Industry & Distribution

1 Launch of Traceability Service Platform across the Value Chain for Cell and Gene Therapy Products to Ensure the Safety and Security of Regenerative Medicine

Cell and gene therapy products in regenerative medicine, in which cells harvested from patients or donors are cultured, processed, and dosed to patients, are subject to product selection errors, temperature deviations during transportation, and scheduling issues such as changes due to patient conditions or culture time. Therefore, quality assurance based on strict individual identification and process tracking of each cell and gene therapy product throughout the value chain is necessary to achieve reliable information sharing among stakeholders.

To solve these issues, Hitachi launched the "Hitachi Value Chain Traceability Service for Regenerative Medicine" as a service platform for integrated management of the value chain of cell and gene therapy products, and started offering it in April 2021. This service platform will enable integrated management of traceability information across the entire value chain, which can be shared by all relevant stakeholders.

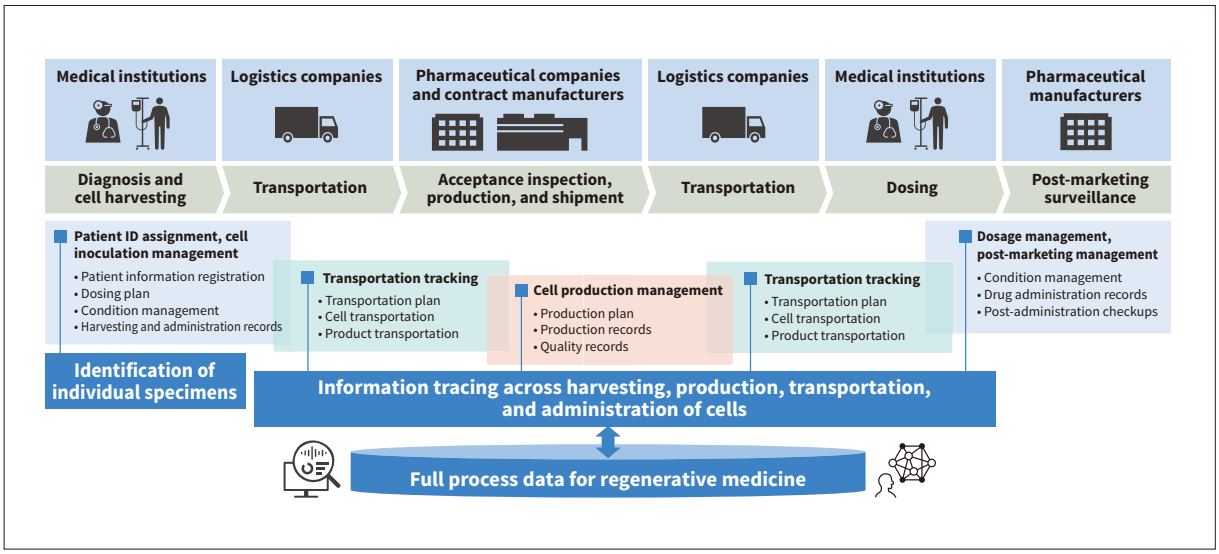
In the future, Hitachi will provide this service to the medical and pharmaceutical industries as one of the Lumada solutions for accelerating digital innovation, and will also expand the service to the specialty drug industry and overseas.

Hitachi will continue to contribute to the spread and development of regenerative medicine, with the aim of making this service platform the industry standard.

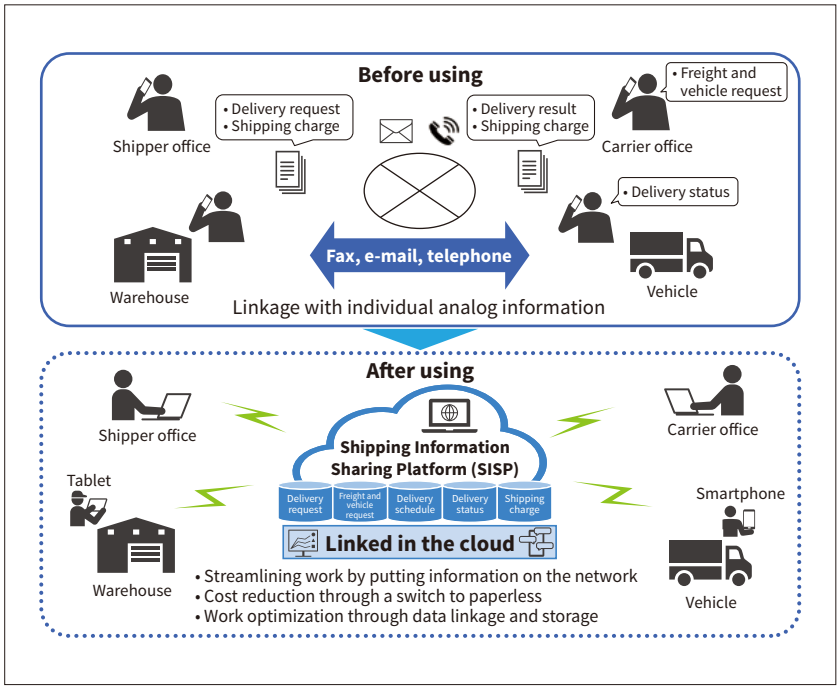
2 Solution for Streamlining Transportation and Delivery and Supporting Safe Operation

Delivery streamlining and driver safety management are urgent issues for the logistics industry. The Shipping Information Sharing Platform (SISP) is a supply chain transportation coordination platform provided by Hitachi that seamlessly connects data from collection to delivery. This platform optimizes transportation and delivery and streamlines work by sharing over the barriers between companies, enabling immediate sharing by using a network of the distribution channels and logistics information that are individually owned by shippers and carriers, with real-time coordination of requests for freight and vehicles, information computerization (paperless information) as well as the state of deliveries.

