

[01] Bosch is turning robots into colleagues

[02] How Bosch is connecting manufacturing– and the benefits this brings workers and companies

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Hannover Messe 2017 (Hall 7, Booth C26) **Bosch is turning robots into colleagues** Workplace 4.0 adjusts to the employee

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- ▶ Dr. Stefan Hartung: “People and machines will work more closely together than ever before. Industry 4.0 makes work easier”
- ▶ Adaptable production allows manufacturers to react quickly to market needs
- ▶ More than one billion euros in extra sales at Bosch by 2020

Hannover – Gently, he grasps the metal part and passes it to his colleague. As he does so, he pays close attention to all her movements so he can stop before they bump into each other. Despite his height of 1.75 meters, his movements are effortless and careful, and he doesn't make a single mistake. “He” is the APAS assistant. This robot, which can collaborate with people without any physical contact, is part of Workplace 4.0, a concept Bosch is presenting at Hannover Messe 2017. Industrial workspaces of the future are fully connected and focus on the needs of employees. “In the coming decades, everyday work in the manufacturing industry will undergo fundamental changes. People and machines will work more closely together than ever before. Industry 4.0 supports workers and makes their work easier,” said Dr. Stefan Hartung, a member of the board of management of Robert Bosch GmbH whose responsibilities include the Industrial Technology business sector.

A workstation that automatically adapts to the worker

At Hannover Messe, Bosch is introducing Workplace 4.0: a workstation that adapts to the worker. For example, the work surface positions itself at the right height, and workers can receive their instructions as a projection at whatever speed they choose. “Digital connectivity and production assistants will make day-to-day work in the industrial sector safer, easier, and more productive,” said Hartung. Automotive manufacturers and suppliers are already using collaborative robots such as Bosch's APAS assistant, but so are producers of consumer goods.

Artificial intelligence supports workers in the production environment

Workplace 4.0 envisions people and machines working closely together, a fact clearly illustrated by the APAS inspector, too, which is likewise making an appearance in Hannover. With the help of a learning image-processing function, the APAS inspector automatically detects when the surface of a production part does not correspond to its specifications. The worker teaches the machine just once regarding how much deviation to tolerate and at what point a part has to be scrapped. Thanks to artificial intelligence, the machine can then apply what it has learned to all subsequent quality checks and carry them out independently. The APAS inspector saves human workers from having to do this monotonous task and ensures a consistently high level of quality for all parts.

Connectivity enables a constant overview of machine data

Connectivity means machine data generated in Workplace 4.0 can be compiled, analyzed, and visualized. Workers can view information on the status of the production environment – for instance, via cycle-time analysis or part and error counters – on a single screen. They can check at any time to see if everything is running according to plan. “Many tasks that used to cost workers time unnecessarily can now be handled quickly and simply, thanks to digital connectivity. In the manufacturing sector, Industry 4.0 makes an enormous difference in easing the burden of day-to-day work,” said Dr. Stefan Aßmann, head of Connected Industry at Bosch, at the Hannover Messe advance press conference. According to a study by the consulting firm Accenture, 63 percent of the workforce expects increasing digital connectivity will improve their working conditions, with just 6 percent expecting the opposite.

Production lines automatically detect the necessary work steps

Nowadays, industrial enterprises and their employees have to be able to quickly respond to new requirements. “With a flexible production facility, companies can better react to the current needs of the market,” said Aßmann. He gave Bosch’s multi-product line in Homburg, Germany, as an example. There, Bosch can manufacture 200 different hydraulic modules from more than 2,000 different components. Thanks to connectivity, these components are automatically ordered in time. The modules control the work and driving hydraulics in trucks or tractors, which help do things such as incline loading surfaces or lift a plow. The production line’s nine stations are connected by a smart network. With an RFID chip attached to each workpiece, the stations know how the finished product has to be assembled and what steps are necessary. The work plans required for assembling the hydraulics components are automatically called up and shown on the monitors as a photo or video. The display is customized to each associate’s level of training, and shown in their native language. The aim is to offer associates the best possible support in their work.

Bosch offers everything concerning connectivity from a single source

Bosch has been working with Industry 4.0 solutions for several years now. With more than 270 manufacturing locations around the world, the company has extensive experience in industrial technology and in the use of software, services, and cloud solutions. As a leading user and leading provider, Bosch offers everything for production and the entire supply chain from a single source. The Industry 4.0 offerings for customers include not just software and product solutions for manufacturing and logistics, but also services and consulting, resulting in concepts that are tailored to each customer. With Industry 4.0 solutions, Bosch hopes to generate [extra sales of over one billion euros and to save another billion by the year 2020.](#)

Expansion of activities with partner country Poland

In Poland, this year's partner country of Hannover Messe, Bosch employs some 5,100 associates and posts annual sales of more than one billion euros. The technology company sells many products there, including Industry 4.0 solutions. Bosch has had a regional company in Poland since 1992, but began selling its products in the country at the beginning of the 20th century. It is continuously expanding its activities there: in 2016, Bosch invested some 80 million euros in the country, primarily in expanding and developing its manufacturing sites.

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The Bosch Group is a leading global supplier of technology and services. The company employs roughly 390,000 associates worldwide (as of December 31, 2016). According to preliminary figures, the company generated sales of 73.1 billion euros in 2016. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected industry. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to create solutions for a connected life, and to improve quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 450 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. At 120 locations across the globe, Bosch employs 59,000 associates in research and development.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant up-front investments in the safeguarding of its future. Ninety-two percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The majority of voting rights are

held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust. The remaining shares are held by the Bosch family and by Robert Bosch GmbH.

