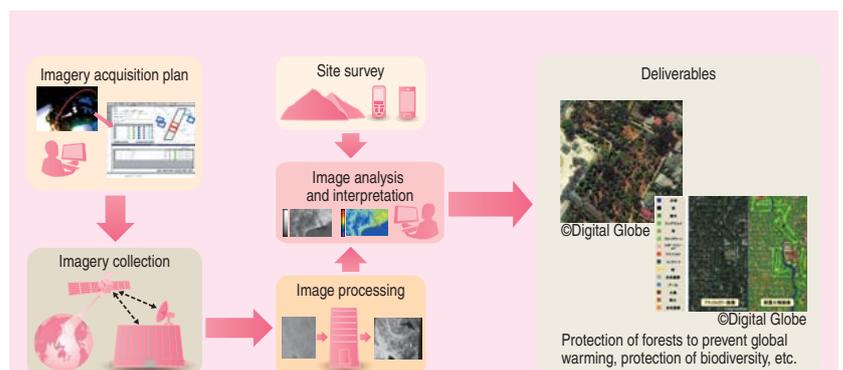
To build a safer and more comfortable society, Hitachi offers multi-level security systems that meet user needs by integrating various technologies, including cyber/physical security, information analysis and visualization, and decision support and training simulations.

## Satellite Imagery Solution

Hitachi draws on its experience in the development of satellite imagery systems to deliver solutions that use satellite images to support environmental protection.

Keeping the global environment requires regular monitoring of forest areas. Reducing greenhouse gas emissions is recognized as an important challenge for mitigating climate change and conserving biodiversity.

Ground-based sensors are inadequate for wide-area or global monitoring. Instead, Hitachi is contributing to the protection of the global environment by supplying satellite imagery solutions using Earth observation satellites.



Satellite imagery solutions for protecting the global environment

## Development of VCB (with Life of 300,000 Switching Operations) for Use in High-speed Trains in China

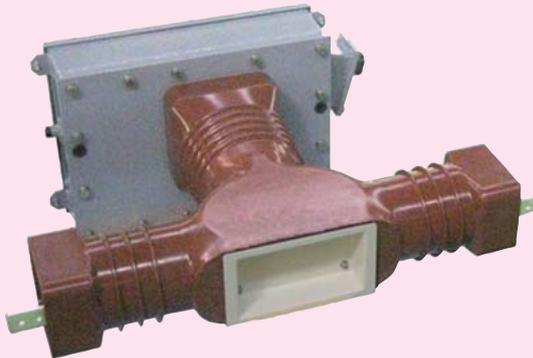
Hitachi is the sole supplier of the vacuum circuit breakers (VCBs) used on the Shinkansen trains in Japan, and has now supplied 2,000 VCBs to The Ministry of Railways of The People's Republic

of China for use on high-speed trains. Because operating practices on the Chinese railway system involve more frequent use of circuit breakers than in Japan, the VCB life (number of open/close operations) is an important specification.

However, while most circuit breakers made by European suppliers have a life of up to 250,000 cycles, the Hitachi model was only rated for 100,000. While some orders could be anticipated based on the current model's track record and reliability in Japan, Hitachi decided to develop a new model that would surpass the industry average with a life of 300,000 switching operations in expectation of customer demands to reduce running costs, and in recognition that faster train speeds in the future would result in an increase in the frequency of switching.

The development, which is now complete, included the upgrading of components to improve their reliability and cope with the shock of repeated switching, designing the new model to have the same overall dimensions as the current VCB to allow for replacement, and conducting testing with an emphasis on durability, including continuous switching tests under both load and no-load conditions.

As well as working to expand Chinese orders for the new VCB with a life of 300,000 switching operations, Hitachi is also seeking to certify the new model under International Electrotechnical Commission (IEC) and other international standards with the aim of also marketing the product in other countries.



Parameter	Current model	New model	
Rated voltage	30-kV AC	30-kV AC	
Rated current	200 A	200 A	600 A
Electrical operation cycles	100,000	300,000	100,000
Mechanical operation cycles	100,000	300,000	
Rated circuit breaker capacity	100 MVA	100 MVA	

AC: alternating current

VCB with life of 300,000 switching operations

## Industrial Computer "HF-W2000 Model 35/30"

As computers with long service lives Hitachi's HF-W series industrial computers are widely used in supervisory and control systems as well as in disaster prevention systems.

