Abstract Submitted
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Flow and clogging of submerged hoppers JUHA KOIVISTO, DOUGLAS DURIAN, University of Pennsylvania — The discharge rate for granular hoppers was recently found to depend on the filling height when the hopper is submerged in water[1]. This effect is further studied with an automated experimental setup consisting of cylindrical flat bottomed hoppers with various diameters and orifices. The grains are spherical glass beads of diameter 1.1 ± 0.1 mm. The flow rate is measured with an electric scale connected to a computer. With this, we confirm the counterintuitive surge in the flow rate as the filling height decreases toward zero. We also find a similar surge for dry gains, but the size of the effect is much smaller and to our knowledge is previously unseen. In both cases we notice that the flow of grains near the wall changes from creep like behavior to mass flow as the hopper diameter decreases. The hypothesis for the surge effect is changes in compatible stresses and force chains. To alter such behavior, on-going work includes changing the fluid pressure and flow rate near the orifice as well as changing the roughness of the walls. Work has also begun on clogging for small orifices in submerged hoppers, where preliminary observations show an exponential distribution of flow durations.

[1]T.J. Wilson et al., Pap. Phys. **6**, 060009 (2014).

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