

Featured Articles

ConSite Next-generation Service Solution Utilizing ICT

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OVERVIEW: There has been a shift in customer concerns over recent years toward reducing lifecycle costs and improving machine availability. Hitachi Construction Machinery Co., Ltd. uses ConSite, a next-generation service solution that utilizes ICT, to deliver a consistent level of high-quality service to customers throughout the world. The company first launched its ConSite Data Report Service for the automatic worldwide distribution of operational information about hydraulic excavators and wheel loaders in Japan in October 2013, with further deployment to other countries from April 2014. As of the end of February 2015, the ConSite service was available for 99,750 machines. The number of machines actually covered by contracts has surpassed the target of 5% to reach 15% of this total by the end of February 2015. Hitachi Construction Machinery intends to expand the range of services it offers in the future.*

INTRODUCTION

WITH the construction machinery industry facing growing demands from society, clean diesel has become a requirement for participation in public works. The stage 1 standards under the regulatory system for construction machinery emissions were introduced for projects undertaken under the direction of the Japanese Ministry of Land, Infrastructure, Transport and Tourism in 1991, the stage 2 standards in 2003, and the stage 3 standards in 2006.

Furthermore, regardless of industry, a high priority has been placed on reducing fuel costs amid the price rises and violent fluctuations in fuel prices over recent years. Because construction machinery is used for heavy work, fuel costs naturally have a significant impact on the total lifecycle cost of machines, and there is a high degree of interest in measures for reducing fuel costs as well as in information on the subject, especially for major customers with large fleets. In particular, fuel-efficient operating practices that utilize information and communication technology (ICT) have become widely recognized as an issue for customers, primarily in developed economies. While construction machinery manufacturers have been adopting innovative measures and making data available on special-purpose websites, not all customers are able to make good use of this information because its use for fixed-point observations requires them to have information technology (IT) skills and to make an effort to collect information.

Meanwhile, advanced skills are now required to repair faults in the control systems of construction machines that involve a complex combination of electronic, hydraulic, and mechanical control to reduce fuel consumption and emissions. Customers concerned about being able to get a quick response when an unexpected fault takes a machine out of service have high expectations for the use of ICT to make available information on operating conditions and enhancements to service infrastructure.

In response to these background factors, Hitachi Construction Machinery has started offering customers its ConSite after-sales service program for construction machines that utilizes ICT. Fig. 1 shows an overview of the service. After undertaking the appropriate procedures with their distributor, customers are able to receive comprehensive monthly reports by e-mail without any effort required on their part, and without needing to log in to a website each time or search for information, etc.

FEATURES OF CONSITE

ConSite is a package from which customers can choose services as required. One option, the Data Report Service, was introduced in Japan in October 2013, with test operation and service delivery commencing globally in 2014, except in North and South America where after-sales service is handled

* ConSite is a trademark of Hitachi Construction Machinery Co., Ltd.

