[01] Old machine + rapid connectivity = new benefit

[02] Bosch initiates new machine language for Industry 4.0

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Old machine + rapid connectivity = new benefit
Sensors and software take Robert Bosch's lathe from 1887 into the age of Industry 4.0

- Werner Struth: "Bosch is opening up the benefits of connected industry to operators of older machines as well."
- Customer benefits include predictive maintenance
- Industry 4.0 retrofit solutions is a global market worth billions
- Solution includes new PPMP machine language

Stuttgart, Germany – It is 129 years old, treadle-operated, and an Industry 1.0 gem. The company founder Robert Bosch himself worked with this 300-kilogram cast-iron lathe beginning in the years after 1887. Among other things, it was used to manufacture parts for the magneto ignition device – the very product that helped the company to achieve its breakthrough at the end of the 19th century. Now, at one fell swoop, Bosch has catapulted this historic lathe right out of the museum and into the age of Industry 4.0. The new Bosch IoT (internet of things) gateway provides the necessary technical support. The connected system combines sensors, software, and IoT-compatible industrial controls, making it possible to monitor the condition of the lathe. Speaking in Stuttgart, Dr. Werner Struth, who is the Bosch management board member responsible for industrial technology and manufacturing coordination, said: "This is the only construction of its kind in the world. It shows that even ancient machines can be connected quickly and easily with the IoT gateway." As a result, he explained, Bosch is "opening up the benefits of connected industry to operators of older machines as well."

Many machines still not part of Industry 4.0

"Many of the machines used in skilled trades or manufacturing are still not connected to Industry 4.0. Among other things, they lack sensors, software, and connections to companies' IT systems – which means that they do not fulfill the essential prerequisites for connected industry. In Germany alone, the number of

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such machines runs into tens of millions. And globally, the market for retrofit solutions like the Bosch IoT gateway is worth billions," Struth said. He noted that industry needs connected machines if it is to be successful over the long term. That is exactly what the IoT gateway ensures – quickly and flexibly. With this gateway, Bosch shows how operators of older manufacturing systems can connect their machines, and thus monitor them in real time and optimize them. This enables things such as predictive maintenance, reducing downtime while increasing productivity.

Long innovation cycles make retrofit solutions necessary

The IoT gateway makes sense technically and economically: innovation cycles in mechanical engineering differ from those in many other industries. Once purchased, machines often remain in use for decades. They can only be changed to meet new demands at great effort and expense. A large part of the installed machinery worldwide is therefore still not networked with connected industry. The need for retrofit connected-industry solutions is correspondingly huge. The same holds true for Bosch: "We are already using the IoT gateway ourselves and saving money. And our subsidiary Bosch Rexroth will be offering our customers this solution from this fall," Struth said. The IoT gateway will be presented to a specialist audience at the sps ipc drives trade fair.

Investment pays off in just 18 months

At the Bosch plant in Homburg, for example, engineers have connected a 2007 test facility for hydraulic valves with the IoT gateway. Thanks to new sensors that monitor the quality of the oil used, it is now possible to determine the point at which oil needs to be changed much more precisely than before. This saves time and money, and is good for the environment. In this specific case, retrofitting with the IoT gateway paid for itself within just 18 months. In a next step, Bosch will retrofit 22 of its other test facilities and then a number of other machines. Aside from the gateway, Bosch also provides the software necessary to analyze, prepare, and present the data on the Bosch IoT Cloud, for example.

The IoT gateway: no need for programming

Depending on the application, the IoT gateway is augmented by sensors that are mounted on the machine to be retrofitted. The sensors record factors such as temperature, pressure, vibration, power consumption, oil quality, angle of inclination, rotational speed, and other parameters. The software translates this data in real time into a format that can be integrated into existing production environments – "like a tireless simultaneous interpreter for Industry 4.0," Struth said. The IoT gateway does not have to be programmed for this purpose; it only needs to be configured using a browser, which means it can be taken into operation much faster. Configuration uses the new, open machine language

(PPMP, production performance management protocol) that was presented recently.

Better quality, timely maintenance

After having been "tuned" for Industry 4.0, the museum lathe is ready for essential new features of connected manufacturing. One of these is process monitoring for constant quality assurance, another is condition monitoring in order to prevent unplanned downtimes. For process monitoring, sensors measure a range of values, including the speed at which the workpiece turns. Cutting speeds that are too high or too low decrease the quality of turned metal parts and can damage the tool. For example, a look at a monitor reveals the data recorded and transmitted by the IoT gateway data, showing the workers operating the treadle that they have to pedal faster or slower in order to reach the ideal speed.

In addition, the newly connected lathe recognizes gradual changes to the drive belt. As it grows older, the leather belt can slip between the drive wheel and the spindle carrying the workpiece. For the human eye, this process is initially imperceptible, but sensors can already recognize deviations in the low percentage range. Once a predefined threshold value – 2 percent slip, say – has been reached, the connected system automatically notifies the maintenance worker responsible, who replaces the belt within a preset period. In this way, the sensors, gateway, and software prevent unplanned downtime of what is now an Industry 4.0-enabled lathe. This increases productivity.