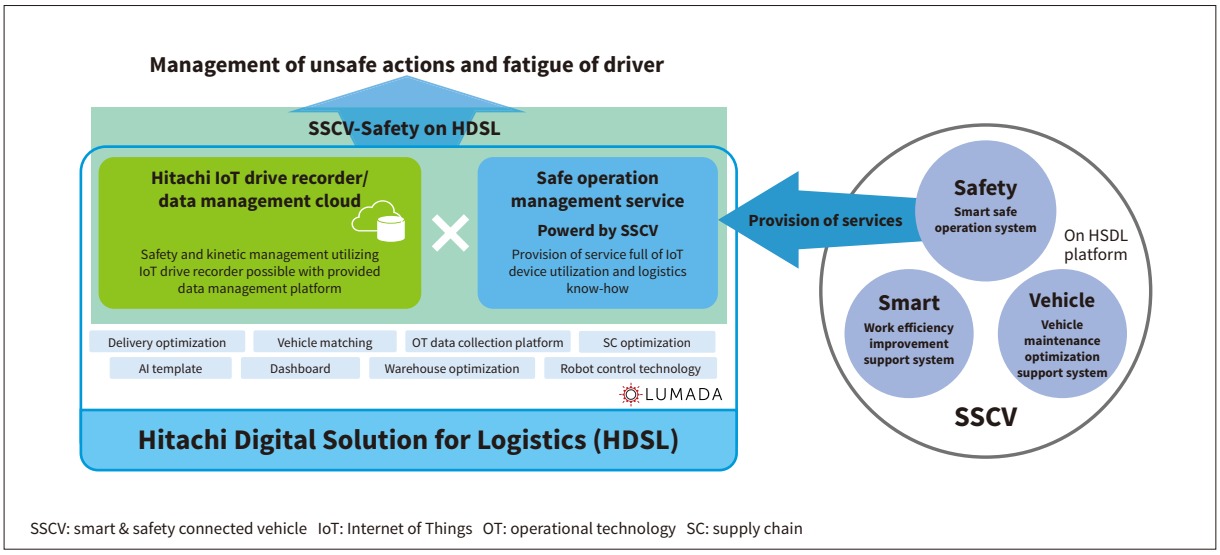
SSCV-Safety on Hitachi Digital Solution for Logistics is software as a service (SaaS) collaboration



1 Overview of Hitachi Value Chain Traceability Service for Regenerative Medicine



2 Overview of SISP



SSCV: smart & safety connected vehicle IoT: Internet of Things OT: operational technology SC: supply chain

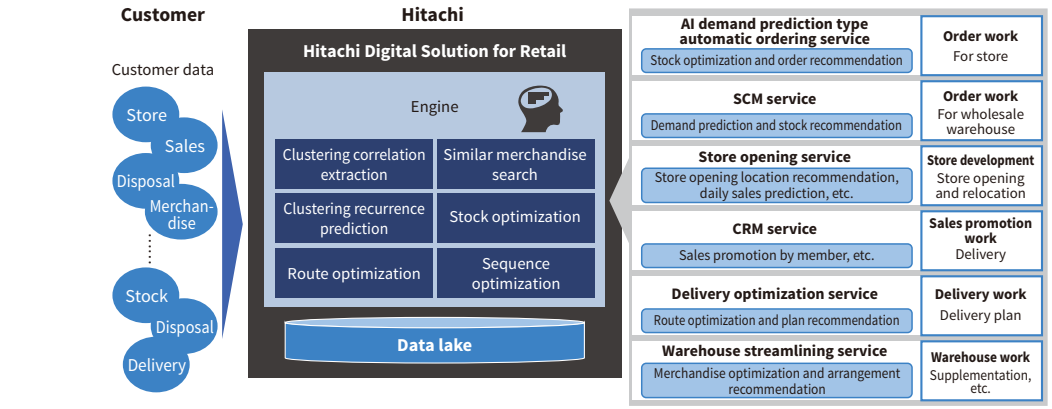
2 SSCV-Safety on Hitachi Digital Solution for Logistics

between the three companies Hitachi, Ltd., Hitachi Transport System, Ltd., and Mitsubishi HC Capital Inc. that analyzes driver health and driving data using artificial intelligence (AI), providing total support for the management of safe operation. It stores the health data of a driver before, during, and after driving (body temperature, blood oxygenation level, blood pressure, and autonomous nerves) in the cloud, as well as information obtained by a drive recorder including distance between cars, acceleration, and so on, analyzing the information with AI in order to pursue the goal of "zero accidents" by providing the driver with notifications in real time and by looking back on operations after they are completed.

3 Hitachi Digital Solution for Retail that Connects the Thoughts of Producers and Consumers

Hitachi Digital Solution for Retail is a platform that successfully connects and shares data from producers to consumers, in a service aimed at retail that autonomously supplies the needed amount of merchandise to those who need it, when they need it.

This service accurately captures demand, controlling appropriate stock levels and eliminating unreasonableness, wastefulness, and inconsistencies in the supply chain, while understanding consumer needs and achieving marketing that can increase satisfaction.



