

# Diesel technologies drastically cut emissions under real-world conditions

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New research from North Carolina State University shows that federal requirements governing diesel engines of new tractor trailer trucks have resulted in major cuts in emissions of particulate matter (PM) and nitrogen oxides (NO<sub>x</sub>) – pollutants that have significant human health and environmental impacts.

"These requirements for new emission control technologies have increased costs for truck owners and operators, and we wanted to know whether there was any real benefit," says Dr. Chris Frey, professor of civil, construction and environmental engineering at NC State and co-author of a paper describing the research. "We found that there is a huge reduction in both PM and NO<sub>x</sub> emissions."

Frey and Ph.D. student Gurdas Sandhu used a portable emissions measurement system to sample exhaust from diesel trucks while the trucks were in use on roads and highways. The emission requirements apply to new trucks, meaning that trucks purchased in 2010 and trucks purchased in 1999 were subject to different emission requirements.

Frey and Sandhu found that a truck in compliance with 1999 standards emitted 110 grams of NO<sub>x</sub> per gallon of fuel used, and 0.22 grams of PM per gallon of fuel used. NO<sub>x</sub> is a significant contributor to low-level ozone, which adversely impacts respiratory health. PM also adversely impacts respiratory health and, because it is largely made up of black carbon, also contributes to global climate change.

Trucks in compliance with newer standards had far lower emissions. For example, a 2010 truck emitted 2 grams of NO<sub>x</sub> per gallon of fuel – a decrease of 98 percent. The PM emissions were 95 percent lower.

The NO<sub>x</sub> reductions stem from the implementation of exhaust gas recirculation and selective catalytic reduction technologies. The PM reductions are the result of installing diesel particulate filters into the tail pipes of diesel [trucks](#).

"While these technologies are a significant investment for truck owners, this study shows that they are achieving a remarkable drop in [emissions](#) of contaminants that have meaningful health and environmental consequences," Frey says.

The paper, "Real-World Measurement and Evaluation of Heavy Duty Truck Duty Cycles, Fuels, and Emission Control Technologies," is forthcoming from *Transportation Research Record*, the journal of the Transportation Research Board (TRB). Sandhu is lead author of the paper. The research was supported by the North Carolina Department of Transportation and the National Science Foundation.

Provided by North Carolina State University

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