Extended Heavy Truck Idling

Fuels, Engines, and Emissions

U.S. Department of Energy

Energy Efficiency and Renewable Energy Program

Oak Ridge National Laboratory

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Transportation

FOR THE 21ST CENTURY

Background

Class 8 trucks often serve as home away from home for the truck driver. It is not uncommon for these trucks to run at idle overnight for 8 or more hours in order to maintain a power supply for lighting, heating, cooling, and ventilation inside the truck cab. The Department of Energy, the Environmental Protection Agency, and the State of New Jersey are collaborating on a study to determine the fuel consumption and emissions attributable to extended idling, and to examine alternative idle-reducing technologies.

The Technology

Five Class 8 trucks were evaluated, representing model years from 1992 to 2001, all with turbochargers, direct injection, and electronic controls. An auxiliary power unit (APU) and a diesel-fired heater system were also evaluated for fuel consumption and emissions. The APU uses a small diesel engine to drive an alternator that charges the batteries, operates a cab heating system, and drives an air-conditioning compressor integrated into the cab cooling unit. The diesel-fired heater system keeps the cab and truck engine warm in winter conditions.

The study was conducted at the Aberdeen Proving Grounds in New Jersey, to take advantage of a large environmental chamber there that simulates a range of summer and winter ambient conditions. ORNL staff transported an emissions bench, complete with particulate matter sampling, to Aberdeen to support the study. Aberdeen staff also tested an emissions bench developed by the EPA.

The trucks were placed in the environmental chamber and emissions were measured at temperatures of 0, 65, and 90°F, and 2 idle speeds of approximately 600 and 1200 rpm, while maintaining the cab interior at a constant temperature.

Findings

Both the APU and the diesel-fired heater units offer potential fuel savings and environmental benefits over truck engine idling. However, at current pricing, fuel savings do not offset the cost of an APU. The diesel-fired heater unit had significantly lower emissions and fuel consumption than the APU, but offers no cooling capability.

In most cases, fuel use and emissions were substantially higher at the high idle speed of 1200 rpm than at the lower idle speed of about 600 rpm.

Benefits

- Replacing extended idling with an auxiliary power source could save fuel and reduce emissions.
- Study of engine control regimes to reduce idle emissions leads to better understanding of basic combustion processes.

Typical exhaust sampling for truck in Aberdeen environmental chamber.

For more information on how ORNL is helping America remain competitive in the 21st century, please contact:

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