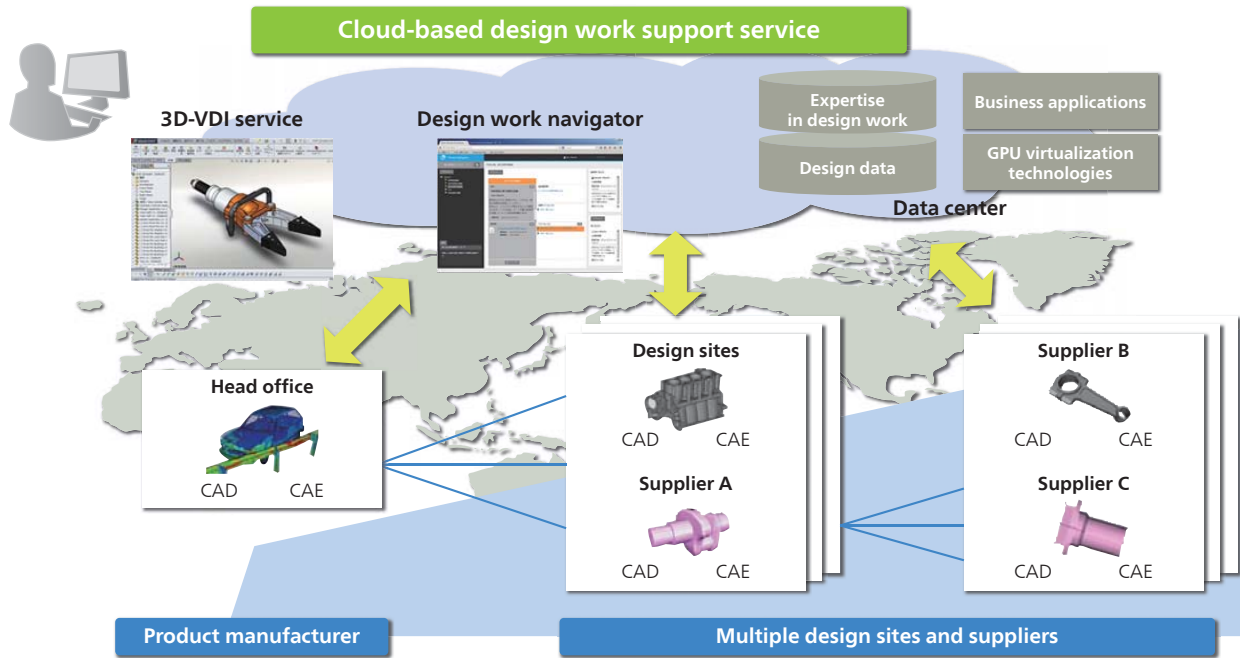


Industry & Distribution



GPU: graphics processing unit

1 Cloud-based design work support service

1 Cloud-based Design Work Support Service

In the manufacturing industry, progress has been made in the practice of coordinated design, whereby multiple companies including manufacturers and suppliers coordinate on design from the initial design stages to drive swift product development. However, the time it takes for companies to share design data with one another and the need to re-work or send back designs due to differing design processes have caused issues.

To address these issues, Hitachi offers a cloud-based design work support service that shares design processes and design data over the cloud. By accessing the design work navigator from their web browser, each designer can share the latest design data using the same design process at any time, and from anywhere. What's more, the software required for design such as 3D computer-aided design (CAD) and computer-aided Engineering (CAE) packages can be used on the cloud through the 3D virtual desktop infrastructure (VDI)* service.

Moving forward, Hitachi will broaden the scope of application for business by expanding the range of service options while helping to reinforce production

