COURSE OVERVIEW

Heat Pipes and Two-Phase Thermosyphons are highly efficient heat transfer elements which utilize liquid-vapour phase change latent heat transport. They have found wide-spread application, ranging from microelectronics cooling in computers and satellites to large-scale waste heat recovery in various industries and power stations. Their modus operandi comprises a multitude of physical phenomena like surface physics, microscale heat and mass transfer, two-phase fluid mechanics and materials compatibility. These devices can be designed in a variety of geometrical shapes and dimensions (from very small cylindrical ball pen size tubes and thin flat plates over complex three-dimensional geometries to huge drum or box type elements and very long (over 100 m) cylindrical elements.

Due to their construction and operation principle and their geometrical design, a multitude of thermal tasks can be accomplished, besides highly efficient heat transport for cooling and heating applications, also special tasks like heat flux transformation, provision of isothermal spaces, thermal diode behaviour and many more.

The lecture course will give an introduction into the physics and operational behaviour of Heat Pipes and Two-Phase Thermosyphons and provide elementary tools for analysis and design of these systems. The most important types are discussed in some detail, and a rather comprehensive overview on technical applications is given.

COURSE CONTENT

- Definition of heat pipe and two-phase thermosyphon; historical overview on development of heat pipe and two-phase thermosyphon science and technology
- Classical heat pipe: operation principle, working fluids, structural materials, wick designs; thermodynamics, heat transfer and fluid dynamic basics, performance limits, figure of merit, thermal network model (performance modeling)
- Micro heat pipe: definition, geometries, operation principle, performance limit. Variable conductance heat pipe (VCHP): operation principle, designs (non-feedback control, feedback control), design (gas control, liquid control, vapour control), performance calculation, temperature control quality
- Thermal diode: operation principle, designs, performance characteristics. Capillary pumped loops (CPL) and loop heat pipes (LHP): operation principle, designs, performance modeling, figure of merit
- Anti-gravity heat pipe: operation principle, designs. Pulsating heat pipe (PHP): operation principle, designs (open loop, closed loop), flow patterns, performance limit
- Rotating heat pipe: operating principle, designs. Classical two-phase thermosyphon: operation principle, thermodynamics, heat transfer and fluid dynamic basics, flow patterns, performance limits, figure of merit, thermal network model (performance modeling)
- Applications: Permafrost stabilization and de-icing, waste heat recovery/heat pipe heat exchangers, cooling of electric motors, micro and power electronics components, Cooling of electric motors, micro and power electronics components, solar energy utilization (solar collectors, solar receivers), isothermal furnaces, calibration devices

OBJECTIVE

- ✓ To provide an understanding of the underlying physical principles of these heat transfer devices
- ✓ To provide the basis for design and performance calculation (modeling) of these devices
- ✓ To communicate the great variety of application possibilities of these devices in a wide field of practical/commercial thermal management tasks. This application-oriented aspect shall be supported by practical design examples

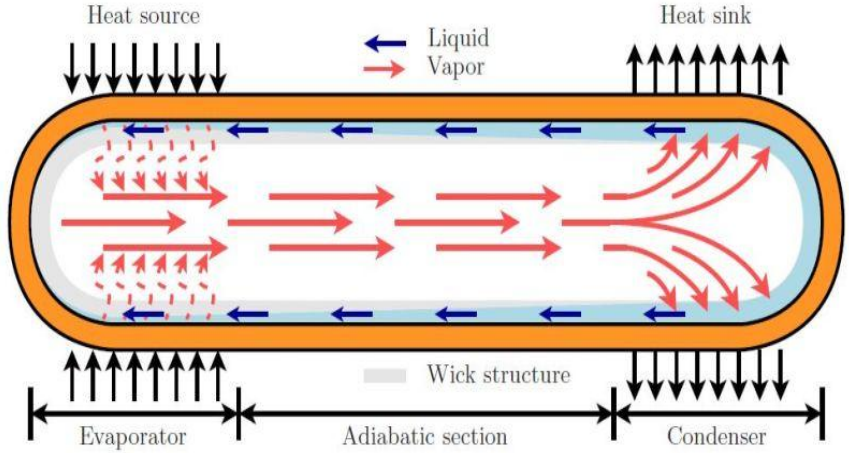
Global Initiative of Academic Networks

Two Weeks Course

on

Introduction to Heat Pipe Science and Technology

December 6-19, 2016



Ministry of Human Resource Development, Government of India

Discipline of Mechanical Engineering

Indian Institute of Technology Indore

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TEACHING FACULTY

Prof. Manfred Groll is emeritus professor of University of Stuttgart, Germany. His research interests include heat pipes and two-phase thermosyphons, including micro and pulsating heat pipes; enhanced two-phase heat transfer, including micro heat transfer in pool and flow boiling; hydrogen storage, sorption heating and cooling systems employing metal hydrides; and nuclear safety. He has supervised/co-supervised 72 doctoral dissertations and has contributed over 360 papers in the area of thermal engineering and energy technology.

During 1975/76 he worked for two years at NASA Ames Research Center, Moffett Field, CA, USA on the development of heat pipe technology for satellite applications. He is Founding Member of the Committee on International Heat Pipe Conferences (1973), acted as Committee Chairman from 1990 till 2004, and since 2004 he is Honorary Chairman. In 2013 he has been awarded the prestigious George Grover Medal for outstanding contribution to the development of heat pipe science and technology.

COURSE COORDINATOR

Dr. E. Anil Kumar is an Associate Professor of Indian Institute of Technology, Indore. His research interests are Metal hydride based energy conversion and storage systems, CO_2 adsorption and resorption cooling and heating systems.

WHO SHOULD ATTEND?

- Undergraduates, M.Tech/M.Sc, and PhD science stream students. Any student with a basic background in thermodynamics/fluid dynamics will be able to follow these lectures and gain valuable information
- B.Tech/B.Sc and M.Tech/M.Sc level teachers who wish to update their knowledge in an important special field of heat transfer
- Executives, engineers and researchers from industry, service and government organizations including R&D laboratories who are engaged in thermal management problems.

REGISTRATION

For registration Please visit site http://iiti.ac.in/GIAN/, click on upcoming courses@GIAN - Click for course registration

Registration Fee:

Students (UG/PG): Rs. 2,000

Research Scholars: Rs. 3,000

Faculty Members: Rs. 5,000

Foreigners: USD 250

Industry and Others: Rs. 10,000

IMPORTANT DATES

Last date of Registration: November 30, 2016

Course Schedule: December 6-19, 2016

TRAVEL INFORMATION

Indore located in Central part of India in Madhya Pradesh State. It will well-connected by rail, road and air. The nearest railway station is Indore Junction and the nearest Airport is Devi Ahilyabai Holkar Airport. For queries regarding travel information, please contact the course coordinator.

ACCOMMODATION

Paid accommodation will be provided to participants on first-come-first-serve basis.

CONTACT DETAILS

For any information regarding eligibility fee payment, travel information, accommodation, etc., please contact the course coordinator via e-mail or phone.

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