REVIEW BRIEFS FROM 2015

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	CHALLENGES AND OPPORTUNITIES WITH ATOMIZATION OF HIGHLY VISCOUS FEEDS
1.1	Project or Review?	Review
1.2	Technical Area	Particle formation
2.0	Submitted by	Justin Moser, Reinhard Kohlus
2.1	Member company/ies	Merck & Co., Inc., University of Hohenheim
2.2	Idea creation date	23-Jun-2015
2.3	Last modification date	
3.0	Short goal description	Provide a literature review of challenges/opportunities with atomization across various high viscosity feed types
3.1	Objectives (at least three)	1. Review of atomization methods (e.g rotary) and equipment variations coupled with governing principles and key failure modes of each. 2. Identification of key feed properties that relate to atomization and droplet formation. Include relation to various atomization methods and failure modes. 3. Opportunities and research directions to improve atomization of higher solids/viscosity feeds 4. Novel approaches/technologies to increase atomization ability of challenging feeds including temperature/pressure modulation, stress/shear disturbance at point of atomization, etc.
3.2	Scope	- In scope: - Atomization of solutions, suspensions, emulsions, etc. - Variations in concentration, material properties, Non-Newtonian fluids, elasticity, solvent volatility, etc. - Pressure, rotary, ultrasonic, piezo-electric, multi-fluid nozzles (e.g 2-fluids) - Out of scope: atomization of melts
4.0	Contractor (two or three)	Ken Giles, Charles W. Lipp, A.H Lefebvre
4.1	Comments about Contractors	Giles (UCD); Lipp runs a consultant company (Lake Innovation LCC); Lefebvre is a pioneer in science of atomization (unclear if he is still in the game)
5.0	Voting @ AGM	Selected / Rejected
5.1	# of Votes	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Energy Utilisation in Milling
1.1	Project / Review	Review
1.2	Technical Area	Size Reduction
2.0	Submitted by	Hugh Stitt, revised by Gary Liu, Joe Atria, Chris Rueb, Marcelo Tavares and Mojtaba Ghadiri
2.1	Member company/ies	Johnson Matthey, Du Pont, Almatis, Aveka, Paul O Abbe
2.2	Idea creation date	
2.3	Last modification date	
3.0	Short goal description	Critically analyse multiple milling technologies both wet and dry with a view to quantify their associated energy utilisation and quantify the energy reduction achievable.
3.1	Objectives	1. To critically review current existing / published work in energy accounting for milling operations for both dry and wet milling. 2. Compare energy utilization across technologies. 3. Use insights gained to propose ideas for improvement 4. Demonstrate at least one approach to improving energy utilization on at least one technology. 5. Identify work on a range of materials from fibrous, biomass, minerals, to organics 6. Identify industry best practice.
3.2	Scope	Energy usage in size reduction processes constitutes a notable fraction of energy uptake by the manufacturing industry, as the process is highly inefficient and significant fraction of input energy is wasted through heat generation and other losses. For both wet and dry milling, the energy utilization is to be quantified for various milling machines.
4.0	Contractor	1.Dr. Rob Morrison (r.morrison@mailbox.uq.edu.au) Julius Kruttschnitt Mineral Research Centre (JKMRC), University of Queensland, Australia; 2. Dr. Stephen Morrell (s.morrell@mailbox.uq.edu.au) Julius Kruttschnitt Mineral Research Centre (JKMRC), University of Queensland, Australia 3. Prof. Luis Marcelo Tavares (tavares@ufrj.br) Department of Metallurgical and Materials Engineering, Universidade Federal do Rio de Janeiro, Brazil
4.1	Comments / experiences	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Biomass Review – Part B – Wet Processing of Living Biomaterials
1.1	Project / Review	Review
1.2	Technical Area	Wet Processing
2.0	Submitted by	
2.1	Member company/ies	Syngenta, Johnson Matthey, DuPont
2.2	Idea creation date	IFPRI AGM 2015
2.3	Last modification date	
3.0	Short goal description	Effects of processing on viability, growth, rheology, mixing of living organisms in suspension. 1. Organism growth: effects of agitation power, mixing time, sparging, and mixing efficiency, etc… 2. Mixing equipment effect: container dimension, rotor/impeller design, et al. 3. Stress analysis on rotor/impeller, mixer reaction forces 4. Rheological measurements of living systems
3.1	Objectives	To find the fundamental principles for maximizing growth and yield of product: • the effects of mixing and sparging • the effects of various process equipment • the key scale-up factors.
