[i] World-leading Advanced Factory "Lighthouse"

Stable Operation Service for Control Systems Based on Maintenance Service Platform Combining OT and IT

Total Support across Entire System Lifecycle

The stable operation service for control systems is an all-inclusive service combining the Hitachi Group's technologies and extensive knowledge of operation and maintenance accumulated over many years. The main features of this service are a 24-hours-a-day, 365-days-a-year one-stop support system, a proprietary support platform that brings together the Hitachi Group's OT and IT technologies and knowledge, and an options system customized for control systems for helping customers in streamlining their operation and maintenance and optimizing costs. This article presents an overview of this service, which supports the proper operation and maintenance of control systems for long-term operation, and introduces new services utilizing digital technology for conducting even more advanced operation and maintenance in response to COVID-19-era and post-COVID-19-era policies.

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1. Introduction

Control systems are key infrastructure elements that support the stable operation of facilities in industrial and social infrastructure fields such as industrial equipment, railways, and power plants. Recently, at sites where control systems are running, there has been a growing need to pass on the knowledge and expertise of control system operation and maintenance as maintenance technicians become older, and the increasing cost of long-term maintenance and upkeep of systems due to the ever shortening life cycle of electronic components has become a key social issue. Also, as the Internet of Things (IoT) becomes more prevalent, control systems are also expected to become more sophisticated and complex, and responding to failures will require more specialized technology and knowledge than ever before.

Previously, the maintenance of control systems delivered to customers had been carried out for each individual system, and whenever a problem occurred, a response team was organized to respond to it. Now, however, technicians must deal with increasingly sophisticated and complex systems using a wider range of technologies and knowledge, and a faster and more streamlined operation and maintenance system is also required to respond to the recent key social issues that were mentioned above.

Under these circumstances, Hitachi has established a new system for providing 24-hours-a-day, 365-days-a-year one-stop support for control system operation and maintenance. It has also built a proprietary support platform that brings together the operational technology (OT) and IT expertise and knowledge of the Hitachi Group, centered on the Omika Works of Hitachi, which has been involved

in the development, operation, and maintenance of a wide range of control systems. This platform is used by specialized technicians to resolve problems with the customer's control system. Hitachi provides this new system and platform as the stable operation service for control systems. This service streamlines the operation and maintenance work that has become a major burden for customers in control systems, which require a quick response in the event of a failure, and also contributes to reduced costs for failure recovery and to more stable system operations.

2. Operation and Maintenance Services that Create Value for the Customer

The stable operation service for control systems is an all-inclusive service combining Hitachi's technologies and extensive knowledge of operation and maintenance accumulated over many years. This service features a 24-hours-a-day, 365-days-a-year one-stop support system, rapid and multifaceted support for customer systems by accumulating and utilizing various technical information related to operation and maintenance, a support platform that integrates Hitachi's technology and knowledge, and an options system customized for control systems that helps to level the maintenance costs of customers through service contracts. These features enable more efficient operation and maintenance work for customers.

