

Industry 4.0: A world of new business models and markets

On April 4, 2017, Festo South Africa hosted a seminar at which its global Industry 4.0 campaign head, Eberhard Klotz demystified the concepts and introduced the key opportunities. *MechChem Africa* summarises his opening session.

Introducing Klotz at the start of the seminar, Festo South Africa's Russell Schwultz says that, while Industry 4.0 is much spoken about: "It doesn't seem real yet. In South Africa, we need to demystify the concepts and make them more practical.

"Globally, unlike many other companies, Festo is able to back the rhetoric with products. Industry 4.0 is something we believe in, we are investing in it and proving the principles in practice in our own factories," he reveals, adding that the purpose of the day is to "decluster and demystify" the technology by introducing things that are happening right now, "things that are sure to affect us in the future".

Klotz introduces Industry 4.0 as the starting point for many changes. His opening slide reads: 'Industry 4.0 describes the fundamental change to value creation chains and the life-cycle of products, where the real and virtual world grow together.'

"Currently, one big disadvantage is that there are no precise definitions for Industry 4.0," he continues. "We tend to draw a broad picture regarding the networking of components, machines and factories. But there are different terms being used to describe this: the Internet of Things (IoT) and SmartFactory, for example.

"In Germany, though, where the Industry 4.0 term was first used, we use it to refer to the change in production and manufacturing techniques that become possible because of the power of modern communication networks," he explains.

"It's about networking of machines and components to enable modifications and changes to be made to production systems. This is the focus from a production point of view," he reiterates, "it's about the use of networking to better manage our production processes."

Related to this is the better use of digital platforms and virtual world models of machines and components. By understanding machines and processes via 3D virtual models and simulations and using these platforms for advanced digital planning, it becomes possible to better align the real and the ideal.

"The performance of the digital representations of factories, machines and components can be compared to those achieved in

the real-world systems, allowing us to optimise our designs, implement better production techniques, reduce waste, make better use of energy, track reliability and improve preventative maintenance concepts," Klotz explains.

Why is Festo interested in this topic? "In our own production systems, we manufacture thousands of products and a huge variety of them. In addition, many Festo customers require customisations to suit their particular needs, and these must be accommodated in short lead times. To do this, we need production equipment capable of making customised goods in small batch sizes in an efficient and cost-effective way," he explains.

Festo also offers a very wide range of electrical and pneumatic solutions and components for factory and process automation applications. "Our customers also face challenges to improve their productivity and effectiveness, so Festo has a vested interest in developing connected components and machines capable of delivering Industry 4.0 advantages," Klotz says.

In Germany, he continues, "Industry 4.0 is a strategic initiative driven by the government with the aim of optimising production across the country. Festo is one out of four industry speakers on the Industry 4.0 steering board, which also includes SAP, Siemens and Deutsche Telekom's T-Mobile." These four companies are responsible for identifying the most effective technologies for the practical aspects of Industry 4.0: enterprise and manufacturing management systems and big data analytics; the electronics, control systems and software; the communication and connectivity; and the physical actuation devices.

Together with working groups, universities and research teams, Germany has developed a long-term roadmap for Industry 4.0 covering the next 20 years, covering the short-term priorities and the long term goals. "Over the next two or three years, standardisation with respect to communication protocols, CAD, visualisation and simulation platforms have been identified," Klotz explains.

International developments

"Industry 4.0 is a small part of a broader picture, which includes connected cars, healthcare monitoring, energy systems man-



agement and public initiatives such as smart cities – all made possible via the Internet of Things. All of these new technologies are likely to be using the Internet as the backbone.

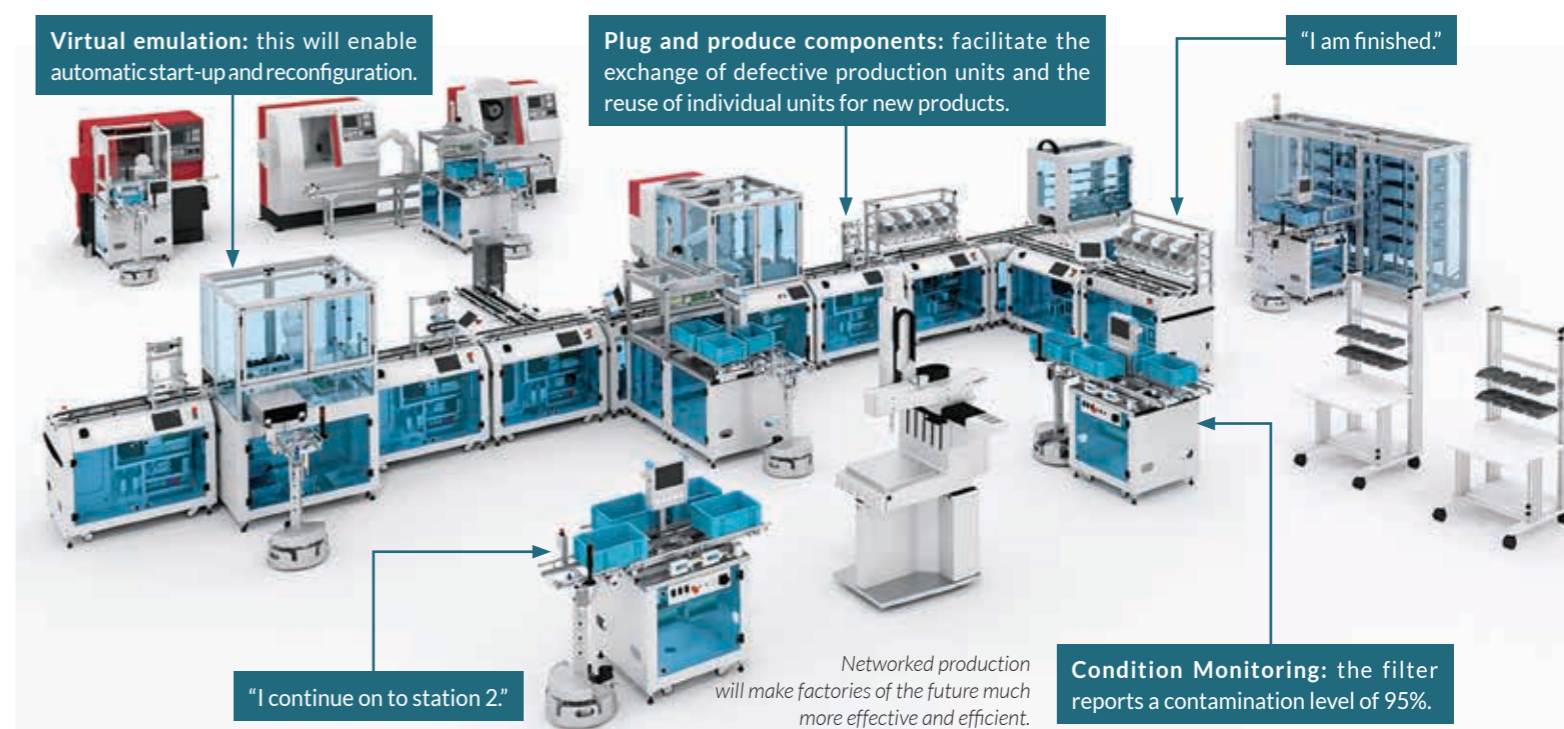
"We are seeing a number of German federations and associations cooperating to make Industry 4.0 happen, starting with standardisation and pilot projects to demonstrate practical implementation. The key challenge is to structure information so that all companies can take a direction that maximises synergy possibilities.

