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Combining Unthrottled Operation with Internal EGR under Port and Central Direct Fuel Injection Conditions in a Single Cylinder SI Engine

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ABSTRACT

This experimental work was concerned with the combination of internal EGR with an early inlet valve closure strategy for improved part-load fuel economy. The experiments were performed in a new spark-ignited thermodynamic single cylinder research engine, equipped with a mechanical fully variable valvetrain on both the inlet and exhaust. During unthrottled operation at constant engine speed and load, increasing the mass of trapped residual allowed increased valve duration and lift to be used. In turn, this enabled further small improvements in gas exchange efficiency, thermal efficiency and hence indicated fuel consumption. Such effects were quantified under both port and homogeneous central direct fuel injection conditions. Shrouding of the inlet ports as a potential method to increase in-cylinder gas velocities has also been considered.