IFPRI BRIEF TEMPLATE

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

Descriptive Title	Dispersion of agglomerates using shear in reconstitution systems.
Working Title[1]	Shear induced deagglomeration during reconstitution.
Technical Area[2]	Wet system
Date	17_6_2025
Short Description	The 2024 Reconstitution Workshop identified a critical gap: the dynamic and complex kinetics of reconstitution. From a processing perspective, this complexity largely stems from how and when energy—through mixing, heat, or shear—is incorporated into a powder/liquid/gas mixture. Energy input can occur when liquids and solids are combined, during the wetting stage, and/or in various forms during the transformation stage. Critically, the use of energy dictates whether the resulting suspension achieves desirable reconstitution properties and product performance. A specific area of interest is employing shear to break up and disperse agglomerated powders during both the wetting and transformation stages. For example, many thickening agents in formulas require energetic incorporation, often via a rotor/stator. Similarly, the dispersion of fillers into hydrophobic liquids like silicones is significantly impacted by the shear conditions during powder wetting. This proposed project extends the 1999-2005 IFPRI-sponsored project by Feke. It will focus on studying the impact of high shear on powder dispersion using devices that allow for well-controlled, adjustable, and characterized shear in the dispersing zone (e.g., in-line rotor/stator).
Objectives	This project aims to investigate the impact of shear and hydrodynamics on the dispersion of agglomerated powders into liquids, specifically focusing on how in-line rotor-stator dispersion affects final particle size. The study will yield models characterizing the relationships among raw material properties, shear-induced energy input, and real-time data collected during the wetting and transformation stages.

[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

Scope	The shear and hydrodynamics at play during the wetting of agglomerated powders by liquids exert a substantial influence on agglomerate dispersion. The project scope encompasses the following: • Conducting an experimental study on the dispersion of agglomerated hydrophilic powder into aqueous and hydrophobic liquids over a wide range of industrially relevant shear rates. • Dilute to mildly dilute systems. • Executing process-scale experiments to quantify the effect of shear on powder dispersion. • Utilizing DEM/CFD modeling to elucidate the impact of shear on the mechanisms of agglomerate breakage and dispersion.

Recommended Contractors (2 or 3)		
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