



Appendix E Project - Integrated Engine – Catalyst System Strategies for Reduced NOx and Particulates

**Status Report
First Quarter 2003**

PROGRAM GOAL

This project is to achieve reduced NOx emissions levels at or below 1.5 g/hp-hr. While it is not the main goal of this program, aggressive reduction of PM will be pursued.

APPROACH

This program will focus on an integrated (total) engine-aftertreatment system approach for emissions reductions of the heavy-duty diesel engine (HDDE). Much attention has been paid to the development of the engine for reducing engine-out exhaust emissions, and to the aftertreatment devices for maximizing post-engine emissions reduction. However, an integrated approach will lead to a global minimum in emissions while minimizing the penalties imposed on other relevant factors such as fuel economy, durability and life cycle cost.

CURRENT PROGRESS AND FUTURE PLANS

Task 5. System Design and Analysis

Complete Truck Installation System Selection, Design, and Analysis

Several alternate SCR and DPF system arrangements were studied before down selecting to the arrangement that met the installation criteria. In the final configuration the urea controller/dosing assembly was positioned on the truck's frame rail. The DPF was close-coupled to the engine, running parallel to the truck frame. The SCR was mounted to the frame rail behind the cab. The SCR inlet location allows for a simple exhaust pipe orientation and urea mixing with the exhaust. The original 150-gallon right-side fuel tank needed to be replaced with a 100-gallon tank to make room for the urea tank and Selective Catalytic Reduction (SCR) housing.

Task 6. Final Procurement, Verification, and Refinements

This Task was completed in the previous quarter.

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Task 7. Initial Field Demonstration

Support Installation and Shakedown of 1st Vehicle System

Installation of the first of three DPF+ SCR systems was completed in this period on a Freightliner Columbia model class 8 line-haul truck chassis. The system was developed and verified on an engine dynamometer under Task 6.

Following chassis dynamometer testing, an approximate 400-mile on-road shakedown (interstate and city driving) was completed without incident. Acceptable system performance was verified including pressures, temperatures, DPF regeneration, and urea dosing. Ambient conditions during the on-road shakedown included record low February Detroit temperatures adding confidence to the acceptability of the system's operating capability.

A driver for the test fleet picked up the truck and report satisfactory performance throughout the 860 miles drive to the test site.

Task 7 has now been completed with the delivery of the first truck.

Task 8 Iterative Upgrades, Testing, and Demonstration

These activities have been initiated:

Document Lessons Learned from 1st Installation

Installation details and corrections have been included in the designs described for Task 5, above, and will form the starting point for the next two installations. As field experience dictates, design upgrades will be incorporated as part of this Task.

Analyze Field Results and Provide Upgrades

A trip to the truck test site was made in this period to establish contact with the fleet personal. This first truck is presently accumulating approximately 5000 mile per week carrying trailer loads of freight. Formal reporting procedures are in the process of being developed in cooperation with the Fleet Service Manager.