BMW GROUP
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Quiet testing for quiet cars: The BMW Group's new aeroacoustic and electric drive center goes into operation

+++ The largest and quietest standing wind tunnel in the world +++ Building as an essential building block for the future of electric mobility +++ Prototype construction for high-voltage batteries and inverter electric motors +++

Munich. The new Aeroacoustics and Electric Drive Center (AEC) starts operations at the BMW Group's Research and Innovation Center (FIZ). After almost forty years, the old aeroacoustic wind tunnel is being replaced by BMW. The building consists of two halves: In addition to a multifunctional part with workshop, testing and measurement equipment and a prototype for high-voltage batteries and inverters, the AEC has a technically and structurally unique wind tunnel. With a length of just under 100 m, a height of 45 m and a width of 25 m, it is the world's largest vertical acoustic wind tunnel and at the same time the quietest.

"Quiet is premium," says Daniel Böttger, Head of Complete Vehicle Development at BMW AG. "Our focus is on meeting the premium standards of our vehicles. An important part of this is acoustics — particularly for quiet electric models." The new wind tunnel enables groundbreaking advances in aeroacoustics research."

"The new AEC is another structural milestone for the BMW Group's development of future mobility solutions," says Dr. Nicole Haft-Zboril, Head of BMW Group Real Estate Management. "About such a complex project
To be implemented in the shortest possible time, cost-effectively and with very high quality, there is a need for close integration between construction, development and production, as well as with all our partners and the City of Munich. The consistent use of lean construction is an important success factor here. "

firm
Bavarian
Motoren Werke
joint-stock company

mailing address
BMW AG
80788 Munich

telephone
+49 89-382-0

internet
www.bmwgroup.com

Quiet wind for precise measurements and perfect aerodynamics

With a background noise level (54.3 dB (A) at 140 km/h), which is as low as a quiet conversation or a quiet air conditioning system, the noises caused by headwind on the vehicle can be precisely measured in the new wind tunnel. With a nozzle cross section of 25 m² and a maximum wind speed of 250 km/h, even the largest and most powerful vehicles such as the Rolls-Royce Phantom or the BMW X7 can be examined realistically. This is achieved through a blower capacity of 4.5 MW and up to 100,000 m³ of air per minute at 250 km/h. The wind tunnel is designed as an acoustic semi-free-field space. This means that apart from the sound-resistant floor, there are no sound reflections. This enables a realistic simulation of the situation on the road. The frequency range for semi-free-field conditions from 30 Hz is unique for a vehicle wind tunnel and covers the entire audible spectrum.

Innovative measurement technology, high flexibility and short changeover times

The acoustic wind tunnel is equipped with the latest measurement technology to drive vehicle development forward. A 216-microphone acoustic camera enables precise localization of background noises with an accuracy of less than one centimeter. In addition, the wind tunnel has a laser vibrometry system, which can be used to measure the mechanical vibrations of the entire vehicle surface synchronously and without contact.

The wind tunnel is also ideally equipped to study wind and rolling noises. A full-fledged acoustic all-wheel drive roller dynamometer can be used regardless of wind and weather to analyze the various phenomena. The wind tunnel is designed in such a way that it offers a high degree of flexibility when carrying out measurements.

The wind rolling sound makes it possible to separate the phenomena of rolling and wind from each other (wind on/off, roll on/off). In addition, various modules, such as a vehicle-accessible glass floor or a vehicle scale for motorcycles, can be replaced in a short time without moving the vehicle. This allows developers to test different configurations quickly and efficiently. With this unique combination of

performance, precision and flexibility, the new acoustic wind tunnel in Munich sets new standards in vehicle development and opens up new opportunities for optimizing vehicle acoustics and aerodynamics.
In this way, the quietest wind tunnel and the most modern measurement technology can be used to ensure the best aeroacoustics for the Neue Klasse.

Flexibility is also of central importance in construction

The AEC basically consists of two buildings that were built in an excavation pit. Structurally, the special acoustic requirements were met with a special decoupling of the wind tunnel from the second "semi-detached house" and the surrounding area. The entire building, from the 3 m thick floor slab to the façade, is sound-insulated against noises from the surrounding area. The entire construction work was carried out in the outbuildings while development was ongoing. The wind tunnel was designed to be upright so that the building ground is used as efficiently as possible. This was the only way to completely meet all requirements for both buildings and to be implemented on the existing space.

Prototypes for the future of electric mobility: high-voltage batteries and inverters

The second "semi-detached house" of AEC is home to workshops, testing and measurement stands, and prototype lines. Here, the focus is also on electric mobility. The experts from the BMW Group are building and testing prototypes of future high-voltage batteries for electric vehicles here. 15,000 m² are available for this purpose on several floors. On a further area of 800 m², inverters for future electric motors will be manufactured on a pilot line — under clean room conditions. The inverter is a crucial component in an electric motor. His task is, among other things, to convert the direct current from the high-voltage battery into alternating current for use in the electric motor. In order to be flexible in the long term, the spaces in AEC are designed to be "multifunctional". This means that the company will also be able to respond to various requirements in the future and rebuild the spaces within a short period of time.

The BMW Group

With its BMW, MINI, Rolls-Royce and BMW Motorrad brands, the BMW Group is the world's leading premium manufacturer of automobiles and motorcycles and provider of premium financial and mobility services. The BMW Group production network comprises over 30 production sites worldwide; the company has a global sales network with representatives in over 140 countries.

In 2023, the BMW Group sold over 2.55 million cars and over 209,000 motorcycles worldwide. Earnings before tax in fiscal year 2023 amounted to €17.1 billion and revenue to €155.5 billion. As of December 31, 2023, the company had 154,950 employees worldwide.

Long-term thinking and responsible action have always been the basis of the BMW Group's economic success. Sustainability is an important part of the BMW Group's corporate strategy, from the supply chain through production to the end of the use phase of all products.

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