Mitsubishi Electric Europe improves PLC-based data logging

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In the push for increased overall equipment effectiveness (OEE), reduced energy usage, improved traceability, analysis of key performance indicators and more, the vital ingredient is data. Barry Weller, Product Manager-iQ Platform, Automation Systems Division of Mitsubishi Electric Europe's UK Branch discusses why data logging has become an essential feature of the modern production line and why it is often best performed within a PLC platform.

These days it's become almost a cliché to say you can't manage what you don't measure, and yet with modern competitive pressures, an increasingly litigious business environment, and the ever rising cost of energy it's never been more important. As a result, where data logging was once little more than an interesting sideshow in the world of discrete manufacturing, it has quickly become an important feature of plants that aspire to world class manufacturing status.
It is perhaps strange that data loggers formed a critical part of test and measurement applications and the process arena for so long without impacting on discrete manufacturing production lines. But sensor derived information has always been acted upon in real time, so production line availability was often seen as a black and white issue, un-needing of the colour that trend information could bring to the picture. But times have changed. Increased competition on an international scale has driven a need to wring every last percentage of efficiency from the production line on the one hand, whilst increasing litigation has placed a new emphasis on traceability on the other.

Production efficiency is an interesting area, in that it looks at so many different

aspects of a machine, line or process and rolls them all up into concepts such as overall equipment effectiveness (OEE). But behind it is the need to minimise downtime, increase quality, reduce scrap or rework and maximise availability. Developed in Japan in the 1960s, OEE is built on a hierarchy of metrics that, when applied to production processes, indicates how efficiently a manufacturing operation is running and/or being utilised. Along with other key performance indicators, OEE scores give an idea of how well a plant is running at any given moment, while providing a measure of the impact of changes in line operation over time.

Two crucial requirements emerge from a focus on OEE: we need real time production information and we need to observe trends. So it is no surprise that increased focus on data logging on the plant floor has come hand in hand with this growing focus on OEE. Only with improved, time-stamped data, continuously collected, can production management be statistically analysed so that machine availability and product quality can be improved. On a single machine, bottlenecks or mechanical problems can be quickly identified and rectified. Logging and monitoring fault codes and error messages can quickly highlight recurring problems and enable appropriate action to be taken. Trends in production tolerances can be monitored and any corrections made long before they impact detrimentally on product quality. The benefits of effective data logging quickly ripple through from improvements on a single line or cell to significant enhancements or refinements to the wider facility.

While OEE brings a statistical focus to product quality, today's manufacturers understand that the customer - and indeed the supply chain to the customer - need assured quality. That means that if somewhere along the supply chain a fault or a problem with a product is discovered, the origin of that fault should be fully traceable. While these levels of traceability have long been felt most acutely in critical markets such as aerospace, pharmaceuticals and food processing, increased litigation across all market sectors has seen a growing emphasis on track and trace. There is evidence all around us that our culture has become a blame society, and someone must carry the can for every problem. Building

traceability into production lines means on the one hand that faults can be identified and rectified long before they reach the customer and on the other that manufacturers can provide documentary evidence to show that any faults that might be subsequently detected did not originate with them.

Again, achieving this level of traceability depends upon the collection and recording of time-stamped data throughout the production process.
Taking production monitoring even further, from OEE has come a focus on the total cost of production. Beyond machine availability and quality, the total cost of production of a given part, also builds in the cost of energy to manufacture that part and looks at energy efficiency as a key performance indicator. As energy costs spiral ever upwards and as more and more companies build reductions in carbon footprint into their mission statements, then managing energy usage is becoming a vital requirement. By monitoring energy usage effectively, manufacturers can begin to optimise processes, manage peaks in demand and reduce cost per part. In addition, as legislation on climate change impacts on the energy consumption by industry in different ways in different countries, so the need to monitor and record energy consumption is growing.

Data loggers can collect and record energy consumption data, highlighting demand and illustrating the impact of any measures taken to reduce the energy usage. Today it is a simple matter, for example, to monitor the kWh, current consumption and run time of automation products such as variable speed drives, providing hard statistical evidence of energy usage.

