



IFPRI BRIEF TEMPLATE

Check One: **Project** **Review** **Collaboration**
 Workshop **Other**

Descriptive Title	Wall make up mechanisms at low stress regimes.
Working Title¹	Wall make up mechanisms at low stress regimes.
Technical Area²	Dry
Date	26/06/2019
Short Description	<p>Wall make up is a prevalent negative transformation in industrial processes especially hopper filling, discharge, agglomeration, spray dry. To elucidate the driving mechanism of moving particles build-up on surfaces of processing equipment (e.g. conveying pipe, cyclone, hopper outlets, dryer outlet). This project aims 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.</p>
Objectives	<ul style="list-style-type: none"> - To understand the mechanisms for particle deposition and its “growth” or “death” with particular attention to surface properties (e.g. finish and surface temperature) at low stresses. - To evaluate the force and forming mechanisms for growth at the boundary. - Develop an experimental setup investigating environmental conditions as well as various wall surface properties relating to the wall make up. <ul style="list-style-type: none"> - Develop a model to predict the wall make up as a function particle and surface/wall properties
Scope	In Scope:

¹ Title used in meeting agendas and file archives

² One or more from the following list: W = wet systems; D = dry systems; F = particle formation; SR = size reduction; M = modeling; SE = systems engineering

	<ul style="list-style-type: none"> - Environmental effects (humidity, temperature) - Wall properties (roughness, hardness, temperature) - Particle properties (material, moisture content, size, shape) - Modeling/experiments - Surface modifications - Characterization methods at relevant conditions (e.g. environmental) - Electrostatic effects - Low stresses <p>Out of Scope:</p> <ul style="list-style-type: none"> - High stresses <p>Glass beads</p>
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Recommended Contractors (2 or 3)		
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