3.2	Scope	Live bioderived materials such as bacteria, fungi, and algae. Production of chemical and pharmaceutical products, possibly including particles. Scale: Lab to commercial production, batch or continuous.
4.0	Contractor	Schuler (Cornell)…
4.1	Comments / experiences	Relevant for IFPRI social activities…. ☺

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Biomass Review – Part A – Wet Processing of Bioderived Materials/Feedstocks
1.1	Project / Review	Review
1.2	Technical Area	Wet Processing
2.0	Submitted by	
2.1	Member company/ies	Syngenta, Procter & Gamble, DuPont
2.2	Idea creation date	IFPRI AGM 2015
2.3	Last modification date	
3.0	Short goal description	Effects of processing on bioderived materials on particle size distribution, particle properties (surface structure, surface chemistry, physical properties) rheology, mixing. 1. Biomass mixing from solids to slurry state: investigate effects of agitation power, mixing time, and mixing efficiency, et al. 2. Biomass particle size distribution effects 3. Mixing equipment effect: container dimension, rotor/impeller design, et al. 4. Stress analysis on rotor/impeller, mixer reaction forces 5. Rheological measurements of wet biomass
3.1	Objectives	To find the fundamental principles for guiding bioderived material mixing from solids to slurry state: • the effects of feedstock property • the effects of various process equipment • the key scale-up factors. • coping with rheology changes
3.2	Scope	Dead bioderived materials used as raw materials for bioprocesses or dead products of bioprocesses. Systems containing live organisms are out of scope. Wet processing of bioderived materials (cellulosics, foods, proteins) Scale: Lab to commercial production, batch or continuous.
4.0	Contractor	Kresta (Alberta), Liberatore (Colorado School of Mines), Ladish (Purdue)
4.1	Comments / experiences	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Controlled agglomerate formation by colloidal self assembly
1.1	Project / Review	Review
1.2	Technical Area	Formation
2.0	Submitted by	J. Michaels, U. Wiesner
2.1	Member company/ies	
2.2	Idea creation date	25 June 2015
2.3	Last modification date	
3.0	Short goal description	Overview of different techniques that exist to control the formation of three-dimensional aggregates of colloids in solution. This may include microfluidics, electrostatic, template, and ligand attachment (e.g. DNA) approaches.
3.1	Objectives	Survey methods for assembly of colloids into larger structured assemblies (1-100 micron) with well-controlled size, shape, and arrangement of primary particles. Consider both single and multicomponent colloidal systems, “Janus” type, and non-spherical colloids.
3.2	Scope	Experimental methods
4.0	Contractor	Ilona Kretschmer (CCNY) Marcus Weck (NYU – Chemistry) David Pine (NYU – Physics or Mat’ls) Dan Luo (Cornell – BEE) - DNA
4.1	Comments / experiences	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Rapid Sensors for Bulk Powders
1.1	Project / Review	
1.2	Technical Area	Dry systems
2.0	Submitted by	Vidya Vidyapati, Massih Pasha
2.1	Member company/ies	P&G, DuPont
2.2	Idea creation date	June 23, 2015
2.3	Last modification date	June 23, 2015
3.0	Short goal description	Identify suitable sensing mechanisms for various systems
3.1	Objectives	Identify scope of application and effective, economical use of various sensors for visualization of PSD, spatial location, shape, composition, bulk density, etc.
3.2	Scope	Technologies currently or soon to be available for industrial applications
		Out of scope – "slow" methods
4.0	Contractor	Richard Tweedie, reference from David Scott, reference from LS Fan (see DOE-NETL website for more contacts at Stanford and Colorado), David Littlejohn-Strathclyde,
4.1	Comments / experiences	