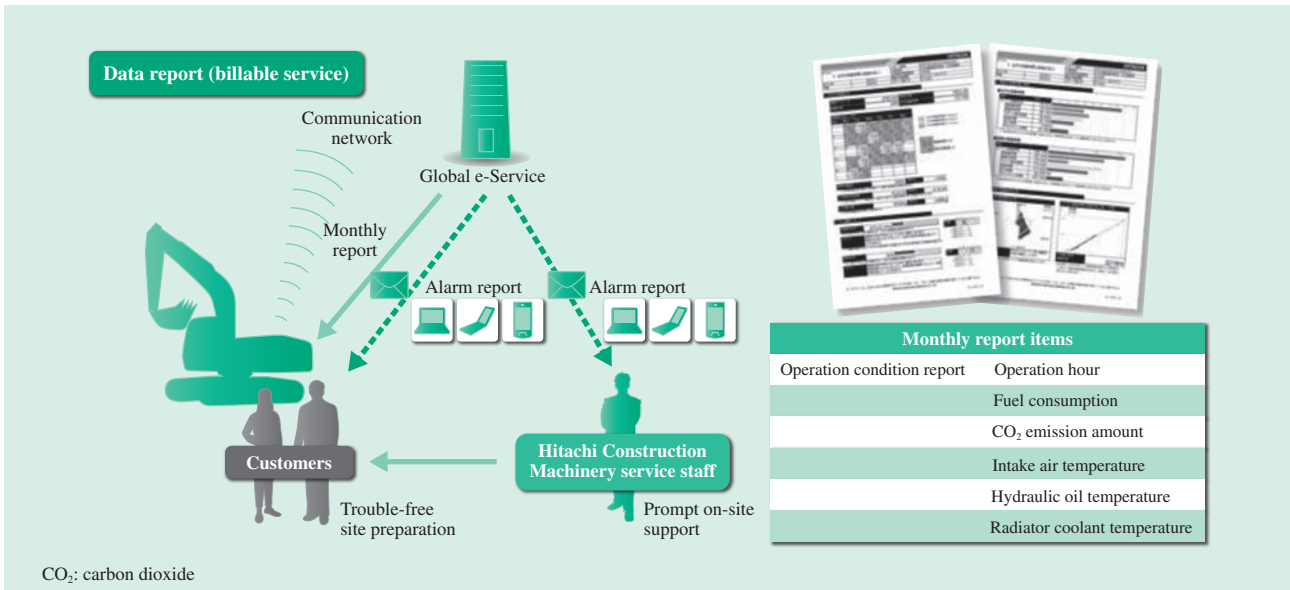


Fig. 1—Overview of ConSite Data Report Service. The service is a support system that utilizes the sensing functions on machines to provide customers and distributors with timely machine-specific information about their operation and faults.

by Hitachi’s partner, John Deere (Deere & Company) of the USA.

The data report service consists of a monthly report service and alarm report service. The features of these are described below.

Monthly Report Service

The monthly report service automatically collects data on machine operation over the previous month and sends it to the customer by e-mail. The service is available in 29 different languages and provides a set of reports that include both summary reports listing information for multiple machines and detailed reports showing operational data for individual machines. Fig. 2 shows the title pages of the monthly reports.

The service makes it easy for customers to obtain information on machine operation in the form of calendar-format operational data, total operating hours, fuel consumption, average fuel consumption, and comparisons with previous months, and also an ECO Operation Report with indices that show trends in energy-efficient operation calculated using proprietary averaging logic. The service also provides an objective assessment of machinery status through comparisons against the average values for other machines of the same model in nearby regions. Because the reports clearly show how the operational efficiency of construction machinery, which tends to vary from operator to operator, differs from previous months, they are readily able to help with workplace

awareness by providing motivation for reducing fuel consumption.

Using measures such as frequently turning off the engine when the machine is idle can significantly reduce fuel consumption as well as the proportion of non-operating time relative to the average (see Fig. 3).

The service is also useful for machine maintenance management, having been designed to facilitate maintenance planning based on information about operation and alarms generated over a one-month period.

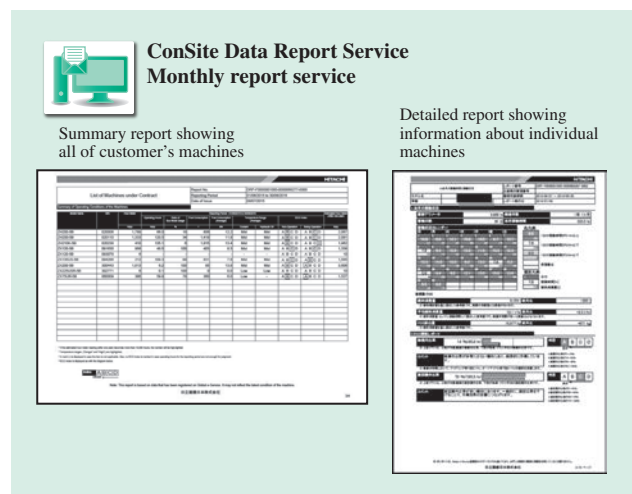


Fig. 2—Title Pages of Monthly Reports. The service provides both summary reports that give an overview of the operation of all the fleet owner’s machines, and detailed reports that show information about individual machines.

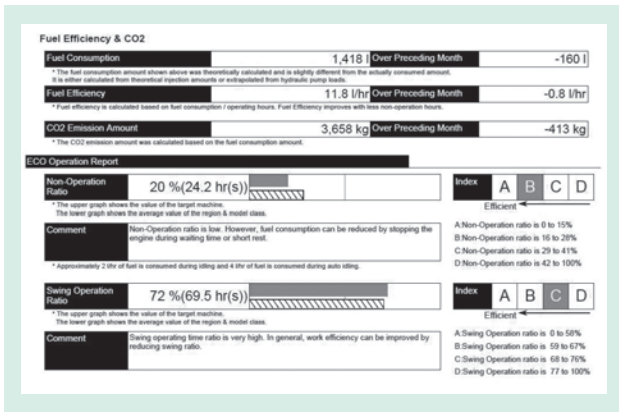


Fig. 3—Fuel Consumption and ECO Operation Report. Factors such as fuel consumption (a top priority for customers) and operation over the month are ranked (A, B, C, or D) based on their respective operation ratios.

Alarm Report Service

The alarm report service sends notifications to specified e-mail addresses, such as the customer’s office or smartphone, when a problem occurs that requires urgent attention and has the potential to take a machine out of service. The aims of the service include shortening machine downtime by enabling staff to keep up with what is happening on the ground, even when away from the site.

