THE DEVELOPMENT AND ON-ROAD PERFORMANCE AND DURABILITY OF THE FOUR-WAY EMISSION CONTROL SCRT™ SYSTEM

B.J. Cooper, A.C. McDonald, and A.P. Walker

Johnson Matthey

Mario Sanchez

Cummins, Inc.

ABSTRACT

The progressive tightening of the heavy-duty diesel emissions legislation worldwide necessitates the development of pollution control systems capable of enabling engines to meet the incoming legislative requirements. It is clear that to maximize the benefit to the environment, as well as to meet the very stringent future standards (especially the U.S. 2010 limits), systems capable of high simultaneous conversions of all four major pollutants -- carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x) and particulate matter (PM) -- are required.

Very high conversions of CO, HC, and PM are achieved using catalyst-based diesel particulate filter (DPF) systems, such as the Continuously Regenerating Technology, (CTR®) system. High NO_x conversions can be obtained using selective catalytic reduction (SCR) systems, in which ammonia (generated from urea) is used to selectively reduce the NO_x. This paper summarizes the key steps in the development of the four-way SCRT™ system, which comprises the CRT system followed by an SCR system. Engine bench results obtained during the development of this system are presented and discussed.

However, the key to real-world emissions benefit is the actual on-road performance of such systems. It is well established that the CRT system provides very high and durable conversions of CO, HC, and PM so the focus of this current work was to demonstrate the NO_x conversion capability and durability of the SCRT™ system.

The SCRT™ unit was installed on a long-haul truck powered by a 15L Cummins engine. On-road NO_x emissions performance was measured using NO_x sensors located upstream and downstream of the SCRT™ unit. Over an 850-km evaluation route, the average on-road NO_x conversion obtained was up to 82 percent, even when the urea injection quantity was set to give a maximum NO_x conversion of around 85 percent. The durability of the system has also been assessed. Over the course of 150,000 km, no reduction in the NO_x conversion efficiency of the system was observed.

The results presented in this paper demonstrate that the SCRT™ system provides very high on-road NO_x conversion and that the system has excellent durability within real-world applications.