Nowadays, industrial computers are gaining attention for their compactness, their reliability, their ability to withstand long-term use for terminal applications, and as embedded devices in information-related fields such as information, communications, and broadcasting. In response to this, Hitachi has developed its latest model, the HF-W2000 model 35/30.

This product is capable of functioning in temperatures of 5–40°C, which is important for embedded-equipment applications and work place terminals, and features backwards compatibility with previous systems (ongoing support for Windows XP and PCI\*) as well as new functionality (new support for Windows 7 and PCI Express). Additionally, the HF-W2000 is quiet and offers dual display in full high definition (HD), allowing it to be used long term for building security and call center applications, and for counter displays. It is also compliant with Voluntary Control Council for Interference

by Information Technology Equipment (VCCI) regulations on electromagnetic interference conforming to Class B standards, which are intended to allow for use in the medical, telecommunications, and broadcasting fields where any effect on peripheral equipment is problematic.

\* See "Trademarks" on page 91.



**Model 35**  
Intel Core<sup>®</sup> i7-610E processor  
(2.53 GHz)

**Model 30**  
Intel Celeron<sup>®</sup> P4505 processor  
(1.86 GHz)

Width x Depth x Height: 93 x 356 x 325 mm

**Equipped with the necessary functions for terminal applications**  
Offers dual-monitor and full HD display capabilities required for counter terminals.  
Reduced fan noise to a level not noticeable in a normal office environment.

**Compatible with both legacy and current operating systems**  
Offers ongoing support for Windows XP, which has a proven track record in industrial systems, as well as compatibility with Windows 7, allowing smooth migration of existing systems.

**Designed for a long service life**  
Intended for seven years of round-the-clock operation  
This is approximately four times the operating life of a standard general purpose PC (with a service life of five years of eight hours' operation per day)

\* See "Trademarks" on page 91. PC: personal computer

HF-W2000 model 35/30 industrial computer

## New Programmable Logic Controllers for Control System

The new programmable logic controllers (PLC) for control system were developed to expand Hitachi's control system business in the international market, offering greater panel wiring efficiency than existing models, while improving functionality and performance. The PLC is a computer unit consisting of a central processing unit (CPU) card, a telecommunication adaptor card, and other components, while the process input/output module (PI/O) acts as an input/output interface for control objects.

The new serial communication interface supports the PLC in improving processing performance and providing multiplexing (including triplication). Since it can be fitted with existing telecommunications cards, the PLC can also be used for replacement of existing equipment mainly in Japan.

The PI/O can be connected directly to a new serial communication interface and can be mounted vertically in order to improve panel wiring efficiency. Featuring cable connection terminal blocks and modules that have been separated for easier maintenance, the PI/O utilizes newly-developed large scale integration (LSI) for connection to an R.Link, making expansion of its capabilities simple. Additionally, support is planned for globally standard interfaces and efforts are currently underway to make the



Programmable logic controllers and concept image of mounted PI/O units

PI/O compatible with open architecture standards.

New serial communication interface has been newly-developed and utilizes relay wiring for compatibility with star connections, circuit redundancy, and large scale systems (connection with 1,280 PI/O blades). It supports a transmission rate of 20 Mbit/s, facilitating the use of hardware transcription to collect reliability, availability and serviceability (RAS) information, and simplifying fault analysis.

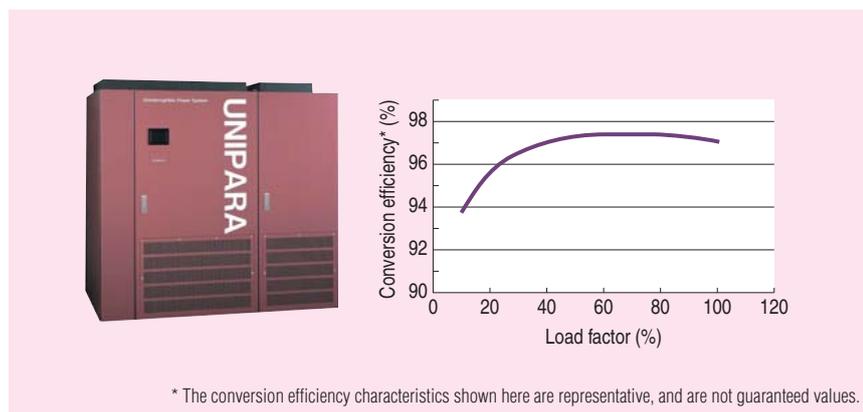
The first new PLC for control system are scheduled for release for thermal power stations in fiscal 2012, and Hitachi plans to expand their capabilities, broadening the range of applications for which they are suited.

