

2006-01-1110

Burn Rate Implications of Alternative Knock Reduction Strategies for Turbocharged SI Engines

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ABSTRACT

This work is concerned with the analysis of different charge dilution strategies employed with the intention of inhibiting knock in a high output turbocharged gasoline engine. The dilution approaches considered include excess fuel, excess air and cooled external exhaust gas re-circulation (stoichiometric fuelling). Analysis was performed using a quasi-dimensional combustion model which was implemented in GT-Power as a user-defined routine. This model has been developed to provide a means of correctly predicting trends in engine performance over a range of operating conditions and providing insight into the combustion phenomena controlling these trends. From the modelling and experimental data presented, it would appear that the use of cooled externally re-circulated exhaust gases allowed fuel savings near to those achieved via excess air, but with improved combustion stability and combustion phasing closer to the optimum position.