Ahead of its competitors, Hitachi Construction Machinery has been providing a similar service since 2000 that has since been copied by others. What makes this service different is its “intelligence filter” function, which uses data science to restrict the information to only that of relevance to the customer (see Fig. 4). This uses a combination of abnormality detection logic

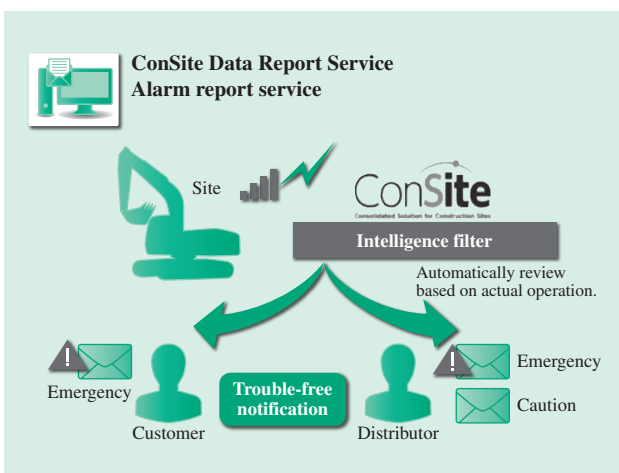


Fig. 4—Operation of Intelligence Filter. The accuracy of machine alarms is improved as far as possible by filtering them based on past experience.

TABLE 1. Automatic Selection of where to Send Notifications Based on Level of Urgency
The system automatically selects where to send notifications based on the level of urgency.

| | Will problem result in machine downtime? | |
|-------------|--|----------------------------|
| | Yes | No |
| Customer | Emergency alarm distribution | – |
| Distributor | Emergency alarm distribution | Caution alarm distribution |

on the machine’s onboard computer and server-side failure diagnosis logic determined from the statistical analysis of large amounts of operational data collected over time. Hosting the failure diagnosis logic on the server side dramatically improves its accuracy by enabling changes to be made as required, such as adding additional conditions or adjusting thresholds. In a trial conducted on machinery in Japan during 2013, there were no incorrect diagnoses among the case of 36 machines that alarm raised.

The system automatically selects where to send notifications based on the level of urgency (potential to cause machine down time) (see Table 1).

DEPLOYMENT OF NEXT-GENERATION SERVICE UTILIZING ICT

Changing Role of Distributors

Customer concerns are shifting beyond just machine performance and initial cost to also include reducing overall lifecycle costs. Accompanying this shift, added value from things like ICT, the availability of support from the official distributor, speed of support, and the ability to offer suggestions have become important factors in choosing a vendor.

Challenges for Distributors

Meanwhile, there is also a need to acquire advanced skills to perform failure diagnosis of increasingly complex electronic, hydraulic, and mechanical control. As the speed of support response varies widely depending on the proficiency of the technician, taking or suggesting action based on information obtained using ICT requires not only knowledge of the machine but also IT skills. Because conventional approaches to training and other aspects of human resource development are inadequate for meeting customer needs, action is required on next-generation services that utilize ICT if the technicians who work for the world’s leading distributors and their branches and sub-distributors are to provide a consistent level of high quality service to customers.

Response to Challenges

Hitachi Construction Machinery has acquired service know-how in Japan by providing service directly, unlike other construction equipment manufacturers, and deploys this know-how throughout the world. Hitachi Construction Machinery has engaged in development based on the considerations of being useful on-site and acting for the customer's benefit by collaborating with Hitachi Construction Machinery Japan Co., Ltd. on ways of standardizing this know-how so as to provide the same quality of service everywhere. One of the outcomes of this work is the ConSite failure diagnosis manual. Before the full rollout of ConSite, Hitachi Construction Machinery spent several years putting together a technical manual that enables technicians with two to three years of experience at the company to provide the same level of support as more experienced staff. A feature of the manual is that it has been designed to enable technicians to assess situations at a glance, and so that the fault can be dealt with in the shortest possible time in a way that is appropriate to the model type and phenomenon.

The manual is used in conjunction with the alarm report service so that as soon as the distributor receives the report they can immediately start working through a seamless sequence of steps: determining the customer name, serial number, and job site; identifying the phenomenon; looking up the manual; and responding as appropriate. This enables response times to be made much faster than the telephone-based response used in the past (see Fig. 5). Technicians can also look at the monthly report delivered to the customer each month and pass on objective diagnoses and other advice based on numerical data.

Hitachi Construction Machinery uses the term "service automation" for this use of ICT to enable all service staff to provide the same level of service, and sees it as an important policy for strengthening distributors over the medium to long term.

