Technical Highlights – July 2013

Film Crew Interviews Fuels, Engines, and Emissions Research Center (FEERC) Researchers for Public Broadcasting System (PBS) Newshour Story on Ethanol Blends Program

Oak Ridge National Laboratory (ORNL) staff were interviewed in July by journalists working on an ethanol story for PBS Newshour. Since 2007, ORNL staff have been researching the effects of intermediate ethanol blends (blends > 10% ethanol) on vehicles, non-automotive engines, and infrastructure materials. ORNL has authored more than 12 reports and papers on the work. Brian West and Scott Sluder spent a day with the journalists discussing the test program, focused mostly on the $20M catalyst durability project that involved aging over 80 vehicles with dedicated fuel blends while driving over 6 million miles. The test program examined not only the immediate emissions and fuel economy effects of increased ethanol blends on vehicles, but also the aging effects. Results were consistent with the literature in that increased ethanol increased some organic gas emissions (such as ethanol and acetaldehyde), while decreasing some other hydrocarbon emissions. Fuel economy decreased with increasing ethanol, as expected. Aging vehicles increased emissions over time, as expected, but there was no fuel-related aging effect. The Environmental Protection Agency (EPA) cited the Department of Energy (DOE) studies when they approved the use of E15 in 2001 and newer vehicles in October 2010 and January 2011.

FEERC Staff Member Interviewed by Chicago Tribune Reporter

A Chicago Tribune reporter interviewed John Thomas concerning vehicle fuel economy vs. speed efforts at ORNL. This led to an article issued May 2013. This article is available at: http://cars.chicagotribune.com/fuel-efficient/news/chi-savings-in-safety-20130531.
This article discusses results for the steady speed vs. fuel economy work performed by FEERC researchers and mentions the fueleconomy.gov website as well as John Thomas, Shean Huff, and Brian West who carried out the study.

FEERC Fuel Economy Report Cited in EPA Docket

A recent ORNL/FEERC publication about effects of ethanol blends on vehicle fuel economy has been cited by several groups in their public comments on the EPA Tier 3 proposed rule, which proposed a change in the Federal Certification Gasoline from an E0 blend to an E10 or E15 blend. The ORNL report was released in June and cited by the International Council on Clean Transportation, the Alliance of Automobile Manufacturers, Ford, General Motors (GM), and the ethanol industry. The EPA protocol for calculating test vehicle fuel economy involves the test fuel heating value and an “R Factor” of 0.6. The R factor was determined in the 1980s and specified to accommodate variability in test fuel heating values that were impacting Corporate Average Fuel Economy (CAFÉ) compliance for the automobile manufacturers. The increasing state of refinement of vehicle fueling has increased the value of R to close to unity; Scott Sluder and Brian West measured it at 0.94±0.04 for the Federal Test Procedure (FTP) cycle through their analysis of the fuel economy data from the DOE Intermediate Ethanol Blends Catalyst Durability Study. The value of R has recently come under increased scrutiny as it will have a significant impact on the vehicle manufacturers if ethanol is introduced into the certification fuel.

FEERC Staff Member Attends the United States Council for Automotive Research (USCAR)-Ethanol Industry Workshop

Brian West attended a meeting hosted by the ethanol industry at USCAR headquarters in Michigan. The ethanol and auto industry are working together to address obstacles to increased ethanol use, such as the possible sunsetting of the current incentives to build Flex Fuel Vehicles (FFV), vehicles capable of

using gasoline, E85, or any blend in-between. The auto and ethanol industries are in agreement on increasing FFV sales and "E85" availability and sales, and exploring the appropriate "E85" blend, such as E60 or E70 year round to alleviate some consumer confusion and variable fuel economy; the American Society for Testing and Materials (ASTM) specification for "E85" changed recently, now known as "Fuel for FFVs," allowing ethanol content to vary between 51 and 83%. Both industries agreed that pricing of E85 in the marketplace and loss of range continue to hinder consumer acceptance, and both are interested in maintaining the Renewable Fuel Standard and continuing FFV production and promotion. Both industries are also interested in exploring the potential of a high octane "Renewable Super Premium" mid-level ethanol blend that could enable higher compression ratios and improved efficiency. (The two industries remain divided on the use of E15 in legacy vehicles, but it is worthy of note that Ford and GM are both allowing E15 in their new vehicles.) Some collaborative DOE/ORNL/Ford work on high-octane fuels is underway now in a turbo-charged gasoline direct-injection (GDI) engine, but both industries would like to see more engine data with high-octane fuels on multiple engine architectures, such as Port Fuel Injection, normally-aspirated GDI, and perhaps additional turbo GDI platforms.

