Overview

Industrial Solution Technologies for Overcoming Customer Challenges

Takumi Sugiura, PE.Jp
Takaki Taniguchi
Shinsuke Kanai
Masatoshi Furuya
Hiroshi Yoshikawa

ENVIRONMENT SURROUNDING CORPORATE ACTIVITY

WITH the growing complexity and pace of change in the environment in which corporations operate, it has become extremely difficult to see what is ahead. In addition to a borderless economy and increasingly intense international competition, worsening resource and environmental problems, more diverse market needs, rapid technical innovation in information and communication technology (ICT) and other fields, and countermeasures to risks that have arisen in recent years, such as measures for dealing with disasters and security, these changes also have a synergistic interaction with the measures that companies are adopting as they globalize their own businesses, such as those for dealing with the regions in which they operate, and will inevitably accelerate further in the future.

Companies need to deal with this ever-changing business environment without falling behind, facing an era in which only those that adapt to change will survive.

What companies require in this situation is the ability to identify the signs of change at an early stage and to respond promptly.

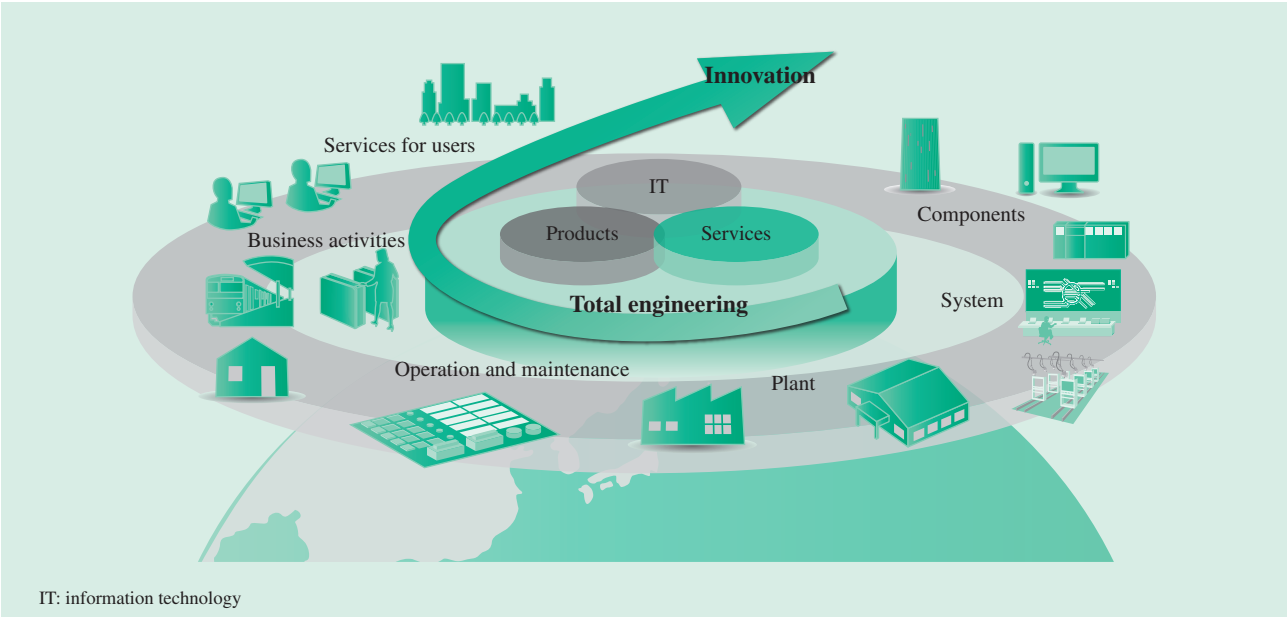
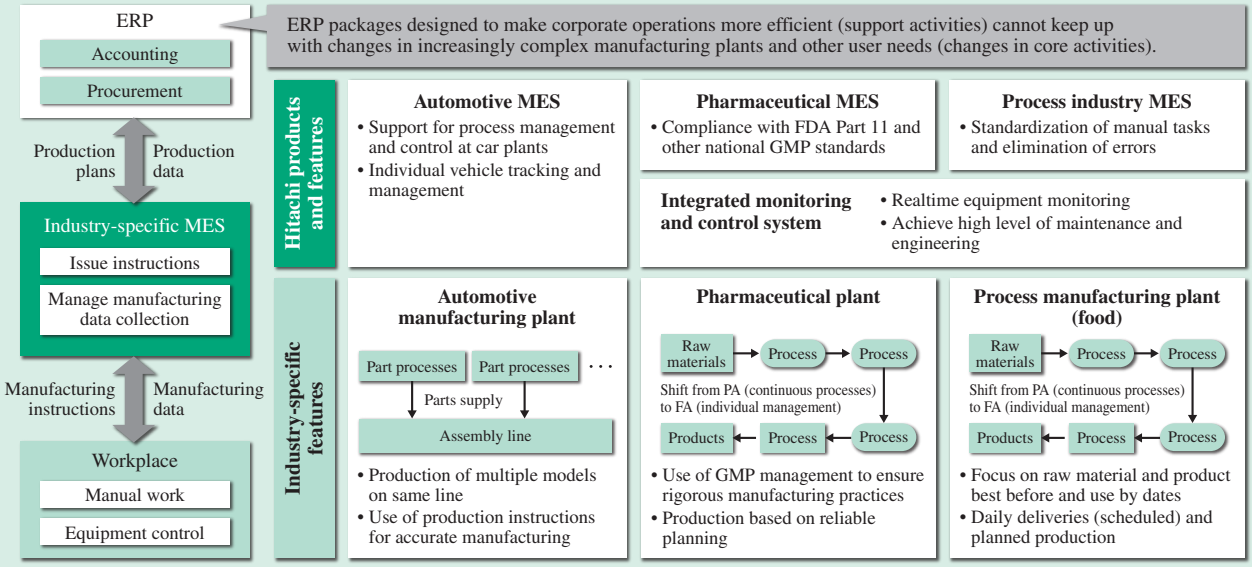


