Pinch-off Dynamics of Non-Newtonian Fluids F.M. HUISMAN, S.R. GUTMAN, P. TABOREK, University of California-Irvine — The pinch-off dynamics of a variety of shear-thinning fluids (foams, concentrated emulsions, and slurries) were studied using high speed videography. The pinch was characterized by the variation of the minimum neck radius $r_{\text{min}}$ as a function of the time to pinch $t$, with $r_{\text{min}} \propto t^\alpha$. The rheology of shear thinning fluids can be characterized by an exponent $\tau = k\dot{\gamma}^n$, with $n < 1$. We found that for a variety of shear-thinning fluids including mayonnaise and acrylic paint, $r_{\text{min}}$ scales with $t$ to a power $\alpha$ equal to the flow index for the particular fluid. The flow index was measured using a TA instruments AR-G2 rheometer. The flow index for acrylic paint was $0.440 \pm 0.014$ and $r_{\text{min}}$ scales with $t$ to the $0.41 \pm 0.03$; for mayonnaise the flow index was $0.355 \pm 0.014$; and $r_{\text{min}}$ scales with $t$ to the $0.35 \pm 0.02$. To study the transition from conventional Newtonian pinch, we systematically varied the concentration of a water-Xanthan gum mixture.

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