Diesel Systems

Hybrid drive systems for the off-highway segment

Technological development in the off-highway segment is driven by the will to increase productivity and lower operating cost. With their increasing use in the automotive segment electrified drive topologies are also becoming cost-efficient when applied to increase the productivity of working machines.

Potential applications

In the off-highway segment there are multiple applications for hybrid drives: from electrification of subsystems and power take-offs or power assistance through to downsizing and downspeeding of the combustion engine by powertrain electrification. Functions such as start/stop or energy recuperation can be implemented. The numerous conditions of service of working machines result in a wide range of different requirements in terms of desired functionality and packaging.

With its wide range of series-tested electric motors and power electronics Bosch is able to deliver the appropriate response to these manifold requirements. Since 2010, these products have been mainly used in hybrid and electric drives of cars and light commercial vehicles. Building upon this extensive experience in development and manufacturing Bosch is systematically expanding the scope of applications.

The result is a modular concept which provides for a comprehensive market coverage of drive variants of light-duty, medium-duty and heavy-duty applications in long-haul and distributor vehicles and busses. Hybrid drives suitable for off-highway applications can be configured as well.

Customer benefits: machine manufacturers

- Downsizing and downspeeding of the combustion engines
- Highest system reliability
- No additional maintenance required for electric machine and power electronics
- Series-tested, mature development and manufacturing processes
- Possibility of further efficiency increases by electrification of subsystems and power take-offs

Customer benefits: vehicle operators

- Reduction of fuel consumption
- Increase of productivity
- Start/stop function possible
- Electrification of power take-offs and implements
- Worldwide Bosch Service Network

Electric hybrid vehicle

1. Electric machine (Integrated Motor Generator, IMG)
2. High voltage battery
3. Inverter (optional with DC/DC converter)
4. Electric Machine (Separated Motor Generator, SMG)
5. Electronic control unit

Signal wiring
High voltage supply
Hybrid system for off-highway applications

The electric drives and the inverters are the core components of the Bosch hybrid system. The system’s flexibility allows it to be used under most diverse operating conditions. The system’s configuration derived from a selection of different control strategies and degrees of hybridization is always geared towards the specific conditions of use.

Function

The electric machine is controlled by the inverter which converts the direct current from the battery into a three-phase alternating current and sets the required torque and speed of the electric machine. If requested by the customer, the control unit can also take over hybrid system control functions. This ensures an optimal distribution of the power output between the combustion engine and the electric machine.

A central control unit, e.g. a vehicle management computer, can be used to regulate the overall energy management to ensure that the energy flows of various subsystems (energy recuperation, cooling system, power take-offs, etc.) are coordinated in an optimum manner.

Outlook

In future, hybrid drives will not remain limited to cars; to an increasing extent they will also be applied in commercial long-haul and distributor vehicles as well as in the off-highway segment. This will result in a significant increase in the efficiency of these vehicles’ and machines’ drive systems.

Bosch is developing and manufacturing future-oriented electrified drive solutions for all segments from light-duty, medium-duty and heavy-duty all the way to off-highway applications.