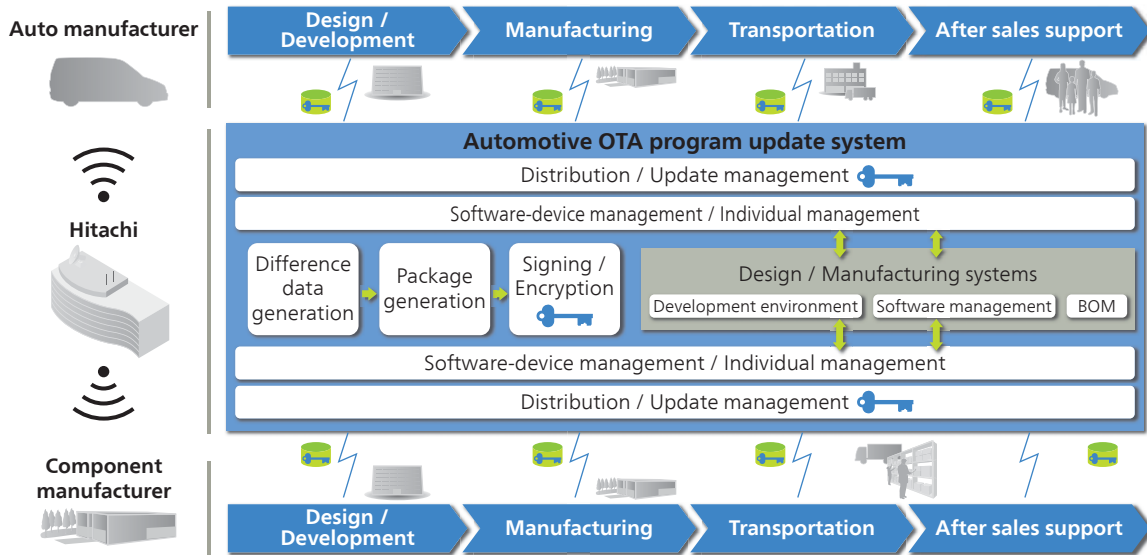
across the entire supply chain that spans multiple companies.

* 3D-VDI: A virtual desktop for 3D-CAD applications.

2 Automotive OTA Program Update System

As one of the core technologies supporting self-driving cars and other next-generation vehicles, Hitachi has developed the over-the-air (OTA) software update system, which updates the software of the electronic control units (ECUs) installed in cars through wireless communications. The system is equipped with security features to ensure safe and secure updates, as well as difference update features that enable high-speed updating. These features help with car security and recall measures, and provide a solution that supports vehicle feature updates in the future.

Software updates currently require extensive person-hours to perform. These updates are not only required for vehicles already on the market, but also in the manufacturing processes (production lines) and transportation processes (ports and vehicle storage



2 Automotive OTA program update system

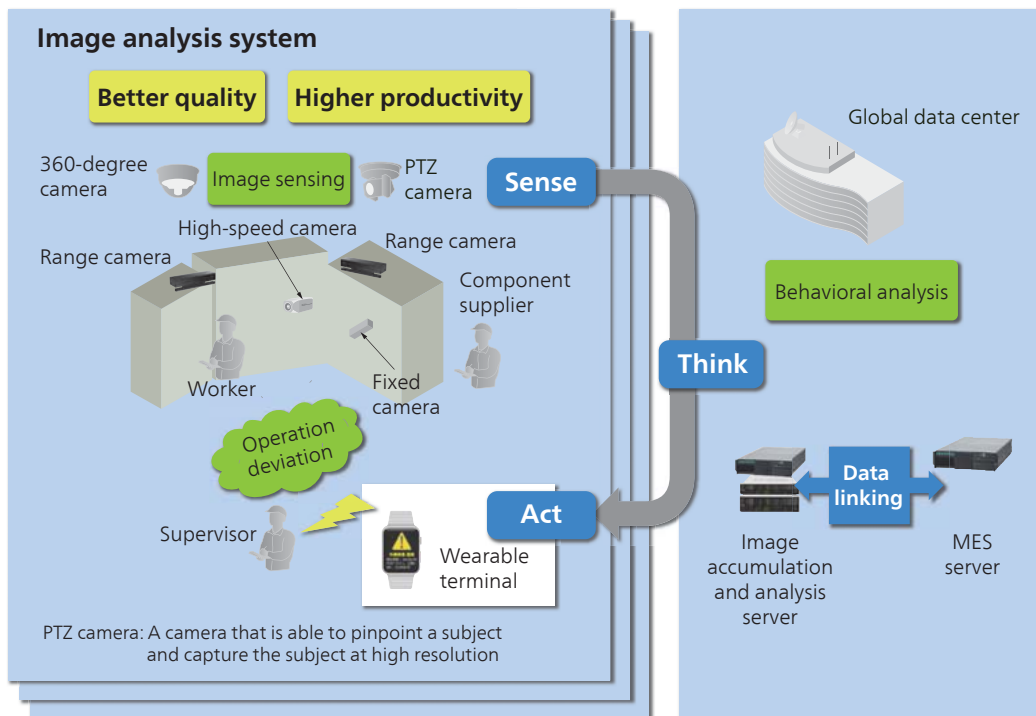
areas) of auto manufacturers, in the manufacturing processes of component manufactures, as well as to update components that are already in the transportation or storage process. To address this need, a solution that combines the ECU development technologies of Hitachi Automotive Systems, Ltd. with the information and communication technology (ICT) of Hitachi, Ltd. to perform software management throughout the entire lifecycle of a vehicle is currently under development.

