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Proper Orthogonal Decomposition Analysis of Turbulent Jet Impingement on Rib-roughened Surface PRASANTH ANAND KUMAR LAM, ARUL PRAKASH KARAIYAN, Indian Institute of Technology Madras, Chennai, THERMO-FLUID DYNAMICS LABORATORY TEAM — A Proper Orthogonal Decomposition (POD) analysis on turbulent flow dynamics of confined slot jet impinging on rib-roughened surface is numerically investigated. The data for POD analysis has been obtained by solving mass, momentum and energy equations in Cartesian framework using Streamline Upwind/Petrov-Galerkin Finite element method. Further, turbulent kinetic energy (k) and its dissipation rate (ε) are modeled using standard k - ε turbulence model with standard wall functions. POD is applied to computational data for a wide range of Reynolds number (Re) = 5000 - 30000 and non-dimensional channel height (H/L) = 0.5 - 4.0 to reveal large scale vortical structures in the flow field. The simulated results demonstrate a better understanding on effect of turbulence and its influence on individual vortical structures for enhancement of heat transfer. The enhancement of heat transfer in stagnation region due to combined effect of oscillation in impingement position caused by large vortical structures and strong acceleration of fluid during impingement is quantified. Furthermore, non-dimensional correlations have been derived for pressure drop and Surface averaged Nusselt number.

Prasanth Anand Kumar Lam
Indian Institute of Technology Madras, Chennai

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