

Mixed convection from semi-circular cylinder in Bingham plastic fluids: Adding buoyancy

Gupta, A., Ganesh, K. I., Melnik, R., Tiwari, A.K.

Journal publication, 2022.

Abstract

We study the mixed convection heat transfer from a semi-circular cylinder in Bingham plastic fluids with adding buoyancy condition. Numerical results indicate that heat transfer from the cylinder is strongly dependent on velocity and temperature profiles, the yield/unyielded zone. In the steady flow regime, Reynolds number, Prandtl number, and Richardson number are expected to be positively dependent on average Nusselt number (which decreases the convection boundary layer). At small Bingham numbers, the effect of forced convection is more dominant whereas large Bingham numbers free convection is more dominant. Finally, using a simple expression, the numerical heat transfer results have been predicted in terms of the j-factor for new applications.

Keywords: Semi-circular cylinder, Bingham plastic fluids, Nusselt number, Richardson number.