Chapter 6
Viscous Flow and Its Effect

Kaliappan S.
https://orcid.org/0000-0002-5021-8759
Velammal Institute of Technology, Chennai, India

Raj Kamal M. D.
Velammal Institute of Technology, Chennai, India

Joseph Manuel D.
Velammal Institute of Technology, Chennai, India

Balaji V.
Loyola Institute of Technology, India

Murugan P.
Jimma Institute of Technology, Ethiopia

ABSTRACT

Viscosity is a property that expresses the internal drag of a fluid to motion; impact of viscosity states the statics and flows. Statics means whenever fluids at zero velocity have no relative movements between layers of fluid and thus du/dy = 0. At the time there is no shear stress and viscosity of the fluid is free. Fluid viscosity plays a major role on the fluid floating in it. The authors focused on solids and fluids and the no slip condition, momentum transfer through molecular motion, shear stress and viscosity, Couette flow, and Poiseuille flow. Here the authors made a discussion the Newtonian viscous flow, and the statement of Newton's law of viscosity was examined. The discussion has been extended up to viscosity and the effect of their temperature and impact of increasing in temperature has been explained along with surface tension.

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INTRODUCTION

The Incompressible and Compressible has a vital phenomenon in fluid mechanics, (Yuan et al., 2019) the compressible flow regime refers to the supersonic/subsonic flow scenario. The incompressible technique, on the other hand, could not accurately depict a number of significant instances with low Mach numbers. In a poppet valve, a cavitating jet is in a similar situation To address the disparity between incompressible and compressible approaches in a thorough manner, (Anand and Christoy, 2021). We address the challenge of stable low Reynolds number flow of a generalised Newtonian fluid through a narrow elastic tube by coupling fluid lubrication theory to a structural problem expressed in terms of Donnell's shell theory (Ahmad et al., 2019). In constant two-dimensional boundary layer flow, the flow and heat transfer of a Cassonian fluid across an extended plate with a Newtonian heating boundary condition are investigated. The control partial differential equations are transformed to nonlinear ordinary differential equations using appropriate similarity transformations before being numerically solved using an implicit finite difference scheme. The flow and heat transfer properties of several integrated parameters, such as Casson's fluid parameter, Eckert's number Ec, Prandtl's number Pr, and conjugate Newtonian heating parameter, are examined and explained (Goldstein, 1948). Singularities may occur in the solution of non-linear parabolic equations due to their non-linearity, according to the research. The equations discovered may aid computers working with laminar boundary layers who require more than a rough answer to have a target to aim for (Dhawan and Narasimha, 1958). On a flat plate, the transition in the boundary layer is investigated from the perspective of intermittent turbulent spot formation. Emmons' probability calculations can be expanded to explain the apparent statistical resemblance of transition zones based on the idea of localised laminar breakdown, which has some experimental evidence. Using these concepts, comprehensive computations of boundary layer characteristics such as mean velocity profiles and skin friction during transition are possible. The intermittency factor is the parameter in the mean velocity profiles, which correspond to a universal one-parameter family. The existence of a relationship between the transition Reynolds number and the rate of generation of turbulent spots is inferred from experimental data (Mureithi et al., 2013) the flow of a boundary layer over a constantly moving heated flat surface with velocity in a streaming flow with velocity and temperature dependent viscosity is investigated in this work. Through the viscous dissipation term, the momentum and energy equations are intertwined. A suitable similarity variable is used to translate the coupled boundary layer equations into a self-similar form. To solve the self-similar boundary layer equations, an effective numerical approach is applied. It is proven that when the velocity ratio is low enough, increasing viscous dissipation dramatically improves local heat transmission, resulting in temperature overshoots near the wall. The temperature-dependent viscosity, as well as the velocity and temperature distribution within the boundary layer, is all demonstrated to be affected by the viscosity variation parameter.

2. VISCOUS FLOW

Viscous flow is a flow in which frictional effects are dominating. The fluid is flowing in layers. The layer that sticks to the wall has no velocity, which is known as the no slip condition, and it causes friction at the wall. Frictional effects exist between two layers of fluid, with the slower layer attempting to slow down the quicker layer, which can be measured using viscosity. We discover that for a wide range of total wedge angles, local solutions exist, and that a class of individual wedge angles and stress exponents

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