

## IFPRI Research Project Brief

### Mechanism of Formation and Growth of Powder Layers on Process Equipment Surfaces at low Stresses

The International Fine Particle Research Institute (IFPRI) wishes to fund a project to elucidate the mechanism(s) of initiation and growth of powder layers on surfaces of process equipment under low compressive or shear stress. This project is motivated by a common process issue in powder processing, sometimes called “make-up”: the formation of thick, immobile layers of powder adhering to walls and internals of equipment such as chutes, silos, pneumatic conveying lines, dryers, mixers, and furnaces. The main objectives of the project are to understand the mechanisms for “nucleation” of a thin powder layer and its growth or death with attention to environmental conditions, surface properties, and mechanical stresses at the surface. It is expected that the project will have a major experimental component involving the development of appropriate experiments with well-characterized and controlled flow and environmental variables.

Investigation of environmental variables (humidity, temperature), wall properties (roughness, hardness, surface chemistry), particle properties (morphology, mechanical properties, surface properties), surface interactions (dispersive, hydrophilic/hydrophobic, electrostatic) are all potentially in scope. Static systems (i.e. caking of powders) and layer formation at high stresses (i.e. in die compaction or extrusion) are out of scope. While the use of highly idealized particles like glass ballotini may provide useful insight into mechanisms, we request that such idealized experiments be balanced with experiments using more realistic (but still potentially simplified) powders.