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, Poul Bach
2.1	Member company/ies	Merck & Co., Inc., Novozymes
2.2	Idea creation date	23-Jun-2015
2.3	Last modification date	14-Jun-2016
3.0	Short goal description	Provide a literature review of challenges/opportunities with atomization across various high viscosity feed types, including high solids suspensions
3.1	Objectives (at least three)	1. Review of atomization methods (e.g rotary, pneumatic- and hydraulic nozzles, drop-on-demand and new emerging technologies from 3D-printing industry) 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. Important droplet attributes include: size distributions (anomalities? Satelites?), spray flux/density (including gas inclusion), initial droplet speed and factors influencing coalescence propensity. 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. 5. Review of predictive models for atomization. Opportunities, drawbacks, future direction
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)	Nasser Ashgriz (Uni. of Toronto), Charles W. Lipp, Threlfall-Holmes (TH Collaborative Innovation), A.H Lefebvre
4.1	Comments about Contractors	Nasser Ashgriz (Multiphase Flow and Spray Systems Lab; ed. of Handbook of Atomization & sprays) 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	Review of the decision-making process in the selection of batch, semi-batch, and continuous processing from a product quality, productivity, flexibility, agility and economic perspective.
1.1	Project or Review	Review
1.2	Technical Area[1]	System Engineering
2.0	Submitted by	Ian Leavesley, Paul Mort, Watano-san
2.1	Member company/ies	Lilly / P&G
2.2	Idea creation date	14-June-2016 AGM
2.3	Last modification date	15-June-2016
3.0	Short goal description	Review of the decision-making process in the selection of batch, semi-batch, and continuous processing from a product quality, productivity, flexibility, agility and economic perspective.
3.1	Objectives	Provide an analytical and holistic analytical approach to guide strategic decision making on the optimal use of batch, semi-batch and/or continuous processing to meet the specified business objectives.
3.2	Scope	In scope: Systems that have particles / colloids as a significant component of the process flow. Multi-unit op operation systems. Include process control elements.
4.0	Contractor(s) with contact information	Marianthi Ierapetritou – Rutgers University USA
4.1	Comments / experiences	While she has been involved with continuous pharmaceutical manufacturing recently, she has most of her experience outside of pharma and equally divided between batch and continuous.

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

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Empty Gels
1.1	Project or Review	Review
1.2	Technical Area[1]	Wet Systems
2.0	Submitted by	Judith Bonsall
2.1	Member company/ies	Unilever
2.2	Idea creation date	14/06/16
2.3	Last modification date	
3.0	Short goal description	Wilson Poon has shown that for traditional colloidal systems it is not possible to produce to stable gel at low volume fractions, however for industry the challenge remains to be able to suspend particles in a "liquid" without the tradition high phase volume colloidal system. There is also a requirement for the material to be shear thinning but with a negligible hysteresis in rebuilding of the structure
3.1	Objectives	Review of the anisotropic materials available to make shear thinning gels at a low phase volume with a yield stress capable of suspending particles up to 50µm
3.2	Scope	Low phase volume – less than 1% "structuring" particles
4.0	Contractor(s) with contact informatio	Associate Professor Patrick Spicer University of New South Wales (Australia) p.spicer@unsw.edu.au **Prof. Dr.-Ing. habil. Dr. h.c. Stefan Heinrich** Technische Universität Hamburg Feststoffverfahrenstechnik und Partikeltechnologie Denickestraße 15 (K) 21073 Hamburg **Ulrich Kulozik** TU München, Chair for Food Process Engineering and Dairy Technology, Germany

4.1	Comments / experiences	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	**EFFECT OF GRINDING AIDS IN INORGANIC DRY GRINDING**
1.1	Project or Review?	Brief
1.2	Technical Area	Size Reduction
2.0	Submitted by	Jeff Hoffmann, Paul O. Abbe Mojtaba Ghadiri, University of Leeds Charles Compson, Almatis Hugh Stitt, Johnson Matthey Akihiko Ema, Nisshin Lisa Taylor, Pfizer.com Alvaro Janda, Particle-Analytics
2.1	Member company/ies	
2.2	Date Idea creation	14-June-2016
2.3	Date -Last modification	
3.0	Short goal description	Review current state of the use of grinding aids in dry milling of inorganic and organic materials.
3.1	Objectives (at least three)	What are the purposes of the use of grinding aids and what are the known mechanism and efficacy.
3.2	Scope	
4.0	Contractor (two or three)	Heekyn Choi, Chnagwan Nat. Univ., South Korea P. Somasandran, Columbia Univ., New York Robert Flatt, ETH, Zurich, Swiss
4.1	Comments about Contractors	
5.0	Voting @ AGM	Selected / Rejected
5.1	# of Votes	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Online real-time monitoring of blend quality
1.1	Project / Review	Review
1.2	Technical Area	Characterization
2.0	Submitted by	Vidya Vidyapati, Mike Gentzler, Navin Venugopal, Jeff Bodycomb
2.1	Member company/ies	P&G, Merck, Corning, Horiba
2.2	Idea creation date	June 14, 2016
2.3	Last modification date	June 14, 2016
3.0	Short goal description	Identify suitable methods/probes/mechanism for monitoring blend quality online and real-time
3.1	Objectives	Identify scope of application and effective, economical use of various methods/sensors for measuring blend uniformity in a process
3.2	Scope	Technology currently available like NIR, UV, fluorescence, X-rays, PAT (Process Analytical Technology) etc.
4.0	Contractor	Dr. Johannes Khinast, Graz University of Technology, Austria; Dr. Thomas De Beer, Ghent University, Belgium; Dr. Fernando Muzzio, Rutgers University, USA;
4.1	Comments / experiences	

