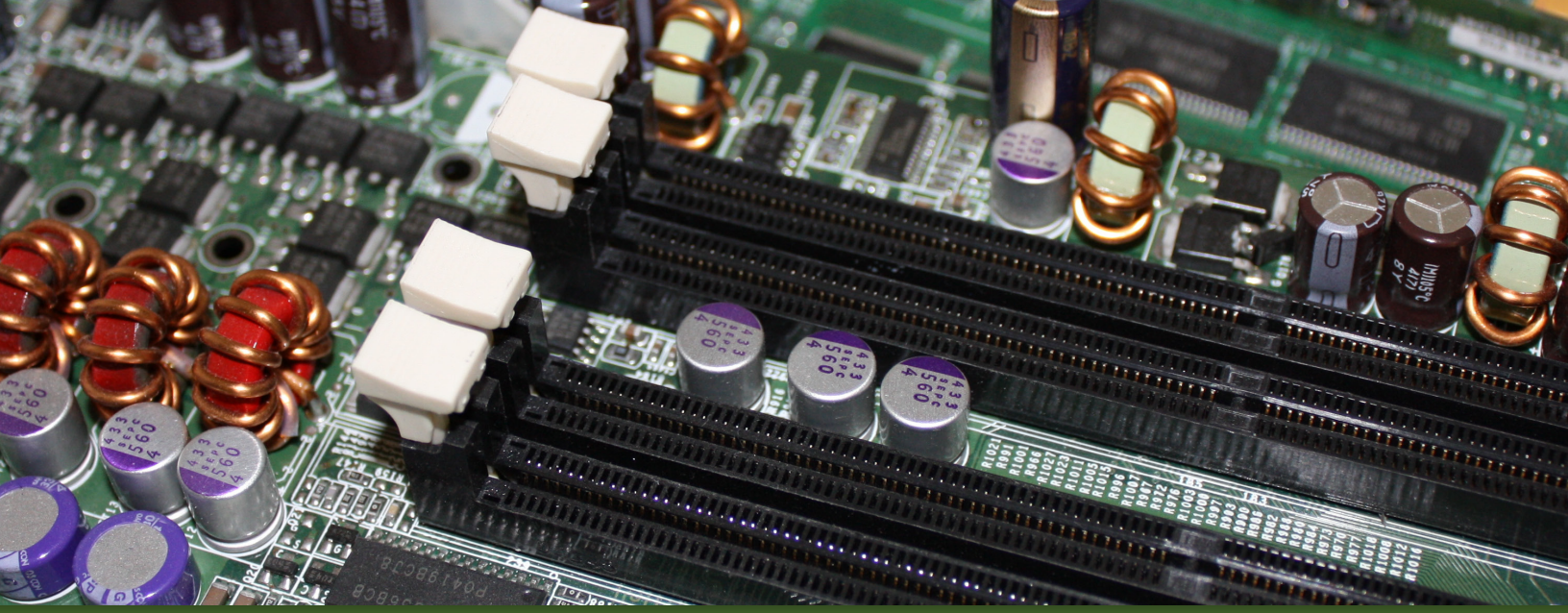

Pre-Summit Short Course

Thermal Management of Electronics –
Calculations, Measurements, Simulation, Review and Selection of Cooling Options

October 4, 2011
Cambridge, MA

Design engineers are dealing with more heat problems than ever before and the task of mitigating those thermal issues within cost and time constraints have never been more challenging. Please join Dr. Kaveh Azar, a global electronics cooling expert and the President and CEO of Advanced Thermal Solutions, Inc. in a full day thermal management presentation that will provide an introduction to electronics thermal management for current and next-generation electronics.

Goal
To provide the audience with the fundamentals of thermal management and explore the salient features and the benefits/short-falls of varied cooling options - from simple air cooling to high capacity refrigeration.

Who Should Attend?
"Thermal Management of Electronics – Calculations, Measurements, Simulation, Review and Selection of Cooling Options" is specifically tailored for engineers who require a principal understanding of electronics thermal management and need practical, focused methods for identifying optimal cooling solutions. This seminar is also suited to project managers, chief technical officers and other who want insight into the thermal design issues that affect product performance.

How to Register
The cost to attend the day-long short course program on October 4, 2011 is $795.00, with a discounted rate of $695.00 if registered by September 9, 2011. Space is limited and advanced registration is required.