## Ultra-efficient 500-kVA UPS

Hitachi's uninterruptible power systems (UPSs) have gained a reputation for their reliability, high efficiency, compact size, expandability, and low running costs. The 500-kVA UPS newly added to the series aims for even higher efficiency.

Hitachi's UPS features three-level converting circuits that greatly reduce loss generated in switching elements, achieving a conversion efficiency of 97%. Furthermore, it utilizes improved filter circuits to cut down fixed losses, and has improved efficiency at load factors between 30% and 80%, which is the practical level of use for this equipment. Hitachi's UPS is designed to reduce the cost of electricity and cooling equipment by reducing energy consumption through increased efficiency. Therefore, Hitachi's UPS can help to make rapidly expanding Internet data centers (IDC) greener.

It is compatible with a range of different highly-reliable systems, including system structures featuring parallel redundant systems, common spare systems, and dual systems that have been handled with the existing UPSs, and allows Hitachi to offer UPS systems that are optimized for specific applications.



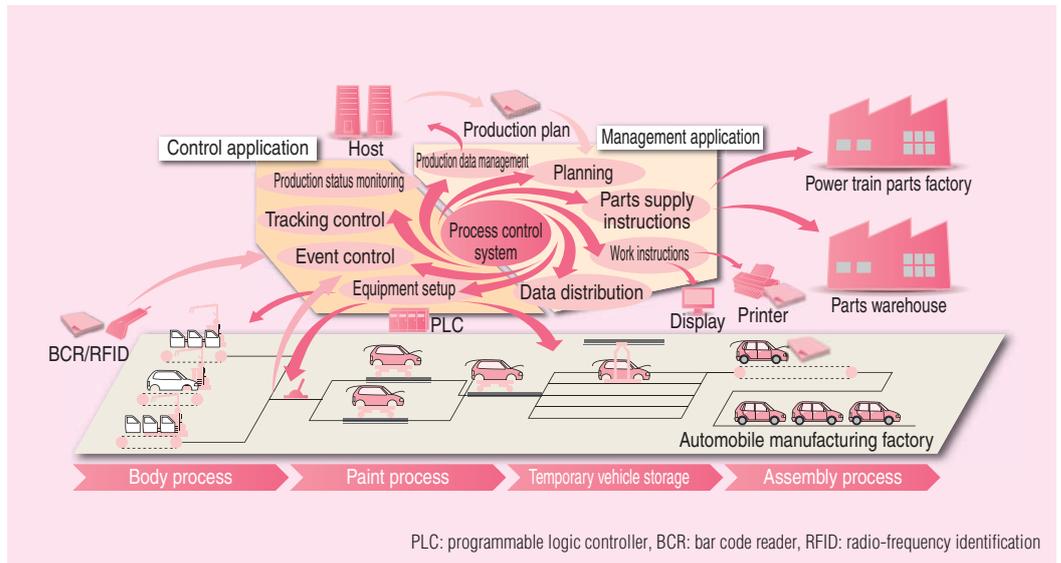
An exterior shot of the ultra-efficient 500-kVA three-level UPS, and its conversion efficiency characteristics

## Process Control System for the Automotive Industry

This manufacturing execution system (MES) software package provides process control for vehicle production in accordance with manufacturing plans.

The number of vehicles manufactured in developing nations, where Hitachi would like to deploy this system will increase rapidly in the future, and moves to make production more efficient are anticipated. It is possible to automate and optimize manufacturing to a certain degree only through the management functions for an overview of production. However, the increase in production quantities means that production takt time is as low as one minute per product on production lines where high levels of efficiency have been achieved, leaving little time to spare for decision making on the production floor.

In answer to such increases in manufacturing volumes, Hitachi has released this system, which focuses on control functions,



Function diagram for the process control system for the automotive industry

featuring tracking control capable of dealing with increases in data volumes and transit points, and on enhancing equipment setup functions in areas such as body manufacturing processing and temporary vehicle storage locations.

Hitachi will continue to develop packages to expand international businesses.

## IE3-compatible Three-phase Induction Motors (Compatible with the Top-runner Program)

In recent years, concerns about global warming have created a heightened need for energy conservation, and higher efficiency is required for electrical motors in particular, since they create

approximately 40% of the demand for electricity. To that end, the International Electrotechnical Commission (IEC) 60034-30 was established in order to unify the levels of high-efficiency motors around the world. Regulations based on the efficiency levels defined by the IEC have been enacted in every country; in Japan's case, the Top Runner Program has been put into place.

