

Industry 4.0 and the retrofit opportunity

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COMMENT



Cloud computing, the Internet of Things and Services, the Connected Enterprise, Smart Factories, cyber-physical systems, machine-to-machine communication, big data analytics and Industry 4.0 are terms dominating automation and manufacturing industry conferences and expos both here and abroad. How much is hype, though, and how relevant is this 'fourth industrial revolution' to South Africa's manufacturing sector?

I was, therefore, pleased to have been invited to a seminar at Festo this month, presented by Eberhard Klotz, head of Festo's global Industry 4.0 campaign.

At its starting point, says Klotz, it's all about networking, between enterprises, factories, machines and individual components. Why? So that information can be automatically collected, communicated, analysed, compared and used to improve manufacturing performance and efficiency.

Automation and control has always, in principle, been about collecting information and using it to adjust how a machine should respond. Even an automatic kettle uses information from a sensor to 'measure' when the water has boiled and to turn it off.

The revolution, however, lies in the exploding power of our communication networks. It is now possible for a kettle to send you a Tweet when it has boiled – and this exists: it's called a Twettle. The associated software app has a Smart Boil feature – which somehow saves energy – and statistical functions enable the number of 'boils' and the energy used to be calculated.

Industry 4.0, which really represents the European approach to applying these new communication possibilities, concerns itself with industrial production methods. Klotz cites the customisation possibilities that now exist because of the Internet, where people can customise the specification of the car they wish to purchase, for example, and send the information directly to the assembly line.

Aspects of Industry 4.0 are already being implemented at Festo's Scharnhausen plant. These include: employees safely co-assembling with flexible robots; holistic energy transparency systems to track and control energy flows; and the use by service engineers of tablets that are directly connected to the diagnostic systems of machines.

Conceivable in South Africa, asks the sceptic?

It seems so. Klotz describes retrofit opportunities as an ideal way of achieving quick gains from Industry 4.0. Even in Scharnhausen, not all of the machines used were new state-of-the-art connected systems.

According to Klotz, Festo also wanted the older machines to be connected to the factory-wide network.

But instead of rebuilding each machine, Festo decided simply to add sensors to monitor the areas of interest, connect these to a small Festo CODESYS controller for data collection and conversion and – using the open OPC UA (unified architecture) communications standard – make that data available to the factory's network.

So the existing machines, some being 20 years old, were converted to Industry 4.0 very simply and cheaply: typically for between €4 000 to €5 000.

By comparing production and energy performance indicators, the factory achieved very rapid returns from three key areas. On the production side, information from each machine enabled bottlenecks to be quickly identified, triggering rescheduling, adjustments to the machine performance and continuous work flow optimisation. As a result, buffer stocks and waste could be reduced.

From an energy management point of view, Klotz says that, traditionally, all machines are turned on in the morning at the start of the shift. Also, machines experience peak energy use at specific times during their production cycles. If peak energy use for several machines coincides, then the factory demand also peaks and higher tariffs from the electricity company are applied.

By staggering the switch on times and the production sequences to avoid overlapping peak occurrences, the factory's peak demand was significantly reduced. "This is so easy if you have the information, but impossible if you do not," Klotz points out.

A third area of direct saving was enabling better utilisation of available waste energy sources. The galvanic baths, for example, had to be heated every morning before use. By simply waiting a few hours until the solar systems had started to generate power, utility energy use was reduced. It was also possible to identify and use waste heat energy, from machines such as compressors, for pre-heating. These changes resulted in a reduction in energy use of one third, a saving of about 1.0 GW, and a cost saving of several million Euros.

It is not necessary to build revolutionary new factories in South Africa to implement Industry 4.0. By employing relatively cheap communication and monitoring strategies, we can retrofit the communication technology and harness these modern principles to better manage production and associated resources. □

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