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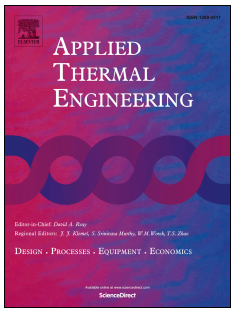

HEAT transfer modelling IN exhaust systems OF high-performance two-stroke engines

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HEAT TRANSFER MODELLING IN EXHAUST SYSTEMS OF HIGH-PERFORMANCE TWO-STROKE ENGINES

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ABSTRACT

Heat transfer from the hot gases to the wall in exhaust systems of high-performance two-stroke engines is underestimated using steady state with fully developed flow empirical correlations. This fact is detected when comparing measured and modelled pressure pulses in different positions in the exhaust system. This can be explained taking into account that classical expressions have been validated for fully developed flows, a situation that is far from the flow behaviour in reciprocating internal combustion engines. Several researches have solved this phenomenon in four-stroke engines, suggesting that the unsteady flow is strongly linked to the heat transfer. This research evaluates the correlations proposed by other authors in four stroke engines and introduces a new heat transfer model for exhaust systems in two-stroke, high performance, gasoline engines. The model, which accounts for both the entrance length effect and flow velocity fluctuations, is validated against experimental measurements. Comparisons of the proposed model with other models are performed, showing not negligible differences in the scavenge process related parameters.

Keywords: heat transfer, unsteady flow, 1D modelling, two-stroke engine

1. INTRODUCCION

In comparison with four-stroke engines, the wave propagation phenomena inside the exhaust system in two-stroke engines is even more critical because of its influence in the cylinder scavenging process, which determines the residual gases and trapped mass for the next engine cycle. The instantaneous pressure in the exhaust system depends basically on the in-cylinder thermodynamic conditions, the opening speed of the exhaust port, the geometry of the exhaust