Digitalisation

Paths to a new world

HoloLens, mobile phones, 3D printing or smart glasses – the gadgets that captured the public imagination in the blockbuster movie "Back to the Future" over 30 years ago have now become a reality. All thanks to digitalisation. Industry 4.0 is automating the modern working world and helping machine and system builders reach new heights. What route will the sector take in order to make the most of digitalisation?

"By consistently merging the digital and real worlds, it will be possible to manage the increasingly dynamic nature and complexity of factories."

Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster,
CEO of the German Research Center for Artificial Intelligence (DFKI)

The international drivers of Industry 4.0 work in close collaboration. The Industry 4.0 platform, through which 300 participants from 150 organisations promote digitalisation in Germany, the "Alliance Industrie du Futur" in France, "Piano Impresa 4.0" in Italy, the Industrial Internet Consortium in the USA, IMSA, the equivalent of the German Reference Architecture Model Industrie 4.0 (RAMI 4.0) in China, and the Robot Revolution Initiative in Japan – all share the common goal of establishing networks and internationally recognised standards on the road towards the production of the future.

The importance of data security
Data is the oil of the 21st century, and storing and processing it creates added value. Well-known Internet giants make a living from the data of their users by using their information to develop business models. A machine with security measures isn't any faster or more efficient than an unprotected machine. This is why the issue of IT security has often taken a back seat. However, data scandals have highlighted the critical importance of confidentiality and data security. In the machine building sector, data security is a major

contributor to business success and future revenues therefore depend on it. In the age of Industry 4.0 and digitalisation, a company that cannot verifiably demonstrate its security credentials will have difficulty obtaining orders, credit and insurance. The German network platform Industry 4.0, together with its international partner networks, is therefore working on this area too.

Who owns machine data?
Thanks to big data analytics, data produced using and by machines can be systematically evaluated on a large scale. Smart analysis leads to greater efficiency, a competitive edge and new business models. But can the "analogue" world keep pace with the fast-moving developments in a digitised industry?

The possibilities of smart data often only become apparent when combined company-wide. Competitors can become partners and partners can become competitors. Questions about data sovereignty as well as the scope and the permissibility of partnerships – in other words, questions about market power and competition law – must be reviewed and possibly regulated differently in the age of Industry 4.0.

Digital images
The administration shell is the interface between the physical object (asset) and Industry 4.0 communication. Every relevant asset has its own administration shell, essentially its own digital image, so that it can be integrated into networked Industry 4.0 production. For example, the administration shell of a drilling machine gives the real asset a unique ID. This virtual identity thus represents the asset as a separate Internet presence.

This virtual ID acts as a standardised communication interface in the network and allows access to all information about the object as well as execution of the command "Drill a hole with a diameter of 3.5 mm and a depth of 4 mm at position 4," for example. The real object, such as a drilling machine, a component or a product together with its administration shell form the Industry 4.0 component. The virtual IT world and the real world of production are therefore increasingly converging.

Fully networked and adaptive
In the age of digitalisation, the automation landscape of the classic pyramid is changing. This change is being accompanied by new products, cloud services ➔

> "As an innovator and trendsetter, Festo is making a major contribution to Industry 4.0. The aim is to support customers and partners and take them into the digitalised age as part of this transformation process."

Dr. Ansgar Kriwet, Member of the Management Board Sales, Festo AG

Goals of future production

Production systems will become digitally networked throughout. This will be achieved when intelligent, self-regulating and self-controlling plug-and-produce components make their own way through a production process. Virtual images of machines and systems will make virtual commissioning and reconfiguration easier. Highly flexible production plants make manufacturing batch sizes of 1 more economical. Speedily balanced workloads in a production network improve delivery performance. Prompt adjustment to the orders in hand ensures the efficient use of resources. Comprehensive condition monitoring helps to avoid downtime and optimises maintenance procedures as well as mobile maintenance.

and apps as well as new online shops with comprehensive, integrated engineering concepts. This will ensure that, in the medium term, data will be available seamlessly and globally on all user devices.

Industry 4.0 relies on fully networked, adaptive production through intelligent products with so-called embedded functions – the cyber-physical systems. Many Festo components already meet the hardware and software requirements. These products can be integrated into IoT or cloud environments such as Siemens MindSphere, Rockwell Factory Talk or the Festo Cloud. With the IoT gateway CPX-IoT, the data can be visualised and utilised on the user interface of Festo MyDashboards.

