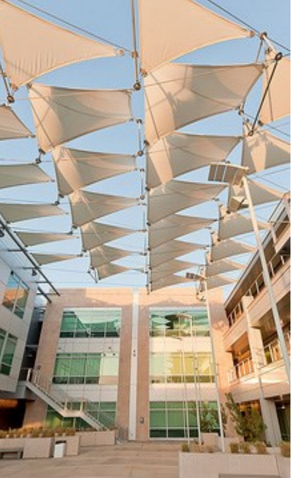

Department of Mechanical Engineering Colloquium

UC RIVERSIDE
UNIVERSITY OF CALIFORNIA

The Department of Mechanical Engineering

PRESENTS

Jorge L. Alvarado, Ph.D.

Department of Engineering Technology and Industrial Distribution
Department of Mechanical Engineering (joint-appointment)
Texas A&M University, College Station, 77843, TX

Friday, April 29, 2016
WCH Room 205/206
11:10-12:00PM

Experimental and Numerical Characterization of Heat Transfer Behavior and Crown Propagation Dynamics Induced by Droplet Impingement

Abstract:

In this study, hydrodynamics and heat transfer characteristics of a liquid droplet train impinging on a pre-wetted solid surface have been investigated experimentally and numerically. Specifically, the effects of high Weber number, droplet impingement frequency, droplet diameter and droplet velocity on liquid film hydrodynamics and heat transfer have been evaluated using state-of-the-art experimental instrumentation. Recently, crown propagation events were imaged using a high-speed camera system given the high frequency of droplet impingement. The high-frequency droplet impingement process was also simulated numerically using CFD software. Crown propagation dynamics were evaluated and analyzed experimentally and numerically. As a result, a revised theoretical crown propagation model based on numerical results has been proposed, which takes into account the radial velocity distribution within the impinged liquid film at the moment of initial spot formation. The revised theoretical crown propagation model gives accurate predictions, which are in good agreement with the experimental results. Recently, the effects of double droplet streams on heat transfer and film hydrodynamics have been studied experimentally and computationally. Results to date show that Weber number and droplet spacing are key parameters in the development of effective droplet impingement schemes for a host of applications.

About the Speaker:

Dr. Jorge Alvarado is an associate professor in the Department of Engineering Technology and Industrial Distribution at Texas A&M University (TAMU). He holds a joint-appointment in the Department of Mechanical Engineering at TAMU. He teaches courses in the areas of thermal sciences, fluid mechanics, and fluid power. Dr. Alvarado's research interests are in the areas of nanotechnology, nano- and micro-scale heat transfer, electronic cooling, phase change materials, thermal storage, bio-fuel combustion, and energy conservation in buildings. He received his BS degree in mechanical engineering (1991) from the University of Puerto Rico at Mayagüez; MS (2000) and PhD (2004) degrees in mechanical engineering from the University of Illinois at Urbana-Champaign.

He has worked and collaborated with the U. S. Army Corps of Engineers, Office of Naval Research (ONR), Kobe University, and the University of Wisconsin at Madison, among others. Recent research work involves enhanced condensation using hybrid surfaces with hydrophobic and hydrophilic properties, characterization of microencapsulated phase change material slurry and nanofluids as heat transfer fluids, as well as the study of spray and droplet impingement cooling using nanostructured surfaces. His publication record includes scholarly articles in journals such as Applied Physics Letters, International Journal of Heat and Mass Transfer, Journal of Heat Transfer and Numerical Heat Transfer among others. He is a member of the American Society of Mechanical Engineers (ASME), American Society of Thermal and Fluid Engineers (ASTFE), and the American Physical Society (APS).