

Sysmac NJ SQL Client

Big Data Drives Productivity Gains



Factory Uses Big Data Solution for Productivity Improvement

- Sysmac NJ SQL Client collects real-time data
- Microsoft SQL Server consolidates information
- Microsoft Excel front end assures global ease of use



Kusatsu Factory Improves Productivity Based on Objective Data

Introduction

Omron's Kusatsu factory needed to identify and assess continuous improvement projects with solid data in addition to anecdotal reports from plant-floor operators. The factory adopted an easy-to-use solution that enables real-time tracing of a product through all the manufacturing processes, and provides visualization to analyze where improvements can be made. The combination of Sysmac NJ SQL Client and Microsoft Big Data software with an Excel front end has helped the factory reduce resources needed to identify and implement production improvements.

"Innovation in manufacturing is ultimately improvement of productivity," says Masaru Takeuchi, Automation Systems Division HQ Senior General Manager of Omron. "The experience and intuition of experts take a major role in improvement activities at production sites, but the improvement points that the experts cannot identify are hidden in the bottlenecks which hinder production efficiency. In order to overcome such situations and promote further improvements, we needed objective data."



"To meet this need, we embarked on a new application of the Sysmac NJ series of integrated Machine Automation Controllers, specifically models with built-in SQL client services that allow a machine or system to log data directly into databases running on a server without any middleware or PC."

The solution uses Microsoft SQL Server and Excel software to consolidate the logs, which are collected from devices on a production line and linked with each product, into the database and can graph the logs in real time. "Some people may avoid Business Intelligence (BI) due to complications. We, however, aimed to visualize actual manufacturing processes based on the Sysmac NJ Client in real time and to create the solution that enables on-site workers to easily graph the data," says Mr. Takeuchi.

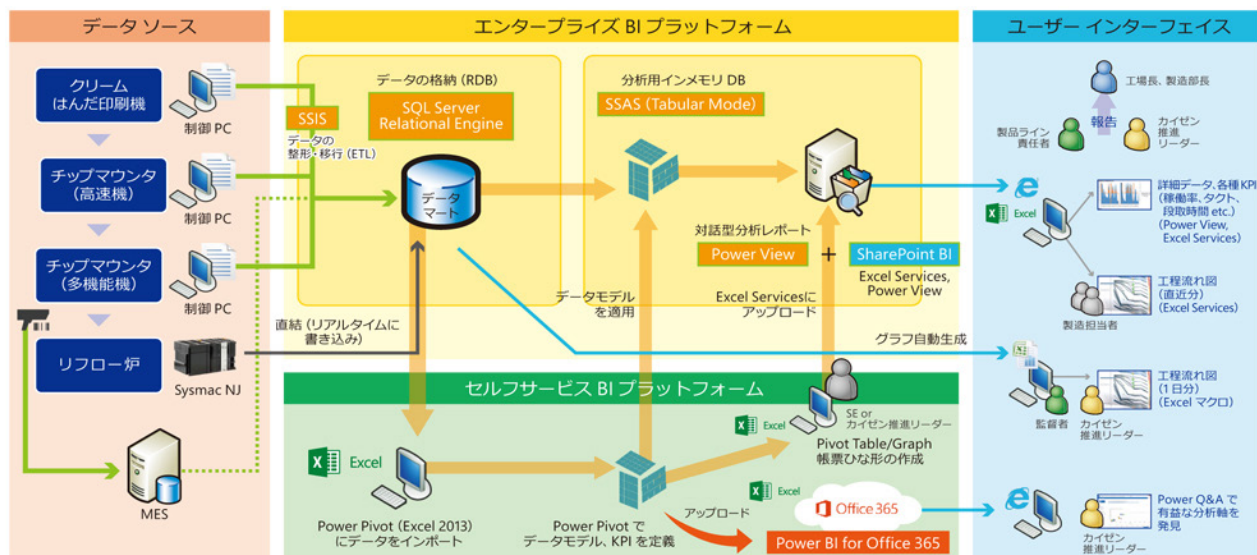
Process and Outline of System Installation

A large amount of data can be analyzed in Excel with no stress by using PowerPivot for Excel.

Our “Sysmac & SQL Direct Connect Solution” can directly link Sysmac with SQL Server in real time. The log data is collected from all devices on the process, linked with each product traveling along the product line. The entire process can be visualized from beginning to end without stopping.

The log data collected on a unique product basis can be converted into real-time charts to display on the portal site using Microsoft SharePoint Server and can be exported to Microsoft Excel using PowerPivot for Excel that is a SQL Server add-in for Excel. PowerPivot, which changes Excel into the BI tool to process more than one million records with Excel’s easy operability, enables huge amounts of real-time data from the production line to be converted into graphs from various viewpoints and analyzed. (See Figure 1.)

