DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

Powering the Road and Air Transportation Sectors with Liquid Fuels

Frederick L. Dryer, Ph.D.
Department of Mechanical and Aerospace Engineering
Princeton University

Abstract: Internal combustion engines running on liquid fuels will dominate the road and air transportation sectors for decades, probably for most of this century. Consumption of transportation fuels derived from petroleum and other fossil resources is currently immense, will grow, and at some distant future time will become unsustainable. Much emphasis has been placed recently on alternative liquids to augment and eventually replace petroleum-derived fuels, with a principal motivation of achieving much lower net carbon cycle and air pollutant emissions from the transportation sector. Long term net carbon cycle emission reductions are proposed to come from carbon sequestration and renewable energy resources, in some cases utilizing fuel cell or battery powered electric vehicles. However, improvements in internal combustion engines operating on liquid fuels also appear to comparable potential for reducing net carbon cycle and pollutant emissions. The successful growth and establishment of a sustainable, profitable liquid alternative fuel industry can be facilitated by approaches that integrate alternative products into the evolving petroleum derived fuel streams, i.e. gasolines, diesel, and jet fuels, with synergistic evolution of and integration with the refining and liquid fuel distribution infrastructure already present.
This presentation will overview internal combustion advances and progress on/emerging tools for evaluating and emulating the physical and chemical kinetic related properties of real fuels and alternative fuel candidates on combustion behavior. New analytical and statistical methods can provide important insights as to how the molecular structures found in a fuel contribute to the physical and chemical kinetic properties relevant to combustion energy conversion processes. Results can in turn assist in screening candidate alternative fuels as they emerge.

Bio: Dr. Dryer received a Bachelor of Aeronautical Engineering degree from Rensselaer Polytechnic Institute in 1966 and a Ph.D. degree in Aerospace and Mechanical Sciences from Princeton University in 1972. He served on the Professional Research Staff from 1971-1981, joined the tenured faculty in 1981, was promoted to full professor in 1983, and is presently an Emeritus faculty (2013) and Senior Scientist. His continuing research interests include: chemistry/chemical kinetics of fuels and hazardous waste materials as related to ignition, combustion, and emissions generation/abatement; petroleum-derived fuels, including gasoline, diesel, gas turbine, and heavy fuel oil combustion properties; non-petroleum-derived alternative fuels, their production, their chemical kinetic properties, and their ability to address U.S. energy security and reductions in net carbon cycle emissions; fire safety related issues on earth and in micro gravity environments; solid phase/gas phase interactions as related to particle burning phenomena and nano-catalysts; emissions from internal combustion engines, including hydrocarbons, nitrogen oxides, aerosol particulates; and emissions interactions including chlorine, sulfur and ash (metals) component effects in stationary energy conversion, chemical processing, and incineration. Dr. Dryer is currently a member of the Combustion Institute (2012 Egerton Gold Medal Awardee; 2014 Invited Plenary Speaker), the American Society of Mechanical Engineers (Fellow), the Society of Automotive Engineers (Fellow), the American Institute of Aeronautics and Astronautics (Associate Fellow; 2014 Propulsion and Combustion Medal), the American Chemical Society, and the National Fire Protection Association. He has published extensively and consulted for the government, industry and the legal profession on combustion, fire safety, energy, and emissions-abatement-related subjects. He is a former associate editor and editorial board member of Combustion Science and Technology, co-editor for the Proceedings of the 26th and 27th International Symposiums on Combustion, and a former editorial board member of the International Journal of Chemical Kinetics and of Progress in Energy and Combustion Science.

Date: September 16, 2016
Time: 3:00 to 4:00p
Place: CB 106
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

UK UNIVERSITY OF KENTUCKY College of Engineering

DEPARTMENT OF MECHANICAL ENGINEERING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY