

Steady State Natural Convection in Vertical Heated Rectangular Channel between Two Vertical Parallel MTR-Type Fuel Plates

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Abstract : The aim of this paper is to perform an analytic solution of steady state natural convection in a narrow rectangular channel between two vertical parallel MTR-type fuel plates, imposed under a cosine shape heat flux to determine the margin of the nuclear core power at which the natural convection cooling mode can ensure a safe core cooling, where the cladding temperature should not be reach the specific safety limits (90 °C). For this purpose, a simple computer program is developed to determine the principal parameter related to the nuclear core safety such as the temperature distribution in the fuel plate and in the coolant (light water) as a function of the reactor power. Our results are validated throughout a comparison against the results of another published work, which is considered like a reference of this study.

Keywords : buoyancy force, friction force, natural convection, thermal hydraulic analysis, vertical heated rectangular channel

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