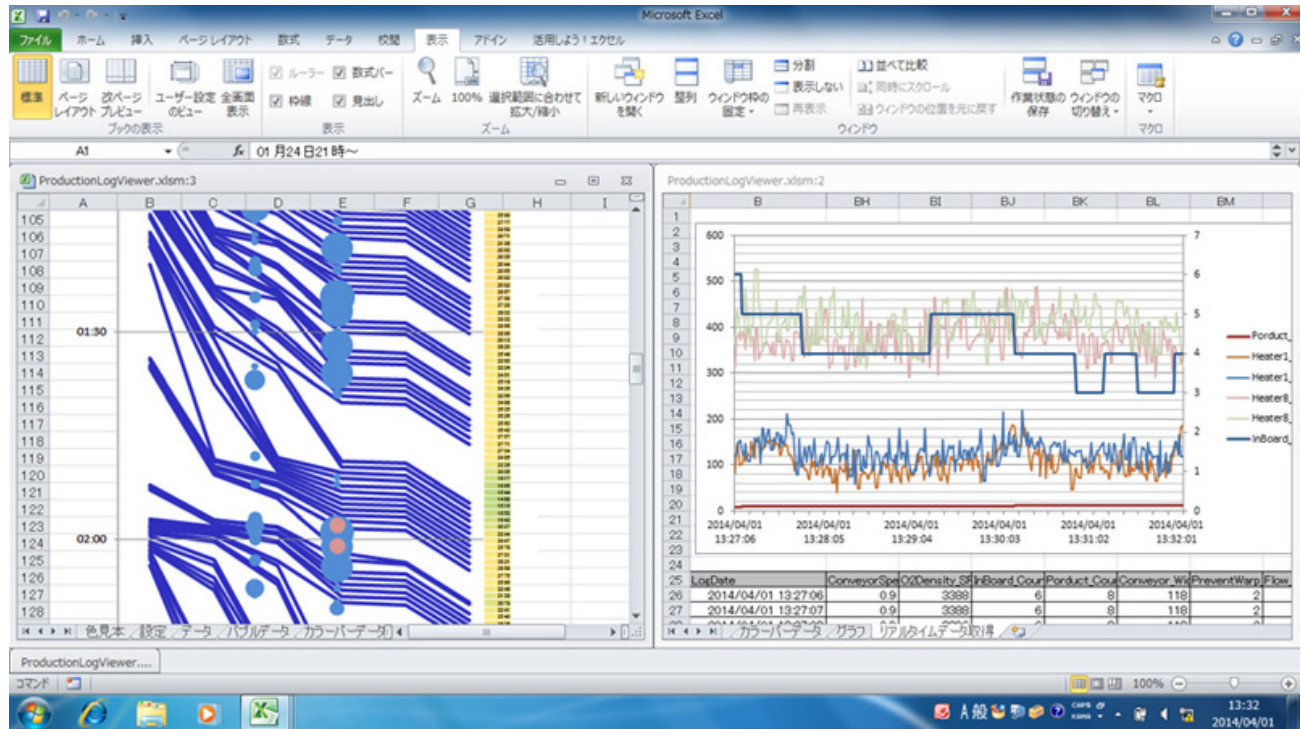
(Figure 1 - Data Flow and Software Functional Configuration)



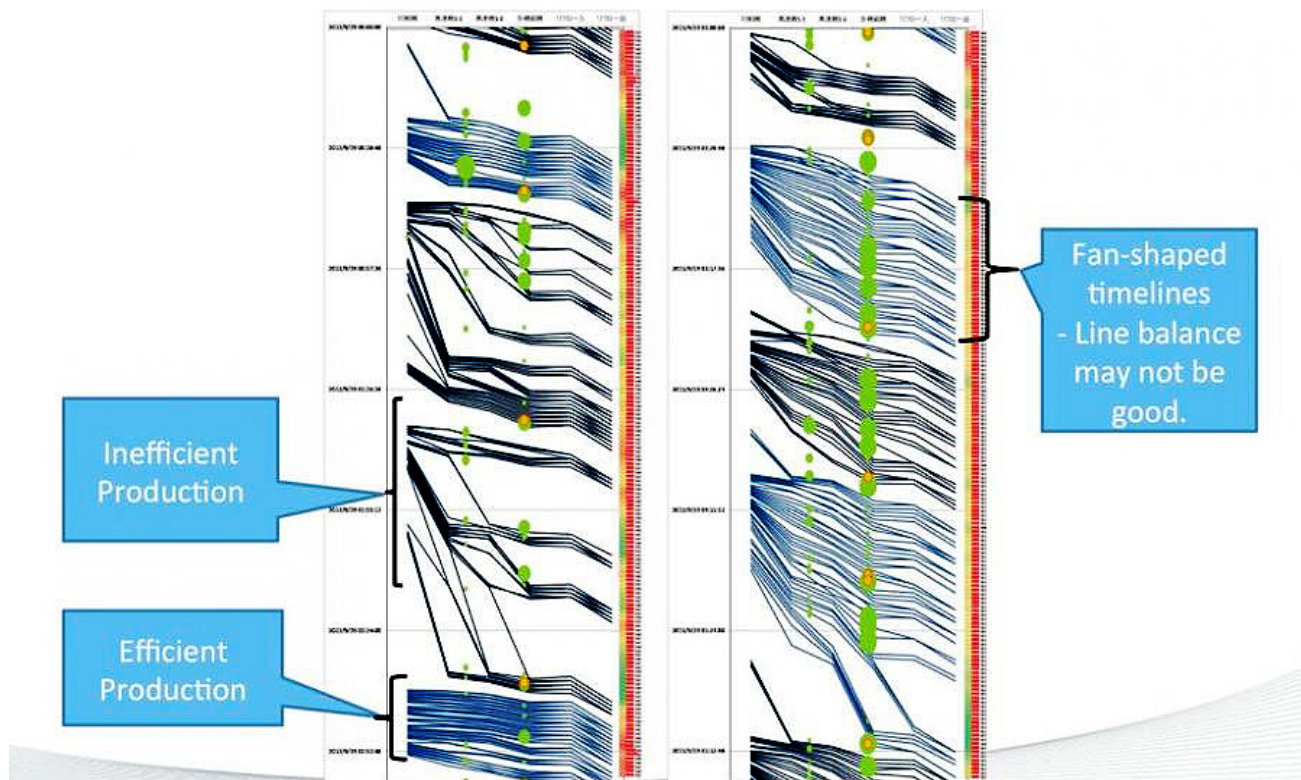
The key feature of this solution is that on-site workers can see the operation status of the production line at a glance. “The important point of this solution is that workers engaged on production lines can use the Big Data directly,” says Katsumi Kono, Kusatsu Factory Production Department Manager of Omron. “In this respect, SQL Server was the best to use as the database because Excel, which has 1 billion users all over the world, can be used for extensive data analysis. We could not decide how to show the default report, so we considered that it was important to show the facts which were visualized by data linked with each product as what they were.

