SURFACE TEMPERATURE AND FREE-STREAM VELOCITY OSCILLATION EFFECTS ON MIXED CONVENTION SLIP FLOW FROM SURFACE OF A HORIZONTAL CIRCULAR CYLINDER

by

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Original scientific paper
https://doi.org/10.2298/TSCI20S1013U

The present phenomena address the slip velocity effects on mixed convection flow of electrically conducting fluid with surface temperature and free stream velocity oscillation over a non-conducting horizontal cylinder. To remove the difficulties in illustrating the coupled PDE, the primitive variable formulation for finite difference technique is proposed to transform dimensionless equations into primitive form. The numerical simulations of coupled non-dimensional equations are examined in terms of fluid slip velocity, temperature, and magnetic velocity which are used to calculate the oscillating components of skin friction, heat transfer, and current density for various emerging parameters magnetic force parameter, ξ, mixed convection parameter, λ, magnetic Prandtl number, γ, Prandtl number, and slip factor, S_L. It is observed that the effect of slip flow on the non-conducting cylinder is reduced the fluid motion. A minimum oscillating behavior is noted in skin friction at each position but maximum amplitude of oscillation in heat transfer is observed at each position $\alpha = \pi/4$ and $2\pi/3$. It is further noticed that a fluid velocity increases sharply with the impact of slip factor on the fluid-flow mechanism. Moreover, due to frictional forces with lower magnitude between viscous layers, the rise in Prandtl number leads to decrease in skin fiction and heat transfer which is physically in good agreement.

Key words: *mixed-convection, oscillatory slip-flow, non-conducting cylinder, slip velocity, current density*

Introduction

The fluid slip is an interesting problem in fluid mechanics due to the absence of the surface effect, fundamental data are still lacking, and it is not sufficiently grasped in the experimental study. The fluid with slip-boundary has various applications in modern technology like artificial heart valves polishing and internal heart cavities. The effects of magnetic field on heat and fluid mechanisms have great interest in molten metal purification, macro and micro-electronic devices, metallurgy, and geophysical systems. Eshghy *et al.* [1] treated a free-convection problem on vertical surface with longitudinal oscillations effects analytically. They examined a

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