In the last couple of years most presentations and articles about Industry 4.0 have explained the background and the concept. Now the focus is turning toward practical examples, case studies and the technology that is available to implement these changes. As both a user and trainer for Industry 4.0, Festo is ideally positioned to share its experience from within its own pilot site installations.

The Festo Scharnhausen plant built in 2016 as the global centre for valves and valve terminals was the first Festo production site to be used as a showcase for Industry 4.0 based technologies. It is therefore a great place to look when customers ask, “what are the key use cases for Industry 4.0” and “where are the quick wins to be found in a digitalisation strategy”?

Examples to be found at Scharnhausen include energy saving, smart / predictive maintenance and productivity related KPIs such as OEE. In this article we are focusing on smart maintenance.

From its inception five years ago the new Festo technology factory at Scharnhausen was to be equipped with a digital maintenance concept. The plans developed between Festo and an external software specialist, included providing iPads for each service/maintenance person which contain the regular maintenance tasks, manuals and repair instructions for all machines, their long-term history as part of a huge knowledge database, and for sure, real time error messages from all machines and their devices.

Starting with approximately 50 connected machines when the factory went live in late 2016, there are now more than 100 key machines and lines on the network. The iPad tablets are connected to each machine by WiFi and upward to the factory’s SAP R3 based MES. Basic functions such as email and chats are available to have instant, direct communication with an expert colleague busy at another machine or the machine suppliers support hotline.

Immediate savings were realised in the travel times and distances. Instead of walking back to the central maintenance office between tasks, maintenance engineers can work directly from one machine to another. Second, the repair time per machine is reduced by support from the software, it allows immediate access to all the information needed, including previous tasks and fixes. The efficiency of the team is increased by sharing knowledge. And through the chat
function, more obstacles could be overcome by remote support from colleagues. The same number of maintenance team members are now able to manage close to a 30% growth in factory size and machinery, which clearly illustrates the process optimisation and saving potential. Overall this initiative significantly increased OEE figures and showed a sensational ROI in less than six months.

Further developments are now being implemented. Festo developed “Smartenance” – an internally developed digital maintenance manager for production supervisors and plant operators that enables paperless maintenance management. The Smartenance app provides clear scheduling and evaluation tools for plant maintenance and is a quick and easy entrance for small end users to digital maintenance. In the past preventive plant maintenance has been a time-consuming process, often documented only with pen and paper. With Smartenance it is easier, faster and safer; it consists of two parts: a mobile maintenance calendar as an app for smartphones and tablets on the shop floor and a web browser interface for managing and documenting maintenance tasks in the office. Intelligent resource management and team collaboration makes maintenance management more efficient.

Based on the Scharnhausen experience the feature set of Smartenance is being expanded to incorporate integration with MES systems. This will enable it to be adopted as the digital maintenance in other Festo global production sites. Trials in Scharnhausen have seen the maintenance team mounting their iPad tablets onto mobile workbenches complete with their tools. Having all documentation and ‘how-to-fix’ video clips immediately available is a great way to share knowledge and improve the average time to fix results.

The further integration between smart products sending data to the cloud creates a picture of how powerful the digital jigsaw puzzle will become. Smart pieces of equipment equipped with sensors can already generate their own cloud data including the impending breach of operating cycle limits or error messages regarding heat or vibration limits. Individual error messages e.g. from a sensor connected to CPX/MPA valve terminal, can be directly uploaded as a task in the maintenance task list. Pop-ups can be created linking third party supplier data and services using Industry 4.0 standards based platforms e.g. pulling in Eplan-based electrical and fluid circuit diagrams. The link to the SAP MES system enables automatic asset and logistics management, re-ordering a broken part after checking line-side, central and supplier stock levels.

In a networked factory where all machines deliver their KPIs via OPC-UA into the central MES system, an online prioritisation of tasks can be provided. Consider five error messages – which is the most urgent, where is a critical bottleneck according to current customer orders? This approach will enable value-stream optimisation in real time.

What else is likely in the near to medium future? The use of virtual reality headsets is already being explored and the training division of Festo, Didactic, are demonstrating the use of Blended and Augmented Reality headsets on the Cyber-Physical training factories being installed into universities and training centres. The best systems are still expensive, reserving the use to high-end applications i.e. aeronautics. However, as the usage grows in standard manufacturing environments the volumes will grow exponentially and the prices will fall.

In the space of just a few years the use of digital maintenance has become the norm within Festo production plants. A lot of this has been technically possible in the past but Industry 4.0 is providing a set of standards that enables the faster and easier integration of these systems, across platforms and suppliers. The elimination of error prone paper systems, faster time to fix, resource transparency and improved OEE has enabled a fast payback on these internal investments and provides a fascinating insight into the future.

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