MAHLE
Powertrain

MAHLE Downsizing Demonstrator Vehicle

- High torque at low speed
- Strong performance with low CO_2
- Recognised industry benchmark

MAHLE Downsizing Engine

The general principle of engine downsizing is based on replacing the current engine in a vehicle with another of smaller capacity but with equivalent performance. This approach is most relevant for large or medium-sized vehicles where the potential fuel economy and emissions benefits can be maximised.

Normally downsizing comes together with downspeeding. The VW Passat Estate (weighing 1,600 kg) was selected as the 'mule' vehicle for this project, with the 1.8 litre turbo gasoline variant of this car providing the dynamic performance targets for the project.

MAHLE and its engineering service provider MAHLE Powertrain started the development of its own advanced downsizing engine in 2006. The first generation MAHLE downsizing engine was designed and developed from clean sheet to running prototype in 12 months.

Having completed the initial development of the MAHLE downsizing engine with a two-stage turbo configuration, the decision was taken in mid-2009 to adopt a single turbo design for the demonstrator vehicle.

Your contact:
Tel. +44 (0)1604 738 000
powertrain@mahle.com

MAHLE Powertrain Ltd.
Costin House, St. James Mill Road
Northampton, NN5 5TZ United Kingdom

www.mahle-powertrain.com

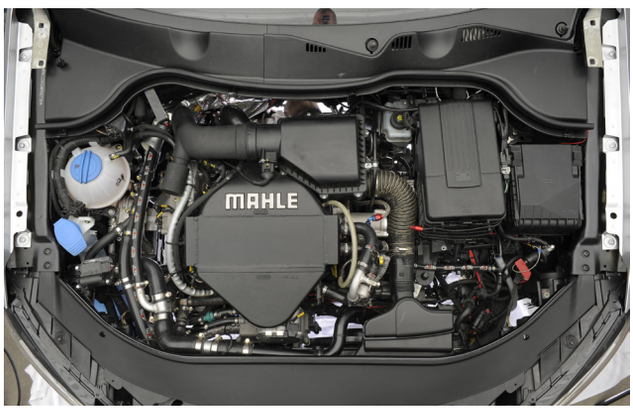
MAHLE Powertrain

MAHLE Downsizing Demonstrator Vehicle

During the turbo mapping phase for the twin-turbo engine, the necessary response and boosting characteristics had been established and specialists at Bosch Mahle Turbo Systems (BMTS) took the opportunity to develop a bespoke turbocharger specifically for the demo vehicle project. The first BMTS unit was fitted to the engine in April 2010 and the initial bench tests confirmed that the targeted power and torque curves could be achieved.

Two engines were installed in identical mule vehicles in June 2010, and further calibration and vehicle development work was then completed. Later that year, the excellent performance and driveability of the vehicle was demonstrated to industry specialists at the Aachen Kolloquium event. Since 2011 the vehicle calibration was further developed and the Stop-Start functionality was activated. Recent independent tests have confirmed that the demonstrator vehicle achieves a fuel economy of 5.8 l/100 km (~49 UK mpg) and CO2 emissions of 135 g/km on the NEDC. On the US FTP75 cycle the vehicle achieves 30.4 miles per US gallon.

The MAHLE downsizing demonstrator vehicle delivers the best of both worlds: flexible and dynamic performance, combined with excellent fuel economy and low emissions.



Technical specifications	
Engine displacement:	1.2 litres
No. of cylinders:	3 in-line
Bore/stroke:	83.0 / 73.9 mm
Compression ratio:	9.3 : 1
Fuel injection:	Multihole central DI
Spark plug:	M10
Engine control:	MAHLE Flexible ECU
Turbocharger:	Bosch MAHLE Turbo System
Maximum power:	161 hp [5000 - 6000 min^{-1}]
Maximum torque:	286 Nm [1600 - 3500 min^{-1}]
Torque at 1200 rpm:	161 Nm
Engine dry weight:	125kg

Vehicle targets and Results	Targets	Results
Fuel consumption FTP75:	N/A	5.8 l/100 km
CO_2 output NEDC:	135 g/km	135 g/km
Emissions target:	Euro 5	Euro 5
Acceleration 80-120 km/h (5th gear)	10.0 secs	8.9 secs

Your contact:
Tel. +44 (0)1604 738 000
powertrain@mahle.com

MAHLE Powertrain Ltd.
Costin House, St. James Mill Road
Northampton, NN5 5TZ United Kingdom

MAHLE Product Information 02/2017

www.mahle-powertrain.com