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Press release

November 27, 2018
PI 10811 RB MK/KB

Ready for the digital transformation in manufacturing: Bosch and IHK offer Industry 4.0 qualification

First Germany-wide vocational training program geared to this new skill-set

- A qualified workforce is essential for companies' transition to Industry 4.0
- First group of associates earns credentials as Industry 4.0 specialists
- Christoph Kübel: "We're preparing our associates for tomorrow's working world."

Stuttgart, Germany. Industry 4.0 has arrived on the factory scene, changing the working world and the demands placed on workers. Germany's federal statistics bureau says the domestic manufacturing industry alone employs more than eight million people. However, a recent study by Bitkom and TÜV-Verband found that only just under two-thirds of these companies offer their workforces training courses relating to digitalization.

Bosch has joined forces with the Stuttgart Region Chamber of Industry and Commerce (IHK) and other science and industry partners to develop a certification course called Fachkraft für Industrie 4.0 (IHK), or Industry 4.0 specialist, and launch a pilot program. The first nationwide IHK training course to cater to skilled workers, it brings technicians up to speed with the requirements of connected manufacturing. Technologies that enable Industry 4.0 applications figure prominently on the syllabus, as do agile working methods. "You have to understand the connected world before you can shape it. We're preparing our associates for tomorrow's working world, and thus setting the stage for successful Industry 4.0 adoption. The new Industry 4.0 specialist qualification will help hone Germany's competitive edge," says Christoph Kübel, the director of industrial relations at Bosch.

The first 12 participants from the Bosch plant at Stuttgart-Feuerbach have completed this course of vocational training. Starting in 2019, various IHK member bodies will offer courses nationwide that are open to all companies.

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Industry 4.0 specialists to shape connected manufacturing

This new certification course caters to skilled workers with job experience in manufacturing and logistics. There are no formal entry requirements. The course consists of five modules totaling 104 hours. Theory and practice are given equal emphasis. Participants learn about connected business models in manufacturing: What technologies are out there? How is data transferred? How do logistics and supply chains work in a digital world? Technology is one focus topic; working methods such as scrum are another. “Technical solutions are just one side of the coin. When it comes to Industry 4.0, what really makes the difference is the workforce. Their ability to spot problems as they arise and find new, creative solutions will take center stage in tomorrow’s factories,” says Dr. Stefan Aßmann, who heads Bosch Connected Industry, the business unit tasked with delivering the company’s Industry 4.0-related software and services. As a leading Industry 4.0 user and supplier, Bosch digitalizes and connects its plants and those of its customers. Virtually all the roughly 280 Bosch plants worldwide have connected solutions in place.

Bülent Cevran, one of the course’s first graduates, has worked for Bosch at Stuttgart-Feuerbach for 20 years. An industrial mechanic by trade, his responsibility as shift supervisor is to ensure there are always enough parts in stock to keep the manufacturing lines rolling. “My job has changed a great deal in recent years. In the past, deciding what parts were needed and then allocating them was a painstaking, manual process. Today this is done fully automatically. We’ve connected our depot with the drivers who deliver supplies to us. Now they always know what, when, and where things are needed. With the benefit of this course, I can play a part in mapping out the plant’s connectivity. My first project after completing it will be to improve the connectivity with drivers and add other use cases, for example, to pick up empty shipping crates,” Cevran says, describing the changes afoot.

Bosch associates can volunteer for the training program and take advantage of various types of support offered by the company, such as time off and tuition assistance. The company also footed the bill for the pilot program. Much of this training takes place during working hours, and around 20 percent off the job.

Industry 4.0 specialists: out of Germany and into the world

Bosch Industry 4.0 experts had a hand in developing the course’s content. Now, as instructors, they are going to help deliver it.

“Digitalization is among the biggest challenges companies face. The IHK supports them with practical programs such as the ‘Industry 4.0 specialist’ certification course. I am delighted that we have such an outstanding partner as Bosch to help develop and roll out this qualification course. Many other companies will benefit from it,” says Johannes Schmalzl, the director of the Stuttgart region IHK.

The German Chambers of Commerce Abroad aims to also offer Industry 4.0 specialist training in countries such as China.

