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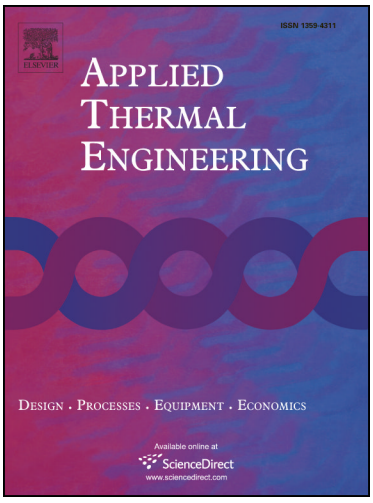

Flow and heat transfer of parallel multiple jets obliquely impinging on a flat surface

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Flow and heat transfer of parallel multiple jets obliquely impinging on a flat surface

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Abstract

The integrated flow fields of multiple interacting jets and oblique impinging flow have been investigated. The flow structure and heat transfer characteristics on the impinged surface are predicted through a comprehensive numerical transient simulation as well as an experimental oil flow visualization. The complicated multi-jet impinging flow is simulated by solving the unsteady Reynolds-averaged Navier-Stokes (RANS) equations with compressibility correction. The near-wall resolution is accomplished by employing an improved analytic wall function (AWF) approach. The oil flow testing is conducted to reveal the flow patterns of parallel multiple impinging jets, using a practical scarfing unit. The deformable oil trace has successfully reproduced the impinging grooves on the flat plate. The results indicated that the generated grooves on the impinged surface are mainly triggered by the multi-jet attraction and combination mechanism caused by the Coanda effect. The defined merging point (MP) location and impinging groove degree are employed to examine the multi-jet flow evolution and the corresponding impinging performance. The heat transfer characteristic on the impinged surface is highly dependent on Reynolds number, jet-to-jet spacing and jet-to-plate spacing. While the flow structure presents insensitive to Reynolds number.

Keywords: heat transfer; multiple jets; impinging jets; impinging groove.

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