Fig. 1—Innovations Created by Total Engineering.
Hitachi products, services, and IT, and the new value created through the total engineering capabilities of Hitachi's Infrastructure Systems Company, accelerate innovations that solve the problems faced by customers and society.



ERP: enterprise resource planning MES: manufacturing execution system FDA: Food and Drug Administration PA: process automation
FA: factory automation GMP: good manufacturing practice

Fig. 2—Industry Features and MES Products for Different Industries.
The philosophies behind the MESs for manufacturing plants in specific industries depend on factors such as the regulatory environment and manufacturing processes required to produce the end product.

SOLUTIONS FOR OVERCOMING CUSTOMER CHALLENGES

Hitachi has been strengthening its ability to act as a one-stop supplier of a wide range of products, services, and "information technology (IT) × operation technology (OT)" in a variety of fields (see Fig. 1). In factories, the manufacturing process is underpinned by production management systems, heating and other utility equipment, parts supply logistics, and equipment maintenance practices, with corporate security also having grown in importance in recent years, food defense[(a)] being a notable example. By supplying companies with functions in a variety of situations that fulfill their need to see what was previously invisible, and that can respond flexibly and quickly, Hitachi believes it can maximize operational efficiency and reduce risk.

The following sections describe the solutions profiled in this issue of *Hitachi Review*.

(a) Food defense
The prevention of the deliberate contamination of food by external parties at all stages, from ingredients procurement to production and sales, and measures for achieving this. Food defense is conceptually different from food safety and security, in the sense that these terms have been used in the past, and is a subject that has attracted growing interest in Japan and elsewhere due to an ongoing series of incidents involving the poisoning of food in recent years.

MEASURES THAT CONTRIBUTE TO HIGHLY EFFICIENT PRODUCTION

Efficient manufacturing requires the use of an MES[(b)] that acts as an intermediary between core business systems and the automation systems used at production facilities, performing realtime monitoring of production equipment, raw materials, inventory levels for work in progress and similar, and other status information, and providing things like work schedules based on production plans and information on operating procedures. Hitachi supplies MESs to a number of different industries (see Fig. 2). This issue includes an article that focuses on an MES package for process industries (food and chemicals), which have a particular need for workplace improvement, and that proposes ways of expediting the plan, do, check, and act (PDCA) cycle and providing seamless coordination with service businesses based on customer needs.