Further information:

Press information: Digital education: apprentices as Industry 4.0 ambassadors

Press kit: Working world Industry 4.0 at Bosch

Press kit: Bosch makes factories smart, lean, and flexible

Press photograph: #1712377, #1712381, #1712400, #1712402, #1712409

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The Bosch Group is a leading global supplier of technology and services. It employs roughly 402,000 associates worldwide (as of December 31, 2017). The company generated sales of 78.1 billion euros in 2017. 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 manufacturing. 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 deliver innovations for a connected life. Bosch improves 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 440 subsidiary and regional companies in 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 125 locations across the globe, Bosch employs some 64,500 associates in research and development.

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Press release

Industry 4.0 at Bosch: the power of an idea
How Bosch makes manufacturing and logistics simpler, more efficient, and more flexible

November 27, 2018
PI 10807 RB Cn/KB

- Sales growth along the entire value chain thanks to Industry 4.0
- Connected industry creates jobs and new job profiles
- Three pillars of success in the factory of the future: people, machines, data
- 5G will be a key technology for Industry 4.0

Stuttgart, Germany – The connected world has arrived, and it is growing and developing every day. With 7 billion people and 50 billion devices connected with each other by 2020, the internet of things (IoT) is transforming the way we live, work, communicate, and interact with one another. It is also changing processes and procedures for manufacturing, transporting, and warehousing goods. The fourth industrial revolution is setting new standards: Industry 4.0 solutions are making manufacturing and logistics simpler, more efficient, and more flexible. As a leading IoT company, Bosch possesses all the core competencies required to shape Industry 4.0. The company digitalizes and connects its own plants, offers customized solutions, and optimizes working conditions. By 2020, Bosch wants to have utilized the potential of Industry 4.0 to save a billion euros at its own sites and generate a billion euros in additional sales.

Industry 4.0 at Bosch – an overview

Connected manufacturing is a mainstay of the company's IoT strategy. All Bosch electronic devices will be web-enabled by 2020. "In the IoT, the real and the virtual worlds merge," says Dr. Stefan Hartung, member of the Bosch board of management with responsibility for industrial technology. "This offers transparency across all processes in real time. In this way, companies can increase their productivity in manufacturing, save resources, enhance safety, and make work simpler. Industry 4.0 adds value – and does so for everyone, at each step along the value chain." The international Boston Consulting Group predicts that companies will manufacture 30 percent faster and 25 percent more efficiently in a connected industrial world. Bosch is committed to Industry 4.0: it

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has already implemented connected solutions in virtually all its roughly 280 plants, and has over 60 Industry 4.0-related products and services in its portfolio. This dual strategy of being a leading provider and a leading user also helped Bosch increase its sales of industrial technology by 7.7 percent to 6.7 billion euros in 2017. “Industry 4.0 is not an end in itself. It harbors huge potential,” Hartung says. “To unlock this potential, we need courage and belief in our own abilities and in the power of change. This isn’t for the faint-hearted. Only those who are willing to take risks will be successful in the long run.”

The factory of the future: human creativity required

The floor, the walls, and the roof are fixed; everything else is movable and connected. People control, monitor, and maintain the production lines. Data supplies an overview. Robots provide support and carry out monotonous, repetitive tasks. This is how Bosch envisions the factory of the future. “People are the creative element, the vital link between machines and data,” says Rolf Najork, head of Bosch Rexroth, one of the leading companies in drive and control technology and a wholly owned Bosch subsidiary. Digitalization in manufacturing and logistics improves working conditions and secures jobs. The figures back up this assertion: the Centre for European Economic Research (ZEW) predicts that digitalization will lead to employment growth of 0.4 percent per year up to 2021. While robots are replacing some jobs, the study concludes, this is more than compensated for by job growth elsewhere. “Industry 4.0 ensures that Germany will continue to be an industrial leader in our globalized world,” Najork says.