Given this requirement to collect and record data, there is the question of how this is best performed, and where. There are many discrete data loggers and there are just as many data acquisition systems and all have their advantages and disadvantages, depending on the levels of data that are needed, how frequently that data is collected, the level of integration required, the ease of translating that data into meaningful information, and more. But in many PLC-based automation processes, the ability to collect data directly within the PLC and automatically transfer that data in simple formats that make it easy to analyse will provide an

ideal, cost-effective solution.
The PLC-based solution is attractive because the architecture for collecting the data is already in place. The PLC is already linked to sensors, actuators, drives, network components and other controllers, reading their inputs and acting upon them. Of course there will inevitably be other data sources to monitor but so much of the hard work will inherently have been done that subsequent integration is vastly simplified.

Automation vendors have long offered add-on data loggers for PLCs. Mitsubishi Electric for example has a cost effective, add-on module for the iQ Platform that delivers all of the data logging performance required for even the most complex of installations. Most recently, though, demand for a new breed of machine control PLCs has come with a corresponding demand for a new type of data logging solution. Mitsubishi Electric addressed the former with the L Series PLC, and the latter by integrating a full featured data logger within it, eliminating the need and cost of an add-on module.

Meeting the needs of OEMs, the L Series PLC has been designed to provide all the performance functions and capabilities required for today's demanding automation requirements in a compact, rack-free package. Bridging the gap between the FX micro PLC and the iQ platform high performance PAC, the new modular controller puts much of the power of a Q series CPU into a small PLC, greatly increasing the range of functionality traditionally associated with PLCs of this size, with ease of expansion and a user-centric design inspired by the FX.

The built-in data logging function provides a simple means for OEE monitoring, energy monitoring, sequencing and production traceability, with the facility to store this data to SD memory card using the integral memory card slot. The same memory card slot also makes it easy to back up or load the CPU programs and parameters.

The built-in data logger supports asynchronous scan-independent sampling as fast as 1ms. Separating its operation from the cyclic scan of the PLC provides far

greater flexibility and sample frequency.
Configuration of the data logger is made with parameterisation rather than programming, saving setup time. This also allows the reports to be quickly reconfigured to capture the data that is needed. The logged files are stored in a Microsoft excel compatible format (csv), which allows easy analysis, Analysis of the logged data is also available in the configuration tool. The setup software is included within the iQ Works software suite and is available for free download from our website.

The L Series supports timed logging as well as trigger logging with a pre-and-post trigger buffer, meaning that at a triggered event (an alarm for example), a number of samples can be taken before and after the trigger. This is very important for diagnosing the events that led to the trigger event, and the subsequent results. Lastly, there is an auto-logging function which allows a 'setting file' to be emailed to the end user anywhere in the world. This can then be copied to an SD card, and when this is inserted into a running L Series the data will be logged automatically to csv format.

We can see, then, that this vastly simplifies the set-up of high performance data logging as a PLC-based solution, making it easy and cost effective to implement a data collection and monitoring system on a per-machine basis. This makes a decision to implement a data logging system a scalable one, rather than a costly all-or-nothing exercise, paving the way for incremental and continuous production improvements and this, after all, is what boosting OEE, saving energy, and implementing traceability is all about.

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Picture 1: Data loggers can collect and record energy consumption data, highlighting demand and illustrating the impact of any measures taken to reduce the energy usage.

About Mitsubishi Electric:

With 90 years of experience in providing reliable, high-quality products to both corporate clients and general consumers all over the world, Mitsubishi Electric Corporation is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, as well as in products for the energy sector, water and waste water, transportation and building equipment.

With around 117.000 employees the company recorded consolidated group sales of 36,3 billion Euro* in the fiscal year ended March 31, 2012.
Our sales offices, research & development centres and manufacturing plants are located in over 30 countries.

Mitsubishi Electric Europe B.V., Factory Automation European Business Group (FA-EBG) has its European headquarters in Ratingen near Dusseldorf, Germany. It is a part of Mitsubishi Electric Europe B.V., a wholly owned subsidiary of Mitsubishi Electric Corporation, Japan.

The role of FA-EBG is to manage sales, service and support across its network

of local branches and distributors throughout the EMEA region.

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