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COMPUTATIONAL MODELLING OF HEAT TRANSFER IN A SPACECRAFT HEAT PIPE.

Abstract

Spacecraft Heatpipe transient operation is numerically modeled. The numerical model presented in this work includes Computational modeling for axisymmetric heat and momentum equations of a fluid flowing through a heat pipe. A special form of diffusion convective heat transfer equation and Navier stokes equations are presented using appropriate assumptions, Initial and boundary conditions. Temperature distribution and profiles of the heat pipe are obtained in terms of axial and radial positions. An axisymmetric two-dimensional mathematical model, which considers adequately the capillary driven convection as well as the effect of the interaction between the flow field and the liquid–vapor interface on the position of the interface and the curvature of menisci, is also developed to investigate the effect of porous structure parameters on the wick's performances without gravity. This simplified model has been validated for each spacecraft heat pipe operating mode for various operating conditions. The model could be a useful tool for the design and simulation of a spacecraft heat pipe. The simulated results show that the method can be further used to optimize the design of a spacecraft heat pipe.