New qualifications and skills required

The digital transformation in general and Industry 4.0 in particular pose new challenges with regard to training workers and dealing with changing working conditions. Interdisciplinary collaboration, the linking of information and manufacturing technologies, and IT know-how will become increasingly important. In addition, social skills such as self-organization, flexibility, and lifelong learning will be in demand more than ever before. To achieve this, suitable boundary conditions should be created. Bosch has recognized this reality and taken on the responsibility of this task: for example, the Drive and Control Academy at Bosch Rexroth supports vocational and educational training providers and universities by means of training courses, training systems, and modern media technology designed to cultivate skills relating to Industry 4.0. The Bosch plant at Blaichach in southern Germany also offers various career development options, ranging from training videos to the integration of technical devices to full-day seminars. The latter teach participants how to use new systems and explain methods for teamwork and management responsibility. In addition, existing trades and apprenticeships are being adapted and new job

profiles developed: Bosch offers training as a production technologist, a combination of a mechatronics apprenticeship and a degree course.
As a global company, Bosch is actively engaged in education and training worldwide. In the central Chinese city of Chengdu, for example, Bosch opened its first Innovation Center for Industry 4.0 in 2017. It offers courses on topics relating to quality, manufacturing, supply chains, and Industry 4.0 solutions. Participants can choose from over 20 different programs. The Innovation Center has a strong practical orientation and offers apprentices the opportunity to work at connected production lines.

Data creates benefits

Bosch combines tried-and-tested production engineering with modern information and communications technology. This approach delivers huge benefits. For instance, associates can access a large variety of data at any time, which they can then analyze and visualize. Errors can be avoided from the very start. And if a fault occurs nonetheless, associates can respond swiftly. This reduces machine downtime and increases production output. “Experience from internal Bosch projects shows that by using intelligent software we can increase productivity every year – at some locations, by up to 25 percent – while also reducing stock levels by up to 30 percent,” explains Dr. Stefan Aßmann, who heads up Bosch’s Connected Industry business unit. “On top of that, we can increase flexibility within plants and retool machines faster and gear them up for customized production – all the way down to batch sizes of one.” It will also be possible for Bosch to become even more economical in its use of resources and make its manufacturing processes even more environmentally friendly. At the Bosch plant in Homburg, Germany, for example, the central IoT software platform uses the presence or absence of associates to determine when a sector is active, and automatically regulates the heating and air conditioning accordingly. “The intelligence of the factory of the future lies in its software – and in the minds of its workers,” Aßmann says. Consequently, Bosch has brought its software together under one roof: with Nexeed, companies can simplify the everyday working lives of its workforce and design their manufacturing and logistics operations so that they are more efficient, more flexible, and more economical in their use of resources.

Intelligent machines

In addition to data, intelligent machines also assist people in their work. Robots weld, glue, assemble, and convey goods around the factory. They react flexibly to people, are able to learn from them, and carry out monotonous tasks and ergonomically difficult sequences of movements. In this way, robots can become colleagues. Recognizing workers, avoiding collisions – production assistants such as APAS from Bosch allow humans and machines to work safely side by

side, without the need for a safety barrier. Equipped with comprehensive safety technology, the robot automatically stops without any contact at all when a worker comes too close. For Bosch, APAS is a technological flagship that has applications in a huge variety of industrial sectors. Bosch evaluates the collected data and findings and uses them to continuously further develop the technical assistant.

There is a demand – the number of robots used in industry is increasing. Therefore, compared to the previous year, the global sales have increased by 29 percent in 2017. However, robots do not only relieve employees, they are also an important factor to remove shortages from the job market.

5G to become a key technology

A key condition for the successful implementation of Industry 4.0 is high-performance connectivity infrastructure with fast internet. After all, a large number of sensors, actuators, and other devices will be all connected with each other in the factory of the future. This will give rise to intelligent systems characterized by a high degree of flexibility, efficiency, and adaptability. A key role here will be played by 5G, the fifth generation of wireless mobile technology whose transmission rate, at more than ten gigabits per second, is ten times faster than the 4G mobile phone network. At the same time, this significantly increases the reliability with which data can be sent and received, along with real-time capability. “5G will be the central nervous system in the factory of the future,” says Andreas Müller from Bosch, who is also Chairman of the 5G Alliance for Connected Industries and Automation (5G-ACIA) founded in 2018. The goal of the initiative, which has brought together more than 40 companies and research institutions to date, is to shape 5G from the beginning so that it meets the future needs of industry. For the first time ever, representatives of the traditional automation and manufacturing sectors will be working together with experts from the information and communications technology industry in global, interdisciplinary cooperation, making the alliance a unique phenomenon worldwide. This is a trailblazing approach that others will follow: “Open standards and platforms coupled with cross-industry collaborations will characterize the manufacturing of tomorrow. No one company will be able to mine the treasures of the connected world single-handed,” Müller says.

