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The Shape of Free Surface in Squeeze and Fountain Flows

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Two related problems in polymer processing deal with the free surface present in squeeze flow of plastometers and the fountain flow in injection molding. Although these problems have been solved in the past by various researchers, a more careful examination can reveal similarities and differences that play a role for different materials. The present work reviews these previous efforts. In addition it offers new results from full parametric studies of the geometric parameter (aspect ratio) in squeeze flow, and of the material parameters for both flows for different fluids. Newtonian, pseudoplastic and viscoplastic models are considered. Both *axisymmetric* and *planar* geometries are studied. The emphasis is on determining the extent and shape of the free surface, and in the case of viscoplastic materials, the location of yielded / unyielded regions for a wide range of Bingham numbers. The free surface shapes are similar but not identical in the two problems, as are the unyielded regions. The present results extend previous simulations and are offered as benchmark solutions for these important polymer-processing problems.