DIESEL EXHAUST EMISSIONS CONTROL FOR LIGHT-DUTY VEHICLES

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ABSTRACT

Results of diesel exhaust aftertreatment testing and analysis being conducted at Cummins, Inc., under the FreedomCAR program are presented. Various NO_x adsorber aftertreatment configurations were tested both in steady state and in transient in an effort to reduce the size and cost of the system while minimizing the fuel economy penalty. Both systems, discrete (adsorber and catalyzed particulate filter) and 4-way (NO_x, HC, CO and particulate matter [PM]), were tested.

After various iterations of the catalyst formulation, regeneration strategy, catalyst configurations etc., the aftertreatment components were integrated and optimized for the light-duty application. The optimized exhaust aftertreatment system was first tested under steady-state conditions in the test cell to evaluate performance and optimize regeneration strategy. The system was then tested in the transient test cell and on the chassis dynamometer. Emission results for FTP-75, US06, HWFET, and UDDS cycles were obtained at different test weights.

Encouraging reduction in both NO_x and PM emissions was observed for all test cycles. Even though the engine-out emissions were high for the aggressive US06 cycle, the system-out results were low, meeting the SFTP Tier II targets. Durability testing was conducted for both the discrete and the 4-way system, the results of which are presented in the paper.

A transient adsorber-modeling tool has been developed to predict and further assist in improving system performance. Results for various other issues including low-temperature light-off, engine-managed regeneration, exhaust sulfur management, system integration, and design trade-off, are also presented and discussed.