MECHANICAL ENGINEERING
M.S. DEFENSE

The Department of Mechanical Engineering presents:

The M.S. Defense of Stephen Chung

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Vibration Induced Mixed Convection in an Obstructed Vertical Cavity

Abstract: Vibrational mixed convection inside an open-ended cavity filled with a porous medium is investigated in this work. Vertical vibration on the left wall and buoyancy induced flow are considered. The effect of variations in governing parameters, such as vibrational Reynolds number, modified Rayleigh number, and the Darcy number on streamlines, isotherms, and the average Nusselt number is discussed. Quantitative assessment and three dimensional qualitative mapping for vibrational, buoyancy, Darcian, and non-Darcian effects is obtained. It is found that vibrational effects are more pronounced at higher values of Darcy and Reynolds numbers, while buoyancy effects are dominant at lower values of Darcy and higher values of modified Rayleigh numbers. It is also found that Darcy and Regular fluid models are applicable at low and high values of Darcy number respectively. At higher values of vibrational Reynolds and modified Rayleigh numbers, the generalized model should be used. The effect of variations of Prandtl number and dimensionless frequency are also examined in this work. Multiple validations show a very good agreement with some of the limited aspects of this study presented in previous works.