(b) MES
An abbreviation of "manufacturing execution system." A realtime system for production facilities in the manufacturing industry with functions that include production monitoring, schedule management, and providing instructions to staff. In addition to making information from production facilities available by linking plant systems and equipment to the enterprise resource planning (ERP) system, the MES also helps ensure that manufacturing is performed in an optimal manner in accordance with the production plan.

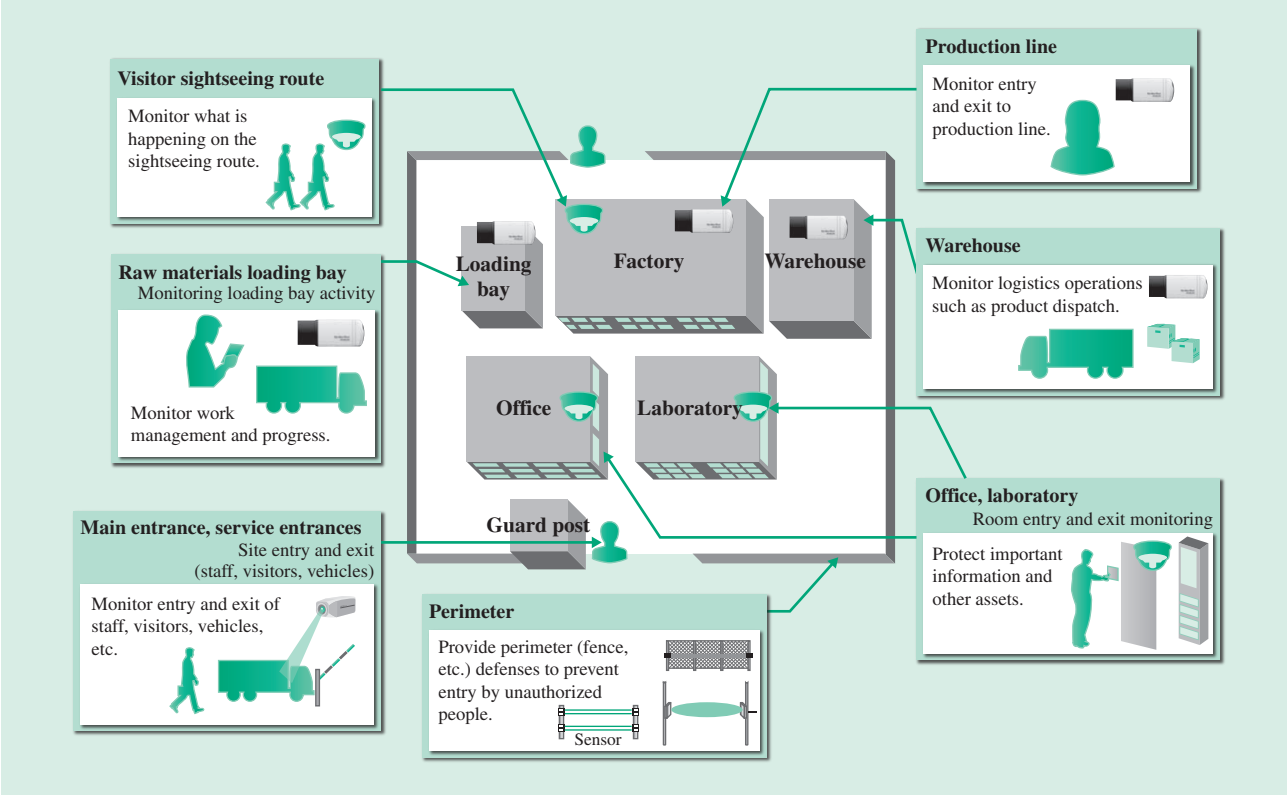


Fig. 3—Overview of Physical Security at Food Processing Plant.
Entry and exit checks on goods, people, and vehicles are important, as are reliable monitoring and recording.

Articles also describe examples of solutions for food processing plants; a solution for regenerative medicine, a field that is expected to achieve an industrial scale; and a newly developed logistics system that supports production systems.