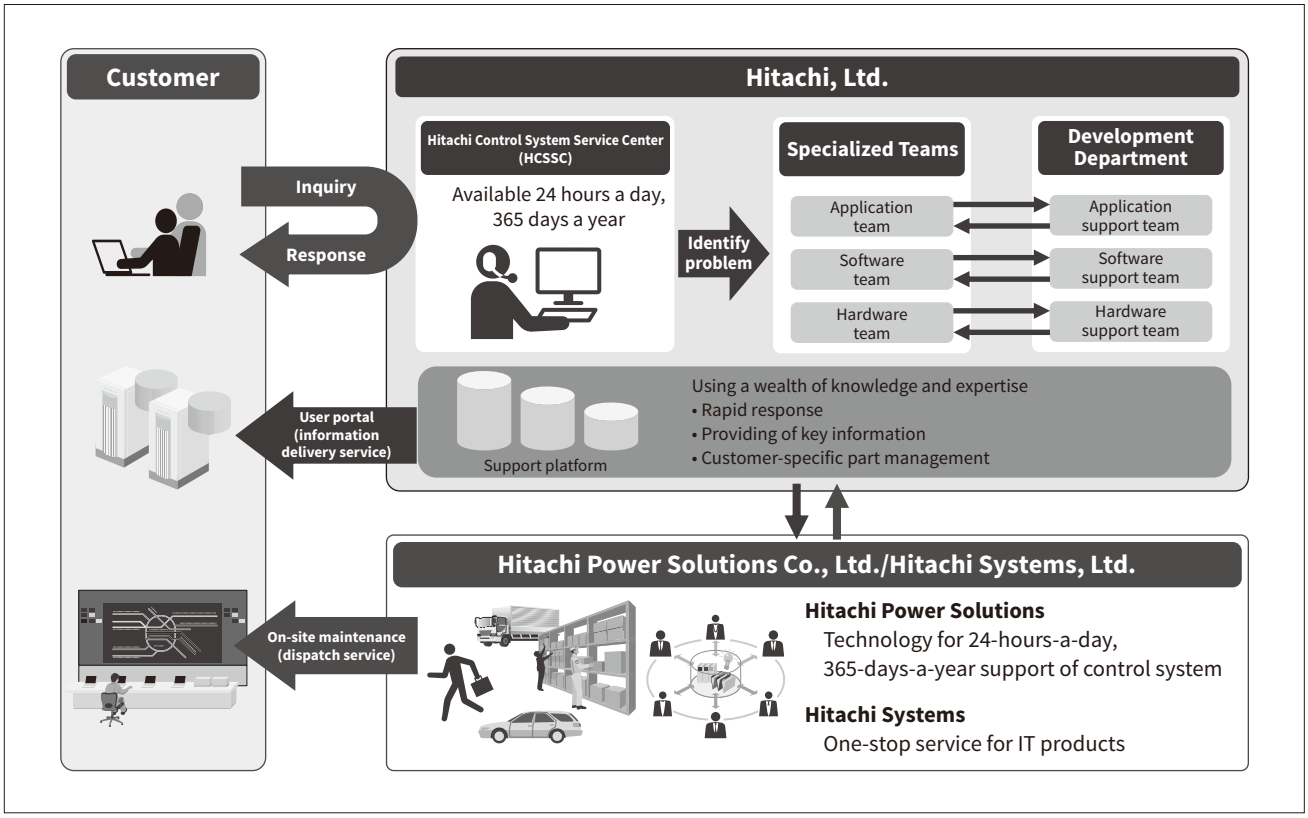
2. 1
One-stop Support System Available 24 Hours a Day, 365 Days a Year

The Hitachi Control System Service Center (HCSSC), a one-stop integrated contact point, is available 24 hours a day, 365 days a year for responding to problems and inquiries with the hardware and software that make up the control system. In the event of a problem in a control system, Hitachi's specialized teams in each field can accurately isolate the problem based on the specific problem situation and the inquiry details, and quickly provide support in the event of a failure, including identifying the failure location, recovery, and investigation of the cause, as well as operation and preventive maintenance, including periodic inspections (see **Figure 1**).

The HCSSC was established in April 2018 for improving service quality and enhancing the capability to respond to failures, and was revamped in October 2020 by adding new services and enhancing security. Looking forward, Hitachi will continue to develop it as a base that supports the stable operations of customer systems by utilizing its expertise and knowledge on operation and maintenance and expanding the scope of support.

Figure 1 — Service Delivery System

Hitachi has built a 24-hours-a-day, 365-days-a-year support system and uses a support platform that can collect and share knowledge on operation and maintenance for contributing to stable operation and streamlined operation and maintenance work for customer systems.



2. 2
Support Platform Integrating Hitachi's Technology and Knowledge

Hitachi's support platform is an environment that can collect and share a wide range of technical information and the operation and maintenance work history of the control system. The operation and maintenance work history, operation manuals, system configuration drawings, customer-specific parts, and other details are stored and collected in a database that can be viewed and utilized by customers at any time through a special customer website (hereinafter "user portal"). This assists in the transfer of expertise and knowledge on operation and maintenance. This platform can also provide notification when the parts making up the system should be replaced for enabling the company to provide proposals for parts replacement at the appropriate time to customers so that it can obtain maintenance parts and optimize inventory management, thereby helping customers to streamline their operation and maintenance work.

