IOWA STATE UNIVERSITY
Department of Mechanical Engineering

Richard and Carol Pletcher Seminar Series

Heat Transfer Challenges in Solar-Thermal and Air-Cooled Electric Power Generation

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Seminar host: Abhijit Chandra

Abstract

Utility-scale solar-thermal electric power generation requires development of energy storage strategies in order to deliver clean power in a cost-effective manner. Similarly, large scale electric power generation using either conventional or unconventional heat sources consumes huge quantities of water, and new approaches are needed to develop cost-effective air cooling strategies.

This presentation will describe recent fundamental and applied research that could lead to significant reduction of thermal resistances that plague both (i) thermal energy storage using phase change materials in conjunction with solar-thermal power generation, and (ii) air cooling of large Rankine cycle plants. Specifically, the opportunities associated with usage of heat pipes, which are passive devices that pose ultra-low resistances to heat transfer, are presented and discussed.

Dr. **Theodore Bergman** received his Ph.D. and M.S. degrees from Purdue, and his B.S. from the University of Kansas (KU). He returned to KU in 2012 and served as Chairman until 2017. He was previously a faculty member at the University of Connecticut (1996 – 2012) and The University of Texas at Austin (1985 –1996). From 1998 to 2004 he was Head of the ME Department at UConn and served as Associate Dean of Engineering for Research and Outreach in 2004 and 2005, also at UConn. He directed the Thermal Transport Processes Program at the National Science Foundation from 2008 to 2010, and also served as Interim Director for the Energy for Sustainability and Combustion and Fire Systems Programs while at NSF. Bergman worked at Black & Veatch early in his career, designing the cooling systems for large electric power generation stations.

Dr. Bergman is a co-author of several widely-used heat transfer texts, has served as an Associate Editor of the ASME Journal of Heat Transfer and Frontiers in Heat Transfer, and has received a number of awards including the NSF Presidential Young Investigator Award and the ASME Melville Medal. A Fellow of ASME since 1995, he has published over 130 refereed articles.

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.

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The Richard and Carol Pletcher Seminar Series was established in 2016 with support from the Pletcher family. Richard "Dick" Pletcher served on the ME faculty at Iowa State from 1967 to 2007. During his tenure Dr. Pletcher made countless research contributions to the fields of fluid dynamics and heat transfer, including co-authoring the popular Computation Fluid Mechanic and Heat Transfer *textbook.*