Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Rinsing Flows of Non-Newtonian Fluids GERALD FULLER, TRAVIS WALKER, TIENYI HSU, Stanford University, PATRICK ANDERSON, Eindhoven University of Technology — The rinsing flow of a jet of water impinging onto both Newtonian and non-Newtonian viscous fluids has been considered to qualitatively and quantitatively understand the flow structure of the resulting hydraulic jump. This study seeks to investigate the interactions of the two fluid system during the transient growth of the flow profile. This growth is seen to vary drastically in magnitude, velocity, and topology, while undergoing varying instabilities, depending on the properties of the coating fluid. Currently, four classes of test fluids, all having approximately equal viscosities at low shear, have been chosen for this study: a Newtonian solution, a viscoelastic polymer solution, a Boger fluid, and a wormlike micelle solution. Each fluid experiences Saffman-Taylor instabilities, and the experiments show that the elasticity of the samples will influence the pattern of the instabilities. The elasticity is also seen to dampen the disturbances of the hydraulic jump, influence the overall jump height, and vary the radial growth of the jump. In addition, the shear-thinning nature of the samples seems to influence the overall velocity of the radial growth, while determining the geometry of the driving front. Finite element simulations are also presented in an attempt to understand these complex flow kinematics.

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Date submitted: 03 Aug 2010 Electronic form version 1.4