Against such a background, Hitachi has developed a series of three-phase induction motors (0.75–300 kW, 2P, 4P, 6P) matched to the levels of this program. Three-dimensional analysis was used to optimize the designs of the motors and achieve high levels of efficiency. The main features of these motors are as follows:

- (1) They meet efficiency standards.
- (2) They have the same mounting dimensions as existing standard motors.

[Dimensions according to Japanese Industrial Standards (JIS) C4210]

Use of the motors will be extended to a range of proprietary products, responding to the demand for energy conservation in more environments where motors are used.

(Hitachi Industrial Equipment Systems Co., Ltd.)



IE3-compatible three-phase induction motor (3.7 kW, 4P)

## Expansion of Oil-free Booster Compressor Series

Oil-free booster compressors are energy-saving compressors that lower the main pressure of factory air systems, and contribute to



3.7-kW (left) and 11-kW (right) oil-free booster compressor

reducing the energy required to supply the necessary amount of air, at the necessary pressure, to the necessary location.

Hitachi has developed packaged, silent-type 3.7-kW, 11-kW, and tank-mounted 11-kW oil-free booster compressors in order to expand the series. The main features of these models are as follows:

(1) Capable of reducing the main pressure of the compressors used as air sources in factories by supplying higher pressure from the oil-free booster compressor, reducing compressor power consumption throughout the factory, and also improving specific energy consumption.

(2) If a fall in suction-side air volume causes the air pressure to drop, the air compressor stops automatically, preventing unnecessary operation and reducing energy consumption further.

(3) Equipped with adjustable pressure switches to control off-operation pressure and the control pressure range (differential) for switching operation on and off.

(Hitachi Industrial Equipment Systems Co., Ltd.)

## Amorphous Transformers

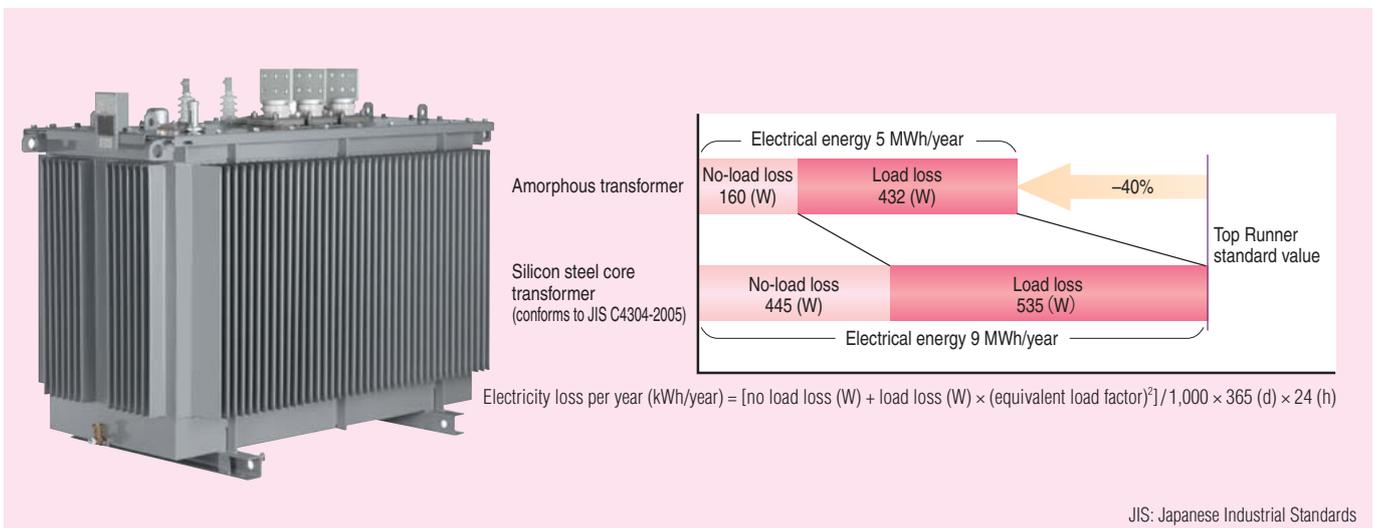
Compared to existing electrical steel transformers, amorphous transformers exhibit excellent energy conservation characteristics for electricity loss reduction, but have tended to become structurally larger in terms of size and mass. To that end, Hitachi has taken its transformers through a series of model changes, aiming to achieve higher efficiency and lighter weight. This has led to the release of a new series of amorphous transformers to replace the previous models.