In the future, by linking design and development technologies such as the manufacturing execution

system (MES) with the individual vehicle management of the OTA software update system and software-device management, Hitachi aims to improve the efficiency of recalls and enhance traceability across the entire lifecycle.

3 Image Analysis System to Detect Operation Deviation by Site Workers and Signs of Equipment Malfunction

In recent years, diversifying market demands and highly sophisticated quality requirements have featured



PTZ: pan, tilt, zoom

3 Image analysis system

prominently in the industrial sector, and various companies are leading advanced research and development to achieve production innovation utilizing new Internet of Things (IoT) technologies.

In the latest of such advancements, Daicel Corporation worked with Hitachi as part of a collaborative creation project to develop an image analysis system designed to improve production quality assurance rates. The system features image analysis technology that detects operation deviation by site workers by analyzing the position of their joints, and also detects signs of equipment malfunction through image data difference analysis. As an integrated system working in conjunction with MES, the detected information is instantly sent to a wearable device used by a supervisor, on which details of the detection and the serial number of the applicable product are displayed. This helps to achieve higher productivity and quality improvements.

Hitachi is currently developing an integrated management solution to support production innovation by combining image analysis systems with artificial intelligence (AI) analysis. This solution service will form the core of Hitachi's IoT platform Lumada and will be provided as a global service to users facing similar market demands and quality requirements.

4 Energy Solutions Utilizing the Self-consignment of Electric Power

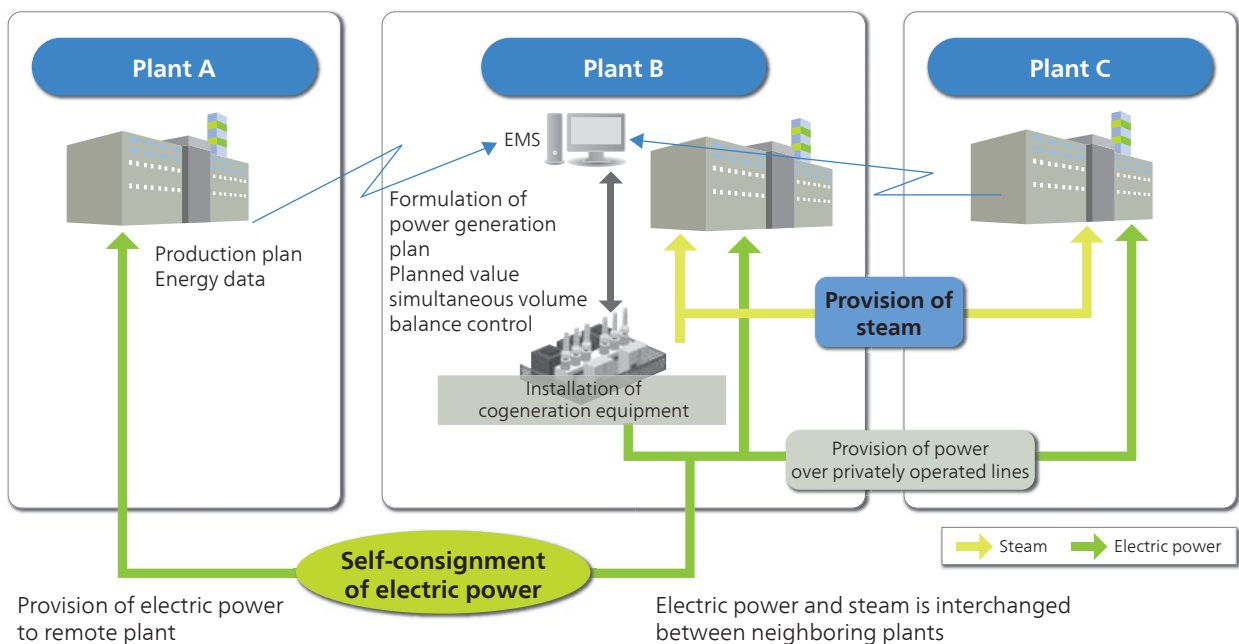
Traditionally, manufacturing businesses that maintain multiple plants have promoted energy savings by optimizing energy on a per-plant basis. However, the

transformation of power systems in recent years has enabled the self-consignment of electric power. This means that electricity and heat generated using cogeneration equipment at plants with high heat demand can be used, and then the excess power can be provided to other plants.