SCM: supply chain management CRM: customer relations management

3 Hitachi Digital Solution for Retail service lineup

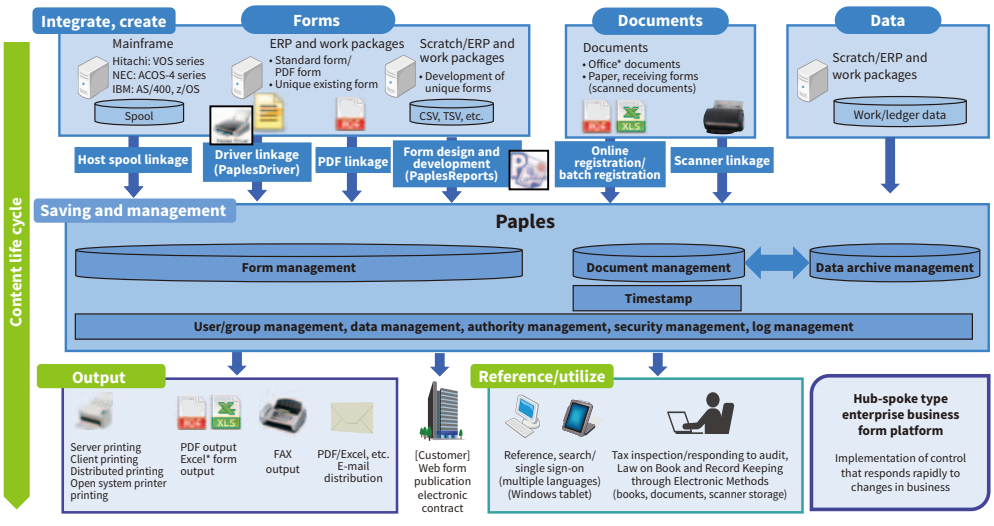
This makes it possible to supply consumers with the merchandise they need, when they need it, and in the amounts that they need it, in a way that leads to a reduction in waste loss with retail that connects the thoughts of producers and consumers.

Hitachi Digital Solution for Retail possesses a shared platform that looks after customer data, and by utilizing its engine, can take on the burden of "knowledge collection and data analysis" with a service prepared to adapt to various different retail tasks.

4 Solution for Complying with Law on Book and Record Keeping through Electronic Methods (Utilizing the Paples Business Form Platform)

Corporations have been switching to paperless business forms in recent years to promote remote working while reducing costs. Also, the Law on Book and Record Keeping through Electronic Methods was amended in 2021 to relax certain requirements, leading to the expectation that the transition to paperless forms will accelerate further. In addition to satisfying the requirements of the Law on Book and Record Keeping through Electronic Methods, the key objectives to introducing electronic business form platforms to facilitate this shift towards paperless forms include "switching to electronic forms while affecting current systems as little as possible," and "simplifying configuration as much as possible" in terms of categorizing bookkeeping, documents, scanner documents, and electronic transactions according to the classifications of this law.

As a solution to these issues, Hitachi provides an electronic business form platform solution that utilizes the Paples* system created by Nittetsu Hitachi Systems Engineering, Inc. Paples has received certification by the



ERP: enterprise resource planning CSV: comma-separated values TSV: tab-separated values PDF: portable document format
* See "Trademarks" on page 150.

4 Overview of electronic business form platform solution utilizing Paples

Japan Image and Information Management Association (JIIMA) as a software satisfying the requirements of the Law on Book and Record Keeping through Electronic Methods, and can be implemented as a single package for "creating and integrating," "saving and managing," and "referencing and utilizing" electronic forms. Paples supports a variety of different interface formats for integrating form data, and can computerize forms without the need to adjust existing systems, which makes it possible to efficiently comply with the Law on Book and Record Keeping through Electronic Methods.

* See "Trademarks" on page 150.

5 "SIMT" Information Structuring Unified Management Platform that Achieves Automation of Plant Operations

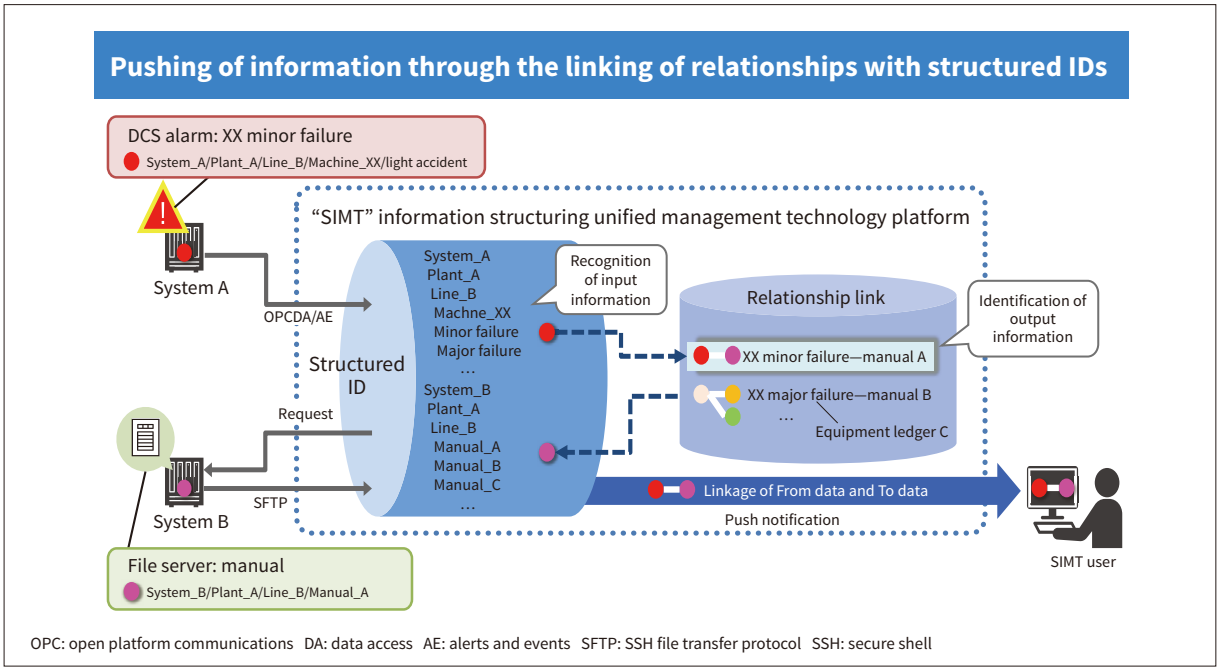
Workers and managers at work sites in the manufacturing industry collect information from systems and combine this with their own experience while carrying out daily tasks. Until now, it has been necessary to access files and data scattered across various existing systems depending on each work situation, which hindered work efficiency. In addition, differences between workers in terms of individual experience and knowledge caused variations in work quality. This is why structured identifier management technology (SIMT) was developed as an information structuring unified management technology platform that can digitize work know-how, while enabling the passing down of technologies and achieving a high degree of equalization in work levels.

