



IFPRI AGM 2019 SIZE REDUCTION AREA

Consultant's Review
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Workshop 2011 Recommendations:

Five research priority topics identified:

1. Review of dry/wet grinding and processing aids (**Kwade's report**), now leading to a milling project brief
2. Grindability' test: modelling (**Ooi's work**)
3. Molecular modelling of mechanical properties (**ADDoPT and VFL Programmes**), also the unfunded project proposal by **Theodorou**.
4. Manufacturing micron-sized advanced materials: the mill as a reactor
5. 'Assessment of energy utilisation distribution throughout the mill across scales



Outcome of Activities since AGM 2018

Current Full Project Briefs:

- A systems engineering approach to dry-milling with grinding aid additives (one proposal)
- Stress-induced transformations due to milling (two proposals)



Plan for 2020 and Beyond

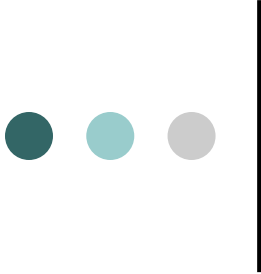
New Proposals? Ideas for consideration

Past Review Proposals for Fresh Consideration:

- Milling of
- soft matter
- Milling of multicomponent materials/ comilling
- Engineering scaling of mills

Workshop:

- Challenges and trends in comminution



European Symposium on Comminution and Classification, ESCC 2019

EFCE 3-Day conference, 2-4 September 2019, Leeds, UK

<https://esc2019.com/>

TOPICS:

- Size reduction and classification related to energy technologies, pharmaceuticals, foods, minerals, and chemicals.
- Mechanochemical, bulk and surface transformations
- Modelling across length scales
- Wear, erosion, and contamination
- Innovations in milling and classification process and equipment
- Nanomilling
- Enabling technologies
- Fundamentals of fracture

Two parallel sessions, 80 papers

Not a single IFPRI member has contributed!

UPDATES

A/Prof. Ecevit Bilgili (ecevit.a.bilgili@njit.edu)

Department of Chemical and Materials Engineering, NJIT, USA



Research area

Particle Technology, modelling and simulation of milling by PBM, drying

Summary of outputs

A pseudo-coupled DEM-nonlinear PBM approach for simulating the evolution of particle size during dry milling, Capece, M.; Dave, R. N.; Bilgili, E.

POWDER TECHNOLOGY Volume: 323 Pages: 374-384 Published: JAN 2018

Apart from Bilgili, nobody else is attending ESCC2019!

UPDATES

Prof. Malcolm Powell (malcolm.powell@uq.edu.au)
JK Mineral Research Centre, University of Queensland, Australia



Research area

Research interests are in the area of **optimisation of comminution circuits** through sampling and modelling, mill liner design, selection of liner materials, and the mathematical modelling of the motion of grinding media in rotary mills.

Summary of outputs

Has developed the use of grind curves to achieve optimisation of operating set points. Successfully applied DEM to a number of situations and contributes towards the idea of a unified comminution model, that brings all comminution models onto a common base. There has also been focus on what is required from DEM and mill modelling to increase understanding of comminution and to aid the design of novel comminution techniques and enhancing control of existing techniques

Publication list: PhD Thesis: Ping Yu: Analysis of the dynamics of tumbling and ball mills by PBM and DEM

UPDATES

Prof. Luis Marcelo Tavares (tavares@ufrj.br)

Department of Metallurgical and Materials Engineering,
Universidade Federal do Rio de Janeiro, Brazil



Research area

Works within areas of Mining, Metallurgical and Materials Engineering, focusing on Mineral Processing and Preparation of Ceramic Precursors. Researches primarily focuses on the **modeling and simulation of comminution processes**.

Summary of outputs

Lots of work relating particle size and parameter effects to stressing energies, distribution of fracture energies and damage accumulation within various grinding media. A number of models developed and proposed to describe breakage and impact predictions. Significant work in analysis of microstructure of rocks and cement clinker.



Stress-Induced Transformations

- Phase-transformation due to milling (Ali Hassanpour and Sven Schroeder, Leeds)
- Surface changes due to milling by FD-IGC (Jerry Heng, Imperial College London)



What is Ongoing at Leeds?

- Modelling of jet mills (AZ)
- Crystal breakage in agitated filter bed drying (AbbVie)
- Grindability inferred from breakability testing using Scirocco and G3 dispersers
- Analysis of pin milling (ADDoPT)
- Collaboration with PSE on impact breakage kernels
- Attrition in CLC systems (TOTAL)



Related Activities

- ADDoPT (Innovate UK). **Sean Bermingham**
- Virtual Formulation Laboratory (EPSRC). **Csaba Sinka**
- Centre for Manufacturability Design
(AZ are seeking additional collaborators). **John Blacker/
Mojtaba Ghadiri**
- Centre of Doctoral Training for Complex Particulate
Products and Processes (EPSRC). **Kevin Roberts/
Frans Muller**
- Organising ESCC2019 at Leeds in September 2019.
Mojtaba Ghadiri