Heat transfer to laminar flow over a double backward-facing step

Abstract

Heat transfer and laminar air flow over a double backward-facing step numerically studied in this paper. The simulations was performed by using ANSYS ICEM for meshing process and using ANSYS fluent 14 (CFD) for solving. The k-ε standard model adopted with Reynolds number varied between 98.5 to 512 and three step height at constant heat flux (q=2000 W/m2). The top of wall and bottom of upstream are insulated with bottom of downstream is heated. The results show increase in Nusselt number with increases of Reynolds number for all cases and the maximum of Nusselt number happens at the first step in compared to the second step. Due to increase of cross section area of downstream to generate sudden expansion then Nusselt number decrease but the profile of Nusselt number keep same trend for all cases where increase after the first and second steps. Recirculation region after the first and second steps are denoted by contour of streamline velocity. The higher augmentation of heat transfer rate observed for case 1 at Reynolds number of 512 and heat flux q=2000 W/m2.

Keyword: Laminar flow; Double backward; Separation flow; Recirculation flow