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Numerical Investigation of Wire Mesh Heat Pipe for Spacecraft Applications

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Abstract : Wire Mesh Heat Pipe (WMHP) as an effective component of thermal control system in the payload of spacecraft, utilizing ammonia to transfer efficient amount of heat. One dimensional generic and robust mathematical model with partial-analytical hydraulic approach (PAHA) is developed to study inside behaviour of WMHP. In this model, inside performance during operation is investigated like mass flow rate, and velocity along the wire mesh as well as vapour core is modeled respectively. This numerical model investigate heat flow along length, pressure drop along wire mesh as well as vapour line in axial direction. Furthermore, WMHP is modeled into equivalent resistance network such that total thermal resistance of heat pipe, temperature drop across evaporator end and condenser end is evaluated. This numerical investigation should be carried out for single layer and double layer wire mesh each with heat input at evaporator section is 10W, 20 W and 30 W at condenser temperature maintained at 20˚C.

Keywords : ammonia, heat transfer, modeling, wire mesh
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