SIMT manages necessary information in a digital and unified manner for use in technology that links structured IDs with relationships, while pushing this information at the necessary timing based on user skills. This has the result of reducing time wasted on information searches while contributing to the streamlining of work, and can also support more advanced decision-making by providing appropriate information to veteran workers. By starting adoption at a small scale, and then gradually expanding the scope of utilization, it is possible to take advantage of previous work knowledge and promote the sharing of information.

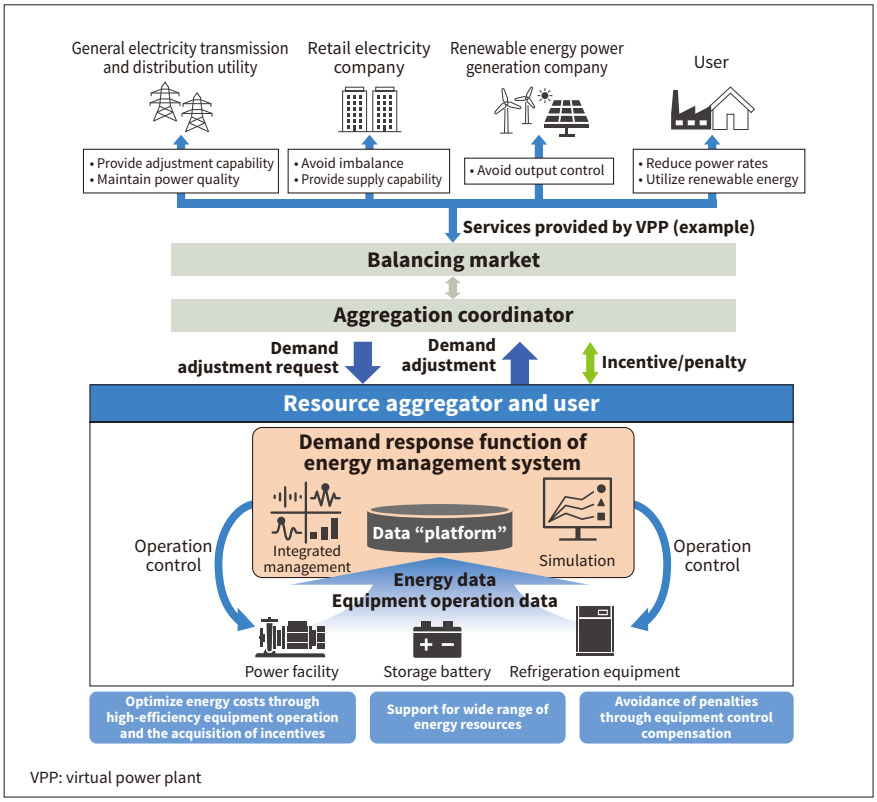
* This product is available only in Japan.

6 Expansion of Energy Management System Functions and Demand Response Functions to Support a Power Demand Adjustment Market

To establish a carbon-neutral society, it is becoming necessary to use renewable energy as a main power supply. However, renewable energy suffers from the disadvantage of power generation that fluctuates according to the weather conditions. This is why expectations are high for the remote and integrated control of energy resources such as storage batteries, power facilities, and refrigeration equipment owned by the user in order to adjust for fluctuations. In April 2021, a balancing market was established for power transactions to make adjustments in response to fluctuations.



5 Overview of SIMT information structuring unified management platform



VPP: virtual power plant

6 Conceptual diagram of energy management system demand response functions

Hitachi has expanded the demand response functions that automatically control a user's energy resources in an integrated fashion using Lumada's energy management system solution, which has been delivered to a large number of users.

The demand response functions of the energy management system offer the following three features:

(1) Adjustment capability prediction function that considers additional costs

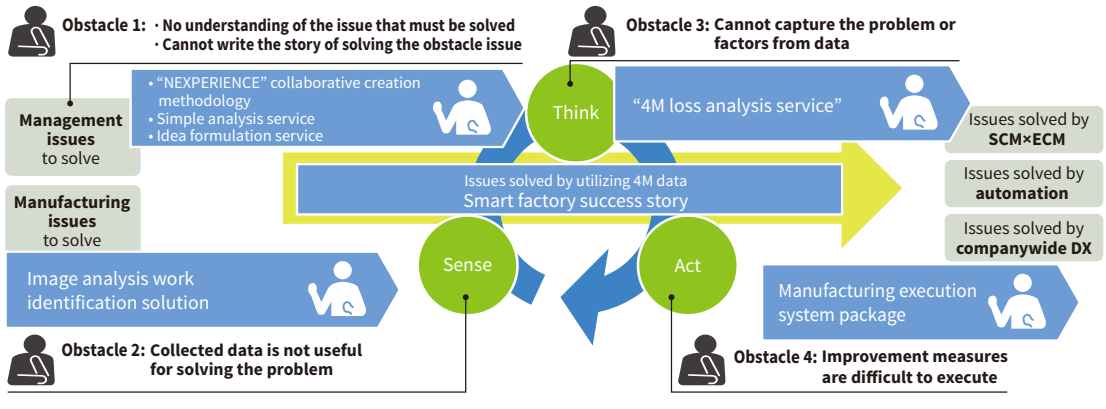
(2) Support for a wide range of energy resources

(3) Management functions for the risk of non-achievement of adjustment capability

* This product is available only in Japan.

