

The impact of suction/injection with radiation effect on natural convective flow over a vertical channel in the existence of point/line heat source configuration

P. Loganathan and A. Mubeen Begum

Department of Mathematics, Anna University, Chennai-600 025, Tamil Nadu, India.

Abstract: The present study manifests the influence of a point-or line-based heat source in relation to natural convection flow in a vertical channel that have suction/injection with radiation effect. The constant heat source is modelled with the Heaviside step function and converted to point/line heat source. The governing equation modelling the flow are solved by Laplace transform technique. Skin friction, Nusselt number and mass flow rate are examined using tabular analysis whilst the physical components like suction/injection(λ), Prandtl number (Pr), heat source(S) and radiation (N) are explored graphically on the velocity and the temperature field. Results illustrate that the velocity and the temperature profile is strengthened as the value of point/line heat source parameters increases. Also, as the parameter Pr, λ and N increases, the velocity profile slows down. This is due to rise in Pr provokes the fluid viscosity to increase which in turn thickens the fluid and slow down the velocity profile. In addition, Heat transfer rate decreases gradually as the radiation and source parameter increases. Moreover, Suction/Injection effects with heat source parameter and radiation effects plays a major role in engineering and industrial applications such as Solar Energy System, Aerodynamic, Oil & Gas Industry, Marine Engineering, Crystal Growth and Environmental Engineering.

Keywords: *vertical channel, suction/injection, radiation, Heaviside step function, point heat source, line heat source.*

