

Development and test of a new catalytic converter for natural gas fuelled engine

ABSTRACT

This paper presents characteristics of a new catalytic converter (catco) to be used for natural gas fuelled engine. The catco were developed based on catalyst materials consisting of metal oxides such as titanium dioxide (TiO₂) and cobalt oxide (CoO) with wire mesh substrate. Both of the catalyst materials (such as TiO₂ and CoO) are inexpensive in comparison with conventional catalysts (noble metals) such as palladium or platinum. In addition, the noble metals such as platinum group metals are now identified as human health risk due to their rapid emissions in the environment from various resources like conventional catalytic converter, jewelers and other medical usages. It can be mentioned that the TiO₂/CoO based catalytic converter and a new natural gas engine such as compressed natural gas (CNG) direct injection (DI) engine were developed under a research collaboration program. The original engine manufacture catalytic converter (OEM catco) was tested for comparison purposes. The OEM catco was based on noble metal catalyst with honeycomb ceramic substrate. It is experimentally found that the conversion efficiencies of TiO₂/CoO based catalytic converter are 93%, 89% and 82% for NO_x, CO and HC emissions respectively. It is calculated that the TiO₂/CoO based catalytic converter reduces 24%, 41% and 40% higher NO_x, CO and HC emissions in comparison to OEM catco respectively. The objective of this paper is to develop a low-cost three way catalytic converter to be used with the newly developed CNG-DI engine. Detailed review on catalytic converter, low-cost catalytic converter development characteristics and CNGDI engine test results have been presented with discussions.

Keyword: Catalyst; Emissions; CNG-DI engine; OEM catco; TiO₂/CoO