1056-76-773 **Jared Debrunner*** (mailjared@gmail.com), Department of Computer Science, California State University, Chico, Chico, CA 95929, **Anton Mazurenko** (anton.mazurenko@gmail.com), Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, **Brent Nelson** (brentnelson6@gmail.com), Department of Mathematics, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL , and **Sergei Fomin** (sfomin@csuchico.edu), Department of Mathematics and Statistics, California State University, Chico, Chico, CA 95929.
Steady State Rimming Flow of non-Newtonian Fluid.

Using a scale analysis and the method of perturbations, a theoretical description is obtained for the steady-state non-Newtonian flow on the inner wall of the rotating horizontal cylinder. The Maxwell upper-convective equation is chosen to model the visco-elastic properties of the fluid. In the general case, the derived governing equations are rather awkward and can be solved only numerically. However, since the polymeric solutes used in roto-molding and coating technologies exhibit the relatively weak elastic properties, the Deborah number for such flows is rather small (De<1). Exploiting this fact, the perturbation method is applied for simplification of the model. As a result, the first order non-linear differential equation for the thickness of the fluid film is derived. An approximate analytical solution of this equation is found. The accuracy of analytical solution is verified by the direct numerical solution of the derived equation. Using the obtained solutions, the criteria which guarantee the stable steady-state flow of the liquid polymer and the uniform final thickness of the coating film are determined. The bounds for the different flow regimes and principal controlling parameters are identified. (Received September 17, 2009)