Through its energy management system (EMS), Hitachi has started to offer a system capable of the planned value simultaneous volume balance control that is necessary for the interchange of electric power. This enables company-wide energy optimization while contributing to a reduced environmental load and lower energy costs.

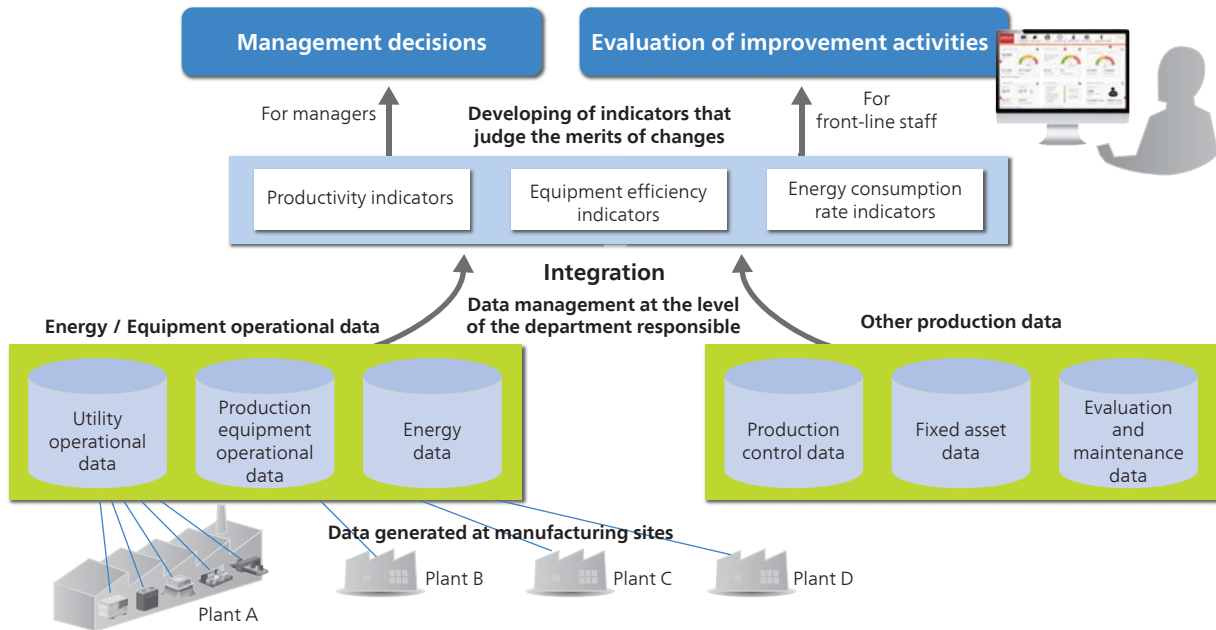
5 Analyzing and Visualizing Management Indicators by Linking Energy and Equipment Operational Data with Production Data

The manufacturing businesses now face a growing need to effectively utilize the various data inside plants to improve production efficiency and quality, and to create new services through their products. Hitachi has developed the energy and equipment management service integrated energy and equipment management service and provides services that manage a wide range of data, including energy, equipment operational status and environmental information. However, to respond to customer needs as the utilization of IoT gathers momentum, there is a need to go beyond the data collected with the energy and equipment management service and offer comprehensive management indicators based on production management information, fixed asset information and equipment maintenance



4 Outline of energy interchange utilizing the self-consignment of electric power

Through a combination of Hitachi energy and equipment management service and Pentaho Software, indicators that judge the merits of changes, such as productivity indicators based on various in-plant data, can be provided



