Corporate Communications
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Interview:
Stefan Juraschek, Vice President Development Electric-Powertrain.

Mr Juraschek, was BMW slow off the mark with electric mobility?
Juraschek: No, absolutely not. The BMW Group actually played a pioneering role with BMW i. Today we are the premium manufacturer offering the widest range of battery electric vehicles and plug-in hybrids. We currently produce the following electrified models: the BMW i3 (third model evolution with 120 Ah) , BMW i3s, BMW i8 Coupe, BMW i8 Roadster, BMW 740e, BMW 740Le, BMW 530e, BMW 225xe Active Tourer, MINI Cooper S E Countryman ALL4 and, in China, the BMW X1 xDrive25Le. Plus, we have also announced new plug-in hybrid variants of the 3 Series Sedan and BMW X5 for 2019 following the arrival of new model generations. This number is set to grow to at least 13 plug-in hybrid models by 2025. Adding these to the wide selection of all-electric cars – whose range is due to increase substantially next year incidentally – will bring the portfolio of electrified vehicles to at least 25.
Sales topped the 100,000 mark last year and will have grown by around 50% this year.

Is the BMW Group prepared if electric mobility starts to gather momentum at an even greater pace in future?
Juraschek: The BMW Group is already developing its fifth generation of electric drive systems, meaning that it has created an excellent foundation for the future. This latest generation will go into service as soon as 2020 in the BMW iX3.
A crucial advantage of this fifth-generation system is that the electric motor, transmission and power electronics now form a single, highly integrated electric drive component. This extremely compact unit takes up far less space than the three separate components used in preceding generations. Its modular construction means that it is scalable, too, allowing it to be modified to suit all sorts of different installation spaces and power requirements. The BMW Group will start to fit the next generation of battery cells in the new, scalable and even more powerful vehicle batteries alongside the introduction of the new electric drive components. The modular “building block” concept will allow the new

batteries to be incorporated flexibly into every vehicle architecture. Another highly integrated component will be added to the portfolio in the form of a DC/DC charger unit.

So how will it all work?
Juraschek: On the one hand, we will have flexible vehicle architectures and, on the other, the scalable and modular building blocks for the electric drive systems. This will bring about a lasting increase in flexibility. In future, we will be able to swiftly decide which models we are going to equip with what mix of all-electric drive, plug-in hybrid drive or exceptionally efficient combustion engines. This will let us partially or fully electrify each model in accordance with market demand, creating the basis for the mass-market introduction of pure battery electric vehicles in the future.

Don't you think there is a risk of not being able to obtain the necessary quantities of raw materials once battery electric vehicles start to be produced in big numbers?
Juraschek: We do not see any supply risks, even in the event of growing demand for battery cells. My colleagues in Purchasing have secured a reliable supply with long-term contracts. We have also built up in-house battery cell expertise over the course of joint projects with international partners throughout the value chain. This is used to ensure access to the technology and to safeguard supplies. At the same time, we are also endeavouring to gradually lower the proportion of critical raw materials that are used. For example, one of the key objectives of our research and development activities is to bring about a substantial reduction in the proportion of cobalt in battery cells.
The electric motor in our fifth-generation electric powertrain is another illustration of this, as it is completely free of rare earths.

Staying on the subject of battery cells: Some well-known competitors of yours are employing round cells or pouch cells. Why are you using prismatic cells?

Juraschek: The prismatic hard case arrangement makes the battery modules more suitable for industrialisation by increasing the level of automation during module assembly. Besides this, safety systems such as a safety valve for shutting down the cell in the event of a short circuit can be integrated more easily. It also allows us to achieve a higher packing density, meaning that optimum use can be made of the installation space in the vehicle.

Battery cell manufacturers in China, Japan and Korea have been investing enormous sums of money in cell development and future battery technologies for years now. Is it still possible to catch up with them, both technologically and economically?
Juraschek: We don't consider any of our competitors to hold an advantage over us when it comes to the battery technology. When all the characteristics are viewed together, our battery technology is on a par with or superior to the competition's, depending on how you look at it. We have been dealing with the issue of battery cells since 2008 and are in a strong position today thanks, among other things, to an international network of collaborations. For us, it is important to continue to expand our in-house expertise and keep advancing battery cell technology. What's more, building battery cell prototypes and producing small batches enables us to fully analyse the production processes and acquire build-to-print capabilities. In this way, we can provide system suppliers with exact instructions based on BMW Group specifications, from material selection through to cell production.

