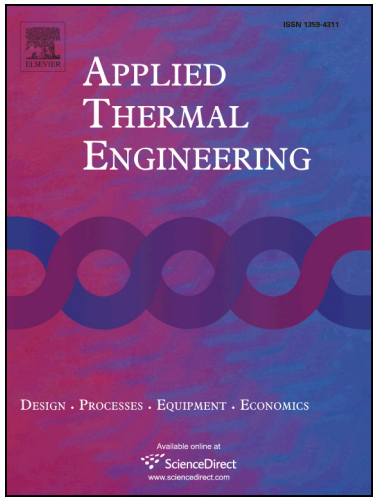

Research Paper

Influence of the nozzle shape on heat transfer uniformity for in-line array of impinging air jets

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Influence of the nozzle shape on heat transfer uniformity for in-line array of impinging air jets

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Abstract

The objective of the present work is to study the influence of nozzle shape on the uniformity of heat transfer for normal jets impinging on smooth flat surface. In the current study, in-line array of nozzles with different shapes, viz circular and square, with equivalent hydraulic diameter of 7.5 mm are used. The uniformity of heat transfer (U) is investigated at Reynolds numbers (Re) ranged from 2000 to 10,000 and the spacing distance (S/D_h) and the separation distance (H/D_h) are each varied from 2 to 8. The experimental results of the average heat transfer are found to be 7.8% higher for circular nozzles than that for square nozzles. The maximum values of local and average Nusselt numbers are obtained at spacing distance of 4 for circular nozzles. On the other hand, the uniformity of heat transfer is improved approximately by 10.7% for a square nozzles as compared to a circular nozzles. Furthermore, the experiments indicate that the uniformity of heat transfer is influenced significantly by the jet-to-jet distance than the jet to plate distance. This implementation presents empirical correlations to compute the average Nusselt numbers as well as the uniformity of heat transfer for both circular and square nozzles.

Keywords: Nozzle shape; In-line array; Impinging flat plate; Nusselt number; Uniformity of heat transfer.