

Abstract Submitted  
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**Transient behavior of granular materials with symmetric conditions for tumbler shapes and fill fractions** NICHOLAS POHLMAN, YUN SI, Northern Illinois University — The typical granular motion in circular tumblers is considered steady-state since there are no features to disrupt the top surface layer dimension. In polygon tumblers, however, the flowing layer is perpetually changing length, which creates unsteady conditions with corresponding change in the flow behavior. Prior work showed the minimization of free surface energy is independent of tumbler dimension, particle size, and rotation rate. This subsequent research reports on experiments where dimensional symmetry of the free surface in triangular and square tumblers with varying fill fractions do not necessarily produce the symmetric flow behaviors. Results of the quasi-2D tumbler experiment show that other dimensions aligned with gravity and the instantaneous free surface influence the phase when extrema for angle of repose and other flow features occur. The conclusion is that 50% fill fraction may produce geometric symmetry of dimensions, but the symmetry point of flow likely occurs at a lower fill fraction.

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