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Title: Downsized Engine optimised for CNG Operation

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Abstract

Gasoline engine downsizing is established as a technology to reduce automotive fleet CO₂ emissions. Additionally, alternative fuels such as natural gas, offer the potential to significantly reduce both tailpipe CO₂ and other regulated exhaust gas emissions without compromising driving performance. This paper presents results which show how the positive fuel properties of natural gas can be fully utilised in a heavily downsized engine. The engine has been modified to cope with the significantly higher mechanical and thermal loads when operating at high specific outputs on compressed natural gas (CNG). In this study, peak cylinder pressures of up to 180 bar and specific power output levels of 110 kW/litre have been realised.

It is also shown that having cylinder components specific to natural gas can yield significant reductions in fuel consumption and potential CO₂ savings of 20-40 % for the legislative drive-cycle region. In conjunction with a variable geometry turbine, a port-fuelled CNG engine can achieve impressive low-speed torque (27 bar BMEP at 1500 rev/min) and good transient response characteristics.