World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:12, No:05, 2018

Mixed Convection Enhancement in a 3D Lid-Driven Cavity Containing a Rotating Cylinder by Applying an Artificial Roughness

Authors : Ali Khaleel Kareem, Shian Gao, Ahmed Qasim Ahmed

Abstract : A numerical investigation of unsteady mixed convection heat transfer in a 3D moving top wall enclosure, which has a central rotating cylinder and uses either artificial roughness on the bottom hot plate or smooth bottom hot plate to study the heat transfer enhancement, is completed for fixed circular cylinder, and anticlockwise and clockwise rotational speeds, -1 ≤ Ω ≤ 1, at Reynolds number of 5000. The top lid-driven wall was cooled, while the other remaining walls that completed obstructed cubic were kept insulated and motionless. A standard k-ε model of Unsteady Reynolds-Averaged Navier-Stokes (URANS) method is involved to deal with turbulent flow. It has been clearly noted that artificial roughness can strongly control the thermal fields and fluid flow patterns. Ultimately, the heat transfer rate has been dramatically increased by involving artificial roughness on the heated bottom wall in the presence of rotating cylinder.

Keywords : artificial roughness, lid-driven cavity, mixed convection heat transfer, rotating cylinder, URANS method
Conference Title : ICTHT 2018 : International Conference on Thermophysics and Heat Transfer
Conference Location : Amsterdam, Netherlands
Conference Dates : May 10-11, 2018