



ZF Hybrid Technology Makes Commercial Vehicles Even More Economical

- **ZF offers hybrid technology, from the electric motor to complete full hybrid systems.**
- **Different hybrid concepts depending on application and customer requirements.**
- **Integration and energy management are core competence.**

With a complete product portfolio, ZF extends its lead as hybrid technology supplier for commercial vehicles. The Group's performance spectrum ranges from the core hybrid component, i.e. the electric motor, to complete hybrid systems. Commercial vehicle manufacturers rely on ZF engineers' services also when it comes to integrating components into the driveline and the energy management system. ZF is counting both on the parallel hybrid – offering well-proven commercial vehicle transmissions also as hybrid version – and the serial hybrid for special requirements, for example with a hybrid axle for city buses. Resource preservation and economy are at the center of attention.

Advantages – above all in city traffic

Major advantages in everyday life, i.e. fuel savings and preservation of components prone to wear, are utilized by the hybrid concept, in particular in commercial vehicles which are used in inner city traffic: buses, delivery trucks, light trucks. In this commercial vehicle class, characterized by many starting and braking processes, the start/stop operation and recuperation of braking energy save considerable amounts of fuel. During start/stop operation, the combustion engine is switched off at standstill and upon request, re-activated by a quick start of the electric motor. Here, drivers do not have to do without anything in terms of driving performance or comfort in contrast to today's vehicles.



From the component to the hybrid system

For applications in commercial vehicles, ZF offers hybrid modules with the product name DynaStart. With up to 120 kW, this main component of a parallel hybrid drive is very powerful and provides an additional torque of up to 1,000 newton meters. Among its advantages are its compact axial design, its robustness, and its everyday suitability because the components have been designed specifically for their use in a driveline. ZF offers DynaStart also as a ready-to-install module, including separating clutch, which makes purely electric driving possible.

Moreover, ZF delivers hybrid transmissions which build upon well-proven driveline technology for commercial vehicles. In the case of the eTronic hybrid version, the 41 kW strong electric motor is integrated into the driveline. A separating clutch decouples the electric motor and the transmission from the combustion engine and, consequently, provides for purely electric driving. For generator operation, the electric motor is also used as power source. The braking effect generated during generator operation is integrated into the brake management system so that the service brakes are preserved. The hybrid transmission offers all of the functions of a full hybrid system and has been optimized for use in light commercial vehicles in delivery traffic. The purely electromechanical solution generates maximum fuel savings at minimum system costs.

Also the HyTronic, the hybrid version of the ZF-AS Tronic lite, offers these advantages. In the case of this automatic transmission which aims at the use in distributor trucks, an electric motor with 60 kW supports the combustion engine. The overall system consists of transmission, electric motor, inverter, high-voltage battery, and power routing. It can cover all the functions of a full hybrid system.

For buses, ZF will count on a hybrid version of the EcoLife automatic transmission in the future. Already during the development of the new automatic transmission, the integration of



a parallel hybrid version has been considered. Instead of the torque converter, an electric motor with a power of up to 120 kW is accommodated in the clutch bell housing. Also the hybrid version of the EcoLife will cover all the functions of a full hybrid system.

System from a single source

All hybrid transmissions by ZF can also be used as power source for power consumers during generator operation. This makes this type of driveline attractive for certain applications, for example municipal vehicles whose PTOs have so far caused additional fuel consumption and noise generation.

ZF provides commercial vehicle manufacturers with complete hybrid systems, all from a single source. These include, among other things, individual components, the energy management system, and hybrid drive management. In this context, the combination of electric motor, combustion engine, and generator function has been adjusted in such a way as to avoid driving conditions with poor efficiency. For example, consumption-intensive downshifts into a lower gear can be avoided in certain situations by activating the electric motor. The optimum adjustment of shift strategy and energy management as offered by ZF is a core competence in the hybrid technology market. It has a direct effect on the actual savings potential and the economy of a hybrid drive.

Serial hybrid concept for city buses

For economical reasons, ZF favors the parallel hybrid concept where electric motor and combustion engine are connected in parallel via a transmission. For certain applications, such as city buses, also serial hybrid concepts are developed which meet specific customer requirements going beyond operating cost savings – e.g. noise comfort and high flexibility. The most recent example is the AVE 130 hybrid drive axle. This serial low-floor drive concept is suitable for energy sources like batteries, diesel-electric drives, fuel cells, and overhead lines. Thus, the vehicle manufacturer is extremely flexible in terms of economical and



zero-emission driving. It is possible to power all rear axles of an articulated bus. Installation requirements for the AVE 130 are the same as with the AV 132 and AVN 132 low-floor axles, and high-volume production brakes are used.

Captions:

- 1.) For applications in delivery vehicles, buses, and light commercial vehicles, ZF offers hybrid modules with the product name DynaStart.
- 2.) The hybrid version of the eTronic transmission is equipped with a 41 kW strong electric motor. Fuel savings of up to 25 percent are possible as a full hybrid version.
- 3.) The AVE 130 hybrid drive axle is suitable for energy sources like batteries, diesel-electric drives, fuel cells, and overhead lines. Thus, the vehicle manufacturer is extremely flexible in terms of economical and zero-emission driving.

Photos: ZF

Press contact:

Thomas Wenzel, Manager Technical Press,
Phone: +49 7541 77-2543, Fax: +49 7541 77-90 2543 ;
E-Mail: thomas.wenzel@zf.com

ZF is one of the world's leading automotive industry suppliers specializing in driveline and chassis technologies. With a workforce of 63,000 employees, the company operates 125 plants in 26 countries. To sustain its success with innovative products, ZF invests at least 5 percent of its annual revenues (about €700 million from an annual total of €12.5 billion in 2008) in research and development.

For photo material and further press information go to: www.zf.com