

F2010-B-050

**VARIABLE VALVE ACTUATION:
PERFORMANCE EVALUATION AND OPTIMIZATION TOOLS.**

I. Montalto(1)*, A. Guzzo(2), A. Riegel(1), F. De Cristofaro(1), A. Casavola (3), S.Bova(2)

(1) Fiat Powertrain Technologies S.p.A., Product Engineering, Gasoline Controls Dpt. Elasis S.C.p.A., via Ex Aeroporto, sn – 80038, Pomigliano D’Arco, Naples, Italy

*(e-mail: ferdinando.decrisofaro@fptpowertrain.elasis.it, alessandro.riegel@fptpowertrain.elasis.it
montalto.iolanda@fptpowertrain.elasis.it)*

(2) Dipartimento di Ingegneria meccanica, Università della Calabria, via P. Bucci 41C, Arcavacata di Rende (CS), Italy.

(e-mail: s.bova@unical.it, guzzo.alessandra@gmail.com)

(3) Dipartimento di Elettronica, Informatica e Sistemi, Università degli Studi della Calabria, via P. Bucci 41C, Arcavacata di Rende (CS), Italy.

(e-mail: casavola@deis.unical.it)

KEYWORDS : calibration tools, optimization, variable valve actuation

ABSTRACT: The development of new engines and power trains is shaped by the ever increasing requirements of the legislator as well as the customer. Compliance with current emission legislation, low fuel consumption and pleasant driving behaviour are prerequisites for a successful product.

These demands are reflected by an increasing degree of freedom of the large number of control variables and, therefore, by an increasing number of parameters that need to be calibrated.

This contradicts the demand for reducing time in the engine development process, even more in “Basic” calibrations, which are a major component in spark ignition and diesel engines. Furthermore, a relevant aspect, when dealing with modern internal combustion engine control systems, is the availability of new robust and multi-objective engine calibration methods and tools, which potentially allow a performance boost with respect to the traditional calibration practice.

In this paper a new software tool is presented, which assists the off-line calibration of the basic algorithms like charge and torque determination, injector model, spark advance calculation, exhaust temperature estimation for catalyst protection and so on.

The use of optimization tools, to speed up the calibration and verification phases, has been proved effective and it is now a current industrial practice. This tool, conceived for the ECU (Engine Control Unit) of a gasoline engine equipped with the VVA (Variable Valve Actuation) technology and developed using MathWorks Matlab software, consists of 33 automatic calibration tools.

The application of this approach, compared with the best competitors techniques, has reduced the experimental test bench effort, the calibration time and has improved the estimation precision up to 4 times.