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Lean Boost and External Exhaust Gas Recirculation for High Load Controlled Auto-Ignition

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ABSTRACT

This work was concerned with increasing the attainable load during gasoline controlled auto-ignition combustion in a multi-cylinder direct fuel injection research engine. To extend the peak output under naturally aspirated conditions it proved favourable to combine internal and external exhaust gas recirculation under stoichiometric fuelled conditions. During turbocharged high load operation it was beneficial in terms of fuel economy to dilute the charge with a combination of internally re-circulated exhaust gases and excess air. Replacing a proportion of these diluents with externally re-circulated burned gases appeared to facilitate lower emissions of HC and CO. The highest load generated via boost was limited by increasing peak in-cylinder pressure and falling gas exchange efficiency. Regardless, the use of boost increased the load at which CAI could be invoked without lean NOx after-treatment.