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Background information

How Industry 4.0 is changing the world of work

Five questions for Christoph Kübel, member of the board of management and director of industrial relations at Robert Bosch GmbH

November 27, 2018
PI 10813 RB MK/KB

How will Industry 4.0 change the world of work?

Industry 4.0 will enable us to strengthen our manufacturing sites' competitiveness, and thus secure employment. We are opting for connected solutions in almost all of Bosch's 270 or so plants around the world. Connected manufacturing gets the best out of the differing capabilities of humans and machines. Robots work accurately without getting tired. Humans have the edge when it comes to knowledge and experience, and know how to find creative solutions for complex situations. Giving machines and equipment connectivity creates value, since the data and information we gather allow us to gain new knowledge. This enables us to increase productivity, conserve resources, increase security, and make work easier. Humans make all the difference where this is concerned. Thanks to their empathy, creativity, and problem-solving skills, human workers are and will remain indispensable. Their talents cannot be digitalized. However, job profiles and qualifications are changing. Interdisciplinary work and lifelong learning are becoming more important. The digital transformation is also a cultural transformation.

How are you preparing your manufacturing associates for the digital transformation?

We are bringing our associates into the change processes at an early stage. We are using pilot projects to gather experience we can put to use later in actual practice. At our Feuerbach plant, for example, we have tested an app that lets associates swap shifts quickly and easily. This is a way of helping manufacturing associates benefit from a better work-life balance.

We are also offering our associates a range of qualification options, such as the new training program that will qualify them as Industry 4.0 specialists. After all, only those who understand the connected world will be able to shape it.

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What is the significance of learning and further training?

We are qualifying our associates for the working world of the future. This is essential if we want to successfully implement Industry 4.0. At the same time, learning will ensure that associates remain employable. That's why learning is strategically vital for successfully shaping the digital transformation. Over the past five years, we have invested over a billion euros in vocational training for our associates. At the moment, we offer around 19,000 training programs.

With our "Bosch Learning Company" initiative, we want to establish a learning culture in the company that facilitates informal, independent learning during day-to-day work. We are using comprehensive qualification programs to prepare our associates for areas such as electromobility, software, and the digital transformation.

We also offer further training programs specifically for manufacturing associates. In the Industry 4.0 specialist training course, we equip participants for the requirements of connected manufacturing. In addition to technological specialist knowledge, we teach them new ways of working, such as agile methods. We provide semi-skilled and unskilled associates with opportunities to qualify for more skilled tasks.

In order to encourage associates to take up further training, we support them with grants or leaves of absence. In that regard, we work closely with the works councils.

What kind of new job profiles will emerge?

Industry 4.0 requires new competencies among associates, in IT as well as in connected business models. We train our associates for these new requirements. Our apprentices learn how to program apps and configure robots. One new occupational profile designed specifically with connected manufacturing in mind is that of a production technologist to manage manufacturing processes. We have been training associates for this role since 2015. Data scientists evaluate large volumes of data and provide recommendations for action based on the information they obtain. There is also a huge need for developers. More than 25,000 software experts already work at Bosch today. Every second vacancy at Bosch is related to software or IT.

To what extent will associates benefit from new techniques and work methods?

Industry 4.0 increases the plants' competitiveness, and thus safeguards employment. In the future, intelligent machines and software will take over routine tasks while humans will carry out more sophisticated activities. Robots, such as the APAS automatic production assistant, will make life easier for associates by taking over dangerous, strenuous, and monotonous tasks such as

manually sorting parts. Autonomous transport robots mean that associates won't have to walk long distances to obtain materials, and can get on with their work without delay. That saves time and frees up workers for other things. People can concentrate on what matters: managing processes, bringing their creativity to bear, and developing new things.