High-Level or Noteworthy Visits

Green Car Congress Visits ORNL

Mike Millikin from *Green Car Congress* (http://www.greencarcongress.com) visited ORNL to better learn about the role of ORNL in addressing the transportation challenges and opportunities of the future. The visit included discussions and tours covering high performance computing, neutron sciences, combustion, emissions controls, battery manufacturing, intelligent controls, and advanced manufacturing.

Invited Talks and Presentations

FEERC Post-Doc Presented at the 1st Annual ORNL Post-Doctoral Research Symposium

Derek Splitter presented at the 1st annual ORNL Post-Doctoral Research Symposium. The Symposium had over 100 submissions. The submissions were pre-judged by ORNL staff with accepted submissions ordered into poster and presentation categories. Accepted posters and presentations were judged by an ORNL committee with awards for best poster, presentation, and two honorable mentions in each respective category. Dr. Splitter presented material on "Renewable Super Premium, a Paradigm Shift in Engine Efficiency." His presentation was awarded Honorable mention for excellence in presentation delivery and quality.

ORNL Advanced Combustion Research Presented at International Energy Agency Task Leaders Meeting

FEERC Researcher Scott Curran presented recent advances in light-duty multi-cylinder advanced combustion at the 35th International Energy Agency Task Leaders Meeting on Energy Conservation and Emissions Reduction in Combustion. The meeting was hosted by the U.S. DOE Office of Vehicle Technologies in San Francisco, California. The meeting is invitation-only and was also attended by ORNL researcher Robert Wagner.

FEERC Researcher Presents Invited Lecture in Tianjin, China, on Accelerating Engine Development

FEERC Researcher Robert Wagner presented a keynote lecture titled, "Accelerating the Development of High Efficiency Engines" at the 5th International Symposium on Clean and High Efficiency Combustion in Engines during a meeting at the State Key Laboratory for Engines (SKLE) in Tianjin, China. The meeting was sponsored by SKLE and attracted many international experts.

Awards

FEERC Fuel-In-Oil Measurement Technology Receives 2013 R&D 100 Award

The FEERC Cummins Cooperative Research and Development Agreement (CRADA) team received the prestigious R&D 100 Award for their fuel-in-oil diagnostic, recently licensed to Da Vinci Emissions Services, Ltd., and now commercially available as DAFIO (Da Vinci Fuel-in-Oil). The system uses a fiber optic probe to obtain real-time measurements of oil in an operating engine to quantify the fuel dissolved in the lubricant oil. This technology enables combustion engineers to rapidly assess any issues related to fuel dilution of oil during development of highly efficient, clean and reliable engines. Prior to the development, significant engine time (tens of hours) was required to investigate oil dilution; with the ORNL innovation this measurement can now be conducted in minutes. This technology was developed in a DOE sponsored ORNL-Cummins CRADA.

Outreach

FEERC hosts Appalachian Regional Commission Summer Science Institute

High school students and their teachers and mentors toured ORNL's National Transportation Research Center this month. The student and teacher researchers are selected from eligible counties in 13 Appalachian Region states from New York to Mississippi. Their time spent at ORNL is designed to motivate the students to continue their science education beyond high school, and to help teachers bring practical examples back to the classroom. The group visited FEERC to learn about the applied R&D aimed at reducing the nation's dependence on petroleum. The tour also included stops at the Power Electronics and Electric Machinery Research Center and the Manufacturing Demonstration Facility.

Tour of FEERC Laboratories Highlight of Science Camp

FEERC researcher Scott Curran and FEERC intern Michelle Edwards hosted two groups of middle school students from the Oak Ridge Associated Universities' Science Camp who were focusing on biofuels and the production of biodiesel during the month of July. Students learned about the different types of engines and how research at ORNL is addressing the reduction of petroleum use through alternative fuel research and research and development into new engines that can exploit the properties of alternative fuels for higher efficiency.