BMW GROUP

Corporate Communications

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Industry 4.0: Intelligent energy data management for sustainable production.

Introduction of 'smart meters' to reduce energy consumption at BMW Group plants.
Savings potential of over 25 million euros with the initial application at the Spartanburg site alone.
Honored with the 'Energy Masters Award'.

Munich. Lower energy consumption, greater reliability in production and higher product quality: all these three benefits can be achieved at the BMW Group's production sites thanks to the introduction of an **i**ntelligent **e**nergy **m**anagement **d**ata **s**ystem (iEMDS in short). The system is based on intelligent electricity meters, which constantly measure the energy consumption of production facilities and robots and align them with a central big data network of the company. Consequently, it can be integrated perfectly into existing systems that record the energy consumption of building and supply structures, offering a valuable addition. Thanks to these 'smart meters', deviations leading to excess consumption can be identified early on. Moreover, the data helps to prevent imminent disruptions or even breakdowns of individual production facilities or robots, thus ensuring the required premium quality of the vehicle production.

The intelligent energy management data system is part of the BMW Group's production concept on 'Industry 4.0'; its development was supported by the European Regional Development Fund (ERDF). Just recently, the BMW Group's comprehensive approach in intelligent energy data management has been recognized with the 'Energy Masters Award' of the Berlin-based executive network Econique at a sustainability summit.

At present, the BMW Group applies iEDMS at the sites in Spartanburg (South Carolina, USA), Leipzig, Regensburg, Munich and Landshut; plans for a rollout to further plants in the BMW Group's global production network with a total of 30 sites in 14 countries are under way. The BMW Group aims at achieving a reduction in specific energy consumption per vehicle produced of at least 45 percent from the 2006 level by 2020. In 2013, the company was able to

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decrease consumption by 31 percent. Global energy savings in production due to iEDMS are supposed to reach seven percent annually. The intelligent energy data management is an integral part of the BMW Group's sustainability strategy; it makes a significant contribution to the environmentally-friendly production of vehicles.

The iEMDS pilot project was carried out in the BMW X assembly at the Spartanburg plant. At this U.S. location alone, energy cost savings arising from the implementation of iEMDS can amount to 25 million euros within the next ten years, according to the estimates of the BMW Group's experts.

At the Spartanburg site, more than 80 production facilities and robots in the vehicle assembly have been equipped with smart meters since 2012. Within only a few weeks of the installation, up to a quarter of the energy costs could be saved for individual facilities. One example: A comparison of three technically identical roller dynamometers showed that one of the facilities required about double as much electricity per unit tested as the other two. The reason was a program error in the ventilation's run-time management.

In addition, the comparison of production and consumption data demonstrated that the roller dynamometers used up an unusually high amount of energy during breaks. This was due to the fact that during breaks, vehicles remained on the test rigs, keeping the facilities from automatically turning off. Together with further optimization activities, the continuous monitoring of the three facilities via iEMDS resulted in total energy savings of over 100,000 kilowatt hours in the first year.

The integration of the intelligent energy management in the BMW Group's big data network opens up a variety of further opportunities. First off, imminent breakdowns of robots and facilities can be identified and prevented. For instance, in the case that a facility is using up more energy without any changes in production parameters, it is rather likely that the cause is a malfunction or wear

and tear, caused by issues such as an overly tight bearing that requires additional power to run the machine. If the consumption or voltage is going down, this might be due to a process error, such as the incorrect application of material in an adhesive bonding machine. Furthermore, the exact knowledge about energy demands of the individual production processes can also be used in the concept development for new robot generations or for the energy supply planning of new BMW Group sites like Araquari (Brazil) or San Luis Potosí (Mexico).

The iEDMS data is recorded and analyzed at the BMW Group's Central IT in Munich where the big data network is hosted. The largest share of data supplied by production is vehicle-related information such as programming and diagnosis results from the up to 80 control units. On top of that, there is the production-related data, such as information on when and where which vehicle was completed and how long it took.

Industry 4.0 at the BMW Group.

The BMW Group has a state-of-the-art production network that is developed further on a continuous basis. Some of the approaches summarized under the term 'Industry 4.0', which are currently the subject of public debate, have previously been introduced at the BMW Group or are in their rollout stage. For the BMW Group, Industry 4.0 does not mean production without people, and also not necessarily increasing automation. In this context, the main issue is the reasonable application of new technologies so as to provide ideal support to the workers in production and production planning. Besides the intelligent data management, the approach also includes sophisticated human-robot systems that can significantly improve ergonomically unfavorable work procedures. As the digital and the physical worlds grow closer together, new opportunities arise that allow people to cooperate more efficiently in the BMW Group's global production network. Mobile assistance systems will offer improved support to production workers in the future. In all these efforts, the focus is not on the technical feasibility, but on the specific benefit in production technologies that actually reaches the end customer.

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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 30 production and assembly facilities in 14 countries and has a global sales network in more than 140 countries.

In 2013, the BMW Group sold approximately 1.963 million cars and 115,215 motorcycles worldwide. The profit before tax for the financial year 2013 was € 7.91 billion on revenues amounting to approximately € 76.06 billion. As of 31 December 2013, the BMW Group had a workforce of 110,351 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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