Department of Mechanical Engineering Colloquium

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

The Department of Mechanical Engineering
Presents

Derek Dunn-Rankin, Ph.D.

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Department of Mechanical & Aerospace Engineering
UC Irivine

Friday, May 23
11:10 AM - 12:00 PM
Winston Chung Hall 205/206

Direct combustion of methane clatherates

Abstract:

Gas hydrates (clathrates) are ice-like crystalline solids that encapsulate guest gas molecules. It has become known that a significant methane storehouse is in the form of methane hydrates on the sea floor and in the arctic permafrost. To better understand the important implications of direct utilization of fuel clathrates, this presentation describes the combustion behavior of methane as it is released from the clathrate cages of a methane hydrate, describing in particular the rate-of-ice melt and water evaporation during the hydrate burn. Experimental and theoretical methods are used to estimate the heat transfer from the flame into the hydrate and to calculate the amount of energy released to sustain the flame. Chemical kinetic effects of high levels of water vapor on the fuel side of diffusion flames, as occurs in methane hydrate combustion, are also discussed. Finally, the presentation also describes briefly the development of a unique facility at UCI, the Deep Ocean Power Science Laboratory. This facility is a joint effort between the School of Engineering and the School of Physical Sciences and is dedicated to exploring the opportunities for power science in the deep ocean environment.

About the Speaker:

Derek Dunn-Rankin is Professor and Chair in the Department of Mechanical and Aerospace Engineering at the University of California, Irvine (UCI). He is also co-Director for CAMP, the California Louis Stokes Alliance for Minority Participation, a program designed to increase minority representation in science and technology. Professor Dunn-Rankin received his Ph.D. degree (1985) from the University of California, Berkeley, with an emphasis in combustion science. He was a post-doctoral researcher at Sandia National Laboratories Combustion Research Facility in Livermore until 1987, when he joined the faculty of Mechanical Engineering at UCI. Dr. Dunn-Rankin's research is in combustion and energy, droplet and sprays, and applications of laser diagnostic techniques to practical engineering systems, with recent emphasis on electrical aspects of flames, and the direct combustion of methane hydrates. He received a National Science Foundation Presidential Young Investigator Award in 1989, the Society of Automotive Engineering Ralph R. Teetor Engineering Educator Award in 1991, a Fulbright Scholar Fellowship in 1997, a Japan Society for the Promotion of Science Fellowship in 2008, and the Oppenheim Prize of the Institute for the Dynamics of Explosions and Reactive Systems in 2013.