Fascinating
Future of Diesels

Today's diesel engines are powerful, clean and fuel-efficient. Preparing them to future emissions and fuel consumption standards, however, constantly presents engineers with new challenges calling for universal solutions.

Diesel engines offer still offer a lot more potential for optimisation, which continues to fortify their vital role in the future too.
Photos: Bosch

In our quest for the automotive drive of the future, one recurring issue remains the electric car, and rightly so. After all, no other drive concept has a higher efficiency ratio when it comes to converting stored energy into kinetic energy. The only problem is that a great deal of questions remains open until the day of electric mass motorisation. That's why the decision-makers at Bosch, the worldwide leaders in automotive suppliers, believe that the combustion engine will continue as the primary drive technology in cars for the next 20 years, as there's still a lot of potential for development in it.

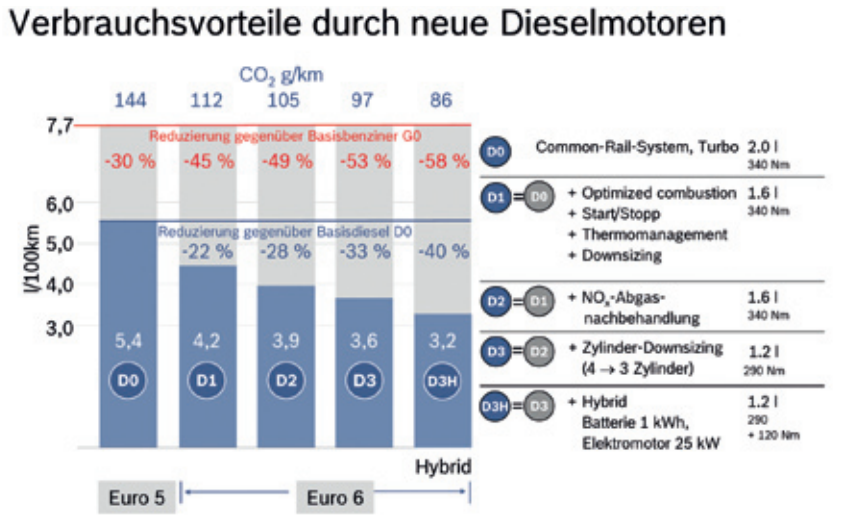
Current Potential for Optimisation

Major factors spurring the ongoing development of today's combustion engines are increasingly strict emissions standards and goals around the world to reduce CO2 emissions along with fuel consumption. In the quest of automakers to meet future CO2 emission goals, diesel engines continue to play an integral part. Modern diesel engines offer a consumption rate 30 to 50 percent better than their gasoline counterparts. Under normal operating conditions, diesels even top gasoline hybrids in terms of emissions.

But the diesel's potential for optimisation doesn't end there. And we're not just talking about its injection system, but the whole engine and its environment. Bosch engineers have already optimised the conventional combustion process for current mass production diesels. By raising the recycling rate for emissions, the load pressures for combustion air and the injection pressures in vast parts across the engine map, they've achieved a combustion process low on nitric oxides. Engineers are also making increased use of measures such as downsizing, start/stop, thermal management and a pre-injection system with an extremely close link to

Reference: amz Diesel spezial 9/2009

Diesel engines are more fuel-efficient than gasoline engines. Improving their fuel consumption and particle emissions even further makes the search for universal solutions essential.



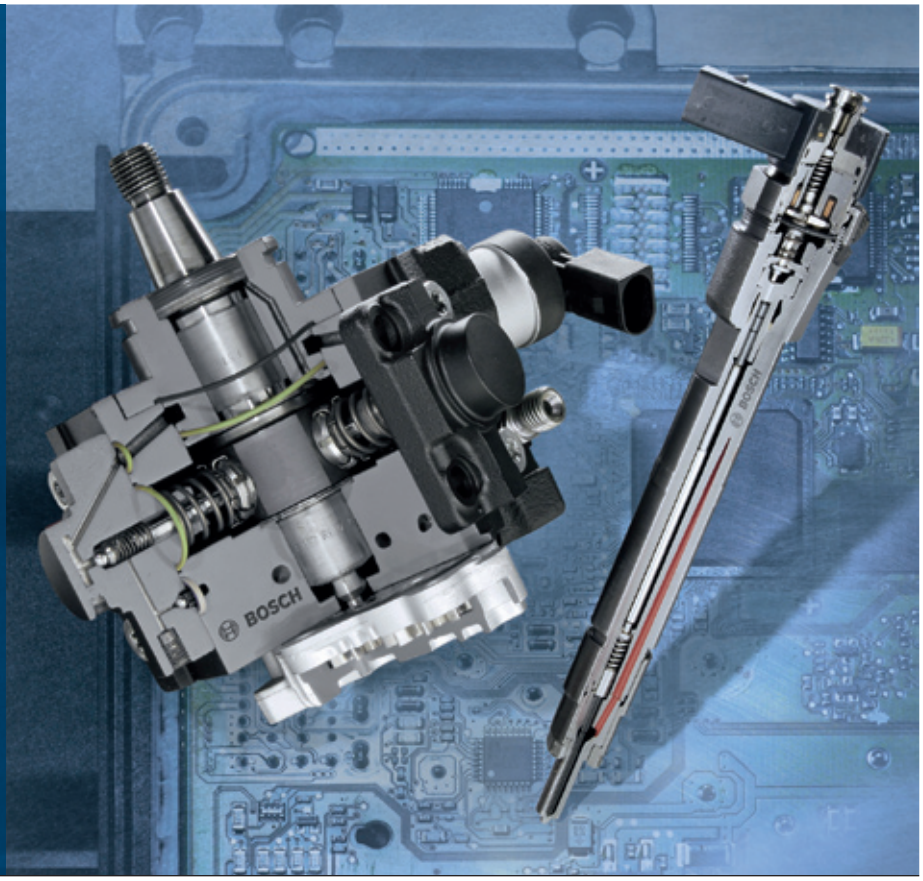
the main injection system. Such a link is made possible with the new and quicker-shifting injectors of Bosch. Even more potential for increased fuel efficiency lies in the hybrid version of the diesel. Bosch is already working very closely together with leading automakers in this field too.

