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Pre Versus Post Compressor Supply of Cooled EGR for Full Load Fuel Economy in Turbocharged Gasoline Engines

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ABSTRACT

The work was concerned with applying cooled EGR for improved high load fuel economy and reduced pollutant emissions in a turbocharged gasoline engine. While the thermodynamic benefits of EGR were clear, challenges remain to bring the technique to market. A comparison of pre and post compressor EGR supply indicated that post-compressor routing allowed higher compressor efficiencies to be maintained and hence reduced compressor work as the mass flow of EGR was increased. However, with this post-compressor routing, attaining sufficient EGR rate was not possible over the required operating map. Furthermore, at higher engine speeds where the pre-turbine exhaust pressure was greater than the intake plenum pressure, the timing of peak in-cylinder pressure was not as readily advanced towards the optimum. In addition, when using a pre-turbine EGR pick-up, the EGR circuit dead volume had to be closed-off to maintain low-speed torque, insinuating some form of hot-side shut-off valve may be required.