

# Reducing power consumption at our company's factories



## Challenges

Reduction of power without decreasing productivity  
Optimization of power consumption

# 23%

reduction in power consumption  
for all equipment, 66% reduction  
for exhaust systems

ULVAC

Extensive knowledge of  
equipment

OMRON

Sensing technology  
that can convert site  
information into data

Identifying the times in which it is possible time to stop vacuum pumps that had been operating 24 hours a day, 365 days a year

Finding time periods to shut down vacuum pumps that would not affect productivity  
Annual electricity costs were reduced by roughly 2.5 million yen per pump

## Actual value of IoT in a project by a vacuum equipment manufacturer, resulting in 23% energy savings for factory equipment

As labor shortages are becoming more serious, data utilization using digital technology is attracting great attention even for manufacturing floors. However, the reality is that even if efforts are made to actually utilize data, many manufacturing industries do not know what to do or how to proceed. Under these circumstances, vacuum equipment manufacturer ULVAC is effectively using "co-creation" to produce positive results. This is an introduction of its initiatives.

### Utilization of manufacturing floor data made possible through "co-creation"

As the issue of labor shortages is becoming more severe, numerous challenges that cannot be addressed simply by extending conventional improvements are appearing even on manufacturing floors. In such an environment, the development of smart factories based on data and implemented with digital technologies such as the IoT (Internet of Things) and AI (artificial intelligence) is attracting a great deal of attention.

However, even though interest in such development is high in many manufacturing industries, a large number of them are facing confusion because they do not know specifically where to start and how to proceed. Under these circumstances, ULVAC, a



External view of ULVAC's head factory (Source: ULVAC)

manufacturer whose core is based on vacuum technology, is working to utilize data from manufacturing floors to produce a variety of positive results.

Although ULVAC had not thoroughly carried out visualization in the first place, it decided to actively incorporate data utilization as one solution to issues such as labor shortages, the aging society, and environmental measures. As a result, the company has achieved various positive outcomes, including a 23% reduction in the amount of electricity used by factory equipment. One of the key points in this company's initiatives for "data utilization" is "co-creation." Why was ULVAC able to produce these results for productivity improvements using data? We will investigate the secrets behind their success.

### Using digital technology to solve the issue of handing over expert technical skills

Founded in 1952, ULVAC is a comprehensive equipment manufacturer with vacuum technology as its core technology. The company primarily deploys products focusing on vacuum-related equipment, but currently its main businesses are in the fields of semiconductor manufacturing and display manufacturing. It provides lines of products such as sputtering equipment, CVD (chemical vapor deposition) equipment, vacuum deposition equipment, and etching equipment.

While these products have been developed and have continued to grow on a global basis, ULVAC considers the aging of skilled engineers, and the associated problem of handing over their skills, to be a serious



Scene from inside of ULVAC's head factory (Source: ULVAC)

“issue that it is currently facing.”

Kimiaki Ohno, General Manager of Control System Development Division at ULVAC Manufacturing Center of Excellence, says, “The aging of skilled engineers is a major concern. In the past, skilled engineers with extensive experience were able to prevent failures and correct defects based on their experience, to maintain quality and ensure delivery times. However, the number of such skilled engineers is expected to decrease from here on as they approach retirement age. Furthermore, their experiences have become a kind of unspoken knowledge so it is difficult to hand over their skills, and there is a need to decide how to address this situation. Issues related to personnel like this are already starting to emerge in many parts

of the company.”

However, without expertise in data utilization, it was difficult for ULVAC as a single company to carry out practical initiatives to respond. Therefore, ULVAC selected OMRON as a “co-creation” partner to create values together.



ULVAC  
General Manager  
Control System  
Development Division  
Manufacturing Center  
of Excellence  
Kimiaki Ohno

## OMRON's vision for the value of “innovative-Automation”

Under the principle of “IoT at an altitude of 10 m or less,” OMRON is actively working on IoT utilization and manufacturing innovation in close connection with manufacturing floors. One concept being promoted by OMRON to show the new values that can be brought to manufacturing floors is “innovative-Automation.”

The “i” in “innovative-Automation” stands for “innovative.” It also refers to the initials of “integrated,” “intelligent,” and “interactive.” Based on the 200,000 types of control devices handled by OMRON in the past, it is characterized by 170 types of control program packages carefully aligned with software, to create new values that apply the IoT, AI, and other digital technology.

Mr. Ohno explained the reasons behind the selection of OMRON as a partner: “We originally had a relationship with OMRON as a control equipment supplier over roughly 30 years, and the first trigger for

our selection was that while we were facing many issues, OMRON’s concepts for carrying out initiatives matched well with us. Under those conditions, we identified specific issues, narrowed down our themes to address to five, and proceeded with the project.”

