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Power Consumption And Granular Flow In A Vibro-Fluidized Stirred Granular Bed JAMES GILCHRIST, KENNETH FORD, HUGO CARAM, Department of Chemical Engineering, Lehigh University — This work examines the behavior of a deep granular bed subject to simultaneous vertical vibration and stirring. The power necessary to stir a 5.6 cm diameter and 20 cm deep granular bed of 150 micron glass beads using a 4-blade vane impeller was measured over a wide range of forcing conditions. Impeller rotation rates from 0 - 1000 rpms and vibration accelerations in the range $0 \leq \quad \Gamma = \omega^2 a/g \leq 4.0$ were explored. Both the power required for stirring and vibration were recorded. Sharp changes in vane power draw indicate flow transitions from dense granular flow to vibro-fluidized flow at a critical acceleration (Γ_c). The total power profile (vane plus vibration power) demonstrates a minimum just above the critical acceleration. Progressive increases or decreases in both vane speed and Γ independently show hysteresis as the flow bifurcates between two primary states of dense granular flow and loose-packed, vibrofluidized behavior. Finally, preliminary results of direct density measurements using a localized capacity probe will be discussed. These observations are compared to those found in fluidized systems and flows generated in high-shear granulators.

James Gilchrist
Department of Chemical Engineering, Lehigh University

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