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Hitachi Global Life Solutions, Inc.

HITACHI
Inspire the Next

Remote Predictive Diagnostics for Heating, Cooling, and Air Conditioning Equipment Using "HiPAMPS" for Anomaly Detection

Climate change is making the reliable operation of heating, cooling, and air conditioning equipment more important than ever. At the same time, it is becoming increasingly difficult to obtain the human resources necessary for equipment maintenance due to the shrinking workforce and the aging of skilled maintenance staff. The exiida remote monitoring service for overcoming these issues not only monitors the performance of heating, cooling, and air conditioning equipment, but also incorporates predictive diagnosis functions for detecting problems with equipment before they cause a malfunction. This is done using the "HiPAMPS" predictive diagnostics system from Hitachi Power Solutions. By drawing on the synergies of the Hitachi group, Hitachi Power Solutions is contributing to overcoming various different challenges and creating new value for customers' businesses.

Challenges	Solutions
1 Malfunction in heating, cooling, and air conditioning equipment can threaten business continuity and even the lives of patients at medical facilities. What is necessary is to act before equipment stops working.	Use exiida remote monitoring service and its predictive diagnosis functions to deal with faults before they occur.
2 Shortages both of experienced maintenance staff and of staff to whom this expertise can be passed on. Regardless of these shortages, reliable operation still needs to be maintained.	Reduce workload through the mechanization of routine daily inspections. This also helps reduce maintenance costs by shifting from breakdown maintenance to predictive maintenance.
3 To comply with the act on rational use and proper management of fluorocarbons, it is necessary to reduce the amount of fluorocarbons escaping from faulty refrigeration systems.	Use predictive diagnosis for the early detection of problems that could lead to the release of fluorocarbons from refrigeration systems. Contribute to solving global warming issues by reducing the amount of leakage.

Project Background

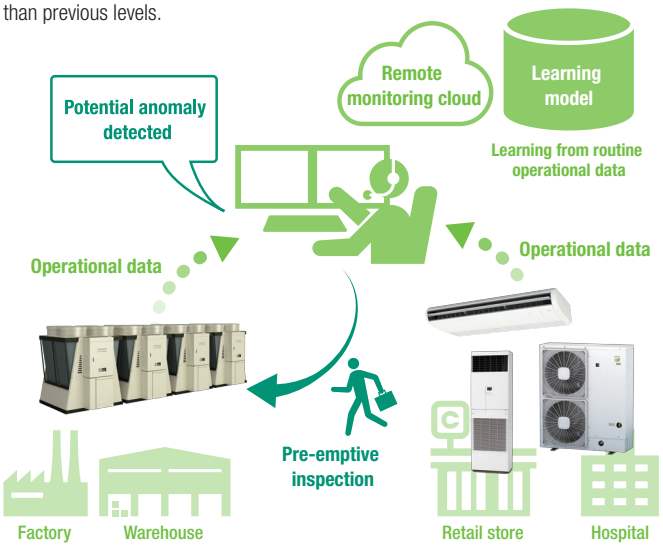
Keep air conditioning up and running! Project accelerated by a sense of mission

Hitachi Global Life Solutions has been supplying remote monitoring services for more than 20 years with the aim of making heating, cooling, and air conditioning systems less intrusive as well as more reliable and convenient. While these services initiate repair work in response to fault alarms from this equipment to get the equipment working again quickly, they have not been able to eliminate downtime altogether. Recalling how they set about looking for ways of performing maintenance on equipment before it fails in order to reduce such downtime to an absolute minimum, Mr. Baba, one of the members coordinating the project, had the following to say.

"For customers whose operations rely on the use of cold storage, for example, sudden equipment outages have the potential to cause significant losses. Likewise, heatwaves in recent years have taken on a new dimension, to the extent that air conditioning faults can put lives at risk. Whether it happens at industrial factories and warehouses or at the hospitals and retail stores that feature in people's daily lives, the failure of heating, cooling, or air conditioning equipment can cause serious losses. To be able to act before equipment stops working is a solution that customers clearly want. This means going beyond breakdown maintenance and implementing precise predictive maintenance practices."

Mr. Baba first heard about "HiPAMPS" from Hitachi Power Solutions just as he was about to embark on development aimed at putting predictive maintenance into practice. This happened when one of the company's senior managers at the time suggested that, rather than starting from scratch, he should consider using HiPAMPS, making the point that this would be good for customers while also helping get the service up and running more quickly. "It was thanks to this suggestion that we were able to launch predictive diagnosis ahead of our competitors," noted Mr. Baba. "We were also able to achieve a high level of predictive diagnosis accuracy thanks to the availability of 20 years' of data that we used to verify the technology."