2. 3
Options System Customized for Control Systems

The options for the stable operation service for control systems consists of problem-solving support to support stable operation, such as on-site maintenance, off-site inspection and repair, and preparation of cause investigation reports, and operation support to support streamlined operation and maintenance, such as periodic inspection and providing of information through the user portal (including inquiry history, documents, asset information such as equipment parts, and other information).

Options customized for the customer's system can be selected for optimizing the customer's operation and maintenance costs. For example, as the maintenance and repair costs of control system components increase year by year, the burden of unexpected repair costs over time will have a significant impact on operations management. In these cases, a stable operations service contract that bundles these options together will average out the annual maintenance costs and help the customer to perform operation and maintenance work according to a clearly-defined plan.

3. Providing High Value-added Services in Response to COVID-19-Era and Post-COVID-19-Era Policies

The stable operation service for control systems was launched as a service to help customers streamline their operation and maintenance work and optimize their costs. However, with the recent spread of COVID-19, this service has been attracting even more attention as a COVID-19-era and post-COVID-19 era policy response. For this reason, Hitachi is developing new services focused on the keywords "remote," "online," and "labor-saving." This section introduces the main services.

3. 1
Remote Monitoring Service

The remote monitoring service remotely monitors the operation status of the customer's system in the secure environment of HCSSC, which is a comprehensive contact point for maintenance. When a failure is detected, the service proactively identifies the failure location, examines the feasibility of on-site maintenance, and quickly takes a series of actions up to recovery. In this way, this service mitigates the risks associated with system failures (see **Figure 2**).

3. 2
Remote Operational Support Service

Normally, the customer and HCSSC are informed of the failure status by telephone. However, with the remote operational support service, not only audio, but also video and various information (documents and photos) is shared remotely for enabling interactive communication. This eliminates gaps in mutual understanding and contributes to the rapid resolution of problems without the need to dispatch technicians to the site.

For example, in the event of a failure in the customer's system, the lighting pattern of the lamps can be shared over

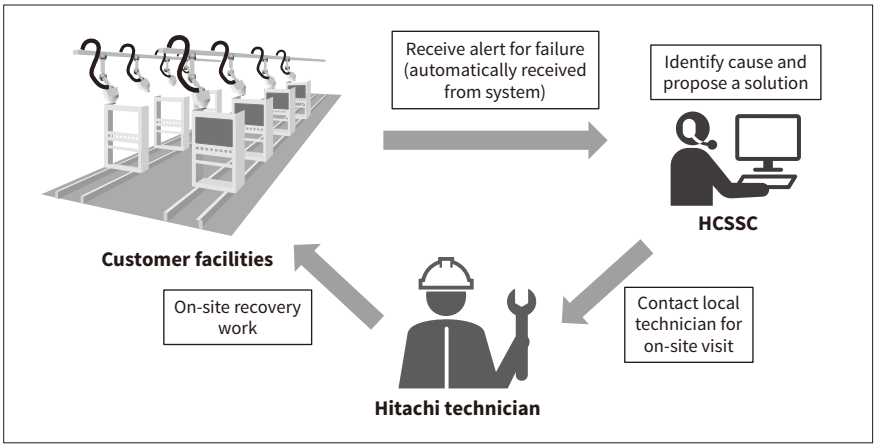
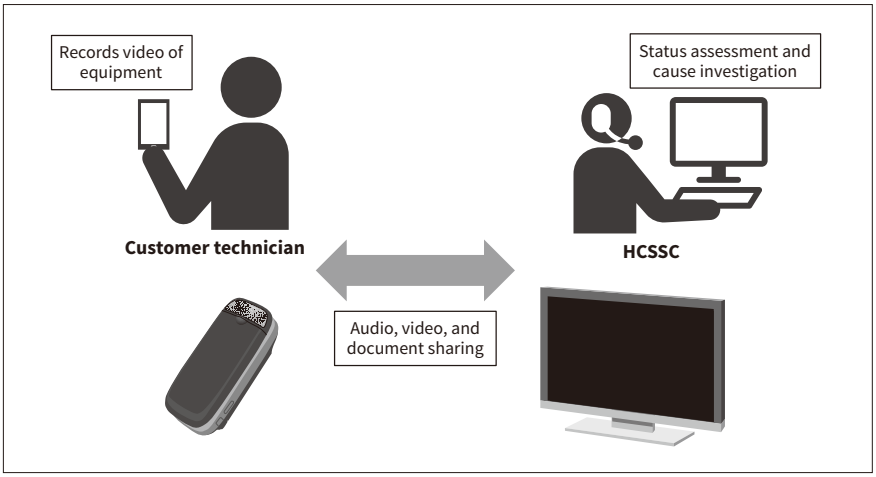