SECURITY SYSTEMS THAT UNDERPIN PRODUCT SAFETY

Earthquakes, eruptions, storms, and other acts of nature are not the only events that can force companies into business interruptions or operational shutdowns. In addition to information leaks, false labeling, and inadequate food hygiene management, malicious acts by staff or acts of corporate terrorism are also serious threats. Hitachi supplies solutions that provide the "adaptivity," "responsivity," and "cooperativity" required for social infrastructure security, and that extend from cybersecurity (anti-virus measures, etc.) to physical security (including premises access control and monitoring). In particular, food security is at the top of the priority list of things that need to be ensured if people are to enjoy a healthy way of life, because the level of damage that can be inflicted on companies is incalculable. This issue includes an article on plant security using the latest Hitachi technology based on case studies of food defense. It describes the operation of security policies, surveillance camera systems with ultra-high-resolution and a high level of data compression for the long-term recording of high-quality video that provide useful methods for reliable recording and checking of historical records, and hands-free systems with detection capabilities that include determining the direction of movement and the presence of large numbers of people (see Fig. 3).

OPTIMAL OPERATION OF ENTIRE UTILITY SYSTEMS

In addition to the monitoring of energy usage, equipment operating status, faults, and other parameters for the utility equipment that supports corporate activity, there is also a need to make ongoing improvements in areas like work efficiency and energy efficiency. To achieve this, Hitachi markets a cloud service based on the mall model that enables participation by a range of stakeholders, from consumers to equipment suppliers, energy suppliers, and national and local government or other agencies to which reports need to be submitted.

