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Design of a Two-Phase Loop Thermosyphon for Telecommunications System (Ⅱ)
— Analysis and Simulation —

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A computer simulation is performed for a two-phase loop thermosyphon for the B-ISDN telecommunications. The aim of this code development is to provide capabilities to predict the affects of many variables on the performance of the proposed TLT system using different empirical correlations obtained from the literature for the evaporation and condensation, and the shape factors available. In the present study, the simulation code is based on the sectorial thermal resistance network built on the flow regimes of the two-phase flows involved. The nodal resistances are solved by the typical Gauss-Seidal iteration method. The code can predict whether the proposed design is possible based on the flooding limit calculation of the system and its results are compared with the experimental results.

Key Words: Thermosyphon, Sectorial Thermal Resistance, Simulation, Two-Phase Flow, Shape Factor

Nomenclature

A	: Area (m^2)
A_f	: Flow area occupied by liquid phase (m^2)
A_g	: Flow area occupied by vapour phase (m^2)
a	: Evaporator thickness (m)
A_x	: Cross sectional area (m^2)
b	: Evaporator width (m)
C	: Parameter
C_{pl}	: Specific heat of saturated liquid (J/kg K)
C_{SF}	: A constant on Rohsenow's pool boiling correlation
D	: Outer diameter of tube (m), parameter
d	: Iinner diameter (m)
D_h	: Hydraulic diameter (m)
F	: Frictional parameter
f	: Friction factor
G	: Mass flux (kg/m^2s)
g	: Acceleration due to gravity (m^2/s)
H	: Specific enthalpy (J/kg)
h	: Heat transfer coefficient (W/m^2K), evaporator depth (m)
H_{fluid}	: Specific enthalpy of fluid (J/kg)
H_f	: Specific enthalpy of saturated liquid (J/kg)
H_{fg}	: Latent heat of evaporation (J/kg)
k	: Thermal conductivity (W/m K)
L	: Length (m)
Nu	: Nusselt number
ΔP_a	: Acceleration pressure drop
ΔP_f	: Frictional pressure drop
ΔP_h	: Hydraulic pressure drop
P	: Pressure (Pa)
$(dP/dy)_p$	: Pressure gradient
Pr	: Prandtl number
Q	: Heat transfer rate (W)
q	: Heat flux (W/cm^2)
R	: Resistance (K/W)
r	: Radius (m)
Ra	: Rayleigh number
Re	: Reynolds number
S	: Shape factor, difined as eqn. (2)

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