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Rapid inline sensors for bulk powders
1.1	Project or Review	Review
1.2	Technical Area[1]	Dry systems
2.0	Submitted by	Vidya Vidyapati, Massih Pasha, Bill Ketterhagen, Hiroshi Moi, Michel Louge
2.1	Member company/ies	
2.2	Idea creation date	June 23, 2015
2.3	Last modification date	June 15, 2016
3.0	Short goal description	Review sensing techniques for powder flows and other dry systems
3.1	Objectives	Review effective, economical use of sensors for measurements of PSD, spatial location, shape, composition, bulk density, moisture and other variables.
3.2	Scope	Technologies currently available or soon to become available for industrial applications.
4.0	Contractor(s) with contact information	Yasushige MORI, Doshisha University, ymori@mail.doshisha.ac.jp ; Richard Andrew Williams, Heriot-Watt University; Brian Marquardt, Applied Physics Laboratory, University of Washington, marquardt@apl.washington.edu
4.1	Comments / experiences	

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IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Toward Systems Engineering Workshop – A Gap Analysis of Systems Modeling, Sensor Capability and Integration thereof.
1.1	Project or Review	Review / Gap Analysis
1.2	Technical Area[1]	Systems Engineering
2.0	Submitted by	Alex Kalbasenka, Peter Vonk, Sean Bermingham, Paul Mort
2.1	Member company/ies	Corbion, DSM~~, P&G~~, PSE, P&G
2.2	Idea creation date	14-June-2016 AGM
2.3	Last modification date	16~~5~~-June-2016
3.0	Short goal description	This is a gap assessment of current capability in modeling and sensors available for systems integration of particulate process systems. The goal is to use this gap assessment as a foundation for a future workshop proposal (circa 2017-18) on Systems Engineering – Automation of Particulate Processing, including process, ~~and~~ product and sensor modeling.
3.1	Objectives	1. Review state of the art and identify critical gaps in systems modeling, including: a. Flowsheets used to integrate unit operations into systems, having mass and energy balances with distribute streams (particulate attributes) that are necessary to control desired product quality attributes. ~~a.~~b. Mechanistic models of sensors (e.g. to account for systematic errors in PSD measurements of non-spherical particles by laser diffraction) that will allow better validation of models that are subsequently used for optimal design and operation. ~~b.~~c. Additional models may include Advanced Process Control (APC) models suitable to link many-to-many relations among process sensors, actuators, and desired product attributes. 2. Review state of the art and identify critical gaps in sensor and measurement technologies for in-line, on-line, near-on-line and inferential sensing of process

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		streams, including distributed attributes (e.g., particle size, shape, porosity, moisture, composition…). a. Are there opportunities to adapt sensor models for more efficient process control purposes?
3.2	Scope	1) IChemE workshop on Systems Engineering Models, Nov 2016 (see S. Bermingham for details) – strong participation and critique – IFPRI funding? 2) Detailed review of recent gap analysis of PAT review article on sensor capability, "Assessment of Recent Process Analytical Technology (PAT) Trends: A Multiauthor Review", *Org. Process Res. Dev.*, **2015**, *19* (1), pp 3–62. http://pubs.acs.org/doi/abs/10.1021/op500261y
4.0	Contractor(s) with contact information	1. Stefan Heinrich, TUHH 2. Jim Litster or colleague, Sheffield 3. Zoltan Nagy, Purdue
4.1	Comments / experiences	The proposal is more of a Gap Assessment and Analysis rather than a conventional review. It is intended to set the stage for a "lighthouse" workshop in Systems Engineering.

IFPRI PROJECT / REVIEW BRIEF TEMPLATE

1.0	(Working) Title	Biomass Review –Wet Processing of Living Biomaterials
1.1	Project or Review	Review
1.2	Technical Area[1]	Wet Systems
2.0	Submitted by	Rajeev Gorowara
2.1	Member company/ies	DuPont, Syngenta
2.2	Idea creation date	IFPRI AGM 2015
2.3	Last modification date	Re-submitted AGM 2016
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(s) with contact information	Liberatore (Toledo) Cranston (McMaster) http://chemeng.mcmaster.ca/faculty/emily-cranston
4.1	Comments / experiences	

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