

Innovative Pump Design Using the Concept of Viscous Fluid Sinusoidal Excitation

Authors : Ahmed H. Elkholy

Abstract : The concept of applying a prescribed oscillation to viscous fluids to aid or increase flow is used to produce a maintenance free pump. Application of this technique to fluids presents unique problems such as physical separation; control of heat and mass transfer in certain industrial applications; and improvement of some fluid process methods. The problem as stated is to obtain the velocity distribution, wall shear stress and energy expended when a pipe containing a stagnant viscous fluid is externally excited by a sinusoidal pulse, one end of the pipe being pinned. On the other hand, the effect of different parameters on the results are presented. Such parameters include fluid viscosity, frequency of oscillations and pipe geometry. It was found that the flow velocity through the pump is maximum at the pipe wall, and it decreases rapidly towards the pipe centerline. The frequency of oscillation should be above a certain value in order to obtain meaningful flow velocity. The amount of energy absorbed in the system is mainly due to pipe wall strain energy, while the fluid pressure and kinetic energies are comparatively small.

Keywords : sinusoidal excitation, pump, shear stress, flow

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