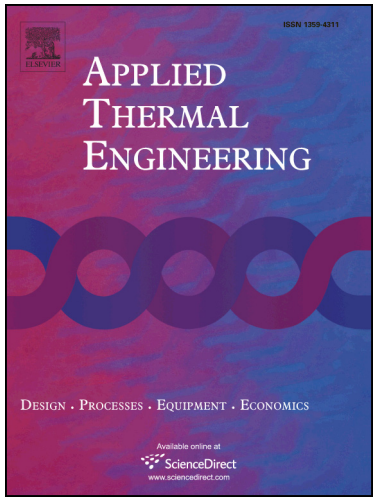

Thermo-Mechanical Design and Characterization of Flexible Heat Pipes

Tanmay Jaipurkar, Pushpit Kant, Sameer Khandekar, Bishakh Bhattacharya, Siddharth Paralikar

PII: S1359-4311(17)30196-5
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2017.01.036
Reference: ATE 9800

To appear in: *Applied Thermal Engineering*

Received Date: 27 October 2016
Revised Date: 6 January 2017
Accepted Date: 10 January 2017

Please cite this article as: T. Jaipurkar, P. Kant, S. Khandekar, B. Bhattacharya, S. Paralikar, Thermo-Mechanical Design and Characterization of Flexible Heat Pipes, *Applied Thermal Engineering* (2017), doi: http://dx.doi.org/10.1016/j.applthermaleng.2017.01.036

Thermo-Mechanical Design and Characterization of Flexible Heat Pipes

Tanmay Jaipurkar[1], Pushpit Kant[1], Sameer Khandekar[1*],
Bishakh Bhattacharya[1], Siddharth Paralikar[2]

[1] Department of Mechanical Engineering,
Indian Institute of Technology Kanpur, Kanpur, 208016, India

[2] Golden Star Technical Services Pvt. Ltd., Pavana Complex,
A39/T204, M.I.D.C., Bhosari, Pune - 411 026, India

[*] Corresponding author: Tel (+91)-512-2597038, Fax (+91)-512-2597408, E-mail: samkhan@iitk.ac.in

Abstract

The paper describes the ongoing design, development, testing and characterization of the thermal and mechanical performance of flexible wicked heat pipes, with typical heat handling capacity of about 60 W, water as the working fluid, length of 270 mm and having internal diameters = 10 mm and 6 mm, respectively. The heat pipes are being designed for passive thermal management, wherein heat transfer is required to be coupled with vibration isolation between the evaporator and condense sections. This prevents the heat pipe, the thermal load, and the heat sink, from getting damaged under required operating conditions. Moreover, precision positioning of thermal load/device is also maintained. The flexibility is provided in the adiabatic section of the heat pipe using a flexible metallic bellow. Experiments are performed to get the axial and angular stiffness of the bellows used and its mechanical response under static loads. A finite element model for the bellow is developed and it is benchmarked against experiments and available design equations. Successful thermal performance for heat pipes under different operating conditions, including bend configurations, is reported and bellow design procedure is outlined.

Keywords*: Flexible wicked heat pipe; Metallic bellows; Thermal performance; Axial and radial stiffness; Design procedure.*