

TECHNICAL HIGHLIGHTS APRIL 2014

Fuels, Engines, and Emissions Research Center (FEERC) Research has Strong Showing at the 2014 Society of Automotive Engineers (SAE) World Congress

FEERC staff led or co-authored 19 manuscripts and 22 oral presentations at the 2014 SAE World Congress. The presented research spanned the expertise of FEERC including presentations related to advanced combustion, controls, renewable fuel opportunities, emissions controls, life cycle analysis, vehicle modeling, fuel economy, and manufacturing. In addition, FEERC staff organized and chaired many technical sessions as well as a special panel session on natural gas for passenger vehicle applications. The SAE World Congress was attended by over 11,000 automotive professionals from around the globe.

The Oak Ridge National Laboratory (ORNL) Coordinates the 2014 Department of Energy (DOE) Crosscut Workshop on Lean Emissions Reduction Simulation (also known as the "CLEERS Workshop")

The CLEERS workshop was held April 29–May 1 at the University of Michigan-Dearborn. This was the 17th CLEERS workshop and over 100 participants from industry, national labs, and universities participated. The workshop contained presentations on in-depth catalysis research and simulation for the transportation industry as well as talks on particulate matter (PM) emissions and control. In addition to invited talks from internationally recognized experts in the field, an industry panel discussion was held on the subject of low temperature aftertreatment needs for advanced combustion and fuels. Pacific Northwest National Laboratory (PNNL) also presented progress on a collaborative effort to establish a test protocol for low temperature aftertreatment.

FEERC Researchers Publish Two Reactivity Controlled Compression Ignition (RCCI) Papers at SAE World Congress

FEERC research Adam Dempsey was lead author and presenter for a paper investigating the effect of a diesel oxidation catalyst on RCCI with low-load, medium-load, and high-load RCCI operation on PM at the 2014 SAE World Congress in Detroit, Michigan. This study was part of a larger collaboration with PNNL using an in-situ method for direct analysis of PM to understand both the exact composition of low-temperature combustion PM. FEERC researcher Scott Curran was lead author and presenter for an investigation of using experimental RCCI data to model drive cycle fuel economy and emissions; modeling conducted by FEERC researcher Zhiming Gao. These results were part of a 2013 high level DOE milestone to demonstrate a 20% improvement in modeled fuel economy with RCCI.

FEERC Director Co-organizes the 4th SAE International High Efficiency Internal Combustion (IC) Engines Symposium

Robert Wagner co-organized an SAE symposium focused on high efficiency IC engines and enabling technologies. This is the 4th year of the symposium with 2014 having the largest turnout of more than 170 participants. Invited presenters discussed recent research in the areas of natural gas combustion, new high efficiency combustion approaches, fuel opportunities, and new lubricants. Scott Curran from FEERC reported on his recent work on multi-cylinder advanced combustion and Jun Qu presented on his recent work lubricants research with a focus on ionic liquids.

FEERC Multi-Cylinder RCCI Engine Running with Computational Fluid Dynamic (CFD) Optimized Pistons

In collaboration with Wisconsin Engine Research Consultants and the Engine Research Center at the University of Wisconsin–Madison, FEERC researchers Adam Dempsey and Scott Curran and FEERC automotive research mechanic, Steve Whitted, installed unique pistons designed for RCCI. The CFD

optimized pistons are specially designed to reduce pressure rise rate and to minimize hydrocarbon and carbon monoxide emissions from RCCI.

HIGH-LEVEL OR NOTEWORTHY VISITS

Dennis Smith of Vehicle Technologies Office (VTO) Visits ORNL

Dennis Smith from the DOE VTO visited ORNL-National Transportation Research Center (NTRC) on April 30 for a program review. Dennis is the National Clean Cities Director and VTO Deployment Manager. His program supports ORNL's efforts in maintenance of the fueleconomy.gov website, which is managed by the Center for Transportation Analysis. FEERC supports this program through vehicle research to develop and validate driving tips.

Alicia Lindauer of Bioenergy Technologies Office (BETO) Visits ORNL

Alicia Lindauer from the DOE BETO visited ORNL on April 16–17, with tours and discussions at the NTRC and ORNL main campus. Alicia supports a wide range of bioenergy research at ORNL, including high-octane fuel studies and strategic analysis.

DOE Deputy Assistant Secretary (DAS) of Transportation visits ORNL and FEERC

The new DOE DAS of Transportation, Reuben Sarkar, visited ORNL. The Sustainable Transportation Program coordinated the visit to show Mr. Sarkar the vast transportation portfolio and expertise at ORNL. This included tours of the FEERC laboratories and FEERC-led presentations on high octane fuel opportunities and FEERC participation in SuperTruck teams with Cummins and Daimler Trucks North America.

Cummins SuperTruck Visits NTRC and ORNL Main Campus

On April 1, the Cummins-Peterbilt "SuperTruck" visited the quad on ORNL's main campus. The SuperTruck is a 10.7 mpg heavy-duty truck developed in a joint industry-DOE program that was led by Cummins and Peterbilt and included ORNL and other collaborating partners. The ORNL team, led by Bill Partridge, contributed to SuperTruck's 75% fuel efficiency improvement by developing and applying a unique laser-diode fiber optic probe to Cummins' engine to optimize engine efficiency.

INVITED TALKS AND PRESENTATIONS

Jun Qu Invited to Present ORNL's Work on Ionic Liquid Lubrication at the Biennial Automotive/Petroleum Industry Forum

Jun Qu was invited to present at the 38th Automotive/Petroleum Industry Forum (Detroit Advisory Panel [DAP]) held in Dearborn, Michigan, April 16, 2014. The paper entitled, "Ionic Liquids as Next Generation Anti-wear Additives: Molecular Design to Engine Dynamometer Testing," presents ORNL's work on ionic liquid lubrication. Every two years the Detroit Advisory Panel sponsors a one-day forum in the Detroit area to address topics that are of interest to the vehicle and engine manufacturer and oil and additive industry. This year, the DAP theme is "Auto-Oil Partnership for Energy Sustainability." Participants are senior-level managers representing the major oil and additive companies in North America and the major vehicle and engine manufacturers and suppliers with significant operations in the Detroit area. At the meeting, Jun Qu gave a review of the ORNL-led research and development (R&D) on developing oil-miscible ionic liquids as next-generation anti-wear additives for automotive lubricants in collaboration with General Motors, Shell, and Lubrizol. This cutting-edge research has been sponsored by the DOE EERE VTO Fuels and Lubricants Program in the past 5 years.

ORNL Advanced Combustion Research Featured in 2014 SAE High Efficiency Symposium

FEERC researcher Scott Curran presented an invited talk regarding single- and dual-fuel advanced combustion at the 2014 SAE High Efficiency Symposium held in Detroit, Michigan. The presentation focused on the comparison of the range of single- and dual-fuel approaches to advanced combustion with a focus on low temperature gasoline compression ignition (GCI) and RCCI. The presentation was part of a session focused on light-duty and heavy-duty advancements in engine efficiency.

AWARDS

FEERC Staff Honored at the 2014 SAE World Congress

Several FEERC staff were honored at the 2014 SAE Awards Ceremony. John Storey was awarded the status of SAE Fellow, Scott Sluder received the McFarland Award for his work with SAE planning and development (second time receiving this award), and Robert Wagner received the International Leader Citation for work on SAE global initiatives.