So why don't you produce the battery cells yourselves?
Juraschek: In the BMW Group's view, producing the cells would not give us a competitive advantage, either now or in years to come. We make electrical components ourselves, using our in-house manufacturing facilities, whenever we think there is an advantage to be gained from it, as is the case with the electric powertrain. That's why we use supplied battery cells to produce the modules ourselves, before turning them into complete high-voltage batteries.

Is it really worth doing that? Surely you could buy the electric motor from a supplier instead?
Juraschek: When the development plans for the BMW i3 became tangible, there wasn't a single electric motor on the market that would have met all our criteria. And today we are still just as unwilling to make any compromises when it comes to key performance characteristics, such as space requirements, output and weight. Drive systems have always been an area that has set the BMW Group apart from the competition. And exactly the same applies to electric drive systems.

All electric motors are basically the same, though. Can customers really notice a difference?
Juraschek: The customer may not be able to identify every characteristic of an electric motor, but a significant difference does become apparent in head-to-head comparisons. Probably the most obvious thing that the customer will notice is the speed up to which the motor can sustain its performance. A more indirect effect is that the vehicle's range will drop faster if the electric motor operates less efficiently.

The BMW Group is working together with Northvolt and Umicore. Why is that exactly?
Juraschek: The objective is to establish a closed lifecycle loop for sustainable battery cells in Europe. This starts with a recyclable cell design and continues with a production process that mainly uses renewable energies. The battery cells should first fulfil their primary purpose in cars for as long as possible. Once their lifecycle there comes to an end, they could potentially be used in stationary energy storage devices. Finally, the battery cell is recycled and the raw materials reused, completing the loop.

And what are the tasks fulfilled by each of the three partners?
Juraschek: The BMW Group is focusing on cell development, Northvolt is building a cell production facility in Sweden and Umicore is the materials cycle and recycling expert.

BMW had already come up with some developments for materials recycling. What do you now expect to achieve by joining forces with Umicore?
Juraschek: Yes, both partners are embarking on this project with their own fundamental developments. We are working together with Umicore on the development of recyclable cell/battery technology that is then followed by a sustainable production process. At a later stage, large quantities of material will, of course, be fed back into the loop for recycling. Before this happens, however, I foresee a long phase of primary use in vehicles followed by second-life use in stationary storage devices.

How does this secondary use work exactly?
Juraschek: As far as the BMW Group is concerned, employing used batteries as stationary energy storage devices is a logical step towards holistic sustainability. The use of stationary energy storage devices is set to gain greatly in importance with the ongoing energy revolution. At times when surplus electrical power is generated from renewable sources, it can be stored in these stationary devices. And during periods of low electricity generation, the storage device can then release the accumulated power. We have already successfully implemented this type of power grid stabilisation with used batteries from BMW i3 and MINI E prototypes as part of joint development projects with partners such as Vattenfall, Bosch and NextEra. The energy storage farm at BMW Group Plant Leipzig, which holds a total of 700 BMW i3 batteries, is one example of how profitable use can be made of batteries at the end of their service life in vehicles by giving them a second life as part of a sustainable energy model. This demonstrates once again how the sustainability concept at BMW i extends far beyond the vehicle.

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The BMW Group

With its four brands BMW, MINI, Rolls-Royce and BMW Motorrad, the BMW Group is the world's leading premium manufacturer of automobiles and motorcycles and also provides premium financial and mobility services. The BMW Group production network comprises 30 production and assembly facilities in 14 countries; the company has a global sales network in more than 140 countries.

In 2017, the BMW Group sold over 2,463,500 passenger vehicles and more than 164,000 motorcycles worldwide. The profit before tax in the financial year 2017 was € 10.655 billion on revenues amounting to € 98.678 billion. As of 31 December 2017, the BMW Group had a workforce of 129,932 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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