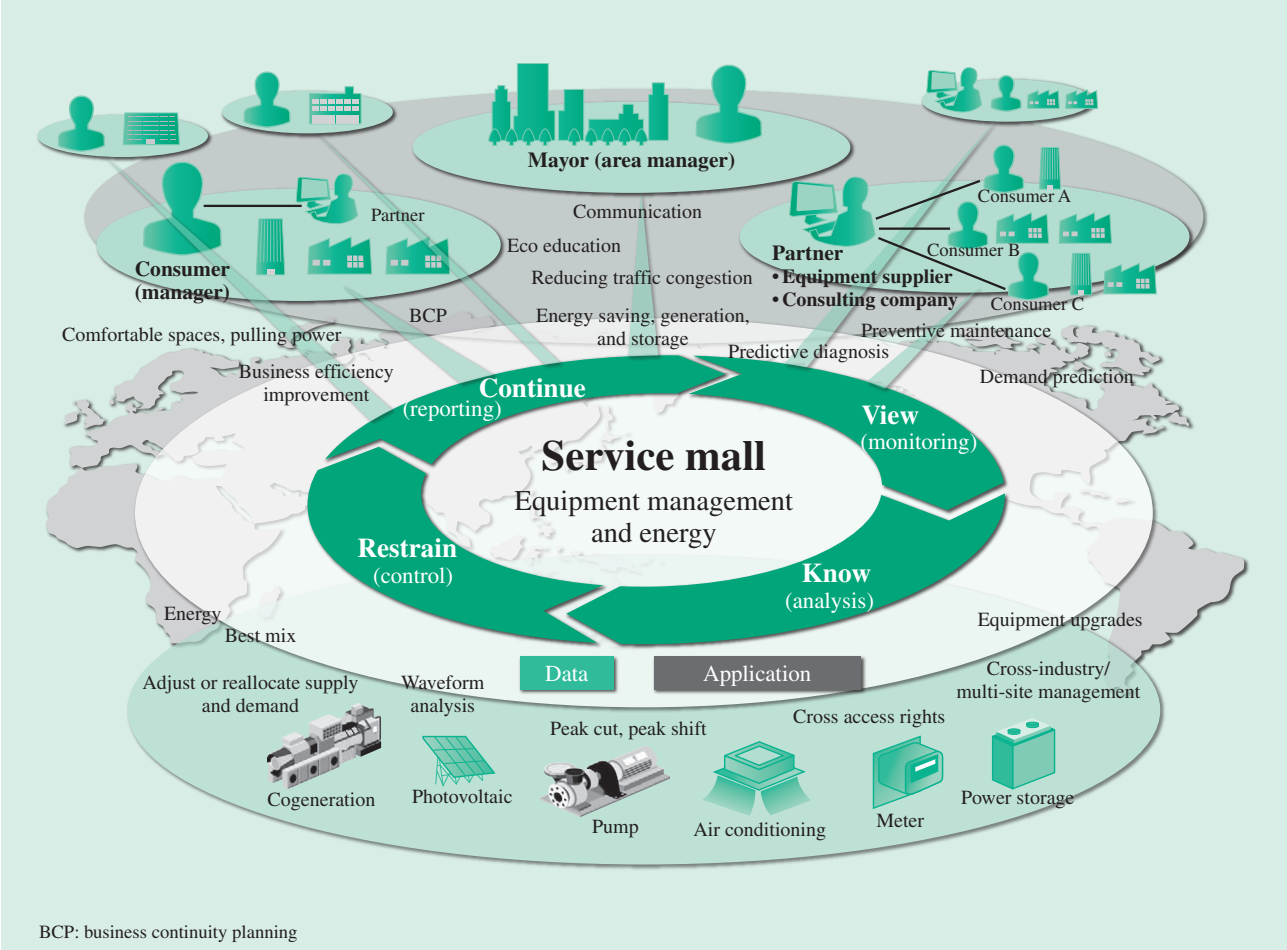


Fig. 4—Service Concept.
By performing integrated management of energy and other operational data from equipment and machinery installed at sites such as factories or retail stores, the service delivers total support that extends from providing and analyzing information to optimal operation, reporting, and maintenance.

Hitachi supplies a service for corporate consumers, incorporating equipment and energy management functions. Stakeholders who have been granted access rights can access the service mall via the Internet and make suitable use of information, including equipment operating data, energy usage, and fault records, in accordance with these rights. By using the functions, which are categorized in terms of "view" → "know" → "restrain" → "continue," it is possible to coordinate the shifting of peaks in electric power consumption with production plans, and to formulate equipment upgrade plans (see Fig. 4).

In an example of the functions bundled with the integrated energy and equipment management service[(c)], this issue also contains an article about a system that performs optimal control of different types of heating and refrigeration equipment in the heating and refrigeration system in the ABENO HARUKAS building, Japan's tallest mixed-use skyscraper.

SERVICE SYSTEM THAT HELPS ACHIEVE EFFICIENT OPERATION OF INDUSTRIAL MACHINERY AND REDUCE COST OF OPERATION AND MAINTENANCE

The requirements for reducing downtime in industrial machinery that has an important supporting role in factories and other plants include using preventive maintenance to minimize the incidence of problems and providing a rapid recovery response when a problem does occur. The difficulties with this, however, are that, because the practice in the past has

(c) Integrated energy and equipment management service
Supplied by Hitachi to corporate consumers, the service enables integrated management of energy and equipment information for various facilities, equipment, and machinery spread across multiple sites in a single energy management system (EMS), and provides benefits such as optimal company-wide use of energy and operational efficiency improvements through a service that supports the adoption of energy efficiency measures based on the analysis and utilization of integrated management data.