“Therefore, we began to make line graphs with time on the Y-axis and movement of the process on the X-axis. The data collected from Sysmac devices was formatted, but the data collected from non-Sysmac devices was required to be arranged, so we used our unique technology.” Shinji Mizuno in Omron’s Kusatsu Factory says he was astonished when he first saw the line graphs that became the prototype. (See Figures 2 and 3)

(Figure 2 - Production Line Graph - Device Data Displayed on Left, Effect on Production Displayed on Right)



(Figure 3 - Interpreting Device Data Graph)



“To be honest, we who manage production sites could not quickly catch on to the visualization of production lines using big data. However, when we saw the line graphs we were really surprised. Movement of a production line was visualized as if the line was monitored by cameras. As we were faced with clues for improvements that we were seeking for a long time, we were excited. Moreover, a visiting engineer from a supplier, who should not know anything about our production lines, correctly guessed the production situation and what happened on that day. I suddenly had high expectations for this solution.”

Examining Improvements Before and After the Solution

The resources for examination of improvements are reduced to 1/6.

“To look for improvement points, we previously asked experts to guess the causes from the error logs that had been recorded in the facility and monitoring systems,” explained Kenji Mizusima in Omron’s Kusatsu Factory. “The error logs, however, are only fragments of facts that are only records of moments after all, so they have limited usefulness in cause investigation. On the other hand, as the data scattered on the production line is compiled into charts in Excel that visualize the flow of the production line, a guess is not required. On-site workers would generate many ideas, such as ‘we want to verify this data linked with other data if we can find that sort of thing’, by viewing the data graphs that show production situation clearly. We realize that we can reduce man power previously used to pick up improvement points up to about 1/6.”

Solution Helps Avoid Repeating Problems at Start-up Plants

Remote support for overseas production sites is also possible.

“The Sysmac & SQL Direct Connect Solution that offers reliable performance for improvements in Omron’s Kusatsu Factory will contribute to accelerating the establishment of new production sites around the world as well as to increasing the improvement speed at existing production sites,” continued Mr. Kono.

“I have observed the launch of overseas production sites many times. In most cases, the troubles that occurred overseas were the same as the problems that had occurred in Japan. Improvement points hidden in existing production lines would appear when new sites were established. Therefore, if more improvement points become obvious by using Big Data, the risk of repeating the same problems will be reduced. Receiving data from Sysmac devices on worldwide production sites allows for the same level improvements of quality and productivity and real-time monitoring of production sites from anywhere in the world. These usages can help accelerate Omron’s global business expansion.”

Accelerating Global Business by Connecting People and Data

“Big Data has existed for a long time in production lines, but the environment to use it effectively has not been created,” observed Mr. Takeuchi. “Data does not make sense until people who support production sites read and use the data. The environment to connect between data and people in the best way was necessary. Our Kusatsu Factory has already used this data to understand the reality of production lines that could not be grasped by using only individual experiences and intuition. The more Big Data is used, the faster overseas sites will be established, as Mr. Kono said. Even if we would like to expand business globally, key persons are limited in number. I hope that the momentum to drive business will be gained when what we previously could not see without visiting the sites can be seen through the data from remote locations.”

“The challenge to improve never ends,” says Mr. Takeuchi.

The Sysmac NJ SQL Client CPU also performs highly synchronized, multi-axis motion. Three models are available: NJ501-1520 for 64 axes, NJ501-1420 for 32 axes, and NJ501-1320 for 16 axes.

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