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NUMERICAL AND EXPERIMENTAL INVESTIGATION TO DETERMINE THE HEAT TRANSFER OF PERFORATED PLATE MATRIX HEAT EXCHANGER

Anish K. John[*,§], K. Krishnakumar[**]
[*] Dept. of Mechanical Engineering, RIT, Kottayam, Kerala, India
[**]Dept. of Mechanical Engineering, CET, Trivandrum, Kerala, India.
[§]Correspondence author. Mob: +91 944 6100541 Email: anishkjohn@gmail.com

ABSTRACT This paper provides the results of simulating single blow transient test method in perforated plate matrix heat exchanger surfaces for finding heat transfer using commercial CFD software. The heat transfer coefficient is obtained from the exit temperature response using its maximum slope and time at which maximum slope occurs. The simulations are performed using CFD software ANSYS WORKBENCH 14.0 to obtain the exit temperature profile. Thirty perforated plates pairs separated with spacers are modelled using Autodesk Inventor Professional 2011. Flow domain is extracted in ANSYS Design Modeller using boolean subtraction. The focus of the investigation is to try to reproduce with reasonable accuracy the experimentally obtained results. First, the paper presents the governing equations and the solving method used in CFD as well as considerations about the mesh generation. Perforated plate and spacer are provided with copper and paper as material. Air is assumed to be the fluid flowing through the plates and spacers. The Reynolds number is 1500. Meshing is generated using ANSYS Multiphysics and method adopted is sweep method to generate hexahedron mesh with 549822 elements. Inlet velocity and pressure are provided as the boundary conditions for the obtaining temperature profile at the exit of fluid. A steady state condition is attained initially before going for required transient analysis. Solution was converged after 200 iterations. Finally, the mesh adaption shows that the result is independent of meshing. The test results obtained through the experimental values are similar to that of numerical values for exit temperature profile.