

Herschel-Bulkley Fluid Flow through Narrow Tubes

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Abstract : A two-fluid model of Herschel-Bulkley fluid flow through tubes of small diameters is studied. It is assumed that the core region consists of Herschel-Bulkley fluid and Newtonian fluid in the peripheral region. The analytical solutions for velocity, flow flux, effective viscosity, core hematocrit and mean hematocrit have been derived and the effects of various relevant parameters on these flow variables have been studied. It has been observed that the effective viscosity and mean hematocrit increase with yield stress, power-law index, hematocrit and tube radius. Further, the core hematocrit decreases with hematocrit and tube radius.

Keywords : two-layered model, non-Newtonian fluid, hematocrit, Fahraeus-Lindqvist effect, plug flow

Conference Title : ICAMM 2015 : International Conference on Applied Mechanics and Mathematics

Conference Location : Los Angeles, United States

Conference Dates : April 03-04, 2015