Abstract No: PO-05

Viscous airflow connected to a compressed Air-shoe

J. Munasinghe*

Department of Mathematics, Faculty of Science, University of Kelaniya, Sri Lanka
*munasing@kln.ac.lk

Viscous concentric airflow in between two parallel circular discs has been considered. Since the gap in between the plates is small, Prandtl boundary-layer equations were used to explain the flow. In order to solve these equations, the method analogous to Karman-Pohlhausen was used and also a polynomial of the fourth order was assumed for the velocity profile. The coefficients of this polynomial were determined via boundary and symmetry conditions, the integral continuity and momentum equations. The latter is derived from the Prandtl boundary-layer equations. The resulting first order ordinary differential equation for the form factor $a(r)$ together with an integral boundary condition was solved numerically. Obtained the results for the form factor and for the pressure variation. For the radius $r \leq 0.028m$, the $1/r$ dependence in continuity equation causes that inertia forces are dominating. This implies that the pressure gradient is positive. For $r \geq 0.028m$, frictional forces are dominating. This implies that the pressure gradient is negative.

Keywords: Viscous concentric airflow, Inertia forces, Pressure gradient, Prandtl boundary-layer equations