Additional information is available online at www.bosch.com, www.iot.bosch.com, www.bosch-press.com, [www.twitter.com/BoschPresse](https://twitter.com/BoschPresse).



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How Bosch is connecting manufacturing– and the benefits this brings workers and companies

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- ▶ Market launch: retrofit multisensor
- ▶ Connected manufacturing for Osram workforce: app for real-time machine data
- ▶ Old machinery, rapid connectivity, new benefits: IoT gateway
- ▶ Energy platform: lower energy costs and CO₂ emissions
- ▶ Twice the volume with factory connectivity: Bosch brake control systems
- ▶ Industry 4.0 production line for various control systems

Hannover, Germany – Bosch offers solutions that connect every stage of value creation: from suppliers through in-house manufacturing to customers. The sensors, software, services, and cloud provided by the broad-based supplier of technology meet all a company's Industry 4.0 needs. Some examples of successful solutions and the benefits they bring:

Market launch: retrofit machine monitoring multisensor

Machine monitoring has never been so easy: a multisensor, or CISS device, is fitted to a moving part on the machine. Thanks to its robust housing, this sensor device is suitable for use in harsh industrial environments with heavy vibrations, soiling, or high temperatures. The machine data is sent via an IoT gateway to the cloud and processed in a transparent way for display on a dashboard. The real-time monitoring and comparison of machine data is thus possible at any time. In the event of irregularities, such as a machine that is vibrating too much, appropriate measures can be taken. This solution can also predict when maintenance will be necessary, before actual problems arise. Bosch has been successfully using the sensor in its plants for over two years.

Industry 4.0 app for workforce: Osram Ticketmanager

Bosch has connected over 80 different machines, some older than others, for the lighting manufacturer Osram in Berlin. The company's plant for xenon lamps in Berlin now has an Osram Ticketmanager. In this way, Osram is helping its workforce put digital, flexible manufacturing into practice. The technology at the heart of this is the Bosch production performance manager (PPM) – a system that coordinates various streams of machine data in real time. The trick is to “translate” the data from various formats into a shared language, which turns it into useful information. Workers can now simply consult an app for a status report on their machinery. This presents a clear overview of any upcoming tasks, such as maintenance work or resupplying materials, allowing them to be organized and processed. The app provides access to all the information necessary for the key tasks. Having successfully concluded the project in Berlin, Osram will now roll the solution out to other plants.

New benefits thanks to connectivity: historic workbench with IoT gateway

It is 130 years old, pedal-powered, and a jewel of Industry 1.0. Robert Bosch, the company founder, himself worked at this cast iron workbench, which dates from 1887 and weighs 300 kilograms. Among other things, it was used to produce parts for the magneto ignition device, the product that helped the company to a breakthrough at the end of the 19th century. At one fell swoop, Bosch has now catapulted this historic workbench from the museum into the Industry 4.0 era – thanks to technological support from its new internet of things (IoT) gateway. The connected system combines sensors, software, and an IoT-capable control system, allowing condition monitoring of the workbench. This unique setup shows that even the oldest machines can be connected quickly and easily to an IoT gateway. As a result, Bosch is making the benefits of connected manufacturing available to factories that use older machinery.

Homburg: lower energy costs and CO₂ emissions

In its plant in Homburg, Germany, Bosch used Industry 4.0 solutions to reduce its annual energy costs by 1.2 million euros. To achieve this, all the relevant machinery was connected to a digital energy platform, where the meter data is processed and presented in a clear way. Associates can see the energy consumption of each machine on a screen or tablet and can make any necessary alterations. Defining upper and lower limits or comparing readings between machines makes it immediately clear where energy is being wasted or when a machine is running under capacity. Not only is Bosch improving the energy efficiency of its own plants, it is also offering customers solutions so that they can do the same. Intelligently connected Bosch solutions have achieved energy savings of up to 25 percent for the company's manufacturing customers.

A single production line for various control systems

On this digital I4.0 production line for Bosch Rexroth control systems, components tell the machinery what they are supposed to be made into. RFID chips are attached to the starting component, a circuit board. From the start, these provide the line with all relevant information about the production steps needed for the control system in question. This means the machinery always knows what to do with each component. A robot at one station, for instance, knows which heat sink to attach to the circuit board.

The line supports people in their work on these complex components. At one of their stations, associates can have lights guide them through their work instructions. The final work step is an inspection of the control electronics. Here, data from preceding stations can be compared with the inspection results to check for deviations and errors. On a similar production line in Homburg, Germany, the company manufactures more than 200 hydraulic-valve variants made up of over 2,000 components.

Twice the volume per hour: Bosch brake control systems

By using connected solutions in its international manufacturing network for the ABS and ESP brake control systems, Bosch has nearly doubled its hourly production volume over the past five years. The manufacturing network comprises 11 locations worldwide, led by the Blaichach plant in Germany. All locations across the network operate standardized machinery that is connected digitally, allowing data to be called up centrally. A comparison of collected manufacturing data ultimately permits much more efficient production: if one plant has a new idea that results in increased volumes on a line, the other plants can make the same modification. In this way, the best solutions can be implemented at all the network's other locations. Whenever a machine is not operating faultlessly, it automatically reports this before any loss in productivity is incurred.

Additional information:

- [Bosch APAS production assistants](#)
- [Bosch APAS YouTube channel](#)
- [Bosch Connected Devices and Solutions](#)
- [Bosch Energy and Building Solutions](#)
- [Bosch IT Shopfloor Solutions](#)
- [Bosch Software Innovations HMI Microsite](#)
- [Bosch Software Innovations YouTube channel](#)
- [Bosch Industry 4.0](#)

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