Integration in MindSphere and Factory Talk
MindSphere is a cloud-based, open IoT operating system from Siemens with which machines and physical infrastructure can be connected to the digital world. This enables huge data volumes from countless smart devices to be used. Festo was the first partner in the MindSphere initiative to integrate a smart field device, the energy efficiency module MSE6-E2M, into the MindSphere via the IoT gateway CPX-IOT in the factory environment.

This integration opened up key aspects such as encrypted connection to the cloud for easy commissioning, MindSphere via MindConnect LIB, and field level via OPC UA. Such Industry 4.0 scenarios provide an opportunity to analyse and above all combine various data in MindSphere. Examples include basic data and insights such as real air consumption and pressure indication in real time, pattern recognition for consumption profiles, leakage and selectable tolerance windows for error messages.

Smart factory
Festo's newest production plants, such as the Scharnhausen Technology Plant, both produce and use these products, thus paving the way for Industry 4.0. The Scharnhausen Technology Plant is Festo's main factory for the production of valves, valve terminals and electronics. It was designed from the outset as a future-proof, adaptable factory for harnessing and implementing ideas from the digital environment. The knowledge gained from Festo research into Industry 4.0 is also incorporated into its further development. Not only is it a smart factory, it will also in future be a fully networked factory. It should be possible to produce millions of units every year, but in flexible batch sizes from 10 to 10,000.

Adaptable: the systems in the Festo Scharnhausen Technology Plant are designed for a wide range of component variants with different batch sizes.


Already a reality: cooperating robot at the Festo Scharnhausen Technology Plant.

Mobile maintenance

An example of the digitalisation approach at the Scharnhausen Technology Plant is the porting of all the data for a machine, such as plans, bills of materials, spare parts and repair instructions, to mobile devices and linking them up to a central computer. This allows on-site maintenance technicians to view, analyse and prioritise all the alarms, and to work their way efficiently from one machine to the next. They can also consult experts online, exchange photos, view stocks of spare parts, and directly pick or order stock – all paperlessly.

Error messages are entered directly in a digital log. "This log is like the machine's medical record," explains Jacob Decker, innovation management expert in the Plant Engineering department of the Festo Scharnhausen Technology Plant. The rollout of the project to all other Festo plants is currently underway. The return on investment takes less than six months – a perfect example of how quickly digitalisation pays. ■
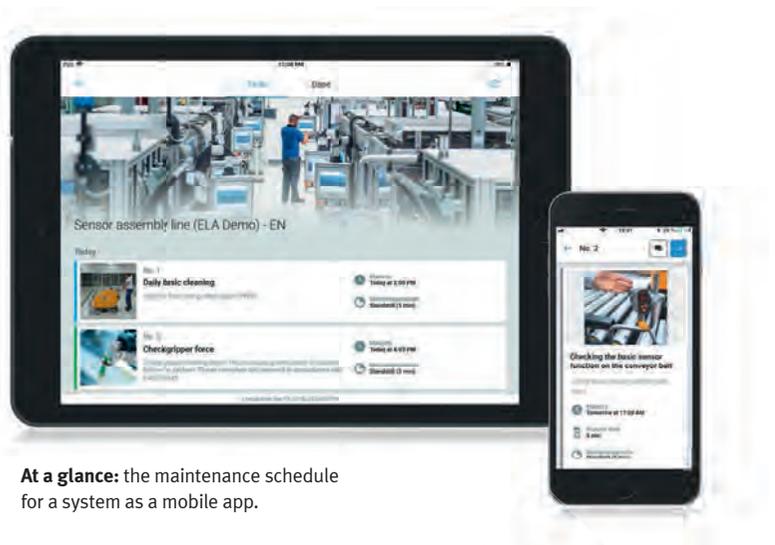
At a glance: the maintenance schedule for a system as a mobile app.

On the way to the production of the future – further information can be found at: **www.festo.com/industry-4-0**

Get digital. Now!

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Get digital. Now! This is the slogan with which Festo is inviting its customers to explore new paths, paths towards digitalisation. You can find out exactly what Festo has been doing in this area on the following pages.

Pneumatics goes digital

The Festo Motion Terminal VTEM is the first pneumatic automation platform to be controlled by Motion Apps. Pneumatic functions are simply added using an app. This makes it possible to replace up to 50 individual components of a pneumatic control loop without having to change the hardware. This synergy between mechanical and electronic components and software is reliable and tamper-proof, as it cannot be adjusted mechanically. Software developers are constantly working on new motion apps for mapping other pneumatic functions. The latest app available to download from the Festo App World features the Soft Stop function. It reduces cycle times by up to 70% as Soft Stop allows dynamic yet gentle positioning motion without needing wear-prone shock absorbers. Further Motion Apps are in development.