The amorphous transformers utilize a newly-developed high-flux density amorphous material that is an improvement over the

characteristics of iron core materials used in transformers, attaining higher efficiency and lighter weight than previous models. The new series of transformers offer a 40% loss reduction compared to Top Runner standard values, and up to 22% reduction in weight (three-phase 300 kVA, 50 Hz), resulting in improved energy conservation performance and easier installation.

These transformers show promise as energy conservation tools for transformer customers.

(Hitachi Industrial Equipment Systems Co., Ltd.)



Exterior of an amorphous transformer and a loss comparison with Top Runner standard values (for an example of three-phase 300 kVA, 50 Hz, at a load factor of 40%)

## Improved Environmental Compatibility of the RX Series of Industrial Inkjet Printers

Industrial inkjet printers are used in a variety of industrial fields as equipment to print information such as dates and serial numbers. Following business environmental protection initiatives, there has

also been a call for the ink materials used for printing to shift to substances that pose less of a burden on the environment. Accordingly, Hitachi has added a range of inks that take these factors into

account to its lineup, seeking to reduce the environmental impact of printing. The main features of these inks are as follows:

- (1) Use of ethanol (which has a small environmental impact) as a primary solvent
  - (2) Excellent visibility even when printing on aluminum cans, on which printing smears easily
  - (3) Can also be used to print on recycled containers.
- (Hitachi Industrial Equipment Systems Co., Ltd.)



RX series industrial inkjet printer and ink lineup

## Cooling Heat Pump Inverter Screw Chiller Unit

Cooling heat pump inverter screw chiller units that supply hot and cold water using air as a heat source [cooling / heating capacity: 265/300 kW (50/60 Hz)] utilize a newly-developed screw compressor to circulate coolant, as well as an internal compression prevention system to achieve a significant increase in yearly energy consumption efficiency. Additionally, they utilize an inverter-based revolving speed control to regulate capacity, and improved load following for water temperature control, making them suitable for year-round cooling and industrial applications.

Ejecting water with temperature up to 60°C has been achieved during heating operations, allowing the products to cope with high temperatures and size reductions for thermal energy storage units when used for cooling. Furthermore, reductions in product size and the ability to install in series allow installation space to be reduced. Moreover, these products feature an internal unit control function for operation, making a dedicated controller unnecessary, and permitting the construction of large scale heating systems consisting of multiple linked units.

Hitachi will continue its efforts related to small volume devices with improved yearly energy consumption efficiency. (Hitachi Appliances, Inc.)

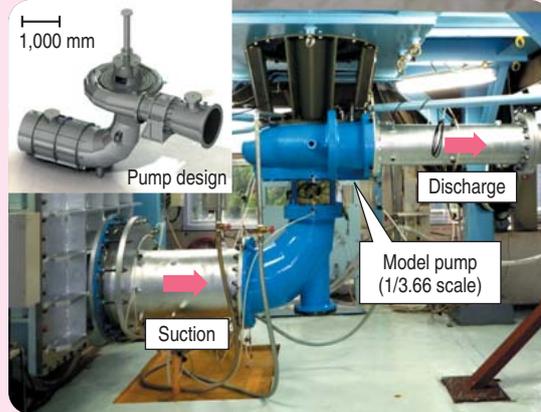


Cooling heat pump inverter screw chiller unit

## Pump for the Shanxi Wanjiashai Yellow River Diversion Project in China

Hitachi has won an order to supply pumps (eight vertical-shaft, single-suction centrifugal pumps with a 2,000-mm diameter) to phase II of the Shanxi Wanjiashai Yellow River Diversion Project from the Shanxi Wanjiashai Yellow River Diversion Project Corporation in China. The project is one of the largest water diversion schemes in the world. It is intended to resolve chronic water shortages by taking water from the Wanjiashai Dam constructed on the Yellow River and carrying it along more than 400 km of waterways with five pump stations arranged in series to supply water to Taiyuan City in southern Shanxi Province and Datong City in the north.

