

Documents

Santhosh, N., Radhakrishnamacharya, G., Chamkha, A.J.

Effect of slip on Herschel-Bulkley fluid flow through narrow tubes

(2015) *Alexandria Engineering Journal*, 54 (4), pp. 889-896. Cited 3 times.

Abstract

A two-fluid model of Herschel-Bulkley fluid flow through tubes of small diameters and slip at the wall is studied. It is assumed that the core region consists of Herschel-Bulkley fluid and Newtonian fluid in the peripheral region. Following the analysis of Chaturani and Upadhyaya, the equations of motion have been linearized and analytical solution for velocity, flow flux, effective viscosity, core hematocrit and mean hematocrit has been obtained. The expressions for all these flow relevant quantities have been numerically computed by using Mathematica software and the effects of various relevant parameters on these flow variables have been studied. It is found that effective viscosity, core hematocrit and mean hematocrit of Newtonian fluid are less than those for Bingham fluid, power-law fluid and Herschel-Bulkley fluid. Effective viscosity increases with the yield stress, power-law index, slip and tube hematocrit but decreases with Darcy number. It is observed that the effective viscosity and mean hematocrit increase with tube radius but the core hematocrit decreases with tube radius. Further, it is noticed that the flow exhibits the anomalous Fahraeus-Lindqvist effect. © 2015 Faculty of Engineering, Alexandria University. Production and hosting by Elsevier B.V.

2-s2.0-84955624899

Document Type: Article

Publication Stage: Final

Source: Scopus

Access Type: Open Access