Engine and Auxiliary Systems

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

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Chapter 1

Experimental analysis and comparison of performance characteristics 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 and conversion efficiencies 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 studied to investigate the effect of varying key parameters on conversion efficiencies and pressure drop. Based on the emission test results, the conversion efficiencies of HC from both converters were calculated and evaluated.

Keywords: catalytic converter, exhaust emission, conversion efficiency, substrate, performance characteristics.

Introduction

A serious issue that is always been debated among the environmentalists over the decades and recent years is air pollution. As the technology keep on evolving and emerging, it carries along undesirable effects apart from its broad application and use. One of the main contributors is said to be the emission of harmful gases produced by vehicle exhaust lines. The number of vehicles miles travels per year continues to increase as a result of higher demand and needs. Consequently, an increase in the number led to the increase of the content of pollutants in air.

The conversion process is performed by means of catalyst which accelerates the chemical reactions (Ganesan, 2004). It remains unchanged through the process and able to sustain high temperatures caused by incoming exhaust stream. Most frequently, precious metals such as Platinum (Pt), Palladium (Pd), Rhodium (Rh) and Vanadium (V) are being used as catalysts and because of their rareness and outstanding ability, catalytic converters become among the most expensive devices in a vehicle. Though the researchers begin to replace them with oxides of base metals, which are much cheaper, such as Zinc (Zn), Aluminum (Al) and Magnesium (Mg), however, due to their lower performance compared to the precious ones, they do not have any