7 Success Story of Smart Factory that Utilizes 4M Data to Lead to Solutions for Customer Issues

Interest in the smart factories is currently on the rise in the manufacturing industry, along with associated needs. Issues must be resolved in the area of overall optimization both in terms of management as well as manufacturing, and there are many different definitions of "smart factory," to the extent where the companies themselves often fail to define actual issues. Hitachi proposes its implementation support for successful experiences leading to the proposal and execution of a smart factory conversion, starting with



ECM: engineering chain management DX: digital transformation

7 Smart factory success story image

the "NEXPERIENCE" collaborative creation methodology and identification of issues that must be solved by utilizing a simple analysis service, and continuing with the visualization of causes and implementation of issue solutions as a smart factory success story.

In the smart factory success story, machine, human, method, material (4M) data analysis is used to add worker action data that was previously difficult to quantify to the result data stored in the manufacturing execution system package, in order to propose on-site issues and solution methods that were previously hidden from sight. Furthermore, breaking down the identified issues and improvement measures as concrete manufacturing work items in the manufacturing execution system enables the execution of even more certain manufacturing.

As described above, Hitachi starts with 4M data and leads to on-site issue improvement measures, then proceeds directly to execution by supporting the acceleration of the issue resolution cycle.

* This product is available only in Japan.

8 Establishment of a Remote Operation Environment for a Steel Plant

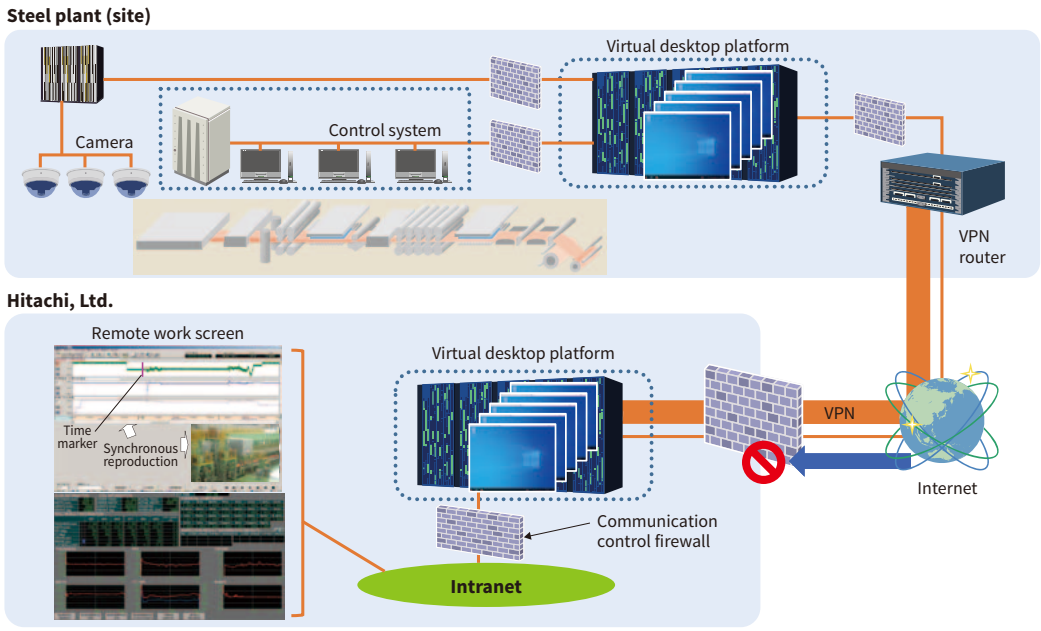
Due in part to the travel restrictions enacted during the COVID-19 pandemic, the need has been growing for remote environments to implement control system tuning that used to be performed on-site at overseas steel plants. To this end, it is necessary to construct remote tuning environments that feel as real as actually being there, while at the same time guaranteeing security in communications with the site. Hitachi has therefore established a remote operation environment for steel plants offering the following features:

(1) Secure remote environment constructed between on-site control system and remote terminal with virtual private network (VPN) and virtual desktop infrastructure (VDI) using two-factor certification.

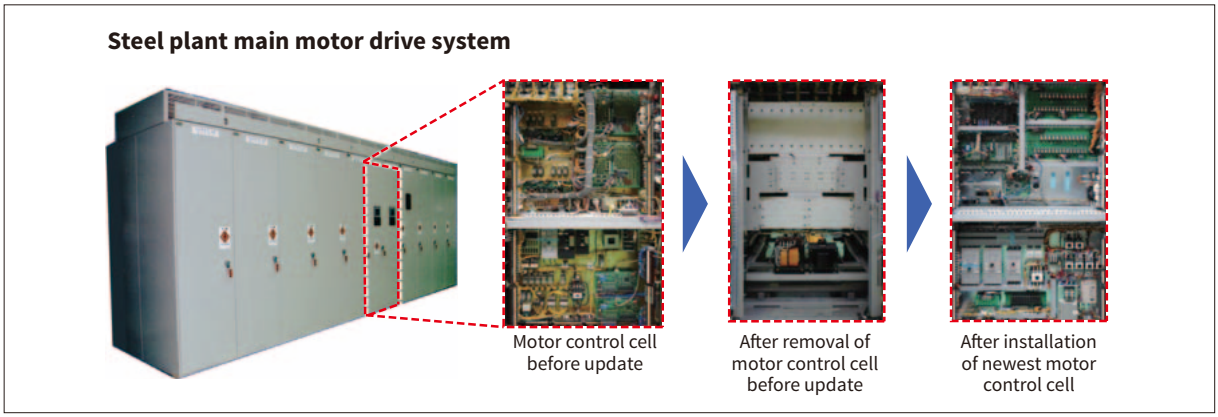
(2) Operational status can be grasped as if the user is actually there over remote communication by displaying and sharing each human-machine interface (HMI) control screen and industrial television (ITV) footage on the remote terminal in real time.

