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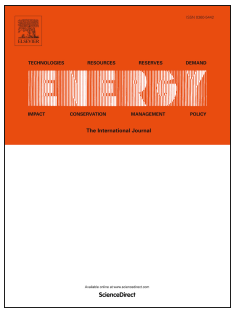

Improvement and application of a methodology to perform the global energy balance in internal combustion engines. Part 1: Global energy balance tool development and calibration

Francisco Payri, José Javier López, Jaime Martín, Ricardo Carreño

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Improvement and application of a methodology to perform the Global Energy Balance in internal combustion engines. Part 1: Global Energy Balance tool development and calibration

Francisco Payri, José Javier López, Jaime Martín*, Ricardo Carreño

CMT-Motores Térmicos, Universitat Politècnica de València, Camino de Vera s/n, 46022, Valencia, Spain

Abstract

The increasingly stringent internal combustion engines emissions regulations, has led to the extended use of after-treatment systems, giving progressively more importance to the engine efficiency optimization. In this framework, the combined modelling and experimental methodologies to perform and analyse the energy balance are key to evaluate the potential of different engine strategies aimed at the consumption optimization and the identification of the improvement paths. This work has been divided into two parts, dealing separately with the development and application of a global energy balance tool. This article corresponds to the first part, which comprises the description of the models required to perform a detailed energy balance and the calibration methodologies followed to achieve accurate energy terms estimation. The models are calibrated based on experimental information, thus, a thermodynamic analysis aimed at defining comparable quantities between experimental and modelled terms is performed. The uncertainty analysis of the tool shows a deviation in the determination of the heat transfer to the coolant and the oil of about ±2%, and in terms of fuel energy about ±1%.

Keywords: Energy balance, Internal combustion engines, Heat transfer, Consumption reduction

*Corresponding author. Tel: +34963877650; fax: +34963877659
Email address: jaimardi@mot.upv.es (Jaime Martín)
URL: www.cmt.upv.es (Jaime Martín)