The pumps are large, high-capacity units with an output of 12,000 kW each and an impeller diameter of approximately 1,700 mm. To achieve a world-leading level of pump efficiency, the pumps incorporate proprietary flow optimization methods based on use of computational fluid dynamics (CFD) for hydraulic design development and visualization of the internal flow. This has resulted in the pump efficiency exceeding the requirements (actual pump efficiency of 93.2% for high-lift pump and 93.9% for low-lift pump). These high-precision pumps, which are now under construction, comply with International Electrotechnical Commission (IEC) standards and incorporate the latest technologies to overcome the numerous technical challenges, which included the highly abrasive charac-



Item	High-lift pump specifications		Low-lift pump specifications	
	Type	Vertical-shaft, single-suction centrifugal	Type	Vertical-shaft, single-suction centrifugal
Diameter		φ2,000 mm		φ2,000 mm
Discharge		6.45 m <sup>3</sup> /s		6.45 m <sup>3</sup> /s
Design head		140 m		76 m
Speed		600 min <sup>-1</sup>		500 min <sup>-1</sup>
Pump efficiency		> 91%		> 91%
Motor output		12,000 kW		6,500 kW
Quantity		6 units		2 units

Model pump test unit (top) and pump specifications (bottom)

teristics of the Yellow River water. Hitachi has been contributing to the large water diversion schemes worldwide. This project represents a first step in China.  
(Hitachi Plant Technologies, Ltd.)

## CE Marking Certification for Oil-free Screw Compressor

The AIRZEUS<sup>\*1</sup> SDS-U series oil-free screw compressor is a general-purpose air compressor used in a range of different industries, including use as a power source for different types of air tools. It features better energy efficiency resulting from structural

improvements to the air block (air compression area), easier operation using a liquid crystal display (LCD) color touch panel, and quieter operation due to a new silencer design and structural changes to the silencer cover. A large number of units have already been sold since its release in January 2009, primarily in Japan and Southeast Asia.

The AIRZEUS SDS-U series has now obtained CE marking certification in preparation for sales in the European Union (EU). CE marking is a safety mark that must be carried by designated products distributed and sold within the EU. Certification for the AIRZEUS SDS-U series was issued by TÜV Rheinland<sup>\*2</sup>, a neutral and independent, specialist third party agency.

In the future, Hitachi intends to commence sales in the EU and accelerate the product's global rollout.  
(Hitachi Plant Technologies, Ltd.)



AIRZEUS SDS-U series oil-free screw compressor

<sup>\*1</sup> AIRZEUS is a trademark of Hitachi Plant Technologies, Ltd.

<sup>\*2</sup> A third party certification agency headquartered in Germany that performs safety testing and certification for electronic and electrical equipment, vehicles, and other industrial products.

## Large Compressor for Manifa Central Processing Facilities of Aramco Overseas Company

In January 2011, Hitachi completed and shipped a large compressor for the Manifa Central Processing Facilities of the Aramco Overseas Company. Supply of the compressor was arranged through Italian company Saipem S.p.A.

The compressor plays a core role in the gas processing and separation equipment for separating the oil and gas components from associated gas, a byproduct of oil production. This application demands a high level of performance of the compressor and over a wide operating range. To satisfy these requirements, three-dimensional impellers were adopted for all compressor stages. Hitachi has been developing these impellers for some time to achieve high efficiency and a wide operating range.

Operational testing of the new compressor verified that it satisfied all of the required specifications and it was able to be delivered on time.

(Hitachi Plant Technologies, Ltd.)



Large compressor for Manifa Central Processing Facilities of Aramco Overseas Company

