

Development of a new 3 cylinder, 1.2l downsizing demonstrator engine

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Abstract

A 3 cylinder, 1.2l engine has been designed and developed to demonstrate production-ready technologies that enable low-CO₂ emissions via downsizing by 50 %. The targets for this engine were to achieve the performance and driveability of a 2.4l naturally aspirated engine whilst achieving CO₂ reductions of 30 %.

This paper describes the initial development results for the engine, including steady state and transient performance. The peak BMEP exceeds the 30bar target and this is achieved with stoichiometric fuelling, as is the majority of the full-load line. The impact of these engine results on vehicle CO₂ emissions is estimated via simulation. Close attention has been paid to minimising other engine emissions and the spray-guided direct injection combustion system achieves excellent catalyst heating performance and combustion stability. Transient response and low-speed torque are enhanced by a two-stage turbocharging system with both mechanical and electrical boosting combinations being investigated.

The design challenge in producing an engine which can reliably deliver the performance levels needed for significant downsizing is discussed and the features of the main engine systems are described. The future potential of downsized engines in stand-alone and hybrid powertrains is also explored.