(3) Various analytical functions such as the synchronous playback of process and video data, video data cueing through time marker operations, and a playback virtual simulator that can playback operation screens from stored data make it possible to quickly identify causes of rolling problems and quality defects.

There are multiple overseas steel plants that have already moved forward with remote control system tuning by applying a development environment, as well as plants that have completed tuning with only remote operation. Hitachi will continue developing its effective remote operation tools while achieving shorter tuning schedules.



8 Example of system configuration of remote environment for control system tuning



9 Overview of technique for retrofitting steel plant main motor drive system

9 Retrofitting Service Updates Control Circuit of Main Motor Drive System Delivered to Turkish Company Borçelik

In March 2021, Hitachi completed renovation by implementing a retrofitting service for the Turkish company Borçelik Çelik Sanayii Ticaret A. Ş. ("Borçelik") for a steel plant main motor drive system previously delivered to the same company.

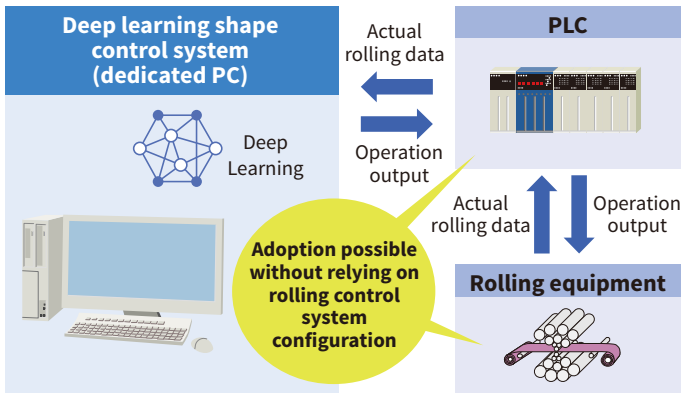
Recently, the revision and abolition cycles of electronic components have been growing shorter, and this has been one factor interfering with the stable supply of control boards for the system. For this reason, there was a high risk involved in continuing to use the system delivered to the Borçelik company after 17 years of operation, starting with its delivery in 2003. This is why, taking advantage of the system's cell concept design philosophy, Hitachi proposed as part of its maintenance service a technique of retrofitting the motor control cell (control circuit including the control board) with cells made up of the newest control board. Using this technique made it possible to achieve the same effects as would have been achieved with a full-scale update, at a lower cost, and with a shorter construction period.

In the future, by applying this technique to the main power circuit cell, not only will Hitachi expand the options it can provide for a system maintainability recovery service, it will also contribute further to the stable operation of the steel plants of customers around the world.

10 General Purpose Packaging of Deep Learning Shape Control System

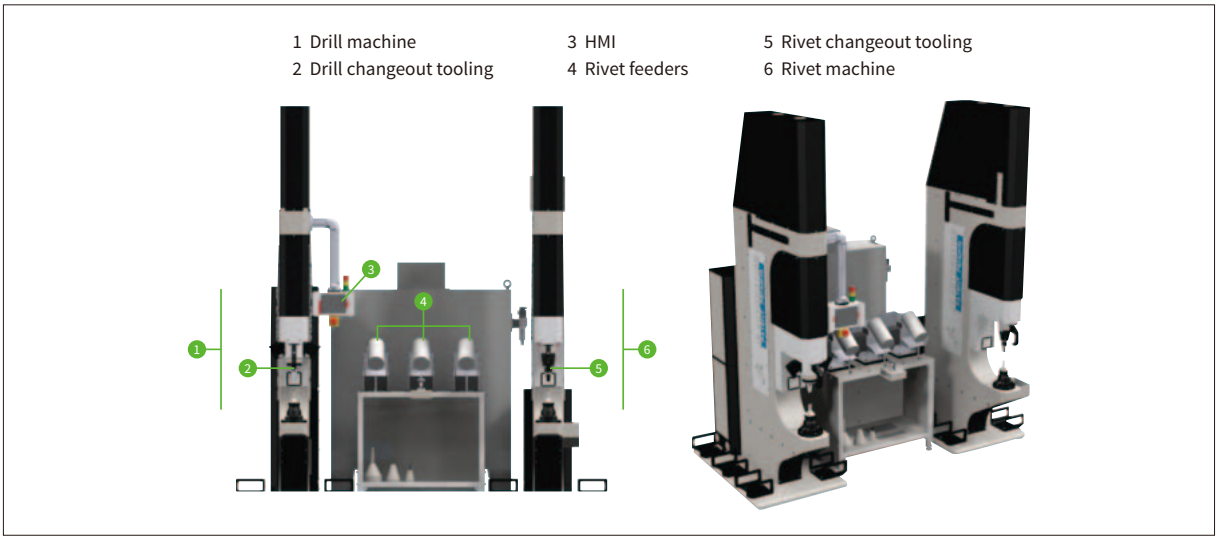
Hitachi provides an automatic shape control system that uses deep learning to control the rippling on rolled steel sheets, and has improved the development and learning capabilities of the control performance evaluation function for the control model constructed using deep learning. Furthermore, Hitachi has developed a general-purpose package that condenses the functions of the deep learning shape control system, including the aforementioned function, in a dedicated PC.

