



IFPRI BRIEF TEMPLATE

Check One: Project Review Collaboration
 Workshop Other

Descriptive Title	Particle transport within unit operations with specific reference to mills and classifiers
Working Title¹	Particle transport within unit operations
Technical Area²	Size Reduction
Date	14 th June 2022
Short Description	<p>For predictive milling the machine and material function need to be known. The machine function depends on the operating parameters of the specific mill which define the transport of the particles to stress zones and defines the stresses acting on the particles. These particles stress on the other side parts of the mill including pins, walls and if present media. Therefore, the complex turbulent two-phase transport of the particles in the mill defines the stress energy and stress number and determine the holdup and the transport to classifiers (i.e. sieves, classifiers, cages, etc). Optimal performance of the mill in terms of product properties but also in terms of energy consumption inherently depends on this critical transport.</p> <p>Building upon the IFPRI experience on modelling of transport both in gas and liquid phase and models for the material function a logical next step would be a review which defines the possibilities for predictive models in different mills. On the basis of this review a following research proposal(s) could focus on types of mill or other unit operations which are accessible by the transport models (eg. Mixers).</p> <p>We expect that these transport models are applicable to all sorts of unit operations dealing with particles and in particular with abrasion and wear in the respective equipment.</p>
Objectives	<p>Key deliverables of this should be a state-of-the-art summary, detailing.</p> <ul style="list-style-type: none"> • Existing 2 phase models for spherical and non-spherical particles • Possibility for scale-up and mapping results e.g. By dimensionless parameters • Application to mills and classifiers • Suitability for industrial reapplication, including computational time, storage, etc.

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	<ul style="list-style-type: none"> • Focus on inertia dominated particle transport, excluding Brownian diffusion transport. • Principle focus would be on dry systems (i.e. including gas phase) • Consider the importance of scale from batch to high-capacity production. • Of particular interest is the transport to and through integrated classifiers • Shapes of interest beyond spheres are regular polyhedral, ellipsoids, fibers, platelets, and aggregates. <p>Welcome additional insight from the review would include.</p> <ul style="list-style-type: none"> • Particle flexibility • Insights on wear within the considered unit operation • Relevant insight in wet systems
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Recommended Contractors (2 or 3)		
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Submitted By:	
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