THE ENVIRONMENTALLY RESPONSIBLE MERCEDES-BENZ F125! IS CAPABLE OF HANDLING ANY TRAFFIC SITUATION WITH ZERO-EMISSIONS

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With its four powerful, wheel-mounted electric motors the Mercedes-Benz F 125! Research Vehicle is a particularly dynamic demonstration of the principle “fascination and responsibility”. Thanks to very generous performance reserves it copes effortlessly with any traffic situation – with no emissions whatsoever.

With its electric drive system based on highly advanced Mercedes-Benz fuel cell technology, the F 125! ensures particularly satisfying and sustained driving pleasure. The electric power for the motors is generated on board by a chemical reaction between hydrogen and oxygen, or obtained from the efficient recuperation of braking energy. The only emission resulting from the chemical reaction is pure water vapour. Total operating range is at the same level as a modern diesel car. The high performance potential of the electric drive components in the F 125! once again demonstrate the versatility of the highly scalable, modular E-Drive system from Mercedes-Benz.

Intelligently conceived vehicle architecture

In the new Mercedes-Benz research vehicle, the fuel cell stack is centrally located under the bonnet at the front, while the compact electric motors are installed near the wheels in the front and rear axle areas. The composite hydrogen reservoir in the area of the centre tunnel, between the front seats and the floor assembly, has a capacity of around 7.5 kilograms and is ideally protected against the consequences of accidents.

Metal Organic Frameworks: the hydrogen reservoir of the future

Metal Organic Frameworks (MOFs) are porous solid bodies which consist of numerous, always identical basic components and can be very variably put together on a modular basis. They are made up of nodal points known as Structural Building Units (SBUs). The connecting elements between these nodal points are formed by organic molecules known as Linkers. This structural principle allows solid bodies with extremely large specific surface areas, which in turn provides the basis for an enormous hydrogen storage capacity.
High storage capacity with low volume and great flexibility

Gigantic “inner” surfaces of up to 10,000 sq. m. per gram – the current status of research – make MOFs attractive for numerous applications: they are suitable as gas cleaners for fuel cells, for example, and also – as envisaged for the F125! – as a storage medium for gases, in this case hydrogen. MOFs can be used as pressurised containers (30-80 bar), but for a higher storage density also as low temperature tanks at 77 K (around -196 degrees Celsius), i.e. considerably above the 20 K boiling point of hydrogen. These attributes and the fundamental variability of the MOF’s shape allow an installation position suited to the vehicle requirements. This means that future MOFs can be flexibly installed in the body structure. Key advantages of this solution:

- Less installation space thanks to better adaptability means more scope for packaging and more room for the occupants.
- The low installed position is conducive to a low centre of gravity, with a positive effect on handling and driving dynamics.
- Full integration into the bodyshell structure ensures the best possible crash and operating safety.

Lithium-sulphur battery with a high energy density

The lithium-sulphur battery installed behind the rear seats has a storage capacity of 10 kWh. It can be inductively charged at “intelligent” charging stations, and the convenient charging process can be monitored and controlled using a smartphone. The principal advantage of lithium-sulphur technology, whose usability in vehicles still requires further research, is the high specific energy density of the cells. Compared to current batteries this allows relatively compact but highly efficient energy storage. When designing the F 125!, the developers worked on the assumption that by the time of its introduction into series production, this battery type will be capable of energy densities up to 350 Wh per kg. This would represent roughly a doubling of current performance. The real potentials of this technology are however the subject of basic research, and are still difficult to assess at present.

All in all, the F 125! represents a further, important step towards the market maturity of a fuel cell powered car in the luxury class. With this research vehicle, Mercedes-Benz is demonstrating completely new future ways to design large and luxurious automobiles that are marketable, environmentally friendly and socially compatible.

Touring saloon with sports car genes

The use of four electric motors has a number of advantages in terms of driving dynamics. Mercedes-Benz has already delivered an impressive demonstration of the performance potential residing in this e4MATIC design with the battery-electric SLS AMG E-CELL super sports car, whose rear-end module was developed further for the F 125!. The new front axle design provides a visionary outlook on the integration of electric drive systems into the front axle. The chosen positioning of the drive components allows optimal weight distribution, and also – thanks to active torque vectoring – the need-related assignment of power to each individual wheel.

Apart from ensuring optimal traction at all times, the electronic all-wheel drive with its wheel-specific yaw-damping improves handling stability at high speeds. During brisk cornering, however, wheel-specific intervention allows a metered increase in the yaw rate with an improved steering response and less steering effort. This drive configuration also allows highly efficient energy recuperation at each wheel, cross-wind stabilisation, avoidance of load-change responses and therefore even more controllable handling when cornering, without the need for ASR (acceleration skid control) intervention.

Ride comfort at the highest level

110 years after the invention of the modern passenger car, the Mercedes Simplex of 1901, Mercedes-Benz is once again presenting a trailblazing, visionary vehicle concept – this time in the form of a sporty and comfortable touring saloon with an emission-free F-CELL Plug-in HYBRID system. The concept anticipates future technological trends, with a vehicle architecture to suit.

The F 125! is the first electric car to feature an air suspension and continuous damper adjustment. The result is an optimal balance between ride comfort, driving dynamics and use of energy. The system also allows the vehicle’s suspension height to be adjusted as a function of speed and vehicle status – e.g. to improve the aerodynamics at fast motorway speeds.

Optimal traction and driving dynamics are ensured by active torque vectoring at the front and rear axles. The single-stage gears at the front and rear axles accelerate the vehicle comfortably and without interruptions in tractive power, right up to the top speed. One technical highlight of the suspension system is special compensation of drive moments in the front axle, which almost entirely eliminates drive and recuperation influences on the steering, and noticeably reduces pitching.
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