IN-CYLINDER FLOW ANALYSIS OF DIFFERENT VALVE LIFT USING CFD

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Abstract:

As it is well known, the variable valve actuation (VVA) enables added control of valve timing, lift and/or duration. With this additional freedom, the efficiency of an engine can be greatly increased. Not only can the compression ratio be increased with the addition of VVA, but also the necessity of throttling can be reduced, [15]

This paper presents a variable intake valve lift (ViVL) mechanism, used to enhance fuel economy. Two operational, in-line, 4 cylinders engines prototypes are working on the test benches: one is a side mounted camshaft and overhead valves (OHV) version (i.e. a pushrod engine), still being built in some countries and the other is an overhead camshaft (OHC) version. Experiments that proved also their ability for the unthrottled operation have been conducted on the engine test bench.

A CFD study on the airflow was launched using the numerical code ANSYS-Fluent in order to get more information about the phenomenon happening during the intake stroke of our prototype ViVL engine. To simulate the turbulent flow which takes place during the air induction, k-ε realizable turbulent model was chosen.

This investigation present results from a 3D numerical simulation of the air flow at an engine speed of 800 rpm, corresponding to the idle operation. For one opening of throttle plate (21.6°) and different valve lifts laws, the purpose was to obtain results about cylinder pressure and air velocity. Also, using the path-lines technique, the visualization of swirl motion is highlighted in this paper.