507 German marks for the lathe

Robert Bosch bought the lathe in February 1887, and also worked on it himself. It seems to have been in use until 1901. Converted to today's currency, what was a purchase price of 507 German marks is the equivalent of around 30,000 to 40,000 euros – for the small company that Bosch had only founded in 1886, it was a considerable investment that was calculated for the long term. "It's still the same today: Machines are expensive. We have to use them as efficiently as possible. Connectivity can play a decisive role here," Struth said.

Internet

The new PPMP machine language:
http://bit.ly/2d7ZYIA
sps ipc drives trade fair:
http://bit.ly/1Qwjet1

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The Bosch Group is a leading global supplier of technology and services. It employs roughly 375,000 associates worldwide (as of December 31, 2015). The company generated sales of 70.6 billion euros in 2015. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing and sales network covers some 150 countries. The basis for the company's future growth is its innovative strength. At roughly 118 locations across the globe, Bosch employs 55,800 associates in research and development. The Bosch Group's strategic objective is to create solutions 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 company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as a "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.

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Press release

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Bosch initiates new machine language for Industry 4.0

Large and medium-sized companies will benefit

- Bosch CEO Denner: “Open standards are one of the fundamental prerequisites for Industry 4.0”
- Barriers to entry for smaller companies removed
- Six SMEs already on board as partners

Stuttgart – Bosch wants to remove one of the biggest barriers for smaller companies seeking to enter connected industry. The company is seizing the initiative and presenting a new, open industry standard it has developed in-house for the exchange of data in connected industry. This will enable interplay between a wide variety of partners in the internet of things (IoT) and in Industry 4.0. Known as the Production Performance Management Protocol (PPMP), the new standard will for instance support the quick, easy, and secure transfer of data from sensors that SMEs supply to manufacturers to the production systems of large companies. The protocol is freely available and free of charge. This removes barriers to entry into connected industry. “Open standards are one of the fundamental prerequisites for making use of the opportunities Industry 4.0 presents. By letting everyone participate in data exchange, they increase interoperability, enable new business models, and enhance the competitiveness of all the companies involved,” said Bosch CEO Dr. Volkmar Denner. “This will help Industry 4.0 to become more widely established more quickly: companies large and small will be able to integrate their products more quickly. Both German industry and the global economy stand to benefit.”

Data improves production management

The new standard developed by Bosch experts supports Production Performance Management (PPM), a process that is central to Industry 4.0. It uses sensors to collect great quantities of data from manufacturing for analysis, with the aim of further improving production processes. Are all the components along a production line really working together as effectively as possible? Is one

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component slowing the process down? Is one piece of equipment drawing an unusually large amount of power? Is a motor overheating and possibly about to fail? A PPM system can answer these and other similar questions – and correct faults. At the same time, PPM makes efficient, comprehensive production management possible.

Bosch creates easy-to-understand machine language

The best possible management of production processes calls for the many sensors and machines in a manufacturing facility to deliver their data to the central PPM software. This is a complicated undertaking, as until now all these machines and sensors have spoken many different languages. It is difficult to get them to communicate with each other, but Bosch has developed the PPMP to enable machines and sensors to communicate better. Like Bosch, many large companies put many components supplied by third parties – frequently specialized SMEs – to work in their manufacturing facilities. These components can be integrated into a production environment quickly, easily, and cheaply. Meanwhile, open standards help SMEs better integrate their products into the manufacturing systems of their large and small customers so both sides benefit. What's more, the PPMP underpins mechanical engineers' ability to connect their machinery directly with software. This means any machine faults can be reported to an app. The person in charge immediately sees the reason for the fault on their smartphone, along with an approach to take to resolve the problem.

Open source helps everyone make progress

The new standard is being further developed in the Eclipse open source community. Initial practical experience with it will also feed into this work, which means anyone can use the protocol free of charge. Several SMEs (Balluff, EGT, Rampf, Cadis, KLW, Schmalz) already support this initiative, which was launched by Bosch. Other companies are expressly invited to get involved. In addition, the shared standard will be used in an innovation project, or testbed, overseen by the Industrial Internet Consortium (IIC) and the Germany-based Plattform Industrie 4.0. Located at Bosch's Homburg plant, the testbed is a collaboration of Tata Consulting, Dassault Systèmes, SAP, and Bosch. Thanks to this new data exchange standard, a production management system there is already receiving data from a variety of different objects, as well as machine data and energy consumption figures. "Many concepts and technologies for the Industry 4.0 era have yet to appear. In order to validate them and bring them to market, testbeds like the one in Homburg involving the IIC are very strategically important," Denner said. "At the same time, they offer smaller companies an opportunity to participate in IoT value chains."

Bosch joins the Labs Network Industrie 4.0

This is also why Bosch recently joined the Labs Network Industrie 4.0. Launched by industry representatives and Germany's Bitkom, VDMA, and ZVEI associations, the network aims to promote German SMEs' implementation of Industry 4.0 technologies. The Labs Network is the first port of call for questions relating to the development of Industry 4.0 solutions.

Related links:

Details about the PPMP at the Eclipse Foundation:
http://bit.ly/2bPLS8d
Details about the testbed in Homburg:
http://bit.ly/2cabkJM
Details about the Labs Network Industrie 4.0:
http://bit.ly/2avZogY

Press photographs: I4.0 sensor kit at the Bosch plant in Homburg, PPMP graph

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