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Northeast Region

DETERMINATION OF THE UNDERLYING CAUSE OF THE BIO-DIESEL NOX-EFFECT IN COMMON RAIL DIESEL ENGINES

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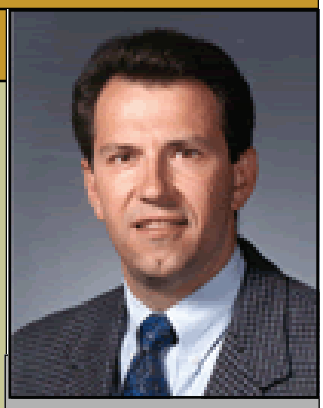


THE BIODIESEL NOx EFFECT: While biodiesel has been shown to reduce emissions of particulate matter, carbon monoxide and total hydrocarbons, there have been widespread reports of increases in NOx emissions. (Cheng et al. reported NOx emissions increases of 1% for each 10% of biodiesel content.)

TWO PREVAILING HYPOTHESIS TO EXPLAIN:

NOx increase arises from changes in mixture stoichiometry at the lift-off length (Cheng et al., Brezinsky et al.)

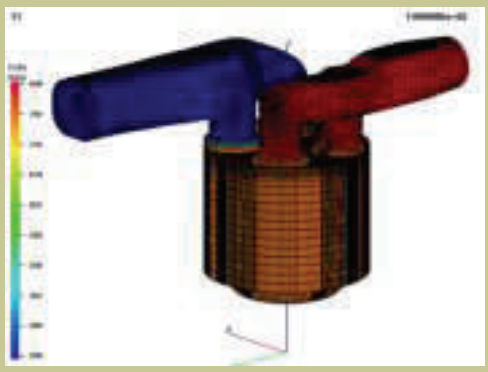
NOx increases arises from changes in radiative heat transfer effects (Cheng et al.) (IN ANOTHER FUNDED PROJECT PENN STATE IS ALREADY EXAMINING HYPOTHESIS #2)

IN CURRENT STUDY: Physical and chemical property effects of biodiesel on the combustion and emissions formation processes in common rail diesel engines. (Test engine will be supplied by Ford Motor Co.)

Start with existing CFD Model

Run numerical experiments to predict NOx emissions for variations in fuel 1) viscosity, 2) density, and 3) latent heat of vaporization.

Verify CFD model predictions through companion experiments in the Penn State Diesel Combustion and Emissions Laboratory.



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