

DEVELOPMENT OF UREA-SCR FOR HEAVY-DUTY TRUCKS DEMONSTRATION UPDATE

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ABSTRACT

Prototype selective catalytic reduction (SCR) systems using urea have been demonstrated on diesel trucks in Europe in recent years. In view of upcoming stringent emissions control standards for US HD diesel engines, urea-SCR is being evaluated by US engine and truck manufacturers. This paper details a project to develop, test, and demonstrate urea-SCR on a US HD diesel engine and Class-8 truck.

A prototype urea-SCR system was applied to a 12-liter HD diesel engine. The engine model selected is rated at 350 bhp and is common for highway trucks. The only engine modifications were changes to the injection timing control map in order to better suit the application of the urea-SCR system.

This paper details two demonstration phases of the project as follows.

The first phase includes emissions cell tests using a new compact SCR catalyst and an engine calibration optimized for lower NO_x. In addition to NO_x, CO, CO₂, HC, and PM, NH₃ was measured to evaluate slip through the catalyst. This data using the new catalyst will show the potential NO_x reduction capability of this technology during emissions test cycles.

The second phase includes application of an SCR system to a Class-8 highway truck. This truck was upgraded to include the new compact SCR catalyst and latest engine calibration. Prototype NO_x sensors were mounted in the exhaust stream before and after the catalyst for over-the-road measurements. NO_x, urea consumption, and fuel consumption were recorded. The truck has been placed in Mack Trucks' fleet and continues to operate on a daily basis.

The results of this study showed substantial NO_x reduction in engine cell and truck tests. The over-the-road measurements provide insight into real world NO_x reduction and urea consumption. Overall, this study provided convincing evidence that urea-SCR may be a key technology to meet future emissions standards.