Figure 2 — Remote Monitoring Service
The HCSSC receives alerts for failures and other events remotely from the customer's equipment and proactively identifies the cause and proposes a solution. After consulting with the customer, Hitachi technicians are dispatched to perform on-site maintenance to help quickly resolve problems.

Figure 3 — Remote Operational Support Service

Previously, customer inquiries were handled by telephone support, but with this service, video and documents can be shared. This makes it easier to assess the on-site situation, reduces the time loss due to waiting for Hitachi technicians to be dispatched, and contributes to quick resolution of inquiries remotely.



video, and the customer's technician or a Hitachi maintenance technician can work under the direction of a specialized team (experts) through HCSSC to resolve the problem quickly. Also, smooth escalation can be achieved by sharing images and videos between customer-side technicians and administrators. By supporting the sharing of information within the customer's organization in this way, including in the case of normal on-site work, the operation and maintenance work are streamlined (see **Figure 3**).

3. 3 Online Training Service

Previously, Hitachi's specialized technicians have provided face-to-face training on how to use the control system and how to deal with problems. With the online training service, remote and online classroom training are provided. Switching to an online format not only reduces opportunities for human contact, but also improves the learning efficiency of customers using this service by allowing participants to repeatedly view the training materials, thus assisting in the transfer of technology and expertise on control systems (see **Figure 4**).

3. 4 Stable Operations Monitoring Service

The stable operations monitoring service contributes to the stable operation of the system by remotely inspecting the customer's system. This service monitors the health status of system operations by periodically collecting operation information such as the operation history and failure history of the devices making up the control system and by visualizing and analyzing changes in the operation status. The results are reported periodically in the form of reports, and if any history information that indicates parts operating unusually or failure factors is found, the system proposes corrective action and assists in the continuation of stable system operations (see **Figure 5**).

4. Conclusions

This article introduced the HCSSC, which is a one-stop contact point for the stable operation service for control systems, the support platform that centrally manages information including operation and maintenance expertise, and various service options.

Figure 4 — Online Training Service

Previously, Hitachi's specialized technicians have provided face-to-face training to customer trainees as instructors, but by moving this process online, the requirements for contact and travel can be reduced.