5 Conceptual image of site data utilization in the manufacturing industry

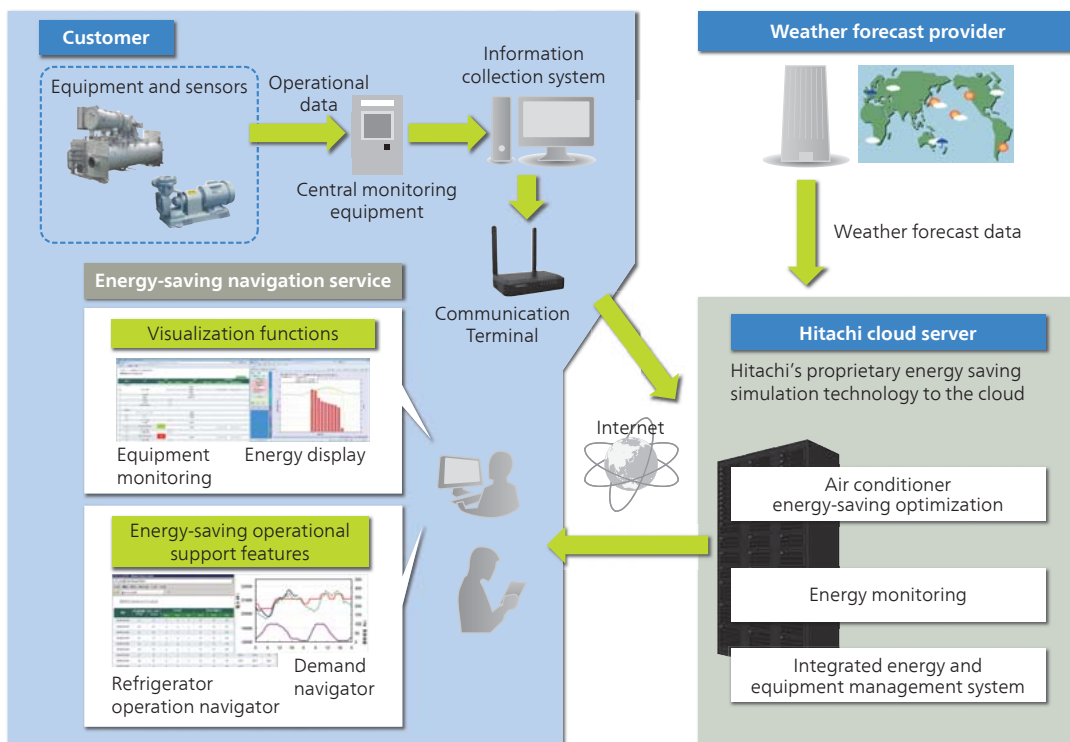
information, as well as to present information that will aid in determining the merits of daily improvement activities at production sites.

To address these needs, Hitachi is currently working on the development of a service that links the energy and equipment management service with the Pentaho data integration and analysis platform software. The solution will employ data analysis to create and display

key performance indicators (KPI) based on increasingly complex and diverse management issues. The service is slated to launch during 2017.

6 Equipment Energy-saving Navigation Service

With cost competition in the manufacturing sector



6 Overview of equipment energy-saving navigation service

spreading around the world, cutting plant operating costs has become a major issue. On the other hand, in terms of the management of plant equipment, the retirement of experienced engineers who have been supporting efficient operation has created a problematic skill vacuum. Given these challenges, Hitachi has begun offering an equipment energy-saving navigation service. The service utilizes functions that calculate the characteristics of equipment and employs technologies to predict the future state of the equipment and simulate its optimum running state. The resultant future equipment operating setting values are then distributed as instructional data.

The service is made up of analysis features that use an IoT platform that collects equipment operating data as well as cumulative data to perform calculations and produce valuable information. This information is then provided through visualization features. Moreover, to enable energy and cost-saving plant operation, an energy-saving operational support feature is also provided. This feature examines utilities such as air conditioning and heat source equipment that consume large amounts of energy at plants, and utilizes weather forecast values and simulation technologies to distribute future energy-saving operational setting values. (Hitachi, Ltd., Hitachi Plant Services Co., Ltd.)

7 Physical Security Solution Integration Platform

Integrated physical security measures are a key challenge

in protecting large-scale infrastructure facilities, plants and commercial facilities from the threat of terrorism.

At the divisions and subsidiaries responsible for physical security systems such as video security, access control and access control for vehicles, the Hitachi Group has refined the technologies and expertise in which each excels. As Hitachi's latest proposition, the physical security solution integration platform combines systems from Hitachi Group companies including network cameras and access control in an integrated fashion to produce a large-scale, wide-area monitoring solution. Further, by performing big data analysis on entrance and exit logs as a result of camera footage-based people flow and behavioral analysis, the platform expands into a problem-solving solution for industry, distribution and commercial facilities.