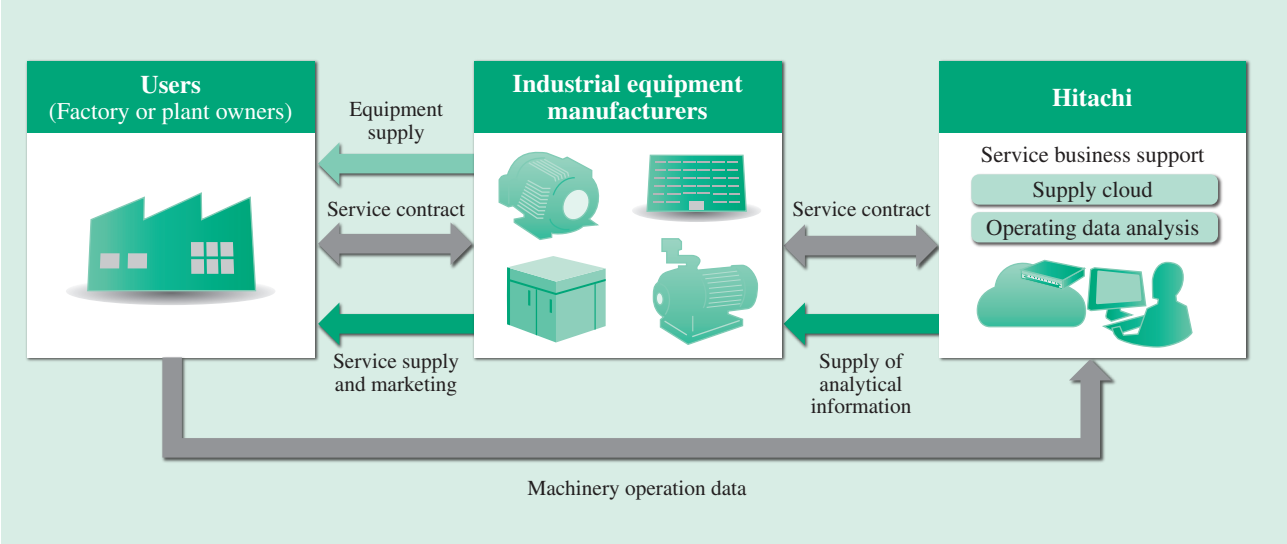


Fig. 5—Overview of Hitachi Cloud-based Equipment Maintenance and Facility Management Service. Hitachi supplies cloud and operational data analysis services to industrial equipment manufacturers.

mainly involved performing status checks by making routine visits to the user or starting recovery work only after receiving notification of a problem, it has been difficult to perform preventive maintenance at the best time, and restoring operation has taken a long time. To solve these problems, Hitachi supplies an equipment maintenance and facility management service platform that it developed itself using cloud computing. By collecting and analyzing operational data, the service platform can be used to provide information that is useful to users, such as suggesting energy-efficient operating practices (see Fig. 5). When utilized for air compressors, the service was able to identify energy-efficient ways of operating equipment through the collection and analysis of operational data. When used to guide workers through operating procedures by using AR(d) for operation and maintenance work at various plants, it has also achieved benefits such as preventing steps from being missed as well as other operational errors.

WORK AIMED AT DELIVERING NEW VALUE AND OVERALL OPTIMIZATION

While the environment in which corporations operate continues to undergo major changes, this article has described Hitachi solutions that respond to customer issues in a variety of fields. All of these are examples of solutions that Hitachi's Infrastructure Systems Company has supplied to the industrial sector by combining equipment, systems, and information and control technology.

By supplying new value to customers through the sharing and analysis of the data collected by each of these systems, and also by performing optimization across multiple systems, Hitachi will continue to operate its Social Innovation Business in the future, not only in industry but also in a variety of other fields.

(d) AR
An abbreviation of "augmented reality." A technology that uses computer processing to overlay information on a view of the real world, or that presents it in modified form, and the environment presented by the technology. One example of AR use is to display operating procedures over images of a plant that have been captured by a camera.

ABOUT THE AUTHORS

Takumi Sugiura, PE.Jp

Corporate Technology Division, Infrastructure Systems Company, Hitachi, Ltd. Having worked on the development of energy efficiency technology and air conditioning systems for clean rooms and other buildings, he is currently engaged in coordinating technology development. Mr. Sugiura is a technical fellow of The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan and a member of the Architectural Institute of Japan (AIJ) and the Japan Society of Refrigerating and Air Conditioning Engineers (JSRAE)

Shinsuke Kanai

Security System Engineering Department, Security & Utility Solutions Division, Urban & Electrical Solutions Division, Infrastructure Systems Company, Hitachi, Ltd. He is currently engaged in the integrated security solutions business.

Hiroshi Yoshikawa

Energy Systems Department, Matsudo Research Center, Infrastructure Systems Company, Hitachi, Ltd. He is currently engaged in the development of information technologies for EPC and services. Mr. Yoshikawa is a member of the Information Processing Society of Japan (IPSJ).

Takaki Taniguchi

Industrial System Engineering Department, Industrial Solution Division, Industrial Plant Solutions Division, Infrastructure Systems Company, Hitachi, Ltd. He is currently engaged in coordinating process industry business.

Masatoshi Furuya

Urban Solutions Engineering Department, Security & Energy Solutions Division, Infrastructure Systems Company, Hitachi, Ltd. He is currently engaged in business planning for equipment management and energy management.