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Press release
Division

Digital education: apprentices as Industry 4.0 ambassadors
1,500 entry-level professionals wanted for digital transformation

August 13, 2018
PI 10105 RB St/KB

- Bosch apprentices impart technical and digital knowledge to school students
- Share of women in STEM apprenticeships at Bosch twice as high as the national average
- High demand for specialists: 1,500 apprenticeships in 2019
- Christoph Kübel: “Only those who understand the connected world will be able to shape it”

Stuttgart, Germany – With curiosity, the eyes of the 18 apprentices follow the small autonomous transport robot as it makes its way across the production hall at the Bosch plant in Homburg. As part of their technical vocational training, they are taking on the role of “Industry 4.0 ambassadors.” To this end, one of the things the six young women and 12 young men are learning about is the use of new technologies in connected manufacturing. “Through projects like these, we aim to give our future specialists the means to play a role in shaping digital transformation at the company and in society,” says Christoph Kübel, director of industrial relations and member of the board of management at Robert Bosch GmbH.

In 2019, Bosch will provide some 1,500 apprenticeships to young people. One in four apprenticeships involves a cooperative education program in a discipline such as electrical or mechanical engineering. Most of the apprenticeships the supplier of technology and services is looking to fill are in careers related to connected manufacturing, including electronics engineers for automation technology, mechatronics engineers, and IT specialists. “Knowledge about digitalization and connectivity is the basis for a successful career start,” Kübel stresses. “Only those who understand the connected world will be able to shape it.” Throughout Germany, more than 4,600 young women and men are currently completing occupational training at the company. At 16 percent, the share of female apprentices in STEM professions is nearly twice as high as the national average. “Mixed teams are more creative and generate better results. That’s why

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we place such importance on diversity in our workforce. One aspect of this is encouraging women to take up technical professions," Kübel says.

Occupational training for the connected future

At more than 50 locations, Bosch is training the specialists of tomorrow. The company constantly adapts the material covered during training to the future needs of its locations, so that apprentices get the best possible preparation for a connected future. Along with new teaching concepts and subjects, such as e-learning, app programming, and robot configuration, educational partnerships play an important role. Together with trainers, apprentices develop fascinating and instructive projects to teach school students about the world of digitalization and connectivity. "As part of the educational partnerships, we start entrusting our apprentices with responsibility for themselves and for projects during occupational training," says Siegfried Czock, head of occupational training and professional training policies at Bosch in Germany. "That way, apprentices learn to use their knowledge in a practical setting and share it with school students through specific project tasks. This interplay between gaining knowledge and passing it on is a very important skill – for today and tomorrow." Throughout Germany, more than 500 Bosch apprentices are already involved in over 300 educational partnerships that take place as part of the Wissensfabrik – Unternehmen für Deutschland (Knowledge Factory – Companies for Germany) initiative, of which Bosch is a founding member.

Apprentices offer school students insights into connected industry

As Industry 4.0 ambassadors, the young apprentices in Homburg, with the support of their trainers, teach foundational digital knowledge at eight partner schools in the city, giving school students a practical look at various careers. Patrizia Sommer, an apprentice who is training to be an electronics engineer for automation technology and is an Industry 4.0 ambassador, is excited about her new role: "I look forward to showing students all the things you can do with Industry 4.0. Often, students don't even know what kind of exciting tasks are associated with careers such as electronics engineering."

School students program an automated vehicle

As part of another educational partnership, apprentices at the engineering location in Schwieberdingen have designed a self-driving model car that is capable of identifying obstacles and avoiding them with the help of an infrared sensor. The necessary programming is done using the Calliope microcontroller. The apprentices are working with seventh graders to assemble and program the car. "At first, the students usually can't imagine how automated driving works. After the project, they're excited about technology, just like I was back then,"

says Romy-Maria Bahmer, who is in her second year of training to become a mechatronics engineer.

Apply now: open apprenticeships for 2019

Open apprenticeships and positions for university students at Bosch for 2019 are being advertised online. Information on apprenticeships and positions for university students is available at bosch.de/karriere. The website also lists the dates when potential applicants can get to know the vocational training departments at Bosch personally.

Press photo: #1452086, #1452087, #1452080, #1452088, #1452090

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Fact sheet

Bosch Industry 4.0 solutions in practice
Bosch plant in Feuerbach is a pioneer and development partner for Industry 4.0

27. November 2018

- ActiveCockpit provides overview of factory operations
- Nexeed software supports workforce in daily routine
- Intelligent supermarket brings transparency to intralogistics
- Transport Management solution permits dynamic route planning

Stuttgart, Germany – Bosch is a leading user and a leading provider of Industry 4.0. The company is digitalizing and giving connectivity to both its own plants and those of its customers. Industry 4.0 solutions are first tested and validated in-house before Bosch markets them to other companies. This means customers benefit from the experience gathered in some 270 Bosch plants and over 700 logistics centers worldwide. One of Bosch's lead plants for this new technology is in Feuerbach, a suburb of Stuttgart. The plant has implemented numerous Industry 4.0 solutions in production and logistics. Here is a selection.