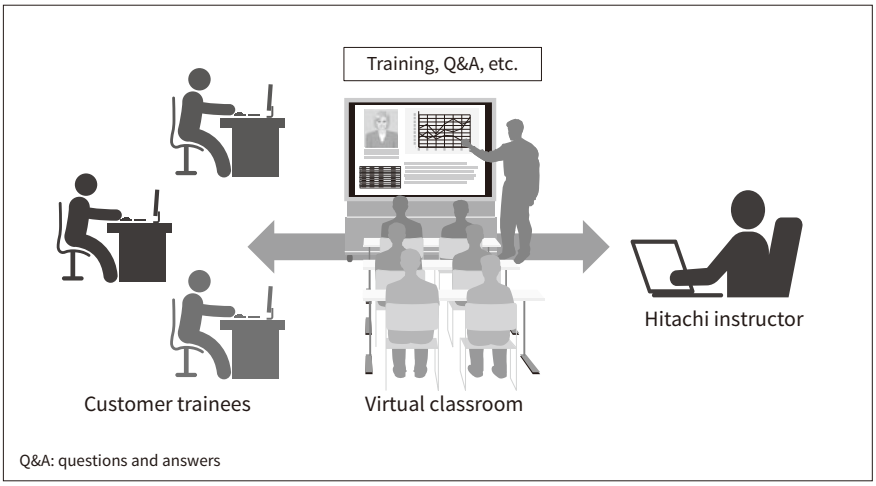


Figure 5 — Stable Operations Monitoring Service

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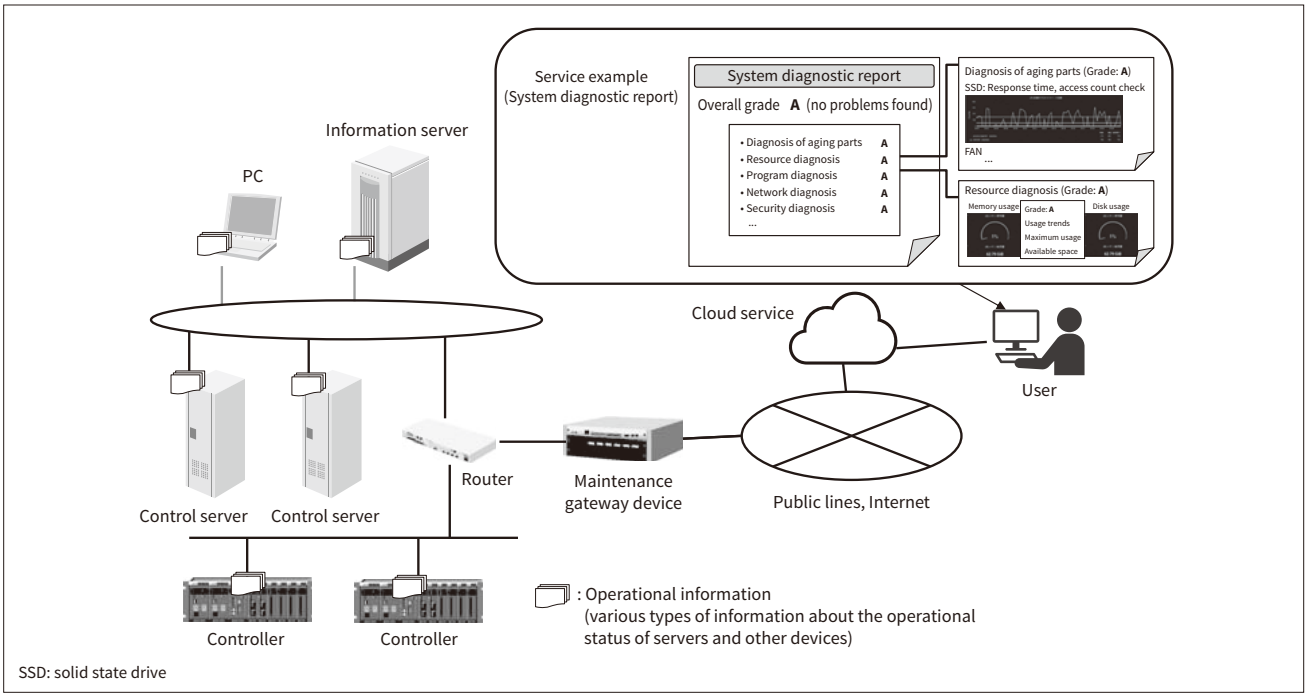

SSD: solid state drive

Looking forward, Hitachi will not only strengthen its support system, enhance its support platform, and expand its service options, but it will also incorporate the latest technologies such as digital technology and artificial intelligence (AI), starting from the issues faced by customers throughout various industrial and social infrastructure fields, and combine OT and IT for providing more advanced operation and maintenance of control systems and for improving the quality of the stable operation service for control systems. The article also presented an example of Hitachi's remote function concepts for the COVID-19 era and post-COVID-19 era.

Previously, maintenance was performed after a problem occurred in the customer's system. However, by adding technology that captures irregularities, such as condition monitoring and identification of signs of degradation, in addition to asset information on equipment parts, this makes it possible to conduct condition based maintenance (CBM), where maintenance is performed on a case-by-case basis according to the state of degradation, and implement maintenance planning. By conducting CBM, customer systems can expect reduced risk of system downtime and equipment replacement costs, thereby contributing to the optimization of customer operating resources. Furthermore, looking ahead, Hitachi will continue providing total support through consulting and operations analysis for the entire lifecycle of the customer's system, including not only the control system, but also its peripheral devices, and contribute to the building of new systems, improving business continuity, and optimizing operations costs.

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