

Accepted Manuscript

The results of comparative analysis and tests of ammonia loop heat pipes with cylindrical and flat evaporators

Y.F. Maydanik, S.V. Vershinin, M.A. Chernysheva

PII: S1359-4311(18)33484-7
DOI: <https://doi.org/10.1016/j.applthermaleng.2018.08.022>
Reference: ATE 12525

To appear in: *Applied Thermal Engineering*

Received Date: 4 June 2018
Revised Date: 1 August 2018
Accepted Date: 7 August 2018

Please cite this article as: Y.F. Maydanik, S.V. Vershinin, M.A. Chernysheva, The results of comparative analysis and tests of ammonia loop heat pipes with cylindrical and flat evaporators, *Applied Thermal Engineering* (2018), doi: <https://doi.org/10.1016/j.applthermaleng.2018.08.022>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



The results of comparative analysis and tests of ammonia loop heat pipes with cylindrical and flat evaporators

Y.F. Maydanik, S.V. Vershinin, M.A. Chernysheva

Institute of Thermal Physics, Ural Branch of the Russian Academy of Sciences, Amundsen St.107a, Yekaterinburg, 620016, Russia

E-mail: mariya@itp.uranl.ru

Abstract

Comparative analysis and tests of ammonia loop heat pipes (LHPs) with a flat disk-shaped evaporator 40 mm in diameter and a cylindrical evaporator 10 mm in diameter equipped with a 40 mm × 40 mm × 12.2 mm copper interface were conducted. Both evaporators had the same heated surface 12.56 cm² in size. The length and the diameter of the vapor line and the condenser were also equal. Tests of LHPs were conducted at +90°, 0°, -90° angles with respect to gravity and identical condenser cooling conditions at +20 °C heat sink temperature. For the cylindrical evaporator, the maximum heat load of 400 W (31.8 W/cm²) was reached at a junction temperature of 86.5 °C. For the flat evaporator, the maximum value of heat load was 320 W (25.5 W/cm²) at a junction temperature of 91 °C. For the cylindrical evaporator, the minimum value of thermal resistance of 0.064 °C/W was reached at maximum heat load. For the flat evaporator, it was 0.067 °C/W at 180 W heat load. As orientation was shifted, the value of the maximum heat load fluctuated by no more than 20-25 % for both devices, while the value of the minimum thermal resistance fluctuated by no more than 4 % for cylindrical evaporator and no more than 12 % for flat one.

Keywords: Loop heat pipe, evaporator, heat load, thermal resistance, heat flux, electronics cooling

1. Introduction

Loop heat pipes (LHPs) are passive heat transfer devices which operate on a looped evaporating-condensing cycle and employ a capillary mechanism for moving the working fluid. These devices were first developed in the 1970s for use in thermal control systems in aerospace applications [1]. The main advantages of LHPs are high heat transfer capacity at any orientation in the gravitational field and in zero-gravity, low thermal resistance, and adaptability for various

Download English Version:

<https://daneshyari.com/en/article/10127270>

Download Persian Version:

<https://daneshyari.com/article/10127270>

[Daneshyari.com](https://daneshyari.com)