

2020-01-30 2nd Steering Meeting - A Systems Approach to Grind Aids

Attendees

- Charles COMPSON
- Jarrod HART
- Anderson CHAGAS
- Bas VAN LAARHOVEN
- Frits VAN DER WESTERLAKEN
- Eric GULLIVER

Apologies

- Arno KWADE
- Sandra BREITUNG-FAES

Agenda

- a) Agenda:
- b) - Review actions (per last meeting notes)
- c) - Review progress
- d) - Planning for coming quarter
- e) - IFPRI summer meeting

Actions from Last meeting:

- Jarrod to propose feed PSD
- Sandra to send delivery contact and address
- Sandra and Anderson to set up mill
- Jarrod to set up next meeting in January

Jarrod Hart's Notes

Actions are all done! Samples of both feeds have been chosen and delivered.

So...

We proceed through Anderson's slides (shared by email to attendees).

There were a few questions...

Slide 4:

Jarrod reminds Anderson of Imerys interest in moisture as a variable in the meso-scale properties. This is seconded by Alteo and Almatris. So far they have dried the samples to remove moisture as a variable, but he agrees they will include levels of moisture going forward.

We also discuss the PSD that will be used for the meso tests - we agree PSD target should be what is relevant in the "heart" of the job, so not at final PSD - maybe most of the way there - half way through by work?

JH Additional comment - in closed circuit grind there will be a steady state PSD in the mill , some selection for extraction by air, and finally selection by the classifier. The PSD in the mill would be interesting for the dense rheology (shear cell) and breakage work, the PSD in the air would be interesting for the airborne agglomeration (dry laser). Population balances should tell us the PSD's at these stages - key point is they will not match the feed or the product!

Slide 5:

Chuck asks if they will use a single ball size or a distribution?

They are using 10mm alumina to start with, but can adapt...

For the speed, how is it reported?

% or critical speed will be recorded, actual speed also available (rpm).

Slide 9 - Schedule

Start date..? As it was October 2019, first Q has already passed, we need to adjust this timeline accordingly.

Reporting?

Reports are due in June but needed to be submitted in May each year to Jim Michaels(ifpri.vp@gmail.com), plus a final report at the end.

Slide 10: Feeds and equipment

PSD device is Sympatec (dry and wet) and also Malvern MS 3000 (also dry and wet)

They will compare using both during the early stages.

At the size supplied, alumina has very little cohesiveness!

Air classifier - steel blades, may buy alumina blade!

Summary

IFPRI attendees all seem happy with progress and the proposal looks sound!

Actions:

- Jarrod to
 - schedule next call in early April (half-way to IFPRI meeting (week of 29 June in Leuven, exact dates and schedule tbc)
 - share the summer meeting agenda when it is published
- Anderson to
 - update timeline
 - add moisture to experimental design

2019-11-11 1st Steering Meeting - A Systems Approach to Grind Aids

Attendees

- Arno KWADE
- Sandra BREITUNG-FAES
- Charles COMPSON
- Jarrod HART
- Anderson CHAGAS

Apologies

- Bas VAN LAARHOVEN

Agenda

This call is to:

- f) Review the plan for the first quarter
- g) Brainstorm on key hypotheses & discuss ways to test them
- h) Ensure all materials and equipment are in place

Actions from Last meeting:

- Arno/Sandra to review preferred PSD and sample amounts wanted and revert
- Jarrod to set up meeting invite for Nov 11th

Jarrod Hart's Notes

First topic, what PSD and quantity is preferred?

Sandra:

- Lab ball mill, media up to 10mm, limited in largest particles possible
- their ideal size for feed would be median 100-150um, d95 <500um

Jarrod:

- Imerys' dry process is typically roller mill, then a ball mill, so most likely ball mill feed will be significantly finer, 150 or 200# (i.e. 80% below 105 or 75um)
- I will ask around what is most usual feed for our ball mills as this would make the work most representative and useful for us.
- I will also get some datasheets for products we make on such a ball mill with the feed we will provide, this should have some PSD data.

Chuck:

- what primary crystal size do they have in mind, they could have any primary crystal size?

Arnaud:

- Worked with 5-10um limestone in the past...
- Oh, alumina, not limestone, worked with 2-3um
- what is normal?

