Technical article

The factory of the future is in Spessart
Bosch Rexroth's fully networked factory manages over 200,000 different variations

The "factory of the future" is no longer a vision from the distant future. But it is also not a new building free of people with futuristic machines and equipment. Rather, it is now being implemented in the manufacturing halls of today by IT professionals, specialists for production systems, employees and employee representatives. The best example of this is Bosch Rexroth's electronics plant in the Wombach area of Lohr. Here a virtually unlimited number of variations are being manufactured, supported by digital systems and without set-up times, all the while continuously improving all indicators relating to productivity, quality, delivery reliability and transparency. I4.0 hardware and software solutions from Bosch Rexroth form the basis for this.

Existing machines that efficiently perform their duties even after decades of use, represent a special challenge for the use of real-time data in a production environment. This is because it can be a challenge to network them without a great deal of effort. "Any intervention in older control systems requires an enormous effort and stops the machine from producing," says Joachim Hennig, Technical Plant Manager at Bosch Rexroth's Lohr-Wombach factory, about the challenge involved. That is why Rexroth has developed a solution that subsequently links the machines without interfering in the controls using its IoT Gateway. It consists of a compact controller with open software and a micromechanical sensor package from Bosch. The IoT Gateway uses sensors to record the operating status, then evaluates and transmits the data. Here there is a major benefit: No PLC knowledge is necessary to commission the Rexroth IoT Gateway. In-house electricians can connect machines within a few hours – a significant saving compared with the one or more weeks an electrician needs for conventional PLC programming. Other software solutions from Rexroth enable direct access to data in older control systems, without requiring the controls to be reprogrammed. This provides for advanced data evaluation. Simple software programmed by the project team at Rexroth calculates the scope of the components on a Rexroth IPC in real time based on the component range for the Printed Circuit Board (PCB) assembly and the expected downtime.

Contact for journalists:

Bosch Rexroth AG

Susanne Herzlieb

97816 Lohr a. Main

Tel.: +49 9352 18-1573

Fax: +49 9352 18-1812

susanne.herzlieb@boschrexroth.de

Serial numbers: The product controls manufacturing

2017-08-10

"For us, the product controls manufacturing, otherwise we wouldn't be able to master the virtually unlimited variety so simply and elegantly", according to Joachim Hennig. "We have networked the entire manufacturing department with all the new and old machines and linked them to our IT systems, in total that's over 2,000 networked devices." A solid basis for this was the introduction of the Bosch Production System, which began in 2007. "The goal was to create a stable and robust factory in which faults hardly ever occur and competition-related indicators are improved continuously. With this networking we have reached a new level of transparency, which was impossible until now", says Dr. Mark Leverköhne, Head of Technical Functions in Wombach.

The manufacturing process begins with the order. For each sales order, a virtual image or digital duplicate of the ordered components is produced as a first step. This includes all technical specifications and an individual serial number, a kind of identity card. This serial number accompanies the components from now on for life. During manufacturing, the real product is then copied and built with the aid of the virtual image and the corresponding process parameters and test programs are correctly loaded automatically. The result: zero set-up time. All the processing steps and test results, as well as the serial numbers of the fitted subcomponents are restored from the stations to higher-level systems. At the end of the process, the digital duplicate in the software corresponds exactly to the physical version, and this enables a high degree of traceability, as well as an excellent basis for optimizing the production.

A high degree of variation requires real-time information

In order to implement the serial number production consistently, 2,000 devices were networked with the Manufacturing Execution System as well as with each other. The spectrum encompasses everything from pick-and-place equipment to printers for the nameplates. A smoothly running process strongly depends on all networked devices being fully functional and online. "We monitor all devices live and whenever faults with a device occur, the maintenance department receives a message immediately", says Dr. Mark Leverköhne with regard to securing productivity along the entire value stream.

