Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Stagnation, circulation, and erosion of granular materials through belt conveyor sluice gate[1] NICHOLAS POHLMAN, MICHAEL MORALDA, Northern Illinois University, RYAN DUNNE, Humboldt State University — Control of flow rates in conversion reactors for discrete materials like biomass can be achieved in belt conveyors through a combination of belt speed, hopper size, and aperture opening. As material is extracted from the bottom of the storage hopper, other material cannot achieve plug flow and therefore is restricted from exiting through a sluice-gate type opening. The excess material moves vertically from the opening causing a pile up and recirculation back along the free surface of the hopper. Experimental results obtained through high speed imaging show the position of the stagnation point as well as the rate of circulation is dependent on the mass flow rate achieved and instantaneous fill level. The movement of material into the plug flow along the belt allows verification of deposition models on erodible beds rather than rigid surfaces with artificial roughness of glued particles. Similarly, the pile-up at the exit influences the efficiency of the transport affecting the narrow energy return on investment of biomass resources. The laboratory-scale behavior can therefore be translated into industrial performance metrics for increased operational efficiency.

[1]This work is supported by the NSF REU Site *Operation E-Tank* under award number 1156789.

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Date submitted: 01 Aug 2013 Electronic form version 1.4