

Media Information  
2 March 2017

## **BMW Group Harnesses Potential of Innovative Automation and Flexible Assistance Systems in Production**

Modernization of work environment increases efficiency of workforce  
People to remain irreplaceable due to cognitive abilities  
60 lightweight robots in series operations by mid-year

**Munich.** The BMW Group continues the persistent modernization of the work environment in the company's production areas. Innovative automation and state-of-the-art assistance systems offer great potential for workstations. As a result, it will be possible to further reduce ergonomically unfavourable and strenuous tasks, giving workers an opportunity to apply their unique cognitive skills to the best effect. While in the past, man and machine worked in separated areas cordoned off by protective fences, the last few years have changed this setup: modern lightweight robots, smart devices and exoskeletons support workers as a direct part of people's work environment in production, making the production system leaner and more adaptable.

Christian Dunckern, Head of BMW Group Production System, Planning, Toolmaking and Plant Engineering: "The digitalization allows the BMW Group to tap a growing range of options on how to advance the production system in many respects. People are more than ever becoming the designers of their own workplaces and can provide answers to the questions of an increasingly complex automotive production."

### **Purposeful application of assistance systems and lightweight robots**

The allocation of roles between workers and available tools is clear: their high level of expertise, creative and cognitive skills make humans ideally suited for tasks that focus on actual value creation, specific precision work and quality management. Assistance systems, on the other hand, support people in carrying out strenuous and repetitive tasks that constitute a stereotypical strain. In production, lightweight robots do not require any additional fixed points and are relatively mobile in where they can be applied. Moreover, they can work directly with people. As a rule, the application of assistance systems is about

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finding reasonable solutions for the respective purpose, always with the focus on the specific benefit to be achieved.

### **Man and machine bringing together their respective strengths**

As early as 2013, the BMW Group commissioned a first lightweight robot that took its place among the workers at the assembly line of BMW Group Plant Spartanburg in the USA. Miss Charlotte, as the line crew calls their robot, is still in use mounting sound insulation to doors, but many things have changed since. Today, over 40 lightweight robots are in use at the BMW Group plants; a total of 60 will be in operation by mid-year. They assume tasks that would be physically strenuous for workers and often pose particular challenges due to the high level of precision required and the repetitiveness involved.

At BMW Group Plant Dingolfing, for instance, a ceiling-mounted lightweight robot in the axle transmission assembly lifts the bevel gears, which may weigh up to 5.5 kilos, and fits them accurately without any risk of damage to the gear wheels. In this production area, workers and robots work together “hand in hand” in a confined space without any safety fences. This collaboration gives people extra time to carry out tasks better suited to their capabilities while the lightweight robot applies exactly the force needed over a long period of time. Safety sensors monitor the functions at all times and stop the process immediately if an obstacle is detected.

Equally demanding is the application of the adhesive to the front windows. What makes this task particularly challenging is that the viscous adhesive must be spread over the large glass surface in one go and without any fluctuation in film thickness. At BMW Group Plant Leipzig, this task is carried out by a lightweight robot that works directly at the line with the human workforce.

But lightweight robots are also becoming more common in areas in which large robot facilities work behind safety fences. Their flexibility, modest space requirements and high level of safety grant people access to areas that used to be off-limits. Thanks to the broad

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range of possible applications, lightweight robots open up new potential in the field of traditional automation and give workers more leeway to implement improvements.

Today, direct man-machine cooperation is also possible with the traditional, large-scale industrial robots. In the transmission installation unit at BMW Group Plant Regensburg, a worker leads a large industrial robot to the screw bonding station. While a laser-based system supports the process of placing the industrial robot, the exact position is determined by the trained worker. The idea for this application was developed by the on-site team itself. Like in other use cases, safety is always the top priority: should a person get too close to the robot while the latter gets into position, state-of-the-art safety technology slows down the movement of the robot arm, if needed to a total standstill, before any danger can arise. Due to the high forces required in the screw bonding process, this particular task cannot be assigned to a lightweight robot.

### **Digital production assistants to strengthen workers**

Up until the beginning of the new millennium, phones were primarily used for making actual phone calls. Today, they fulfil a great variety of functions. And just like our everyday living environment changes, so does the working environment in production.

Work gloves are fitted with barcode scanners on the back of the hand to omit the cumbersome steps of picking up the scanner, scanning an object and putting the device back. The scan process is now triggered by the worker pushing a button on the index finger with the thumb. This way, individual production processes can be improved and accelerated, leading to improvements in process quality and occupational ergonomics. 230 of these innovative work gloves will be in use at the BMW Group before the end of the year.