ActiveCockpit – manufacturing data at a glance

Bosch Rexroth's ActiveCockpit intelligent communications platform can visualize data to make it easy for anybody to understand. The large display gives workers information on the current status of production. To do this, the platform processes and visualizes data in real time. The increased transparency this brings to factory operations paves the way for clear, sound assessments. Workers and companies all benefit, as it means problems can be identified immediately, downtimes reduced, and quality increased.

Nexeed – making work easier with software

The Nexeed Production Performance Manager ensures systematic improvements in production by helping workers make decisions quickly and easily. To do so, it gathers and harmonizes real-time production and machine data from a variety of sources in the manufacturing environment, gives it a clear structure, and presents it to workers on their mobile devices. This saves both time and money.

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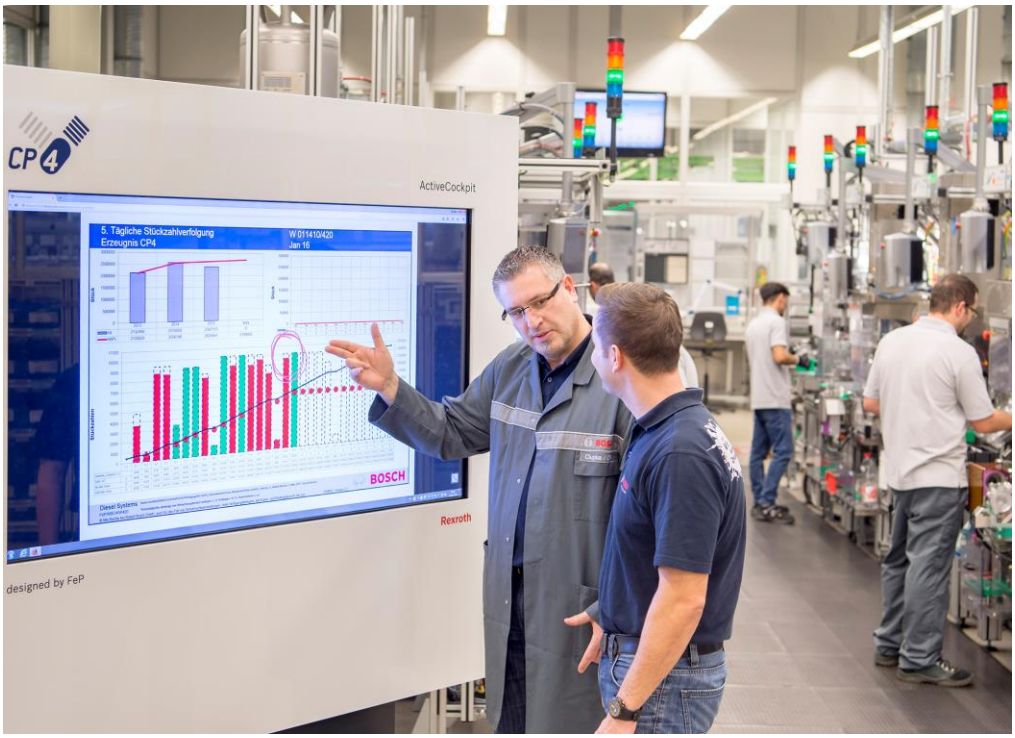
Intelligent supermarket – more transparency in logistics