🌐 www.festo.com/vtem
🌐 www.festo.com/appworld

Smartenance – the maintenance app

Preventive plant maintenance is a time-consuming process which, astonishingly, is for the most part still documented using pen and paper. **Smartenance**, the digital maintenance manager for production supervisors and machine operators, is the first exclusively digital product from Festo. It is available to download as a mobile app for smartphones and tablets in the Apple and Google app stores. The dashboard can simply be opened in a web browser. Smartenance enables end customers to plan, monitor and evaluate system maintenance. A digital maintenance schedule makes maintenance easier, quicker and more reliable. Reciprocal checking by system operators and production managers provides greater reliability. It eliminates many processes and the need for coordination.

🌐 www.festo.com/smartenance

Increased productivity with cloud services

Benefits of digitalisation

If the power of digital transformation is harnessed correctly, there are many advantages for everyone:

• Greater productivity in design and production
• Optimised and accelerated processes
• Improvements in overall equipment effectiveness (OEE), primarily through preventive and predictive maintenance concepts
• Traceability of production
• Energy monitoring

Further processing and long-term analysis of data takes place in the **cloud**. Dashboards visualise the information obtained. Festo supports machine builders and end users with visualising and processing data. The result is increased productivity through better utilisation (OEE), lower costs through greater energy efficiency and fewer downtimes thanks to comprehensive diagnostics, condition monitoring and improved maintenance. This is done through the IoT gateway CPX-IoT, the first turnkey solution for IoT-enabled components and dashboards. It connects components and modules from the field level, such as the valve terminal CPX/MPA, the energy monitoring module MSE6-E2M or handling systems, to the Festo Cloud via their OPC UA interface.

🌐 www.festo.com/iot
🌐 www.festo.com/e2m

Training 4.0

The path to the digital future is a journey into an uncertain future for many workers, engineers, IT specialists and managers. Many workers fear losing their jobs as a result of digitalisation and artificial intelligence. There is a noticeable blurring of the lines between IT, electrical engineering and mechanical engineering. **Festo Didactic** therefore offers skills development programmes with turnkey training factories, laboratory facilities, innovative training systems, e-learning and training programmes to make people fit for the fourth industrial revolution

🌐 www.festo.com/didactic

World of work 4.0

The workplace of the future could be the **BionicWorkplace** from Festo. In this concept study for the "World of Work" 4.0, people work together with a bionic robot arm as well as numerous assistance systems and peripheral devices that are networked and communicate with each other. The technology supports the workers and makes their jobs easier when carrying out strenuous or hazardous activities.

🌐 www.festo.com/bionicworkplace

What is your role at Festo on the road towards digitalisation?

Jost Litzen,
Digital Strategy and Business Model

"My job is to develop and implement ideas for new apps. The Smartenance app is the first app that our customers are now using."

Thomas Heubach,
Head of Digital Business Projects

"In my department we are looking at the future of digitalisation. Our aim is to identify trends and developments in the online world and implement them through the Festo Cloud, the CPX-IoT gateway, the dashboards, and so on. We are considering the entire chain from measured value to added value for the customer."

Dominik Heigemeir,
Head of Market Communication,
Festo Sales Germany

"Digitalisation has arrived in industry! My job is to provide our customers with detailed information about digitalisation and present the solutions that make it possible. How digitalisation is handled will determine whether providers and users are among the winners or losers."

Tilman Schäfer,
Head of Digital Customer Journey

"The employees in my area develop solutions for making the customer's journey along all contact points with Festo as simple and efficient as possible and to map this journey digitally – from customer service through product selection and ordering to issues such as maintenance and service."

Martin Maichl,
Digital Pneumatics

"With the Festo Motion Terminal, Festo launched the world's first pneumatic module with pneumatic functions that are assigned using software apps. Our department is developing new digital functions for it."

Christian Kubis,
Head of Plant Engineering

"My task at the Festo Scharnhausen Technology Plant is to test and evaluate the Industry 4.0 ideas that will make our plant more productive."

Simon Colas,
Head of Didactic at Festo France

"The CP Factory from Festo Didactic enables people to acquire skills for 'Industrie du Futur' or Industry 4.0 in the areas of modern industrial control systems, communication, processing and protecting data, the concepts of modern production processes as well as the optimised use of production data."