

EXPERIMENTAL VERIFICATION OF MATHEMATICAL MODEL OF THE HEAT TRANSFER IN EXHAUST SYSTEM

by

Snežana D. PETKOVIĆ^a, Radivoje B. PEŠIĆ^{b*}, and Jovanka K. LUKIĆ^b

^a Faculty of Mechanical Engineering, University of Banja Luka, Banja Luka, Republic of Srpska,
Bosnia and Herzegovina

^b Faculty of Mechanical Engineering, University of Kragujevac, Kragujevac, Serbia

Original scientific paper

UDC: 536.24:519.23:621.43.068

DOI: 10.2298/TSCI110517102P

A catalyst convertor has maximal efficiency when it reaches working temperature. In a cold start phase efficiency of the catalyst is low and exhaust emissions have high level of air pollutants. The exhaust system optimization, in order to decrease time of achievement of the catalyst working temperature, caused reduction of the total vehicle emission. Implementation of mathematical models in development of exhaust systems decrease total costs and reduce time. Mathematical model has to be experimentally verified and calibrated, in order to be useful in the optimization process. Measurement installations have been developed and used for verification of the mathematical model of unsteady heat transfer in exhaust systems. Comparisons between experimental results and the mathematical model are presented in this paper. Based on obtained results, it can be concluded that there is a good agreement between the model and the experimental results.

Key words: cold start phase, exhaust system, heat transfer, experimental verification, mathematical model

Introduction

The objective of the modern society is to make new relations between humans and automobiles, based on harmony with the global environment. The first step in this direction is the introduction of legal limits on exhaust emissions of automobiles. With the sequence of new technological solutions, the exhaust emissions of the vehicles are reduced by 98% in relation to the level achieved before the regulations on exhaust emission were introduced. Such efficiency in reducing the exhaust emission can only be achieved when the catalyst has reached the working temperature. The warming-up period of the engine and the catalyst is usually called cold start phase (CSP) [1]. Literature data show that approximately 60-80% of total vehicle emission of hydro carbon (HC) and carbon oxide (CO), during CSP at environmental air temperature of 18 °C, is emitted in the warming-up period. Between 95% and 98% of total vehicle emissions are released during the warming-up period at environmental air temperature below 0 °C, [2, 3].

* Corresponding author; e-mail: pesicr@kg.ac.rs