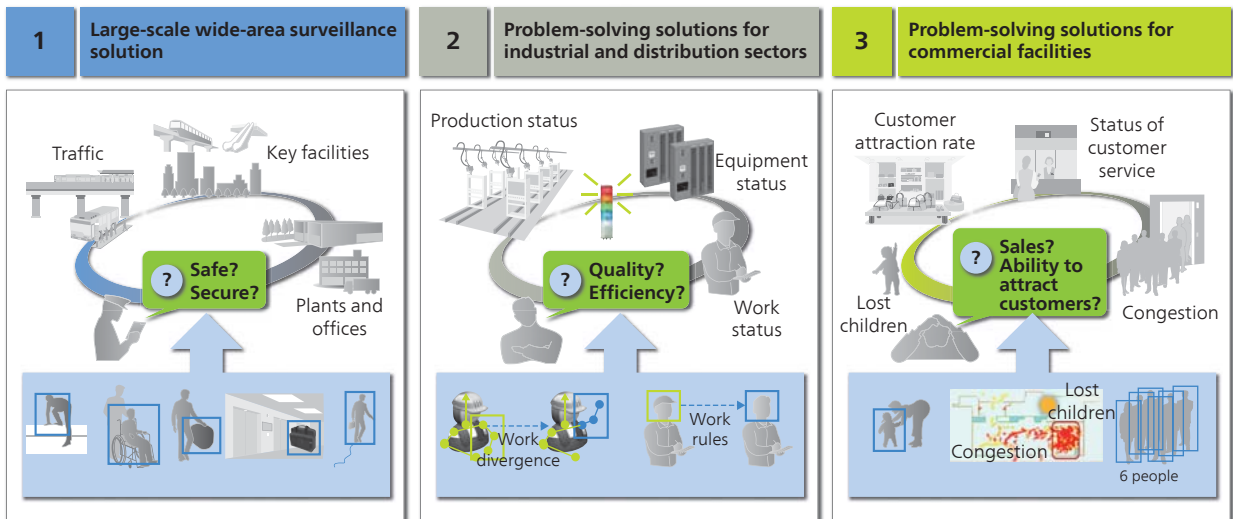
Looking ahead, Hitachi aims to build and install problem-solving systems in short order by accumulating and analyzing data in collaboration with customers, and by utilizing customer know-how.

8 Cloud-based Equipment Maintenance and Facility Management Service Utilizing AR Technologies and HMDs

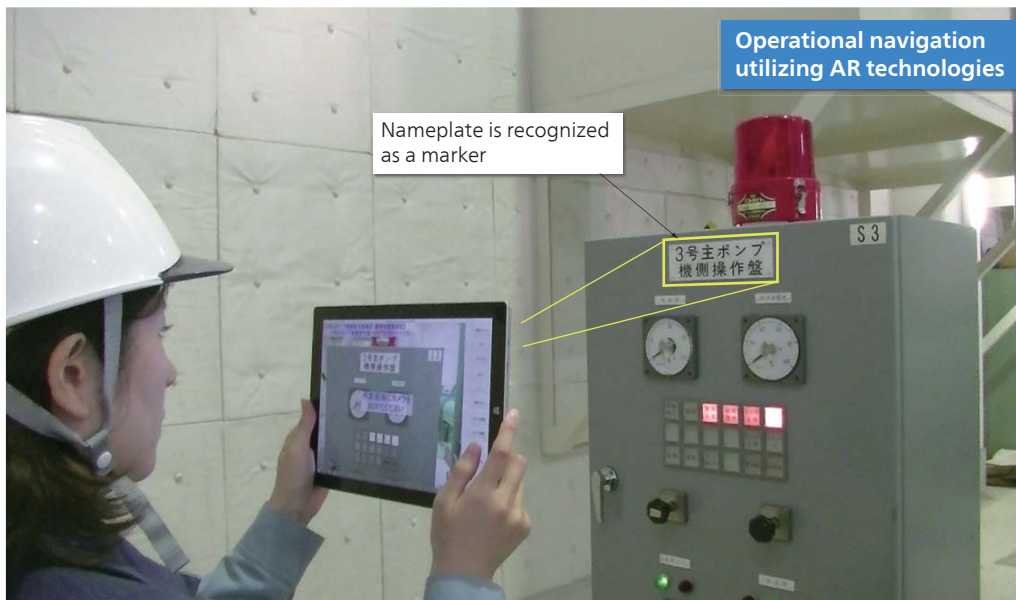
While facility and equipment maintenance and upkeep costs continuing to expand as the aging of Japan's social infrastructure advances, the preservation of maintenance technologies has become increasingly important due to the aging and large-scale retirement of experienced workers. Given this, Hitachi has begun offering a cloud-based maintenance and facility management service

Solutions offered through the physical security solution integration platform

Services go beyond surveillance purposes, effectively utilizing video data to obtain, management, analyze and present information based on on-site data in a centralized way



7 Obtaining, managing, analyzing and presenting on-site information through the physical security solution integration platform



8 AR marker recognition

that combines augmented reality (AR) and head-mounted displays (HMDs) with eye-level cameras in a bid to pass on skilled techniques, improve work efficiency and reduce human error through the use of IT in field work.

