

Tips & Technology

For Bosch business partners

Current topics for successful workshops No. 55/2013

Diesel injection



BOSCH

Invented for life

Hybrid in diesel vehicles

Hybrid vehicles, in other words vehicles with at least two energy conversion units and two energy storage systems, are gaining in significance. The number of vehicles in this segment newly registered in Germany in 2012 increased by nearly 70 percent as compared to the previous year. By contrast, there was to a certain extent a distinct drop in the number of new gasoline and diesel vehicles registered during the same period. Consequently, hybrid vehicles will also become more of a factor in terms of workshop business in the years to come.

Bosch played a large part in the development of one particular hybrid system used in the diesel sector. The technology already being employed and under development is discussed in this article.

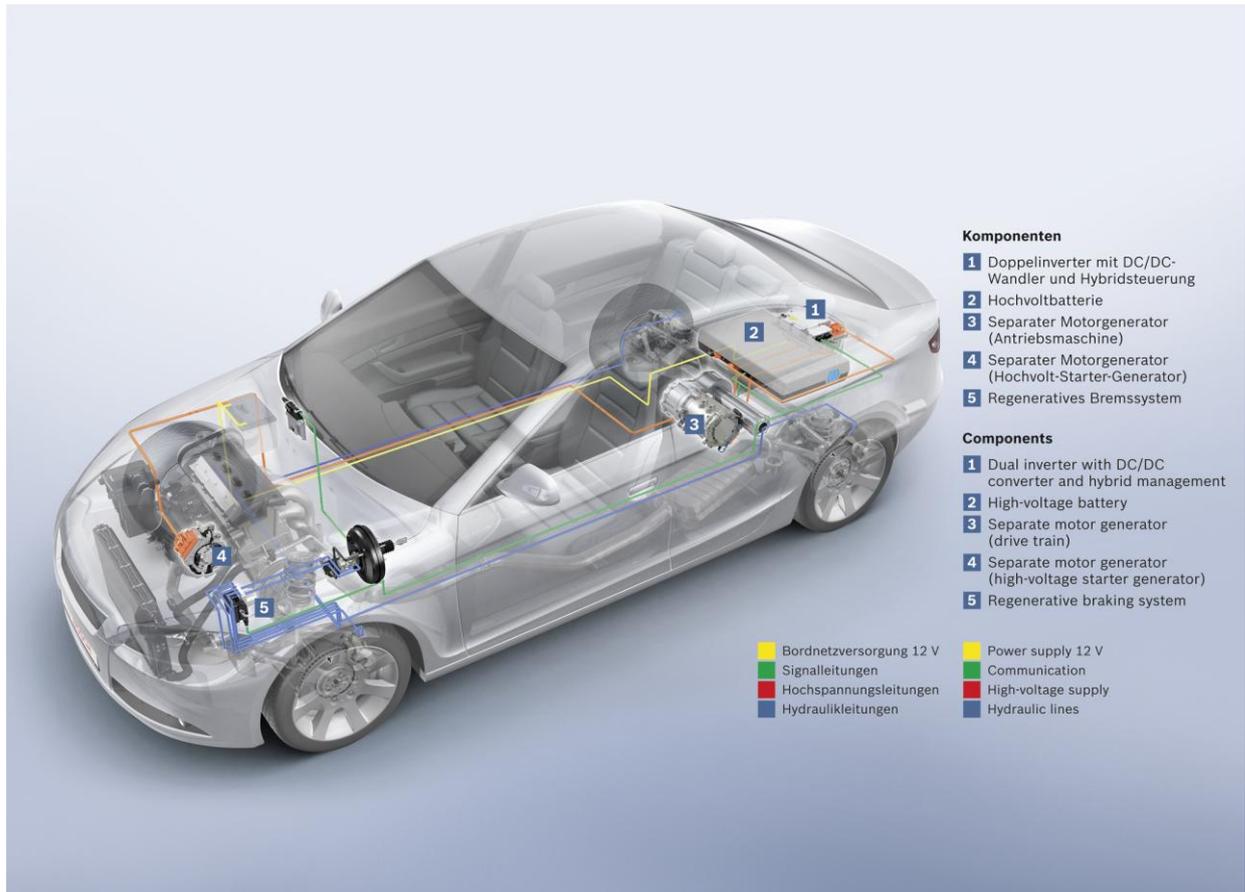
Axle-split hybrid system

The axle-split hybrid system, jointly developed by Bosch and PSA, is the world's first diesel hybrid drive. The combination of a front axle driven by way of the engine and an electrically driven rear axle cuts fuel consumption by up to 35 percent compared to a conventional diesel engine. At the end of 2011, the Peugeot 3008 HYbrid4 became the first vehicle to be equipped as standard with this new drive concept. PSA now also manufacture the Peugeot 508 model as a station wagon (RXH) and a saloon (Hybrid4) as well as the Citroen DS5 as HYbrid4 with the axle-split drive system.

