Diesel Systems

Common Rail Systems with up to 2,000 bar for off-highway applications

Common Rail Systems refined specifically for off-highway operation are robust and powerful, fulfilling the market-specific requirements.

Based on the previous generations, Bosch develops off-highway systems with rail pressures of 1,800 bar and 2,000 bar, including a new injector. This injector has a fast-switching, pressure-balanced solenoid valve and an integrated additional high-pressure volume. These systems are evolutionary, fully compatible developments which will be in series production in 2013.

Possible applications
The system family, with a maximum rail pressure of 1,800 bar (CRS2-18-OHW) or 2,000 bar (CRS2-20-OHW), was developed first and foremost for use in the off-highway sector: agricultural and construction machines, industrial applications up to 130 kW for 4-cylinder engines and up to 200 kW in the case of 6-cylinder engines.

Operating principle
The Common Rail System family for off-highway applications has been developed on the basis of proven passenger-car system components. In adapting it for off-highway operation, we have specifically taken into account rough operating conditions with long periods of full load operation and large injection quantities. Anti-wear measures for the hydraulic components ensure a lifetime of about 8,000 operating hours even when using fuel with low lubricity.

The injector is capable of holding a high-pressure volume. This design reduces pressure oscillations, which results in reduced quantity waving. Compared with the CRI2-16-OHW the system efficiency has been increased by reducing the return flow quantity.

Customer benefits
- Off-highway qualified systems with 8,000 h lifetime even at a high percentage of full-load operation
- Contributes towards achieving future emissions limits (Tier 4, Stage 4)
- High efficiency even at low engine speeds
- Easy integration into existing and future engine platforms
- Limp-home operation
- High flexibility in base engine and exhaust-gas treatment design due to high system and injection pressure
- High robustness and reduced quantity waving
System design

The CP4 high-pressure pump is used for all pressure levels from 1,600 bar to 2,000 bar. This allows a pressure increase without changing the pump drive.

The HFR-20 high-pressure rail has a dual-stage pressure-limiting valve which protects the system from overload and offers limp-home operation.

The powerful second generation injectors have a pressure-balanced solenoid valve and give engine developers a high degree of freedom in designing the injection pattern. In a very narrow time slot, up to eight single injections per stroke are possible. This multi-injection capability contributes to a further reduction of fuel consumption and subsequently CO₂ output as well as reduced noise and exhaust-gas emissions.

All system functions are monitored and controlled by the engine control system. The engine control unit also supports exhaust-gas treatment systems such as exhaust-gas recirculation and diesel particulate filter. The EDC17 control unit is suitable for chassis mounting or optionally also for engine mounting.

Outlook

Bosch engineers are already involved in the evolutionary development of this modular system. Future generations will take advantage of this strong foundation and use it for system pressures over 2,500 bar.