When a field worker reads an AR marker or nameplate attached to equipment using a terminal, information superimposed on the actual on-site equipment displays work methods and points of caution is displayed on the terminal screen, and graphical navigation based on a pre-determined scenario will launch. By following the displayed instructions, even an inexperienced worker can proceed with the work accurately.

Through the use of an HMD, managers and field workers can share status information through visual and auditory information when seeking instruction from an expert or experienced engineer, or when dealing with unexpected trouble. This means that a manager cannot only communicate through audio but, based on the images output by the eye-level camera on a worker's HMD, input images and enter text concurrently to provide accurate work support in real-time.

In the future, advances in wearable technologies will make it possible to incorporate sensory data other than vision and hearing, expanding the scope of AR utilization.

9 Hot Strip Mill System for Tata Steel Limited, India

An electrical control system for conventional hot strip mill supplied to Tata Steel Limited of India has commenced production. This is an integrated steel plant that enables production through processing of raw

material to making of steel strip/plate. The plant is designed to produce high class steel strip/plate used for tubes, engineering and automobile segments etc. Hitachi has provided the electrical control system in roughing mill, finishing mill and down coiler area of hot strip mill.

The control system provides not only the accuracy of thickness and width of the strip/plate, but also a state of the art technology for stable production with consistent product quality. Hitachi has provided looper non-interacting control for the purpose of stable rolling and improving the product quality.

To enable product development and decision making, Hitachi has provided a material property prediction system. Moreover, Hitachi has also supplied a 6.6 kV class inverter with water cooling that reduces the crucible size to around 65% of that of the conventional inverter.



9 Electrical control system for conventional hot strip mill



10 Cold rolling equipment for Zhejiang Nisshin Worthington Precision Specialty Steel Co., Ltd.

10 Cold Rolling Control System for Zhejiang Nisshin Worthington Precision Specialty Steel

From July 2016, Hitachi began commercial operation of the reversible type cold rolling equipment delivered to Zhejiang Nisshin Worthington Precision Specialty Steel Co., Ltd. (China), and the equipment continues to operate smoothly.

Hitachi delivered a controller capable of high-speed arithmetic operations, high-performance large-capacity insulated gate bipolar transistor (IGBT) drive unit, Indian-made small-capacity IGBT drive unit and Chinese-made regular panels and control panels to build the control system.

Switching the mill rolls in the rolling machine allows the equipment to operate in two different patterns, rolling mode or steel plate surface quality adjustment mode. Based on the experience it has accumulated to date, Hitachi achieved smooth switching between operating modes and stable operation, and also attained high product quality in terms of plate surface quality, plate thickness, and shape. Hitachi also expanded the feature set of a tool that saves past equipment operating data and allowed twice as much data to be saved to improve equipment maintainability.

Moving forward, Hitachi will launch improved high-value added products on the global market to meet the needs of customers.

11 Dustless Chute for Particulate Matter

The dustless chute for particulate matter is a piece of equipment that prevents dust emission without the use of supplemental dust collection equipment when discharging a material to be transported in powder form from a silo storing grain or similar to a truck.



11 State of grain being discharged from a dustless chute

In general, truck loading equipment uses dust collection equipment and an uplifting chute to reduce the dust produced by the grain. However, conventional equipment incurs running costs for power and maintenance, and has not been adequate in terms of performance or operability. On the other hand, rather than dispose of generated dust, the dustless chute reduces production of the dust itself through a mechanism that deposits the material to be transported inside the chute, producing dust reduction effects equal to or greater than existing equipment.

The main features are as follows.

- (1) As supplementary equipment (dust collection equipment) is not required, initial costs as well as running costs such as power and maintenance can be reduced.
 - (2) The chute can be easily installed in existing equipment through a connecting tube.
 - (3) The time taken for dispatch (discharge) work is about the same as for existing equipment.
- (Hitachi Plant Mechanics Co., Ltd.)

12 Loading Plan Optimization Software To Equalize Loading Work Quality and Improve Transport Loading Rates

The shift to overseas production sites has continued among manufacturing companies, and there is an increased need to minimize the volume of goods transported overseas through improved loading rates. To address these needs, Hitachi Industry & Control Solutions, Ltd. provides the loading plan optimization software loading plan support system, which uses loading algorithms based on loading conditions to automatically devise efficient cargo arrangements.