## Sorting Equipment System / 3PL of Distribution Center for Individual Deliveries

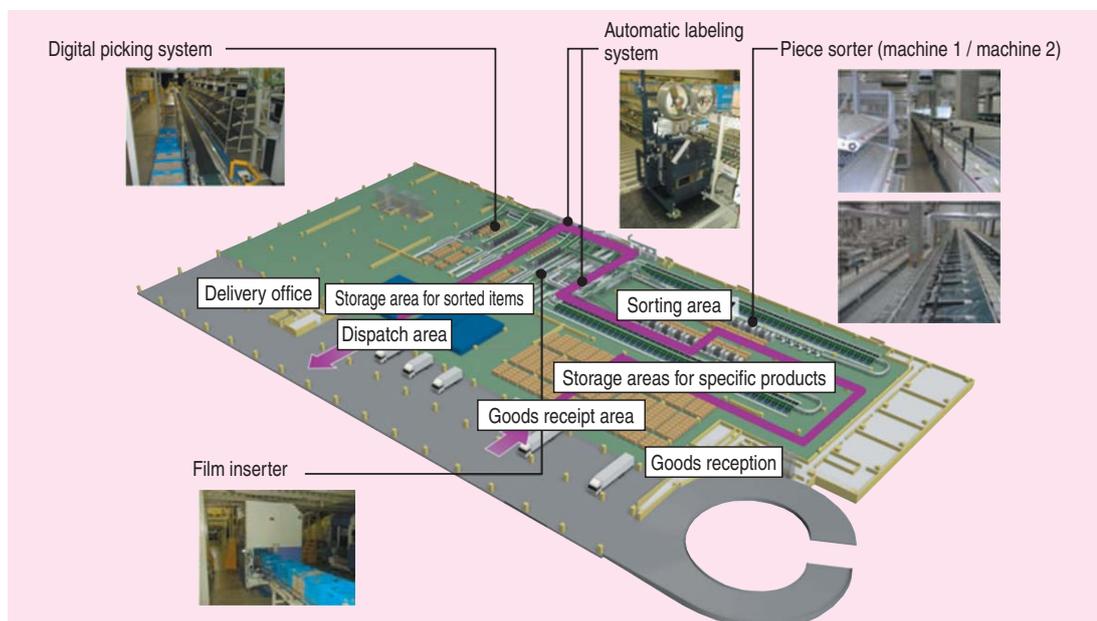
Sorting equipment lines and outsourcing (3PL: third party logistics) have been utilized at the Zama food distribution center, Japan, which handles individual deliveries for the U CO-OP Consumer Co-operative Federation, beginning operations February 2011. It is responsible for the logistics infrastructure used to supply the CO-OP's safe and secure foodstuffs to all of its members in the Kanagawa, Shizuoka, and Yamanashi areas, with

precision and at low cost.

Developed by Hitachi Plant Technologies, Ltd., the sorting equipment line is an installed system able to sort products quickly for delivery to each family of CO-OP members. Consisting of a digital picking system used by many CO-OPs in the past, combined with a piece-sorting system, the sorting line has been integrated under a high-speed control system to allow high-speed

sorting with low staffing numbers. Additionally, Hitachi Transport System, Ltd. acts as a third party logistics provider, handling center management such as sorting operations, inventory management, and delivery, and provision of assets including the sorting equipment lines.

Hitachi intends to build on its achievements with this distribution center to cater to similar distribution centers for delivery to individuals, in industries such as the mail order business.



An overview of the sorting distribution center for CO-OP members at Zama food distribution center of the U CO-OP Consumer Co-operative Federation

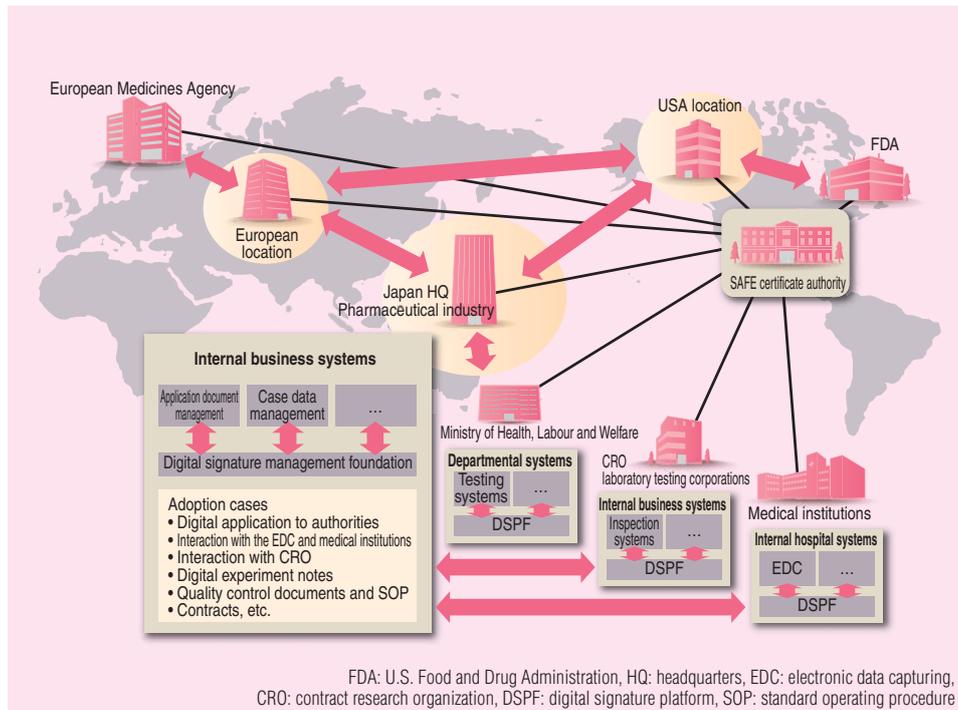
## A Digital Signature System for the Pharmaceutical Industry

Digital signatures are a technology for verifying the authenticity of signatures attached to electronic documentation when it is sent or received, and for preventing the falsification of data during trans-

mission. In the pharmaceutical industry in Europe and the USA, Signatures and Authentication For Everyone (SAFE) standard digital signatures have become the de facto standard for data exchange between businesses, and for the creation, sending, and storage of documentation submitted to supervisory administrative bodies.

