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Exhaust Gas Recirculation for Improved Part and Full Load Fuel Economy in a Turbocharged Gasoline Engine

Alasdair Cairns, Hugh Blaxill, Graham Irlam
MAHLE Powertrain Ltd.

ABSTRACT

The work was concerned with the use of exhaust gas recirculation to minimise CO₂ and pollutant emissions over a wide operating range in a multi-cylinder research engine. Under part-load conditions a combination of internal and external EGR was used to invoke controlled auto ignition combustion and improve fuel consumption. Outside the CAI regime, small additional fuel savings could be made by employing reduced EGR rates in spark ignition combustion mode. At boosted high load conditions a comparison of excess fuel, excess air and cooled external EGR charge dilution was made. It was apparent that cooled EGR was a more effective suppressant of knock than excess air, with combustion phasing further advanced towards the optimum and improved combustion stability achieved over a wider operating range. The full load emissions reduction potential of EGR was also demonstrated, with emissions of CO₂ reduced by up to 17% and engine-out HC and CO decreased by up to 80%.