The control performance evaluation function evaluates control model performance during application to



PLC: programmable logic controller

10 Overview of deep learning shape control system



11 SmartAttach Automated Nutplate Installation System with component overview

real equipment based on rolling result data. It is now possible to support the decision whether or not to apply this deep learning shape control system to real rolling equipment that was previously not targeted for application. In addition, the learning function expands the input/output and structure of the control model so that it can be changed according to the rolling equipment, thereby enabling control model construction that responds flexibly to equipment requirements. In addition, this package uses a dedicated PC to perform control calculations. In this way, the system receives the rolling result data and sends operation output in a mechanism that can be adopted without relying on the configuration of the rolling control system.

The effectiveness of this package has been demonstrated after being installed for rolling equipment without a history of adoption of Hitachi rolling control systems. Hitachi will continue applying this package to a wide range of rolling equipment systems.

11 Automating Nutplate Assembly and Installation Operations for Aircraft Manufacturers

The average airplane utilizes 25,000 nutplates – all traditionally installed by hand. JR Automation's patent-pending SmartAttach Automated Nutplate Installation System completely changes the customer's manufacturing practice for nutplate attachment by eliminating the need for manual alignments and procedures including drilling, lubrication, countersinking, and riveting operations required by conventional nutplate attachment methods.

With a modular design, the system allows for increased flexibility in production layouts, cutting floor space requirements by up to 80% compared to conventional methods. Operators can also quickly and easily change out both drilling and riveting tooling to meet demand variability, with both off-the-shelf and customizable tooling options available.

SmartAttach is integrated with Lumada Manufacturing Insights, Hitachi's AI-enabled and data-driven IoT solution. Accordingly, the system has been developed with the following functions and provides the customers with solutions to optimize production.

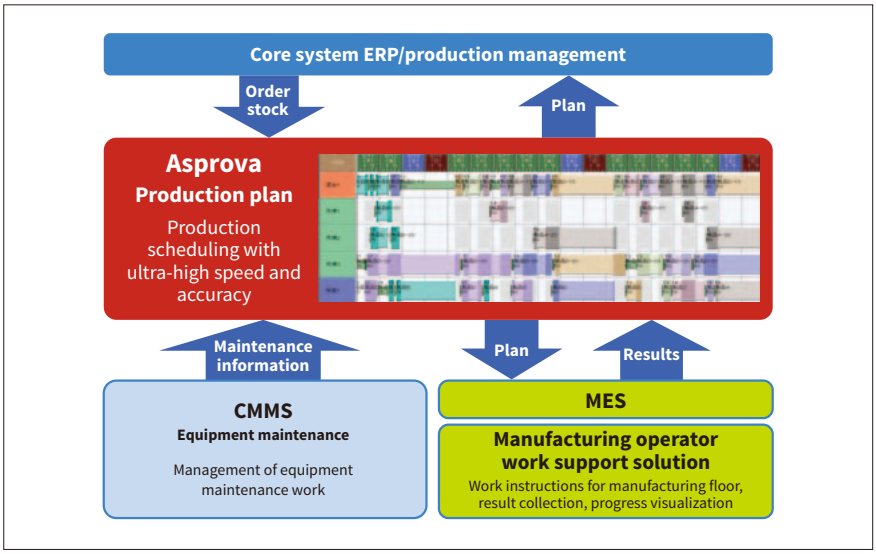
(1) Process information: Cycle time and part-to-part time
(2) Machine health and key performance indicators (KPI)
(3) Anomaly detection and predictive maintenance

The Lumada Manufacturing Insights solution allows for expansion and connections with supervisory control and data acquisition (SCADA) and manufacturing execution system (MES) for additional scale and functionality.
(JR Automation)

12 Production Planning Solution

As the pace of change increases in the environment surrounding consumer needs and the manufacturing industry, the industry demands flexible production scheduling (production planning). Production planning faces issues such as risks involved in the passing down of work skills due to a high dependence on individuals and highly specialized scheduling that lacks flexibility, increasing the need for the introduction of a production scheduler as a means of resolving these issues.

This solution combines solutions for production management and equipment maintenance with a production



12 Production plan optimization solution

scheduler to support the achievement of efficient and flexible production planning.

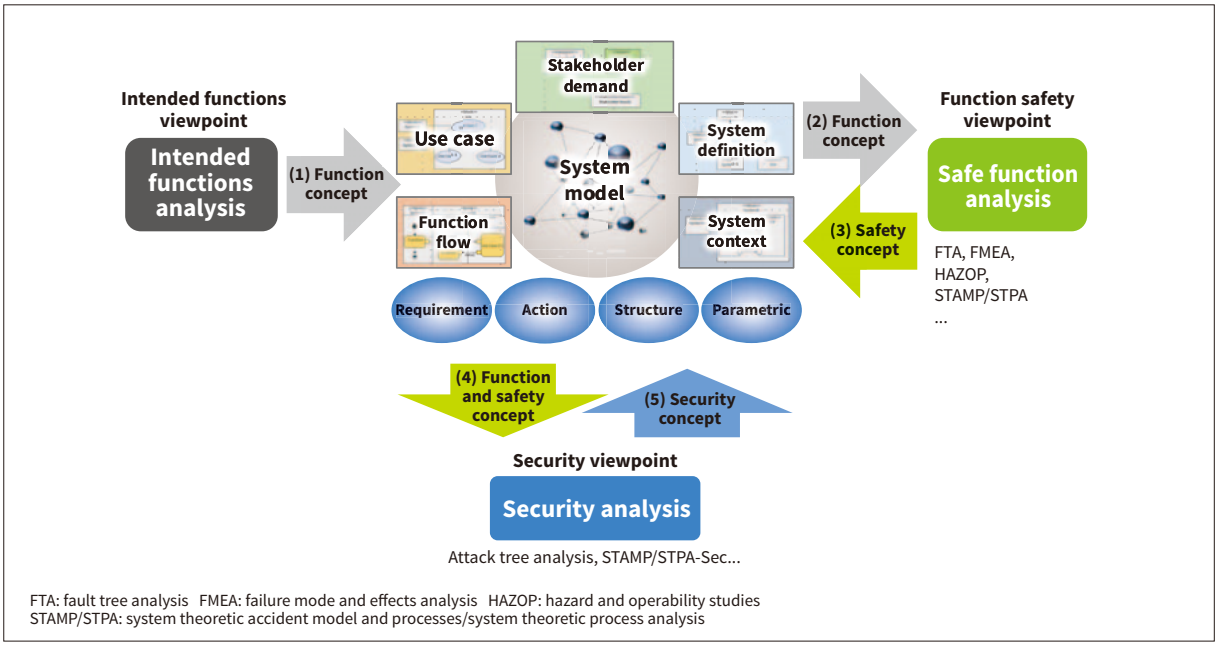
Linking the production scheduler (Asprova*) with the MES or maintenance management system [computerized maintenance management system (CMMS)] adds each system's results and proper equipment information values, making it possible to implement a highly accurate plan. This way, even if a problem suddenly occurs on the manufacturing floor, the production plan can be rapidly revised and simulations can be run, leading to the benefit of a removal of the personalization that would previously require reliance on a specific person in charge, while contributing to the streamlining of work.

