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NUMERICAL INVESTIGATION OF THE INFLUENCE OF GEOMETRY ON THE THERMAL PROPERTIES OF A HEAT PIPE

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ABSTRACT

The unique property of a very high heat transfer rate in heat pipes, which originates from the phase change of a high latent heat working fluid, has led to their use in a wide range of engineering applications such as electronics cooling, heat exchangers, spacecraft and satellites etc. The zero-power demand, low weight, compactness and reliability further the benefits of their use. A small amount of working fluid inside a sealed pipe is used to transport heat with a slight temperature difference between the evaporation and condensation segments. The recirculation of fluid is realized through a wick structure and driven by capillary forces. In order to investigate the influence of the shape of the heat pipe on the rate of heat transfer, a numerical test was performed on two types of flat geometry heat pipes – square and hexagonal shaped, as well as circular and ellipsoidal shaped. The parameters of interest were pressure and temperature distribution, velocity in condensation direction and thermal conductivity distribution. Results indicate that the difference in geometry causes differences in all observed parameters, and thus significantly affects the thermal properties of the heat pipe.

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