"Our perspective is that the technology is likely to get stuck if we miss the opportunity to standardise. If you buy one component from Festo and another from elsewhere, it is important that they can easily be made to work together," he continues. Klotz compares this to the success of USB technology, which enables a host of different devices to be interoperable with an unlimited number of peripheral devices. Any device you plug in downloads its driver automatically and is communicating within minutes.

"In the USA, a slightly different approach has been taken. They are more pragmatic, involve collaboration between innovators, who develop and test systems very rapidly and, if they work, these are immediately deployed. But is there conflict?" he asks.

"In the US, they are further ahead with respect to Internet-based communication, while in Europe, we focus more on horizontal and vertical networking inside the machines of production. We see the two approaches as supporting each other rather than being in conflict," suggests Klotz.

The Chinese government has also instigated a parallel strategic initiative called China 2025, which has similar goals to our Industry 4.0 initiative. "We know that the Chinese adapt and learn fast, so they are already chal-



lenging our pace and ideas. So getting started is becoming an imperative," he adds.

Opportunities presented by Industry 4.0

Industry 4.0 approaches are being implemented in practice in all cases where networking will lead to better control, organisation and efficiency, but a clear customer benefit must first be identified. "This is critical," says Klotz. "There must be a tangible benefit to the customer, otherwise, there is no point in investing in these systems," he argues, adding: "We see five possible areas where Industry 4.0 could deliver customer value.

Production will become flexible with 'plug & produce' capabilities for minimum lot sizes at competitive prices. "In the car industry, for example, more and more people have individual needs and preferences. This is also starting to happen in food and textiles. Even shoe companies can now offer personal modifications to suit personal tastes based in an online order.

For this to be possible, production systems are needed that are capable of making these individualised products directly from the online order instruction, ie, without the need for direct human input.

Engineering processes: "In the past we had mechanical engineering and electrical engineering using different design packages and data formats. The same applies to the programming of the PLC systems; data input had to be redone at every stage. We are clearly missing an opportunity to use a common platform for all of our pre-production engineering and simulations, so that we can convert data into the different platforms automatically. Over the next couple of years

a German Automotive manufacturer will be trialling some options that could make this a reality," Klotz reveals.

Energy management: Increasing resource efficiency at component, machine and factor level is now demanded in order to reduce the effects of global warming. "Simply by collecting the right data and planning production to optimise energy use and time of use, significant savings can be achieved. Also by better sizing the production systems to actual requirements, we avoid over-engineering the machines, which makes them more energy efficient," he explains.

Logistical processes: Via accurate demand planning, production can be better matched to demand. "On the logistics side, we tend to prefer to overproduce. In the case of food, for example, this overproduction is often simply thrown away. By accessing better and more precise data – from social media, online marketing and industry networking systems – it becomes possible to better match production to what is likely to be needed and consumed. This allows buffer stocks to be reduced and waste avoided, adding sustainability," Klotz says.

Predictive Maintenance: Collecting accurate data can be used in condition monitoring systems to increasing machine availability. "This aspect goes to the heart of whether Industry 4.0 involves revolution or evolution. Certainly, we already do a lot of predictive maintenance, using sensors linked to PLCs with dedicated analysis and recording systems.

"But there are no standards, and it is therefore expensive. Industry 4.0 aims to revolutionise the communication aspects of monitoring systems. As soon as one adopts



On display at the seminar is a Festo Didactic system demonstrating the flexible manufacturing opportunities already on offer.

web standards, the information can much more easily be accessed using our consumer communication devices – phones and tablets, for example. The tools become more accessible and big data analytics can be widely applied to individually connected machines. Predictive maintenance will become cheaper and much easier to implement," he explains.

Much of the individual aspects of Industry 4.0 are already available as islands of relatively expensive technology. "The technology itself is nothing new. But the communication and networking technology is revolutionising the way our technologies will be deployed," Klotz says in concluding his first session. □