

Influences of Diesel Particulate Filters on Secondary Emissions of Unregulated Species under Transient Conditions

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Abstract

To meet more stringent regulations, diesel engine manufacturers have been working extensively to develop aftertreatment technologies in order to reduce the emission levels of the criteria pollutants. These criteria compounds are considered to be a risk to the environment and public wellbeing and are regulated world-wide. The majority of the aftertreatment technologies have been designed with the most consideration given to particulate matter (PM), oxides of nitrogen (NO_x), carbon monoxide (CO), and hydrocarbons (HC). However, it is also important to understand what influences these technologies may have on the levels of secondary emissions, especially those unregulated species which are of toxicological concern and formed due to a variety of physical processes or chemical reactions.

The goal of the present study was to perform a comprehensive analysis of the diesel engine exhaust products in order to gain a full understanding of the influences that an aftertreatment technology has upon the secondary emissions. The study utilized source sampling techniques to analyze a wide spectrum of chemical emissions from a heavy-duty diesel engine. Results showed a significant reduction for the emissions of PM mass, carbon monoxide (CO), hydrocarbons (HC), inorganic ions, trace metallic compounds, elemental and organic carbon (EC and OC), and polycyclic aromatic hydrocarbons (PAHs), through transient testing.