EXACT SOLUTIONS FOR OSCILLATING MOTIONS OF SOME FLUIDS WITH POWER-LAW DEPENDENCE OF VISCOSITY ON THE PRESSURE[*]

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Dedicated to Dr. Vasile Drăgan on the occasion of his 70th anniversary

Abstract

Analytical expressions for the steady-state components of the dimensionless starting solutions corresponding to some oscillatory motions through a horizontal rectangular channel of two classes of incompressible Newtonian fluids with power-law dependence of viscosity on the pressure are established in the simplest forms. The fluid motion is generated by the lower plate that oscillates in its plane. For validation, three limiting cases are considered and interesting graphical representations are provided. It is worth pointing out the fact that such solutions are important in practice for those who want to eliminate the transients from their experiments. In addition, the dimensionless steady shear stresses corresponding to the simple Couette flow of such fluids are constants on the whole flow domain although the adequate velocity fields are functions of y.

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