ANALYTICAL SOLUTION FOR PREDICTING HEAT PIPE PERFORMANCE [+]

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Abstract:

Analytical assessment of heat pipe's thermal performance is the objective of the present work. A new direct and explicit thermophysical term is essentially proposed for the first time, based on the main role of heat pipe's effective thermal conductance. This work provides a unique view into preference and selection of heat pipes of different designs, or between wicking and wickless heat pipes. Calculation of the derived Preferential Factor is mainly classified on the basis of application's purpose. Three main computational classifications are distinguished: sizing design, end differential temperature and thermal rating, in fhis tendency, analysis of influence of some dimensionless parameters on effective thermal conductivity (K) and preferential factor (PF) is considered for conventional cylindrical heat pipe and closed two-phase thermosyphon, at various working fluids: water (H_2O), heptane (C_7H_{16}) and ethanol (C_2H_5OH). The corresponding affecting parameters include: operational temperature, length ratio, wick structure thickness (number of wick layers), thermosyphon liquid fill ratio and envelope material. The results indicated significant generic controlling parameters and specific limiting values. In the range of the three classified design cases and studied conditions. Changing the type of tube material, has no effect on preferential factor, while influence of working fluid type is different, and ethanol exhibits higher and sudden changes.