INCOMPRESSIBLE CONFINED SWIRLING FLOW IN A CYLINDRICAL CAVITY WITH ROTATING LID UNDERTHE INFLUENCE OF AXIAL TEMPERATURE GRADIENT OR AXIAL MAGNETIC FIELD

Abstract:
Incompressible lid driven swirling flow in a cylindrical cavity has been investigated under the influence of axial temperature gradient or axial magnetic field. Finite difference solution of Navier-Stokes Equations, expressed in primitive variables using cylindrical coordinates, is obtained on a staggered grid using pressure correction technique. A systematic study is carried out to investigate the influence on the lid driven swirling flow due to: (i) presence of thin stationary or rotating rod along the axis, (ii) presence of axial temperature gradient and (iii) presence of axial magnetic field. It has been observed that all three have significant effects on swirling flow. Wherever possible, present results have been validated against available numerical solutions or experimental data. Both two dimensional axisymmetric as well as three dimensional computations have been performed. Computer codes for various swirling flow problems have been developed in C language by the author.

Key Words: Navier-Stokes, incompressible, swirling flow, cylindrical cavity, staggered grid, Primitive variables.