

## The MAHLE Downsizing Engine – High Performance and Low Fuel Consumption

Volker Korte, Grant Lumsden, Neil Fraser, Jonathan Hall  
MAHLE Powertrain Ltd., Northampton

### Abstract

Maximising fuel economy and thereby minimising CO<sub>2</sub> emissions are among the most important objectives for the future development of engines and vehicles. Various technologies have been developed for gasoline engines with the aim of achieving a significant reduction in fuel consumption. Downsizing, as the combination of reduced displacement and pressure charging is one of the most promising options and is also relatively straightforward to implement in the short term.

MAHLE have recently designed and built [1, 2, 3] an engine to demonstrate the application of aggressive downsizing to gasoline engines in order to improve operating efficiency. The engine was also designed to serve as a platform for addressing the technical challenges associated with downsizing, chiefly:

- A robust combustion system that allows a high compression ratio to maintain part load efficiency
- Good low speed torque and transient performance
- Real world fuel consumption benefits through a reduction in full load fuel enrichment
- Base engine robustness and durability

These challenges require unique engine solutions to enable the significant efficiency improvements of an aggressively downsized engine to be realized. In addition, technologies from across the business group were used to create highly integrated and low-cost sub-system designs.

This paper summarizes the development status of the new engine. Several of these 1.2 l, 3-cylinder high specific output gasoline downsize engines have now been built and are undergoing testing in line with the MAHLE Powertrain Development Verification Plan (DVP).