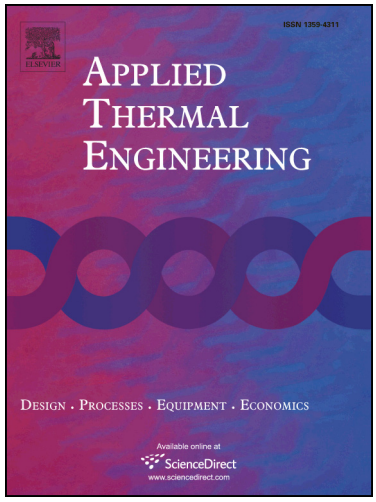

Numerical Analysis of Steady State Heat Transfer for Jet Impingement on Patterned Surfaces

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ABSTRACT

This analysis considers the steady state heating of a plate with a patterned surface under free liquid jet impingement. A constant heat flux was applied at the plate from the bottom while the top surface was cooled by liquid slot jet impinging perpendicular to the plate. Calculations were done for Reynolds number (Re) ranging from 500 to 1000 and indentation depths from 0.000125 to 0.0005 m for two different surface configurations. The effect of using different plate materials was explored for the rectangular step case. The distributions of the local and average heat transfer coefficient and the local and average Nusselt number were calculated for each case. It is seen that increasing the Reynolds number (Re) increases the local Nusselt number for all cases. It is observed that increasing the indentation depth for the rectangular surfaces leads to a decrease in local heat transfer coefficient whereas for triangular patterns, a higher depth results in higher heat transfer coefficient.

KEYWORDS

Steady state conjugate heat transfer, free jet impingement, patterned surfaces

NOMENCLATURE

a Indentation depth [m]