

Good things come in three cylinders

Stuttgart, September 2011 – MAHLE has installed its downsizing demonstrator engine in a roadworthy mid-range vehicle (VW Passat). The unit, which is loaded with the latest technologies, demonstrates that the combustion engine still has tremendous future potential when it comes to CO₂ reduction and performance.

Downsizing—that is, displacement reduction, turbocharging, and direct injection—is currently the most promising alternative on the path to more economical gasoline engines. The potential contained in this technical concept is evident in the MAHLE demonstrator engine, which replaces a naturally aspirated engine nearly twice its size.

The 1.2 liter three-cylinder engine was developed by MAHLE Powertrain, a subsidiary of MAHLE. Significant partners in the development of this complete engine were Bosch (electronic control unit, injection, ignition) and Bosch Mahle Turbo Systems (turbocharger), a 50:50 joint venture between the two parent companies, MAHLE and Bosch. The engine has been installed in a series production vehicle (VW Passat) and demonstrates excellent drivability, emissions behavior, and exceptional fuel efficiency.

Fuel consumption for a standard NEDC is only 5.8 liters per 100 km (CO₂ emissions of 135 g/km). The engine meets the current EU5 emission standard, and has the potential to reliably meet EU6 limits as well.

Thanks to ample torque, even at low speeds (161 Nm at 1,200 rpm), the unit has a starting performance and elasticity comparable to modern diesel engines. For example, it accelerates the Passat, weighing about 1,600 kg, from 80 to 120 km/h in just 8.9 seconds. The peak torque of 286 Nm matches that of a naturally aspirated

engine twice its size, and it is available over a wide speed range, from 1,600 to 3,500 rpm. The peak power output of 120 kW (163 HP) would also require significantly greater displacement and more cylinders in a conventional naturally aspirated engine.

In 2007, with its first two-stage turbocharged demonstrator engine, MAHLE proved that downsizing allows remarkable power output and high fuel efficiency. Since then, the engine has been under continuous development: for example, the two original turbochargers have been replaced with one turbocharger from Bosch Mahle Turbo Systems, which exhibits higher charge air pressure and good responsiveness. The current second generation of the downsizing demonstrator now offers cost-effective series solutions that are available with a short lead time.

When it was presented to the audience of experts at the 19th Aachen Colloquium in the autumn of 2010, the high-tech unit received excellent reviews. The engineers at MAHLE have been continuously refining the vehicle application since then. In line with the presentation of the drive concept at the MAHLE technical press conference in June 2011, it combines excellent driving performance and day-to-day reliability with low fuel consumption and emissions values.

The MAHLE downsizing engine is a technology demonstrator that underlines the potential of a new generation of gasoline engines.

The MAHLE Group is one of the 30 largest companies in the automotive supply industry worldwide. With its two business units Engine Systems and Components and Filtration and Engine Peripherals, MAHLE ranks among the top three systems suppliers worldwide for piston systems, cylinder components, as well as valve train, air management, and liquid management systems. The Industry business unit bundles the MAHLE Group's industrial activities. These include the areas of large engines, industrial filtration, as well as cooling and air-conditioning systems. The Aftermarket business unit serves the independent spare parts market with MAHLE products in OE quality. In 2010, the MAHLE Group achieved sales of approximately EUR 5.3 billion (USD 7 billion); more than 47,000 employees work at over 100 production plants and eight research and development centers.

Further queries:

MAHLE GmbH
Birgit Albrecht
Corporate Communications/Public Relations
Pragstrasse 26–46
70376 Stuttgart, Germany
Phone: +49 (0) 711/501-12506
Fax: +49 (0) 711/501-13700
birgit.albrecht@mahle.com

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