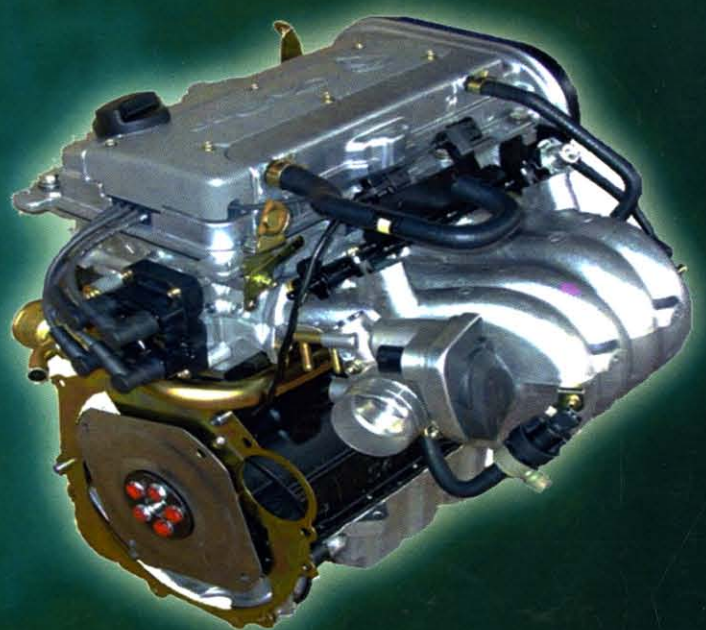
Engine and Auxiliary Systems

Edited by
Prof. Dr. A.K.M. Mohiuddin



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Chapter 2

Experimental analysis and simulation of catalytic converters

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Abstract

The purpose of this chapter is to present the results of an experimental study of the performance of ceramic monolith three-way catalytic converters (TWCC) employed in automotive exhaust lines for the reduction of gasoline emissions. Two ceramic converters of different cell density, substrate length, hydraulic channel diameter and wall thickness were investigated. After completing the test, the converters were cut to extract the substrate or 'honeycomb' inside the housing and being analyzed for microstructure and materials composition using Scanning Electron Microscopy (SEM) and Energy Dispersive Analysis (EDX).

Simulation program using commercial computational fluid dynamics (CFD) software packages, GAMBIT and FLUENT 6.1 was used to verify experimental results.

Keywords: catalytic converter, exhaust emission, conversion efficiency, substrate, energy dispersive analysis.

Introduction

The experiment is carried out to analyze the performance characteristics and behavior of the three-way ceramic monolith catalytic converter (TWCC) especially its efficiency in reducing the amount of pollutants. Experiment is conducted to compare the performance of two ceramic converters of different hydraulic diameter, channel length and cell density on conversion efficiencies and pressure drop (Mohiuddin & Nurhafez, 2007). By observing the results, suggestions on the considerable design geometries for catalytic converter properties are made.

Emission test on engine test bed with converter installed and how engine operating conditions would influence the performance of catalytic converter is investigated. The test is done at various engine speeds and at different air-to-fuel ratio.

The main objective of the chapter is to compare and analyse the performance characteristics of converters from PROTON Wira 1.3L and another one from FIAT Punto Selecta 1.2L. Both converters had same substrate material.