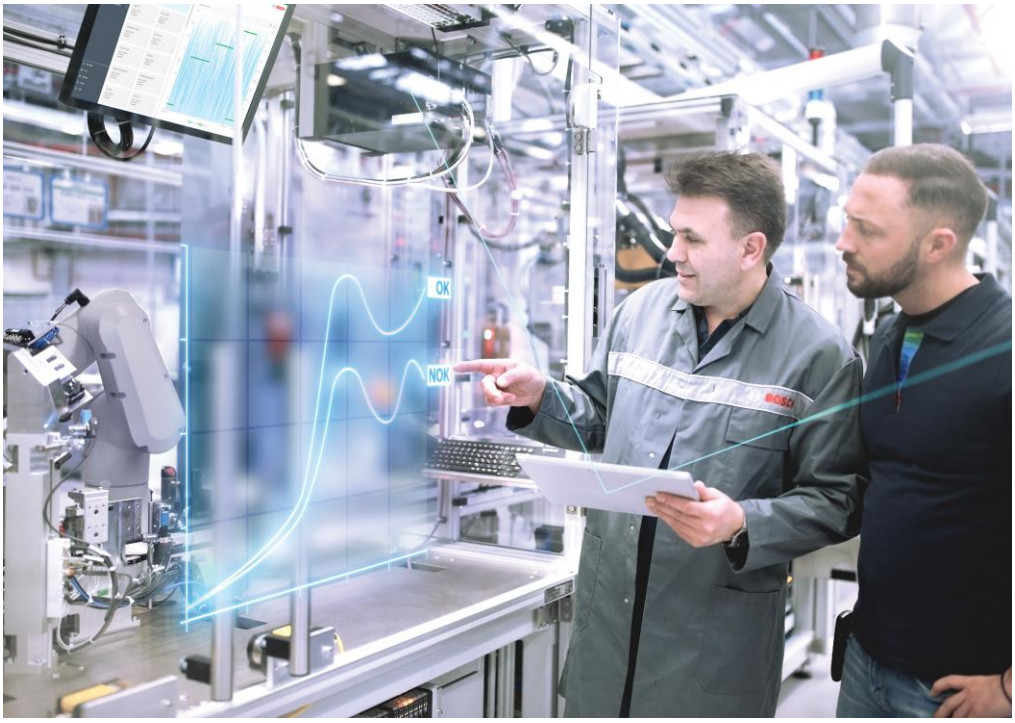
Bosch Connected Industry's intelligent supermarket is an optimized solution for manufacturing-related warehouses. It involves equipping individual small load carriers or belts with technology including RFID tags and digital kanban cards. This automates the process of booking materials in and out, which used to have to be done manually. Not only does this make life easier for workers, but it also means the supermarket's stock is available in near real time. In addition, the system indicates the belt onto which incoming stock should be directed. The intelligent supermarket is currently being piloted in the Feuerbach plant. Once the project has been successfully concluded, the solution will be made available in the market.

Transport Management – intelligent planning for intralogistics

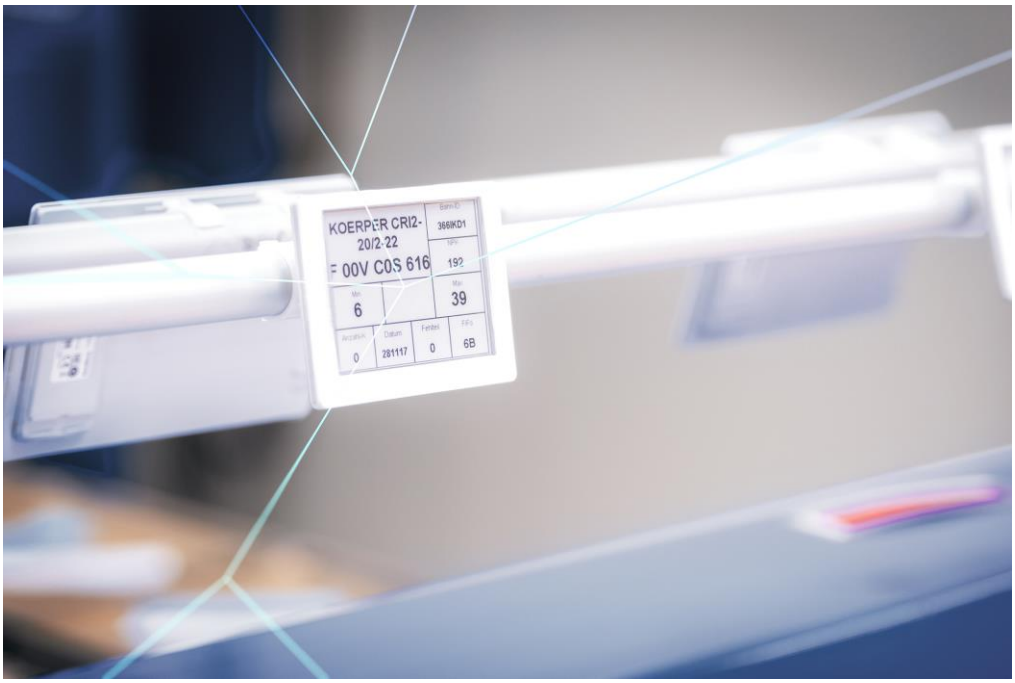
Bosch Connected Industry's sophisticated Transport Management solution facilitates dynamic planning of intra-plant logistics. The system stores all vehicles with their load status, position, route, and maximum load capacity. For incoming orders, this information is used as the basis for selecting the right means of transportation for the goods. Transport Management can also optimize existing milk run processes: using data from the system, bus-style routes that previously had to include a stop at all predefined waypoints can now focus on goods that are actually ready to be picked up. The system displays up-to-date information about routes and shipments on drivers' tablets.



