EXPLORING LOW NO_X AND LOW PARTICULATE MATTER COMBUSTION REGIMES

Robert M. Wagner, Scott Sluder, Sam A. Lewis Sr., John M. Storey

Oak Ridge National Laboratory

ABSTRACT

We are investigating nontraditional combustion regimes for improving engine-system efficiency and reducing the performance requirements of post-combustion emissions controls. Combustion regimes of interest exhibit simultaneous low engine-out NO_x and particulate matter emissions. These regimes are realized through a combination of high EGR rates and/or fuel injection parameters.

In this study, we performed detailed emissions characterization for improved understanding of the combustion process as well as the environmental impact of operating in these regimes. Advanced techniques were applied for speciation of hydrocarbon (HC) emissions and particulate matter (PM).

HC speciation has thus far revealed the presence of many short chain hydrocarbons and partial oxidation products that were not present in the fuel. PM characterization revealed that a significant percentage of the PM in these nontraditional regimes is soluble organic, which may be treated with a simple oxidation catalyst. We are also investigating the possibility of increasing the speed/load envelope of these nontraditional regimes as well as evaluating their applicability to regenerating NO_x adsorbers and diesel particulate filters.