

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



Thomas A. Butcher, Ph.D.

Deputy Chair, Energy Sciences and Technology Department
Head, Energy Conversion Group
Brookhaven National Laboratory, Upton, NY

Lecture Title: Reducing Petroleum Fuel Use in the Northeast

Friday, December 9, 2011 2PM, Room 173 Light Engineering

Abstract

A number of economic and environmental factors are causing significant changes in the mix of fuels and energy conversion technologies being used for heating buildings in the Northeast. The most significant trends include increased interest in low-cost energy efficient technologies, increased use of wood as a fuel, and increased interest in a very wide range of liquid biofuels. Technical and cost barriers to the deployment of these trends are leading to the need for R&D which can create practical solutions. This presentation will cover relevant activities and interests at BNL. For simple efficiency of heating systems, low cost, corrosion resistant heat exchangers are needed and one key area of interest is polymer composites. While approaches like this can help achieve boiler and furnace conversion efficiencies near 100%, this will clearly not be high enough for the future. Technologies such as fuel-fired absorption and adsorption heat pumps and micro-CHP (systems which produce both heat and power) will be needed. BNL is involved with absorption systems, HCCI engine microCHP concepts, and TPV/TE hybrid power production. Wood use is now increasing faster than that of any other fuel, leading to very strong regional concerns about particulate emissions. Wood is now the most significant source of particulates in upstate New York and is expected to be the dominant pollutant in our whole region in the coming years. Low cost, zero-carbon emission combustion technologies are needed along with innovative particulate control technologies. BNL is involved with testing methodologies as well as with the development of condensing heat exchangers for integrated particulate capture. There are many liquid biofuels competing to replace petroleum but there are very significant barriers which need to be addressed including basic elastomer compatibility, oxidative stability in storage, low temperature flow properties, combustion and air pollutant emissions. BNL is involved with many different fuels in these areas.

Biography

At present, T. Butcher is the Deputy Chair of the Sustainable Energy Technologies Department and Leader of the Energy Conversion Group. Work within this group includes liquid fuel combustion; biofuels applications; polymer composite heat exchangers; solar thermal systems; micro combined heat and power concepts; absorption heat pumps; wood boiler emissions and efficiency; and advanced materials for geothermal energy applications. T. Butcher received his **Ph.D. (Mechanical Engineering) from SUNY-Stony Brook**, **MS (Mechanical Engineering) from Stevens Institute of Technology**, and **BS in Marine Engineering from the U.S. Merchant Marine Academy**. During 30+ year research career at BNL, has been involved with a wide range of research projects related to energy and fuels. This has included: coal slurry fuel development and combustion; conversion of tar waste into fuel; diesel engine emission studies; fouling in oil-fired boilers; condensing economizer design for thermal performance and particulate capture; advanced coatings and materials for condensing heat exchangers; heat exchanger corrosion rates and fuel impacts; advanced HVAC equipment concepts; low emission burner design; Thermophotovoltaic power generation (TPV); and Computational Fluid Dynamics (CFD) applications.