More Pressure for more Flexibility

Ever since its market launch in the year 1997, Common Rail has become the standard injection system among diesel engines. Without it, diesel engines would not be as powerful, comfortable and low on emissions as we know them today. No other injection system is as capable of uniting the same high degree of injection pressure and flexibility in its rate-of-discharge curve, and finding a substitute for this proven accumulator fuel-injection system anytime soon is unlikely.

Although Bosch developers have already raised the bar with products currently under mass-production systems, they still have many possibilities to explore. Especially the cost-efficient solenoid valve injector is seeing a bona-fide period of renaissance. Pressure-compensating solenoid valves are reaching the point of enabling Bosch injectors to handle pressures reaching as high as 2,000 bar – at a performance rate equalling that of today's piezo injectors. Still, their development doesn't stop there. In the near future, expect to see piezo

Injection systems of the future have to show higher-pressure capacities and the flexibility to boost on their rate-of-discharge curves.



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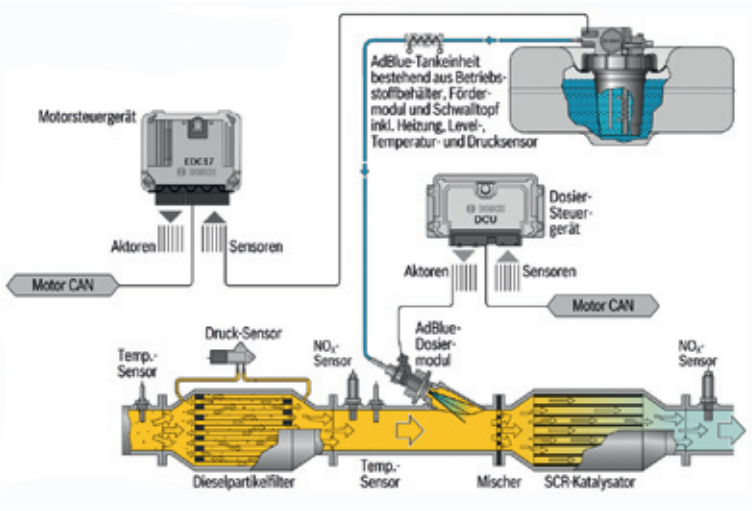

Exhaust-gas treatment for the reduction of NOx levels opens up whole new avenues for engineers to improve the efficiency ratio of diesels even further.

systems handling a maximum injection pressure of much as 2,200 bar. High injection pressures coupled with equal flexibility showing on the rate-of-discharge curve present the key factors in optimising combustion.

Getting a Grip on NOx Emissions with Exhaust-gas Treatment

Diesel engines mainly work by using excess air, generally producing lower CO and HC values. What makes life for them are the soot particles and high quantities of nitrous oxides in their exhaust. Globally restricted emissions and the introduction of motor vehicle taxes based on fuel consumption call for new ways in the reduction of emissions. Perfected particle filter systems have helped reduce those particles by 98 percent. In order to slash nitrous-oxide values, developers so far have overwhelmingly relied on compromises in their formation of mixtures, usually to the detriment of fuel efficiency.

Exhaust-gas treatment for the reduction of NOx levels, however, has opened up new avenues for engineers to further improve the efficiency ratio of diesels. One effect of increasing engine efficiency is to simultaneously increase harmful and thus limited emissions of nitrous oxide. The subsequent reduction of nitrous oxide emissions by means of an SCR (Selective Catalytic Reduction) catalytic converter in the exhaust system allows the diesel to run at a higher efficiency ratio. It now consumes five to seven percent less fuel. To make this possible, Bosch engineers have adapted the Denoxtronic system already used in commercial vehicles to technology used in cars.

A number of OEM manufacturers are already applying this innovative technology to their mass-production vehicles. Already available in the United States, said technology is slated to reach Germany too as early as 2009. In its car version, Denoxtronic integrates its sending unit in its carbamide tank. Its metering module is arranged in front of the SCR converter for activation by the metering control unit. The latter is linked to the engine control unit via a CAN bus.

It's safe to say that the future of the diesel engine is a fascinating one. Its market share is on the rise worldwide. That's why car service centres owe it to themselves to deal intensively with diesel engines and with systems associated with them. Because doing so allows them to capitalise on the growing service potential of diesels, to boost their workloads and to offer their customers truly full-range service.

Reference: amz Diesel spezial 9/2009