At the Bosch plant in Feuerbach, manufacturing associates use the ActiveCockpit to analyze data from the production process.



Thanks to the Nexeed Production Performance Manager, associates in the Feuerbach plant can monitor machinery and perform predictive maintenance.



The intelligent supermarket in the warehouse shows stock levels and indicates the belt onto which stock should be directed.

Bosch Transport Management gives drivers all the up-to-date information they need at a glance.

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Fact sheet

The Bosch plant in Feuerbach – where tradition meets high-tech

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Feuerbach, in Germany, is home to Bosch's biggest, as well as oldest, location worldwide. It was established by Robert Bosch himself in 1909, and is home to a Bosch plant that has been in existence for more than a century. In other words, it has a rich history. At the same time, it also has a very bright future – not least because the plant has kept pace with progress and is now profiting from the benefits of Industry 4.0 in the areas of manufacturing, maintenance, transport, and monitoring. For example, with a network of over 550 items of connected machinery throughout the plant, the condition of individual production systems can be monitored via a graphic display showing their current operating status. Equipped with this knowledge, plant engineers can intervene at a first sign of a problem, thereby reducing machinery downtime and increasing output.

At the same time, the plant also benefits in the field of logistics, where seamless connectivity has substantially enhanced processes and brought greater transparency. For example, a smart supermarket system with put-to-light technology automates the management of inventory and simplifies sorting in a materials store that is located close to the production line. All parts removed are recorded by the inventory management system, and replacement orders automatically dispatched. The resulting transportation is undertaken by digitalized milk runs or fully autonomous ActiveShuttles.

Alongside the extensive deployment of software-based solutions, the Feuerbach plant is also driving forward the development of human-machine interaction. This includes the use of APAS, an automatic production assistant that works hand in hand with human operatives without the need for a protective fence. In other words, Industry 4.0 is changing the face of manufacturing and, with it, the nature of manufacturing jobs. Feuerbach has been quick to respond to this trend. In spring 2018, skilled workers from the plant commenced training for the new, nationwide qualification for Industry 4.0 specialists established by the Chamber of Commerce and Industry (IHK).

In addition, in its role at Industry 4.0 lead plant, Feuerbach is doing pioneering work on 5G for the entire Bosch manufacturing network with its approximately 250 plants. For this purpose, Bosch has applied for and received a 5G license to build a private campus network. The set up of the network is planned in 2020.

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General information

- **Plant name** Feuerbach Plant
- **Established** 1909
- **Surface area** approx. 109,100 m²
- **Workforce** approx. 3,000
- **Products** High-pressure pumps and components for exhaust-gas treatment
- **Core competencies** Lead plant functions, digitalization/Industry 4.0, carbon coating, contact measurement, Bainitic hardening
- **Division** Powertrain Solutions

Facts and figures: Industry 4.0 in Feuerbach

- Over 550 items of connected machinery
- 10 percent reduction in cycle times
- Over 50 percent reduction in administrative overheads for production management due to introduction of the Active Cockpit interactive communication platform
- Over 50 percent reduction in energy requirements (as per January 2019 compared to 2007), also as a result of smart connectivity for diverse data sources