Contact for journalists:

Bosch Rexroth AG

Susanne Herzlieb

97816 Lohr a. Main

Tel.: +49 9352 18-1573

Fax: +49 9352 18-1812

susanne.herzlieb@boschrexroth.de

Technical article

Uncovering errors directly along the value stream

The PCB assembly at the Rexroth factory is extremely varied and there needs to be a 100% examination of all assembled products. Due to the large degree of variation, it was previously difficult to detect deviations and systematically evaluate them. Therefore, factory management demanded, first and foremost, the introduction of faster, shorter control loops. Software now evaluates the results from various test facilities online and also shows, using traffic light logic, if there is an accumulation of error messages at the respective test bench or for the tested material number at all test benches. The first level of error analysis and containment can be done directly on the value stream. The operators can respond much faster and initiate countermeasures without first waiting for more specialists or supervisors to be consulted.

The focus is still on people

Thanks to the introduction of Industry 4.0 in small, manageable steps, employees were able to shape the development of the factory of the future and were able to witness the progress first-hand in their day-to-day work. They receive optimized support through the creation of 3D online construction guidelines for the assembly lines that can be retrieved parallel to the individual work pieces. At the same time, the numerous paper-based documentation requirements that were carried out until now have been eliminated. This significantly reduces the proportion of activities that do not add value.

The systematic qualification of employees

"With each improvement, we have to constantly question the benefits and proceed with the implementation in small steps", says Dr. Mark Leverköhne. "The important thing is that the benefits of innovation are quickly accessible to our employees." The starting point for him is that the focus is not on monitoring employees, but rather on supporting employees. That is the only way for networking to achieve the necessary acceptance the Head of Technical Functions firmly believes. At the same time, the plant uses the principles of continuous improvement and supplements them with new approaches, such as short-cycle 'hackathons', in order to get new i4.0 solutions into productive operation within a few days and therefore, in addition to the improvements to the value stream, to achieve widespread employee qualification, which is essential.

Contact for journalists:

Bosch Rexroth AG

Susanne Herzlieb

97816 Lohr a. Main

Tel.: +49 9352 18-1573

Fax: +49 9352 18-1812

susanne.herzlieb@boschrexroth.de

Technical article

Onwards towards the future

"In a short time wireless communications and autonomous, networked transport systems will become the norm. Increasingly more transparent value streams are going to be arranged more flexibly, until the material automatically finds its way through the factory and low-cost sensors, as well as progressive computing power provide self-learning systems", Joachim Hennig believes. Here, too, the factory will lead the way so that tomorrow and the day after tomorrow, it will continue to be a competitive factory of the future.

Background information about the factory

At the Lohr-Wombach factory, Bosch Rexroth produces custom servo motors and drive control units with integrated control functionality. The steps range from automated PCB assembly to purely assembly-related activities to extensive and automated quality testing. Some 200,000 variations are produced in small batches, whereby cutting-edge assembly lines as well as considerably older production facilities are networked with each other via an MES.

This factory shows how an existing manufacturing facility becomes a factory of the future that benefits employees, thanks to the introduction of a production system and then the gradual networking of all means of production. Networking is based primarily on hardware and software modules, as well as in-house systems that have to prove themselves here first before they are marketed.

Further information is available under: www.boschrexroth.com/press

Contact for journalists:
Bosch Rexroth AG
Susanne Herzlieb
97816 Lohr a. Main
Tel.: +49 9352 18-1573
Fax: +49 9352 18-1812
susanne.herzlieb@boschrexroth.de

Images:

Image 1: The "factory of the future" comprises a virtually limitless amount of variety.

Image 2: 2,000 manufacturing facilities are networked with the Manufacturing Execution System and with each other.
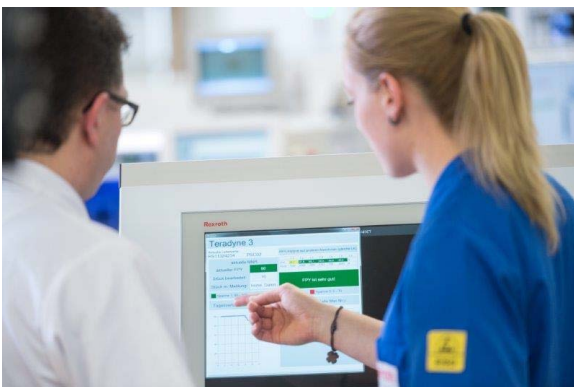

Image 3: Focus on staff support: The benefit needs to be tangible