

# Evaluation of Ultra Clean Fuels from Natural Gas

## Goal

Through the National Energy Technology Laboratory's "Ultra Clean Fuels" program, Conoco has partnered with Nexant Inc., Cummins Engine Company and the Pennsylvania State University to study applications for and optimization of ultra clean fuels. A major task under this program is to evaluate Fischer-Tropsch diesel fuel in a compression ignition engine with aftertreatment devices and in-cylinder instrumentation to optimize formulation, and thereby production, of the F-T diesel fuel. An outcome of these efforts will be demonstration of a fully optimized fuel-engine-exhaust aftertreatment system, with underlying scientific studies of the formulation and combustion.

## Team

The EMS Energy Institute is currently working with the National Energy Technology Laboratory's "Ultra Clean Fuels" Program, Conoco, Nexant Inc., Cummins Engine Company, Air Products & Chemicals, Inc., PetroTech Gas, Inc. and AVL Powertrain Technologies, Inc.

## Project Discussion

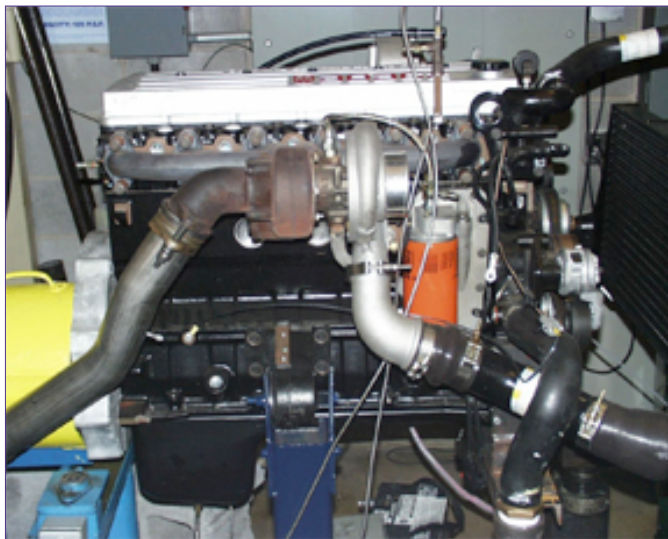
Fischer-Tropsch (F-T) diesel fuels offer the potential for greatly reduced particulate emissions, zero sulfur and high-cetane number. Challenges with F-T fuels include their low lubricity and poor cold-flow properties. A major goal of this program is to determine the optimal formulation of F-T fuel to maximize emissions benefits without sacrificing performance. The program involves detailed studies of the combustion process, emissions and the impact of fuel formulation on the effectiveness of aftertreatment devices. The primary apparatus for this work is the Cummins "ISB" 5.9L turbodiesel engine, which has been instrumented with in-cylinder pressure sensing and optical access via an AVL Engine Videoscope. Both particulate and NO<sub>x</sub> control systems will be employed with the engine.

Experiments will be based on steady-state testing protocols, during which the composition of gaseous and particulate emissions and the morphology of the particulate matter will be examined. Comparisons between current diesel fuels, prototype 2007 diesel fuels and the Conoco F-T diesel will be made to assess the incremental benefits of reducing sulfur and eliminating aromatics.

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## Potential Benefits

Using abundant natural gas and coal resources to make ultra clean transportation fuels provides the nation with several benefits. By using domestically abundant resources to make transportation fuels, the nation can reduce its dependence on imported oil and reduce the possibility of significant damage to the economy in the event of worldwide supply or price fluctuations. Also, the lifetime of the existing petroleum resource will be extended if other resources are used to fuel the transportation sector. Finally, by providing ultra clean transportation fuels, the environmental impact of the transportation sector can be reduced and at the same time vehicle efficiency can be increased, providing a reduction in global warming gas emissions.



Cummins ISB 5.9L 6-Cylinder Turbodiesel in the 250 hp Engine Test Cell

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