Another example is the use of augmented reality applications on smart devices such as tablet computers, on which the image of a component can be overlaid with virtual specifications. The tablet computer then compares and evaluates the actual and target states, allowing the worker to determine whether the part matches the target requirements and identify and resolve potential issues early on. Augmented reality applications are applied

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at the BMW Group in early-phase concept validations, initial sampling inspections and tool acceptances at suppliers as well as in the maintenance of running systems.

Innovative exoskeletons worn directly on the body can act like a second skeleton, i.e. as an external support structure for the body. The BMW Group uses both upper-body and lower-body exoskeletons. The exoskeleton vest for the upper body strengthens the movement of the upper arms of people who have to carry out tedious tasks. The vest's joints have an integrated mechanical spring support that gives arms greater strength. 24 of these exoskeleton vests are currently in use in the series production of BMW Group Plant Spartanburg; 44 more will be added over the course of the year.

Lower-body exoskeletons can be found in the production areas of several BMW Group plants in Germany. Acting as a chair-type support, this kind of exoskeleton improves workers' posture and offers relief in carrying out assembly tasks that require crouching or remaining in other positions that might affect people's health. On top of that, the leg support structure can transform prolonged standing into sitting and thus improve the comfort and flexibility of working conditions. The exoskeleton consists of movable splints that can be affixed to the legs or torso and locked in different positions. At present, the BMW Group's German plants use a total of 11 lower-body exoskeletons.

### **Efficiency and effectiveness at the workplace – more room for creativity**

The BMW Group aims to ensure an efficient, stable and flexible production. At the same time, the company pursues the goals of assigning staff according to people's individual strengths and capabilities and of developing the work environment further. Being spared particularly strenuous activities, workers have the time and energy to tackle more demanding and creative tasks.

Christian Dunckern: "In the time of smart devices and digitalization, we must still keep an eye on the added value the applied technology offers to the company. Nobody is better qualified to judge this than the people who actively shape our production system on a daily basis. This way, technology at the BMW Group actually serves the people and expands their creativity and efficiency."

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If you have any questions, please contact:

**Corporate Communications**

Andreas Hemmerle, Communications Production Network BMW Group  
Telephone: + 49 89 382-21880  
[Andreas.Hemmerle@bmwgroup.com](mailto:Andreas.Hemmerle@bmwgroup.com)

Sandra Schillmöller, Communications Production Network BMW Group  
Telephone: + 49 89 382-12225  
[Sandra.Schillmoeller@bmwgroup.com](mailto:Sandra.Schillmoeller@bmwgroup.com)

Frank Wienstroth, Head of Communications Production Network BMW Group  
Telephone: +49 89 382-54459  
[Frank.Wienstroth@bmwgroup.com](mailto:Frank.Wienstroth@bmwgroup.com)

Media website: [www.press.bmw.de](http://www.press.bmw.de)  
[presse@bmw.de](mailto:presse@bmw.de)

**The BMW Group production network**

Strong customer demand and the launch of new models resulted in very high capacity utilisation for the BMW Group's production network in 2016. With 2,359,756 vehicles produced for the BMW, MINI and Rolls-Royce brands, production volumes reached a new all-time high. This figure included 2,002,997 BMW, 352,580 MINI and 4,179 Rolls-Royce units. The company's German plants, which produced more than one million vehicles, are responsible for roughly half of production volumes.

With its unparalleled flexibility, the leading-edge production system is in excellent shape for the future. Based on Strategy Number One NEXT, it is characterised by a high level of efficiency and robust processes. The BMW Group's production expertise represents a decisive competitive advantage and contributes to the profitability of the company and its sustainable success.

Quality and speed of reaction are key factors in the BMW production system, as well as flexibility. Digitalisation, standardised modular concepts and intelligent composite construction testify to the high level of expertise within the production network. At the same time, the production system offers a very high level of customisation and allows customer specifications to be modified up until six days before delivery.

**The BMW Group**

With its three brands BMW, MINI and Rolls-Royce, the BMW Group is the world's leading premium manufacturer of automobiles and motorcycles and also provides premium financial and mobility services. As a global company, the BMW Group operates 31 production and assembly facilities in 14 countries and has a global sales network in more than 140 countries.



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In 2016, the BMW Group sold approximately 2.367 million cars and 145,000 motorcycles worldwide. The profit before tax for the financial year 2015 was approximately € 9.22 billion on revenues amounting to € 92.18 billion. As of 31 December 2015, the BMW Group had a workforce of 122,244 employees.

The success of the BMW Group has always been based on long-term thinking and responsible action. The company has therefore established ecological and social sustainability throughout the value chain, comprehensive product responsibility and a clear commitment to conserving resources as an integral part of its strategy.

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