IMPLEMENTATION EXAMPLES

Package Deals

There are numerous examples, particularly in Europe, of customers making use of the features of the ConSite Data Report Service and adopting ConSite in conjunction with an extended warranty, maintenance contract, or other additional options bundled with the service.

These package deals provide greater reassurance and are particularly suited to large customers with

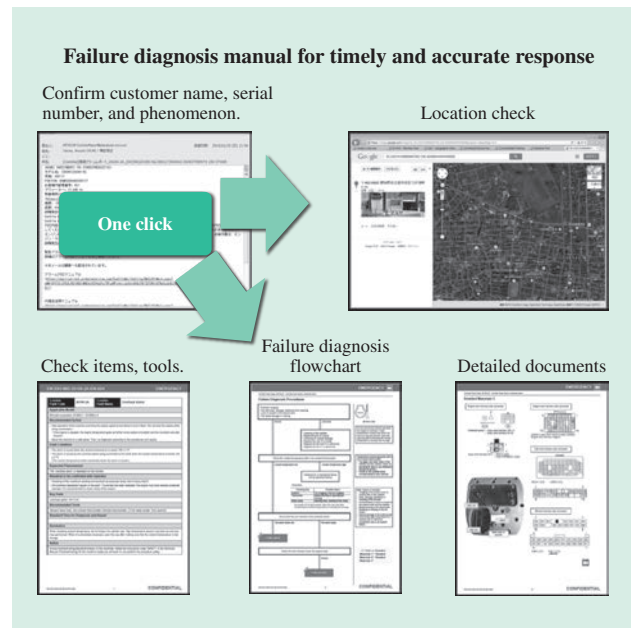


Fig. 5—Integration of Alarm Report and Failure Diagnosis Manual.

The same level of service quality can be achieved everywhere in the world by incorporating experience and other know-how built up in Japan into a manual and standardizing it.

planned programs of capital investment. In Japan also, Hitachi Construction Machinery Japan offers packages on its latest models that include standard warranty for a new machine, extended warranty, and maintenance program. Similarly, in Oceania, the ConSite automated data report bundled together in a package with the extended warranty and call center support is offered on new machine sales.

Rather than compelling distributors to adopt particular practices, Hitachi Construction Machinery contracts separately with each distributor regarding the range of services it will offer.

Customer Feedback

Hitachi Construction Machinery has received the following feedback from customers who have adopted ConSite.

- (1) It is essential that everyone, including on-site staff, be able to understand what the data means so that it can be followed up with action.
- (2) The reports provide a lot of usable data.
- (3) Use of color presents information on daily operating hours at a glance.
- (4) It is helpful to get a detailed picture in 15-minute intervals. This highlights opportunities for improvement in the behavior of individual operators by, for example, showing who starts their work on time and who does not.

(5) The proportion of non-operating time contains hints about how to improve things like operational efficiency and fuel consumption. While it is difficult to determine what constitutes an appropriate value, determining this is part of our own (the customer's) know-how.

Large customers in Japan who were the early adopters of the service commented on things like the reports being automatically provided on-time each month and their appreciation of the oversight mechanisms. They also requested proposals and the holding of regular meetings with site staff using information provided by Hitachi Construction Machinery Japan. Overall, the feedback indicates that the service contributes to higher levels of customer satisfaction, with the level of orders for services and parts from customers who have contracted to receive ConSite data reports having increased subsequent to their starting to receive the service.

Number of Contracts

As of the end of February 2015, the number of machines for which the ConSite service was available totaled 99,750. While Hitachi Construction Machinery had set a target of obtaining contracts for 5% of these, because many distributors in different parts of the world wanted to offer the service on all new machine sales, the actual number of contracts totaled 14,990,

reaching the upwardly revised target of 15% of the above machines.

Outside Japan, trial installations and full-scale installations have commenced in the developed economies of Europe, Oceania, and elsewhere, and also in emerging economies such as China, Turkey, Kazakhstan, Kenya, South Africa, Thailand, Malaysia, and Indonesia. There is particularly strong interest in fuel consumption monitoring from customers in Europe, the UK, Asia, and Oceania.

CONCLUSIONS

As use of ConSite extends worldwide in the future, Hitachi Construction Machinery intends to utilize feedback on the use of machinery in different ways and in different environments, as well as feedback from customers and distributors, to improve the accuracy of portent diagnosis (warning sign diagnosis), lifetime prediction, and similar analyses.

Hitachi Construction Machinery also plans to add a number of new options to the service by expanding the scope of the data being analyzed to enhance the identification of complex interrelationships between different types of operational data. By continuing to work in conjunction with Hitachi, Ltd., Hitachi Construction Machinery Co., Ltd. aims to take advantage of the comprehensive capabilities of Hitachi.

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