

Title: Modeling Gas-Particle Transport, Deposition, and Wear in Mills and Classifiers

Jesse Capecelatro, University of Michigan

Abstract: Mills and classifiers are essential for particle size reduction and separation across various industries. Numerical modeling offers significant potential to guide equipment design by facilitating control over particle transport and identifying high-wear zones. In industrial contexts, where substantial volumes of particles are processed, even slight improvements in grinding efficiency can yield substantial economic benefits. A major challenge lies in addressing the impact of gas-phase turbulence, which influences the motion and spatial distribution of fluidized particles, leading to heterogeneous deposition and increased localized wear. This talk reviews recent progress in understanding and modeling key processes at the scale of individual particles and coarse-grain approaches for simulating industrial units. Advances in numerical simulations over the past few decades are outlined, concluding with insights into future research directions. High-fidelity simulations of particles in wall-bounded turbulent flows will be presented to illustrate heterogeneous deposition patterns and their implications for surface wear.