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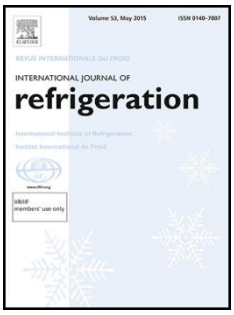

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Effect of Reynolds Number on Flow and Heat Transfer in Incompressible Forced Convection over a 3D Backward-Facing Step

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Highlights

- Periodic instability on heat transfer are clarified.
- The heat transfer is greatly enhanced with the increase of *Re*.
- Taking away the hot fluid and bringing cold fluid are identified.

Abstract

A three-dimensional incompressible numerical model for the case of the 3D backward-facing step flow is established to investigate the characteristics of fluid flow and heat transfer in the low and middle Reynolds number ranges ($200 \leqslant Re \leqslant 1400$). The governing equations, including continuous, unsteady Navier-Stokes and energy equations, are solved by the finite volume method in FLUENT. The simulation results show that the time averaged reattachment length reaches the peak value at $Re = 1000$, and subsequently decreases as the increase of *Re*. The formation of secondary peak *Nu* influenced by flow instability has a better contribution to the heat transfer at the center area. Taking away the hot fluid and carrying the cold fluid into the floor wall caused by periodic instability has positive effects on heat transfer enhancement.