As a member of the SAFE-BioPharma Association, a USA non-profit organization that promotes the SAFE standard, Hitachi is able to offer digital signature solutions based on this standard. Hitachi obtains information related to digital signatures for the international pharmaceutical industry in a timely manner, and has had proof-of-concept tests conducted in Japanese pharmaceutical industries and medical institutions, and briefings for Japanese industry groups, promoting the implementation of the SAFE standard in Japan.

Hitachi will develop infrastructure systems and applications for the exchange and sharing of highly confidential digital information that makes use of the SAFE standard.



A digital signature system for the pharmaceutical industry that facilitates the sharing and exchange of digital information

## Cold Rolling Mill for North America

The pickle line and tandem cold rolling mill (PLTCM) 1 continuous pickling cold rolling mill supplied to Severstal North America, Inc. (SNA) has entered commercial operation and is operating successfully.

The plant is intended to produce high-grade automotive sheet steel, and represents the first time that Hitachi has supplied electronic equipment for a cold rolling mill in North America. The plant has been well received thanks to its use of advanced technologies, including comprehensive automation that eliminates the need for hardware switches in operation panels, and high-performance insulated-gate bipolar transistor (IGBT) drives. Based on the success of this project at SNA, Hitachi has won an order for the electrical system for a PLTCM from Ternium S.A. de C.V. of the United Mexican States. The project involves Hitachi acting as a partner to North American supplier Rockwell Automation, Inc. This enables local sourcing of some equipment and comprehensive post-commissioning support.

Along with expanding sales of electronic equipment in the North American market, Hitachi is also looking to extend its markets into Central and South America in the future.



PLTCM 1 continuous pickle line and tandem cold strip mill

## Electrical Control System for Hyper UCM Laboratory Rolling Mill

Mitsubishi-Hitachi Metals Machinery, Inc. has completed construction of its Hyper UCM\* laboratory rolling mill.

The Hyper UCM is a coil circulation type continuous cold rolling system that incorporates a welder and looper located

between the payoff reel (uncoiler) and left tension reel (left-side coiler). Coils are welded together to allow continuous rolling, and then cycle back to the entry-side so that the target strip gauge can be achieved in multiple passes.

The electrical control system uses newly developed control technologies to perform continuous cold rolling using coil circulation. Among these, key new technologies include looper position and tension control that operates in coordination with the welder, gauge control technology that can cope with rolling at extremely low speeds during welding, a flying roll gap opening technique to allow the weld point to pass during continuous rolling, and remote monitoring and maintenance of the electrical control system. The mill is used to evaluate their functions and control system performance.

Hitachi intends to utilize the Hyper UCM in the development of new technologies that fuse mechanical and electrical systems.

\* UCM is a trademark of Hitachi, Ltd.



Hyper UCM laboratory rolling mill and control room

## Order for Synthetic Rubber Manufacturing Plant of Asahi Kasei Chemicals Corporation

Hitachi Plant Technologies, Ltd. has received an order for a solution-polymerized styrene-butadiene rubber (S-SBR) manufacturing plant with an annual capacity of 50,000 t to be constructed for Asahi Kasei Chemicals Corporation on Jurong Island in Singapore (scheduled for completion in January 2013, with operation to commence in May 2013).

Asahi Kasei Chemicals' decision to build this plant was motivated by the rapidly growing international demand for S-SBR, which is ideally suited for use in fuel-efficient high-performance tires, and by the growing market for tire rubber in Asia.

Hitachi is recognized for its know-how and understanding of polymerization processes, its track record in the construction of plants outside Japan, and a level of cost-competitiveness unmatched by other engineering companies thanks to its capabilities that include rigorous global procurement arrangements. As a result, it was awarded the engineering, procurement, and construction (EPC) contract for this plant in January 2011. With plans for further expansion of the plant already in place, Hitachi aims to win orders for additional work.

Hitachi plans to win further EPC contracts from Japanese companies expanding into Asia by using its experience in the execution of this plant.

(Hitachi Plant Technologies, Ltd.)



Groundbreaking ceremony held on June 22, 2011