International Conference on Recent Trends in Mechanical Engineering
International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

Experimental Studies on Oscillating Heat Pipe using conventional and Nano Fluids

Parashuram A K[1], K. RamaNarasimha[2], K. Gopalakrishna[3]

[1]Department of Mechanical Engineering, K S Institute of Technology, Bangalore-560062, Karnataka, India

[2]Department of Mechanical Engineering, K S School of Engineering and Management, Bangalore -560062, Karnataka, India

[3]Department of Mechanical Engineering, Jyothy Institute of Technology, tataguni off kanakapura road, Bangalore - 560082, Karnataka, India

ABSTRACT

Oscillating heat pipe (OHP) cooling is the new and emerging technique in the field of thermal management of electronics. In the present work, transient and steady state experiments are conducted on a multi turn closed loop OHP. Evaporator and condenser wall temperatures are measured. Copper is used as the capillary tube material in the evaporator and condenser sections with inner diameter of 1.5 mm and outer diameter of 3 mm. The total length of the closed loop pulsating heat pipe is 2040mm. The experiments are conducted in vertical orientation for different heat loads varying from 20 W to 40 W in steps of 5W. The OHP is tested with different working fluids viz. Acetone, water, SWCNT and Graphene. The performance parameters such as temperature difference between evaporator and condenser, thermal resistance and the overall heat transfer coefficient are evaluated. The experimental results demonstrate that SWCNT& Graphene particle based Nano fluid is the better working fluid among the working fluids considered in terms of lower thermal resistance and higher heat transfer coefficient. The multi loop OHP is found to perform better for all heat loads & working fluids considered.

Keywords: Nano fluids, oscillating heat pipe, experimental studies, thermal performance

I. INTRODUCTION

Thermal management is the challenge of the day in electronic product development. Presently, the chip heat flux level ranges between 40 to 120 W/cm^2. It is expected to increase to 200 W/cm^2 in the next few decades. Several cooling methods are employed to cool the electronic devices. Heat Pipe is being explored for electronic cooling devices with promising results. Even though the conventional heat pipes are excellent heat transfer devices their application ismainly confined to transferring small amount of heat over relatively short distances.