

## **Selected Technologies Beneficial to Engine Downsizing**

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### **ABSTRACT**

Gasoline engine downsizing has been demonstrated to give significant reductions in vehicle fuel consumption and CO<sub>2</sub> emission levels by effectively moving the engine operating points for any given drive cycle to a more efficient region of the BSFC map.

However, continued downsizing of automotive powertrains requires ever higher specific power outputs on the one hand, and results in increased engine residency at higher load on the other. These factors result in a greater proportion of the real-world driving time spent within the less efficient knock-limited regions of the operating map. For this reason, overall vehicle fuel efficiency becomes increasingly sensitive to full load efficiency, and the potential of further downsizing becomes limited.

To enable downsizing to be taken further, MAHLE Powertrain have investigated a number of complementary advanced technologies to help maintain good operating efficiency throughout the engine operating regions e.g. high temperature exhaust components, bio-fuels with high octane numbers, EGR, and water-cooled exhaust manifolds.

This paper shows results and draws conclusions from investigations conducted by MAHLE Powertrain into the effectiveness of these technologies on highly downsized engines.