Making use of the system equalizes the quality of loading plans that have been dependent on individual skills until now, while shortening planning times and reducing the volume of transportation containers. Moreover, the introduction of a system based on a cloud

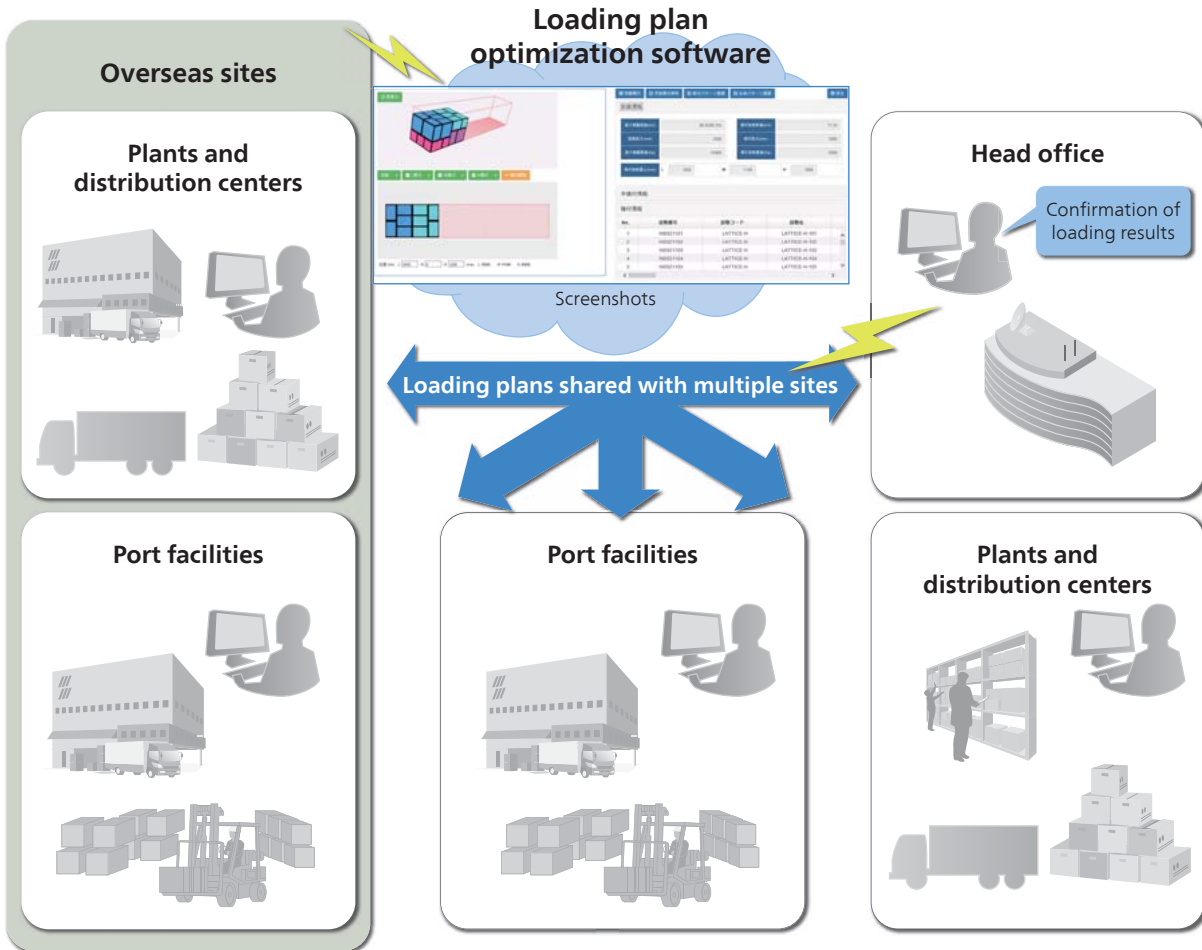
environment and multi-language support means that loading results can be shared with overseas sites, helping to improve loading quality at remote locations and enhancing the loading plan skills of workers.

Moving forward, efforts will be made to help improve transportation quality and reduce costs primarily through knock down (KD) packaging* for applications

such as loading plans for freight containers, loading plans for truck-based transportation, and packaging work plans at distribution centers.

(Hitachi Industry & Control Solutions, Ltd.)

* Knock down packaging: The practice of packaging completed components after breaking them down into the constituent parts.



12 Conceptual image of load planning support system of loading plan optimization software