The axle-split hybrid drive system from Bosch won the 2012 innovation award at the Automechanika Trade Show in Frankfurt in the "OE Products & Services" category. This prize honors products and concepts of an exceptionally innovative nature which make a contribution to cost-effectiveness and environmental protection.

In addition to system expertise, Bosch also provided the central components for the world's first axle-split hybrid.

At the heart of the electric drive system is the so-called Hybrid Power Control Unit (HPCU). The power electronics unit not only incorporates the control software for the two electric machines and the hybrid management system, but also acts as a pulse inverter for supplying the alternating current generated by the SMG 138/80 to the battery in the form of direct current. It additionally operates as a DC converter between the low-voltage vehicle electrical system and the high-voltage electric drive system. This component has to satisfy enormous demands: It has to handle currents of up to 340 A and voltage levels of up to 300 V in a space with a volume of only around twelve liters.



The water-cooled electric drivetrain integrated into the rear axle – the so-called separate motor generator SMG 180/120 – has to manage with a space of just 180 millimeters in diameter and 120 millimeters in length in the tightly packed axle module. Within the confines of the space available, the permanently excited synchronous machine produces a peak power of 27 kilowatts and a huge torque of 200 newton-meters. It has a continuous rating of 20 kilowatts at speeds of up to 7 500 revolutions per minute.

Alongside the rear-end electric machine, the Peugeot 3008 HYbrid4 has a second permanently excited synchronous machine from Bosch. This SMG 138/80 (diameter 138 millimeters, length 80 millimeters) in the engine compartment acts as a high-voltage starter generator for the start/stop system. Its main function is however to supply power for the rear-wheel drive (when the high-voltage battery is flat), the vehicle electrical system and the air conditioner. To achieve this it is driven by the diesel engine by way of a heavy-duty belt. The fact that it generates current in virtually all operating situations whilst driving permits a cost-cutting compact design for the high-voltage battery acting as a buffer and energy store. The continuous rating of the SMG 138/80 is 7 kilowatts at up to 15 000 revolutions per minute. It has a peak performance of eight kilowatts.

To enable the ESP® to provide optimum assistance for PSA hybrid vehicles as well, the two companies have jointly developed new functions specially adapted to the hybrid drive system:

- Limitation of the regenerative rear axle electric drive (RBC®) to ensure vehicle stability in all situations.
- Adaptation of the ASR settings to the driving mode selected to provide an ideal balance between power and comfort in any conditions.

Option of all-wheel, front-wheel or electric rear-wheel drive

The outstanding feature of the hybrid system is the partial all-wheel drive of the 3008 HYbrid4. With the axle-split concept from PSA and Bosch, the conventional front-wheel diesel drive is augmented by an electrically driven rear axle to give a powerful thrust. The rear axle module takes the form of a 27 kilowatt (37 hp) electric machine and a differential. It acts as a booster when accelerating sharply and the all-wheel drive provides additional traction in critical situations. The torque of the electric machine at the rear axle is also able to eliminate power loss during gear changes in the direct-shift transmission. In urban stop-and-go traffic and at low speeds, the electric drive can also power the Peugeot 3008 HYbrid4 independently without any emissions. Depending on the charge of the nickel-metal hybrid battery, the electrically-powered range of the diesel hybrid is a good four kilometers. The diesel engine cuts in again automatically as soon as the energy starts to run out.

Servicing hybrid vehicles

Special knowledge and additional training are required for working on hybrid and electric vehicles. The Bosch training program provides the opportunity to acquire the necessary knowledge.

Courses are available on the following topics for example:

- "Qualification for work on HV intrinsically safe systems in motor vehicles" e.g. on hybrid-electric, fuel cell vehicles (course number 1 987 726 163)
- Hybrid and electric vehicles Alternative drive technologies (course number 1 987 726 169)

For further information on Bosch training courses visit www.werkstattportal.de

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