

Documents

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Fluid-structure interaction analysis of transient convection heat transfer in a cavity containing inner solid cylinder and flexible right wall

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Abstract

Purpose: This paper aims to investigate the fluid structure interaction analysis of conjugate natural convection in a square containing internal solid cylinder and flexible right wall. **Design/methodology/approach:** The right wall of the cavity is flexible, which can be deformed due to the interaction with the natural convection flow in the cavity. The top and bottom walls of the cavity are insulated while the right wall is cold and the left wall is partially heated. The governing equations for heat, flow and elastic wall, as well as the grid deformation are written in Arbitrary Lagrangian–Eulerian formulation. The governing equations along with their boundary conditions are solved using the finite element method. **Findings:** The results of the present study show that the presence of the solid cylinder strongly affects the transient solution at the initial times. The natural convection flow changes the shape of the flexible right wall of the cavity into S shape wall due to the interaction of the flow and the structure. It is found that the increase of the flexibility of the right wall increases the average Nusselt number of the hot wall up to 2 per cent. **Originality/value:** To the best of the authors' knowledge, the unsteady natural convection in an enclosure having a flexible wall and inner solid cylinder has never been reported before. © 2019, Emerald Publishing Limited.

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