(Hitachi Industry & Control Solutions, Ltd.)

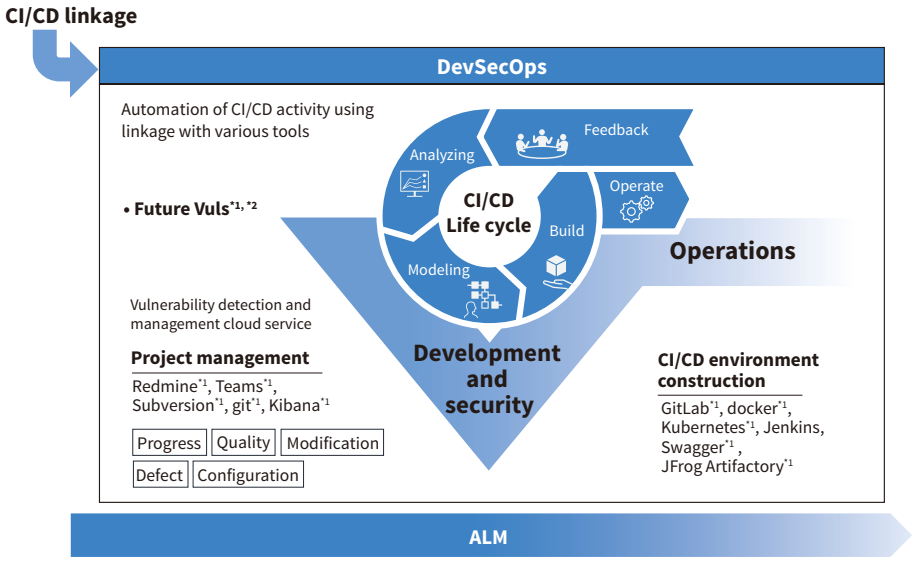
* See "Trademarks" on page 150.

13 Safety and Security Solution

The development of products with connected functions using the network, such as IoT equipment, must give consideration to the occurrence of external threats to intended functions by applying design techniques that achieve both "safety and security design." During the process of design aimed at achieving safety and security, it is easy for requirements to interfere with each other due to differences in design viewpoints, design oversights, or the need for reworking to occur. For this reason, it is necessary to perform a trade-off analysis using unified system design information with an iterative design technique. By applying model-based systems engineering (MBSE)



13 Image of safety and security design method in MBSE



ALM: application lifecycle management
*1 See "Trademarks" on page 150.
*2 A cloud-based security service provided by Future Corporation that provides integrated management of operation manager tasks, such as automatically checking for vulnerabilities in the operating systems (OS), applications, and software used to configure a system. https://vuls.biz/

13 Image of DevSecOps utilizing CI/CD

as a solution, it becomes possible to analyze using design information in a unified system while visualizing impact, thereby achieving efficient iterative design.

Streamlining design involves the construction of a development process using a continuous integration/continuous delivery (CI/CD) tool set, automating quality, cost, and delivery (QCD) activity, and visualizing quality and processes. DevSecOps (shifting left) can be achieved by incorporating the security-by-design philosophy advocated by the National center of Incident readiness and Strategy for Cybersecurity (NISC) into CI/CD.

Safety and security design can be realized by combining CI/CD with MBSE using DevSecOps. It is also possible to consider the impact on intended functions in incident responses at the operating stage (shifting right), thereby achieving rational and continuous system development and operation.

14 Design Support Tool Utilizing VR Aimed at Regenerative Medicine Facilities

When it comes to the engineering, procurement, and construction (EPC) of regenerative medicine facilities, or cell processing facilities (CPF), if a customer does not have a great deal of experience in constructing facilities, reworking may be required frequently due to issues such as changes to room layout or size and revisions in equipment arrangement, resulting in increases to the required design workload. Therefore, Hitachi created a design support tool that can be used to reproduce the equipment layouts and arrangements in a CPF using virtual reality (VR), which provides a high level of immersion and makes it easy to perceive the expanse of space, while interactively fine-tuning designs.

This design support tool can load a flat layout created using computer-aided design (CAD), arrange walls and windows, doors, pass boxes, and other architectural elements and building equipment, and freely arrange various types of devices, furniture, and other objects so that the user can experience the results in VR while securing work space and making adjustments, considering how to prevent interference between devices or in the flow of work traffic. The state of adjustment work can also be shown in an external monitor in order to share it with multiple people. Adjusted layouts can then be recorded using screenshots and a dimensional measurement function, and then reflected in CAD drawings. These features can be expected to provide benefits such as the rapid approval of drawings and improvements in customer satisfaction. (Hitachi Plant Services Co., Ltd.)

14 Using VR design support tool