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Benefits of Late Inlet Valve Timing Strategies Afforded Through the Use of Intake Cam In Cam Applied to a Gasoline Turbocharged Downsized Engine

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ABSTRACT

Gasoline engine downsizing is already established as a proven technology to reduce automotive fleet CO₂ emissions. Further real world benefits are possible through more aggressive downsizing, however there is a trade-off between maintaining a high compression ratio for good part load fuel consumption and maintaining optimal combustion phasing at higher loads. There are many different technologies, which could be applied to gasoline-downsized engines in order to improve efficiency. One is to adopt a Miller/Atkinson cycle, which uses variable valve timing to reduce throttling losses in part load operation and reduce effective compression ratio to optimise combustion phasing at higher loads.

MAHLE Intake CamInCam® is a technology enabler for Miller/Atkinson cycle operation. It uses asymmetric intake valve timing control to effectively provide a method of running increased intake cam duration allowing Late Intake Valve Closing cycle strategies to be adopted.

This paper investigates the effects of this technology applied to a 1.4-litre gasoline direct injection engine. It demonstrates high load combustion phasing improvements through reduced effective compression ratio and improvements at part load through pumping work reduction. The paper also covers the investigation of asymmetric cam control on charge motion through the use of moving geometry CFD.