

A Systems Engineering Approach to Dry-Milling with Grinding Aid Additives

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Project summary

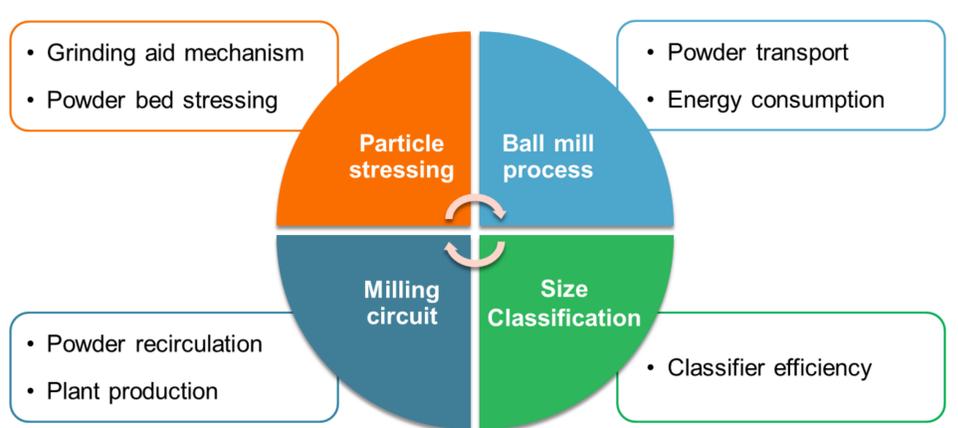
Long term objectives:

- Obtain qualitative/quantitative effects of grinding aid additives on material behaviour, process aspects and energy flows.
- Develop a system engineering approach for optimizing and scaling industrial dry grinding processes.

First phase (3+1 years period):

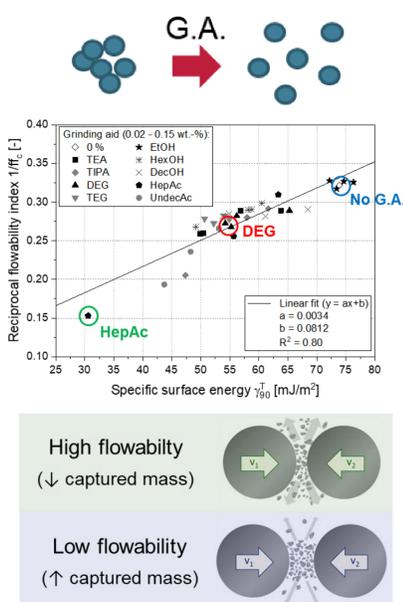
- Focus on the grinding aid impacts on the grinding aspects during ball milling, air classification and closed circuit plants.
- Those information is used to predict particle size distributions and energy consumptions.

System engineering approach



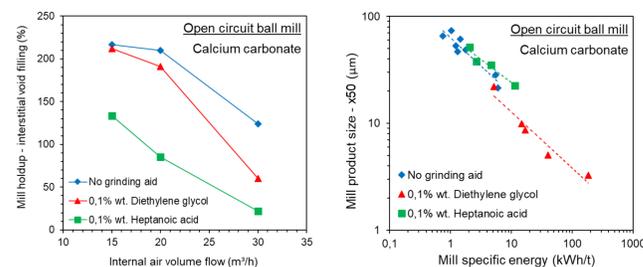
Micro scale

Grinding aid action

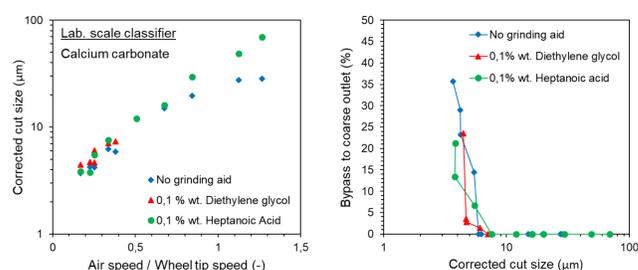


Macro scale

Ball milling

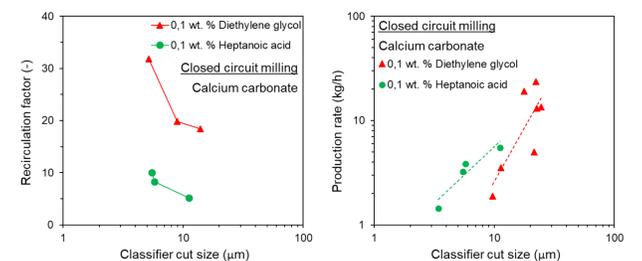


Air classification

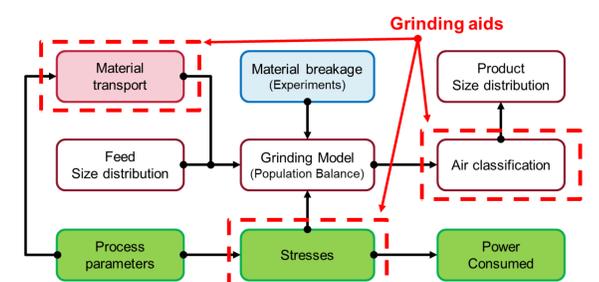


Macro scale

Closed circuit



Model structure



Future work

From Micro to Macro

- Relation between microscopic particle properties to macroscopic powder behavior
- Microscopic particle properties: Particle size, surface area and surface energy
- Macroscopic powder properties: Ring shear test, powder rheometer, heap angle, angle of repose
- Design of a characterization procedure to obtain required model parameters

Modelling of axial powder transport during milling

- Based on milling data combined with macroscopic powder properties

Validation of flowsheet tool with industrial data

- Collection of industrial plant data (either provided or by a sampling at the plant)
- Characterization of material and flowsheet simulation of circuit for validation

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