That customers had been waiting for predictive diagnosis to become available was demonstrated by the rise in the number of service users during the 18 months or so after adding the function to the service, the number increasing to 1.5 times larger than previous levels.



Manager, Planning Department,
Air Conditioning Systems and Engineering Division
Hitachi Global Life Solutions, Inc.

Mr. Yoshiaki Baba

Hitachi Power Solutions Co., Ltd.

Project Outcomes

Helping achieve reliable operation of industrial and medical equipment while also resolving maintenance staff shortages

The exiida remote monitoring service can incorporate “HiPAMPS” from Hitachi Power Solutions. This provides predictive diagnosis that works by correlating a wide variety of parameters (coolant pressure, temperatures, currents, and so on) to determine the condition of equipment. It raises an alarm whenever it detects a change that has the potential to develop into a fault. Mr. Tokura was one of the members who worked on the development and operation of the system. He explained as follows how they went about achieving accuracy.

“Experienced maintenance staff are able to assess the condition of equipment based on plant data such as pressures or temperatures that change with the seasons, for example. The trick to predictive diagnosis lies in being able to make judgements in this intuitive way that comes naturally to humans. Because the condition of otherwise identical machines varies depending on how they are used and the conditions under which they operate, the starting point for predictive diagnosis is the use of remote monitoring to collect approximately a year’s worth of data on normal plant operation from each customer. We then analyze this data to produce learning models.”

Assistant Manager, Planning Department,
Air Conditioning Systems and Engineering Division
Hitachi Global Life Solutions, Inc.

Mr. Noriyuki Tokura

The availability of past data meant that existing customers of the remote monitoring service were able to adopt predictive diagnosis immediately. On the subject of where the service is used, Mr. Tokura commented that, “A notable application for the predictive diagnosis service is at medical facilities. The cooling systems of MRI and CT scanners necessary to operate continuously due to the heat generated by their magnetic fields. The predictive diagnosis services for keeping these systems running play a very important role in maintaining confidence in healthcare work.”

Mr. Baba also emphasizes the benefits of the system for cost reduction, saying, “Air conditioning maintenance was a significant cost for a retailer that operates nationwide. They became interested in our service as a means of cutting maintenance costs and are currently trialing its use. This is bringing a shift from time-based maintenance to condition-based maintenance practices for things like routine inspections. Parts replacement is one example. Whereas time-based inspections involved replacing all of the parts listed on the inspection instructions, condition-based maintenance performs inspections only when the equipment reports a problem and only replaces the relevant parts. This cuts costs by only replacing parts when necessary. As the system learns from data analysis and from analysis results, it should uncover the keys to further efficiencies.”

Along with improving customer satisfaction by reducing the workload of maintenance staff and cutting maintenance costs, predictive diagnosis is also increasingly being seen as a system for ensuring the smooth running of society and industry.

Future Plans

Service upgrades beyond anomaly detection

The emergence of the exiida remote monitoring service was ahead of its time. Work has now moved on to the identification of faulty components and the prediction of equipment life, two features that Hitachi Power Solutions has already rolled out in its solutions. Mr. Tokura explained by saying, “From a customer’s perspective, what you want to know when a potential fault arises are things like where the problem lies and how much time there is before the fault actually happens. We hope to use HiPAMPS to provide a more fine-grained response to these needs.”

Meanwhile, what is also necessary is action on pricing to make the service more attractive. Mr. Baba laid out the plans for its future by saying, “With remote monitoring still being expensive, there are customers who have yet to adopt it despite recognizing the need. Along with offering a combined proposition that integrates products and services in the form of cooling, heating, and uninterrupted operation, we are also seeking to reduce the cost to a level that will make the service more attractive. Moreover, we hope to build on our successes in Japan to deploy the service globally through collaborative creation with overseas vendors.”

Now equipped with predictive diagnosis, the exiida remote monitoring service is making an important contribution to society and industry. The plan for the future is to work closely with Hitachi Power Solutions to exploit group synergies further.

■ User’s Profile

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https://www.hitachi-gls.com/

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Business activities: Sales of (and provision of engineering and maintenance services for) home appliances, air conditioning equipment and other equipment and provision of products and solutions utilizing digital technologies

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