Chuck:

- their range goes from of 0.3um to 25um for alumina...
- 2-3um can be representative of a major type....

Jarrold:

- How much material?

Sandra:

- 800-1000kg bags on pallet 40x25kg bags

Chuck:

- That's OK, please email shipping address [+contact person and phone number]

Sandra:

- Which grinding media, steel or alumina

Jarrold and Chuck:

- Alumina! (for marble, colour is degraded with steel despite it's higher energy efficiency we cannot use it)
- 92% is usual, better toughness, except for high grade products which may be purer

Jarrold

- What target PSDs? What can mill make is the first question
- First step is to make a few different PSD's, testing limits of the mill...
- Then introduce grind aids and see if they can improve efficiency

Chuck

- Interested to examine distribution changes, from preground, to preclassified, to classified,
- what yield rate and quality improvement can be achieved with a grinding aid?
- wants increased rate (%), or for same rate, better quality...

Jarrold:

- What is quality for you?

Chuck:

- Quality could be the same median PSD, but improved 40um or 20um residue...

Jarrold:

- Yes for us steepness is also often a goal, it could be lower topcut for a given d50, BUT ALSO a higher d50 for the same topcut, it could be d95, for gloss in paint the "Hegman Gauge" value is key, not the d50.

Jarrold

- A note on humidity, for us, very dry material sometimes does not grind well and may stick on the balls - and water should be considered a grind aid, so humidity and feed moisture needs to be controlled carefully in all tests, it may be wise to start with a water dose curve, grind:
 - Dry (dried 150C overnight)
 - Dosed to 0.5wt% water
 - Dosed to 1wt% water
 - Dosed to 2wt% water
- Only consider chemical grind aids once water is controlled for. It may be that grind aids are synergistic with water, or anti-synergistic!
- Is this noticed for alumina? What is usual grinding moisture?

Chuck

- Only when grinding very fine (>5m2), alumina is not really sticking in ball mills, they are often only 0.1-0.2wt% moisture. Should be able to mill these materials as they come...

Action Plan next 6 weeks:

- order beads
- set up mill
- set up measurements
- Test ways to reliably and representatively to take samples
- Have some limestone they can use but real testing will await samples from Imerys and Almatris

Actions:

- Jarrod to propose feed PSD
- Sandra to send delivery contact and address
- Sandra and Anderson to set up mill
- Jarrod to set up next meeting in January

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Jarrod Hart

2019-09-26 Kickoff Meeting - A Systems Approach to Grind Aids

Attendees

- Arno KWADE
- Sandra BREITUNG-FAES
- Charles COMPSON
- Jarrod HART

Apologies

- Bas VAN LAARHOVEN

Agenda

This call is to:

- a) Review the proposal to ensure we understand it, and to agree the first steps.
- b) Check on systems materials and scope. Sort out the supply of samples.
- c) Plan and schedule for continued contact and clear communication.

Jarrod Hart's Notes

Scope

Basic Plan

- Y1 fundamentals
- Y2 modelling
- Y3 bring together

Model system would be

- A ball mill in a closed circuit with a classifier
- Two inorganic materials: alumina and calcium carbonate

We could also look at a air-classifier jet mill later.
Y4-6 second phase could expand to include organics

Discussion

The team has a small ball mill with classifier, (hoso/alpine), recovered from another university. They also have dry media mill they can couple with the classifier, and a Netzsch jet mill.

Early planning:

We will provide feed materials, Chuck will provide alumina, Jarrod carbonate. Arno to provide us with:

- Preferred rough psd of feed
- Amount wanted (bearing in mind we may struggle to provide more the exact same material later, we have some variation in production so it would be better to use a single batch of each.
- Delivery details (address, contact name and number)
- Feed will be supplied as bags on pallet(s).

Schedule for Review:

Project to start around the start of November, they will start by getting the ball system up and running.

We propose an hour catch up each quarter.

First meeting proposed for Monday November 11th, 9AM German time, then again in January, April and at the IFPRI summer meeting.

For the November meeting we will:

- Review the plan for the first quarter
- Brainstorm on key hypotheses & discuss ways to test them
- Ensure all materials and equipment are in place

Actions:

- Arno/Sandra to review preferred PSD and sample amounts wanted and revert
- Jarrod to set up meeting invite for Nov 11th

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Jarrod Hart