

PERFORMANCE CHARACTERIZATION AND MODEL VERIFICATION OF A LOOP HEAT PIPE

Mike Pauken and José I. Rodriguez

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California, USA 91109

Abstract

A simple Loop Heat Pipe with a single evaporator and condenser was tested and modeled with two different working fluids: ammonia and propylene. While ammonia exhibits many desirable heat transfer characteristics, its freezing point is too high to prevent freezing in the condenser lines during a safing mode on a satellite platform. Consequently, propylene makes a good compromise since it has a lower freezing point and relatively good heat transfer properties. A test program was developed to compare the performance degradation of a propylene LHP versus an ammonia LHP.

The performance of the propylene LHP was characterized by a series of tests with heat loads of 10 to 200 watts placed on the evaporator. The ammonia filled LHP was tested with heat loads of 10 to 800 watts to the evaporator. The removal of those heat loads occurred at sink temperatures on the condenser ranging from -10°C to 20°C . The LHP was also tested in a horizontal and a vertical orientation.

The steady state and transient performance data of the LHP was used to validate a nodal network model of the device. A comparison of the evaporator temperature as a function of evaporator heat load was made between the model predictions and collected data.

José I. Rodriguez
Jet Propulsion Laboratory
MS 157-316, 4800 Oak Grove Dr.
Pasadena, CA 91109-8099

Phone:(818) 354-0799
Fax (818) 393-4206
email: jose.i.rodriguez@jpl.nasa.gov