IFPRI
International Fine Particle Research Institute

IFPRI BRIEF TEMPLATE

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

Descriptive Title	**Multiscale Investigation of Fluidization-Induced Segregation in Fine Powders: From Lab Testing to Process Modeling**
Working Title[1]	**Fluidization-Induced Segregation in Fine Powders**
Technical Area[2]	Dry Systems
Date	June 2025
Short Description	Fluidization-induced segregation is a critical mechanism affecting fine powders during handling operations such as storage containers (e.g. bins, hoppers, etc) filling and discharge. In addition, it can have **significant effects** on **product quality** in industries where compositional uniformity is essential (e.g. food, pharma, consumer goods, chemicals). **The extent and dynamics of segregation at industrial scale is still not well understood**. The segregation effects often amplify with scale. There is a need for comprehensive experimental and modelling approaches to understand and mitigate the phenomena in real processing environments.
Objectives	- Use lab scale testing to understand **critical material parameters** (Size, cohesion, density, shape, permeability, etc) affecting fluidization-induced segregation. - Conduct **process scale experiments** to quantify segregation across different materials, flow rates, fall heights - Study the **effect of scale up** on segregation mechanism and severity. - Apply **CFD-DEM modelling** to simulate the evolution of segregation during filling and discharge. - Exploring **initial/boundary conditions** around valve geometry and venting - Combining experimental and modeling data in order to link material, process, and operation properties to the likelihood and extent of fluidization segregation.

[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

	- Propose and evaluate **practical mitigation strategies** (process (venting) and product)) to reduce fluidization induced segregation
Scope	-Fine powders. -Storage container filling and discharge -Various fall heights - Single component with size distribution --Blends (Binary, tertiary, multicomponent)

Recommended Contractors (2 or 3)		
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Ben Glasser	Rutgers	
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Submitted By:	
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