To register for the short course, please visit www.coolingzone.com
For more information, please contact Debbie at 508-329-2021 or registration@coolingzone.com

Course Agenda

The seminar runs from 8:00 a.m. to 6:00 p.m. and includes a continental breakfast, lunch, and afternoon refreshments.

Morning Session - 4 hours

Attendees will be taken from the basic definition of electronics cooling and why thermal management is required; to how to calculate certain parameters; to how to accurately measure them; and to where and how to use simulation tools like CFD, for effective thermal management. These include:

- **Fundamentals of Electronics Cooling**
  What it is; why it needs to be considered; how it is approached and what needs to be considered.
- **Required Calculations in Thermal Management**
  A set of calculations and respective procedures for analytical modeling of components, boards and systems.
- **Effective Characterization – The Role of Measurement in Thermal Management**
  Basic principles of measurement are examined and proper practices for temperature, velocity, pressure and heat flux are reviewed.
- **The Role of Software in Thermal Management—CFD Simulation**
  Understanding the fundamentals of CFD simulation and reviewing the best practices in modeling electronic components, boards and systems.

Afternoon Session - 5 hours

This session is designed to provide the attendees with features, selection and salient characteristics of different cooling systems. These include: selection and design of heat sinks and thermal interface materials, fan selection and characterization, and their role in electronics cooling. The use of vapor chambers and jet impingement for cooling of high power components and boards will also be reviewed. The session ends with an extensive review of cooling solutions that has been developed from vacuum tube to modern high power electronics. These include:

- **Heat Sink Design and Thermal Interface Selection**
  This topic will feature a review of the process of heat sink design and selection and the role of thermal interface material in cooling of electronic components.
- **Fan Characterization and Its Deployment in Electronic Systems**
  This session will involve a review of fan types, their characteristics and best deployment practices. This will include an examination of how fan characterization is done and how to use fan curves for fan selection.
- **Vapor Chamber and Jet Impingement For Thermal Management of High Power Electronics**
  A review of the design and operations of vapor chambers and how they are deployed in electronics components will be conducted. Also included will be a look at jet impingement characteristics and its heat transfer benefits/shortfalls in tough-to-cool electronics.
- **Review of Salient Features of Market-Developed Cooling Solutions**
  In this period, an exhaustive review of cooling solutions that have been developed across the electronics industry will be presented. The review starts at the vacuum tube era and continues through to today's sophisticated electronics. This presentation will encompass all market sectors: from LEDs and consumer electronics to space and military applications.

About the Speaker

Kaveh Azar, Ph.D.

Dr. Kaveh Azar is the President and CEO of Advanced Thermal Solutions, Inc. (ATS), a leading edge thermal management company involved in developing liquid and air cooling solutions for the telecomm and computing market sectors. Under Dr. Azar's leadership, ATS has expanded globally with offices in Europe and Asia, and has become the leading supplier of cooling solutions and thermal management consulting to the telecomm market sector. Prior to ATS, Dr. Azar was the founder and manager of Lucent Technologies thermal management center, responsible for developing the next generation of cooling systems. In addition, Dr. Azar has authored Lucent's thermal roadmap and served as the corporate thermal consultant. While at Lucent, he developed a state-of-the- art thermal/fluids laboratory for simulation of components, boards and systems. Since 1985, Dr. Azar has been an active participant in electronics thermal community and has served as the organizer, general chair and the keynote speaker at the national and international conferences sponsored by ASME, IEEE and AIAA. He has also been an invitee to national bodies such as NSF, NIST and NEMI for organizing government and industry research goals in electronics cooling. Dr. Azar has been an adjunct professor at a number of universities in the USA, and lecturers worldwide on different facets of electronics cooling. He holds more than 31 national and international patents, has published more than 73 articles, 3 book chapters and a book entitled, "Thermal Measurements in Electronics Cooling" and has edited a 5 book series, "Qpedia – Electronics Thermal Management." In addition, he served as the Editor-in-Chief of Electronics Cooling Magazine for eleven years, and is currently the publisher of Qpedia, a monthly publication dedicated to thermal management of electronic systems. Dr. Azar has received several recognitions within Bell Labs and other entities that include Bell Labs' President Silver Award, Strathmore's Who's Who, The Uptime Institute for Visionary Leadership and IEEE SEMITHERM Significant Contributor Award in thermal management of electronics systems.

Register Now

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International Business and Technology Summit

Thermal Management of Electronics

Emerging Technologies for Advanced Cooling of Electronic Systems

October 5 - 6, 2011 | Cambridge, MA