One of the topics being addressed is the reduction of power consumption at ULVAC’s own factories. At ULVAC’s head factory, a variety of equipment is operated but only minimal equipment was used for monitoring, other than to monitor control of the equipment itself. According to Mr. Ohno, “Even if we were to try to utilize data, we didn’t have enough of it, and we didn’t know where to begin in order to optimize our power usage.”

OMRON’s data utilization service for the manufacturing floor “i-BELT” was therefore applied in its practical measures.

## Promoting “co-creation” by applying the data utilization service for the manufacturing floor “i-BELT”

“i-BELT” provides values through “innovative-Automation” as a co-creation type service. Its key point is that it does not simply analyze data, but combines OMRON’s engineers with on-site expertise, its own know-how on manufacturing floors, and its knowledge of control equipment and software, so it continually works with customers to advance manufacturing floor innovations. With a focus on “co-creation,” it repeats the processes of “collecting and accumulating data from manufacturing floors,” “visualizing and analyzing data,” and “feeding back to control” as if moving

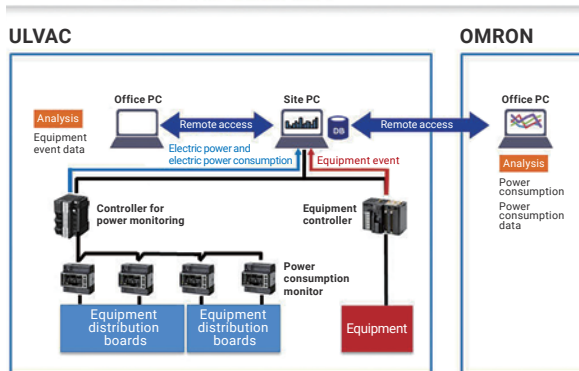
around on a rotating belt, to proceed with the evolution of manufacturing floors as a partner.

There are many cases in which manufacturing floors have no experience related to the introduction and use of IoT, or human resources with such knowledge, so “it is difficult to know where to begin.” However, since this is a “co-creation” type service, one of its features is being able to provide support in the areas from consulting to operation until actual results are achieved.



Since positive results were achieved with vacuum pumps, ULVAC will continue to work further on energy conservation for other equipment and devices, and will expand the scope of co-creation using “i-BELT.” Mr. Umezawa indicated a stance to move on with further energy conservation measures: “Thinking about combinations of operation data will allow energy to be further conserved even with existing equipment. By deploying this to other equipment, we are hoping to contribute to the reduction of power consumption throughout the entire factory. As the next phase, we are intending to work on reducing the power consumption of heaters.” ULVAC has also set forth a policy to further expand initiatives to improve productivity through data utilization in addition to energy conservation, without relying only on the know-how of skilled engineers.

### Example of System Configuration using i-BELT



System configuration for energy visualization

### Expanding the results of internal data utilization to customers

Although this project only involved data utilization within ULVAC, in the future there are plans to expand its scope further and utilize data to enhance the values provided by ULVAC itself to customers.

“As an equipment manufacturer, we have thorough knowledge of equipment. On the other hand, the task of data collection is a specialty of OMRON with its outstanding sensing technology. By taking advantage of each other’s strengths in this project, we were able to create value on our manufacturing floors. We believe that by directing this kind of collaboration to our customers, it will allow us to help in solving their problems,” explained Mr. Ohno, showing his desire to build an ecosystem that includes customer companies. He added that ULVAC is intending to include condition based maintenance (CBM) to prevent sudden failures and other problems with equipment, and support for autonomous improvements based on data. According to him, “A very important point is for customers to feel secure when using our equipment. In order to accomplish this, we must not only collect data, but also analyze it and link it to services.” He speculated that even further into the future, “We will be able to discover correlations between equipment and quality by analyzing the status of customer product quality, and which sensor data is related to which parts of equipment. Currently, we are promoting quality improvements based on the expertise of skilled engineers in the field, but by evolving sensing and analysis technologies even further we will create a world in which the advancement of productivity will be centered around data. I believe we must become a guide to lead us to that kind of world.”

However, the more we try to create a world that combines the value of equipment with the value of data utilization, the more important the role of partners will become. In many manufacturing industries, it remains difficult to produce results through “data utilization.” Even if attempts are made to actually utilize site data, there are many cases in which there are concerns over questions of “how much of what data to obtain for which equipment.” In addition, in order to analyze the data obtained and actually feed back the results to sites to plan for improvements, coordination with control devices and the installation of equipment will be required. Implementing this entire cycle within one’s own company can be seen as an extremely high obstacle to overcome.

OMRON’s “i-BELT” has the characteristics of being able to cover the range of this complete cycle, and to provide support through co-creation until results are achieved. One significant advantage is that the time required to obtain results can be greatly reduced compared to the time for repeated trial and error by one company alone. In this sense, OMRON’s “i-BELT” can become a powerful companion for companies that wish to begin utilizing manufacturing floor data.

\*The indicated contents, organization names, affiliated departments, and other information are current as of November 2019.