

RioTinto

MIT Global Summit on Mine Tailings Innovation

19th – 20th September 2024

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Dewatered Tailings: Option to Reduce, Enabler to Reuse

Kaci Jenkins - Principal Advisor R&D, Copper

Why Dewatered Tailings?

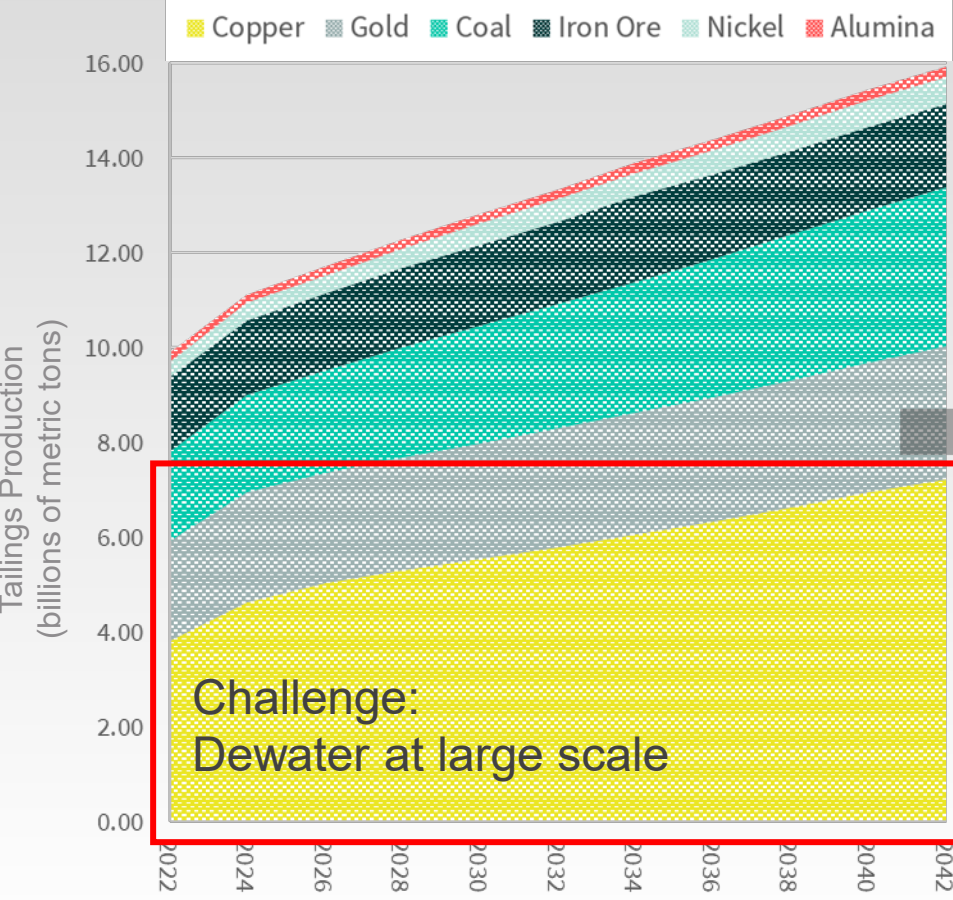
Tangible and Intangible Benefits to complete or partial dewatering

- Reduction in water usage
- Reduced storage area
- Reduced potential for environmental harm due to tailings storage
- Ability to demonstrate safe closure (i.e. no credible failure modes), reducing post-closure liability and monitoring times
- Unlock resource potential and support key business priorities



The size of our challenge

Future Global Annual Tailings Production - High case - Business as usual



ICMM, Hatch, IEA, S&P Global

Copper Tailings: Upwards of 120,000 tons per day

Height 5.8 km
Volume 199 km³
Weight 278 Billion Tonnes
Equivalent To ~79 Million Olympic Swimming Pools

Largest Dewatered Operation: 50,000 tons per day

Volume 7.0km³
Weight 9.9 billion tonnes
Equivalent to ~2.8 million Olympic swimming pools

Equivalent to ~13.7 million olympic swimming pools

MANHATTAN BROOKLYN

Response | Filter Manufacturers



A brand of
Aqseptence Group



With a max total filtration volume of 71 m³, and a max total filtration area of 2.850 m², the GHT5000F Domino is the **largest filter-press available in the market**. On large throughput projects, the GHT5000F Domino will significantly improve the capital cost of a tailings filtration plant compared with installing many smaller filter presses for the same duty. On a case-by-case basis, it is possible to evaluate the Total Cost of Ownership (TCO) and determine if a reduced number of large filtration trains offers savings versus a system with more units of smaller size.

<https://www.diemmefiltration.com/filterpress-for-sludge/filter-press-ght-5000f-domino/>

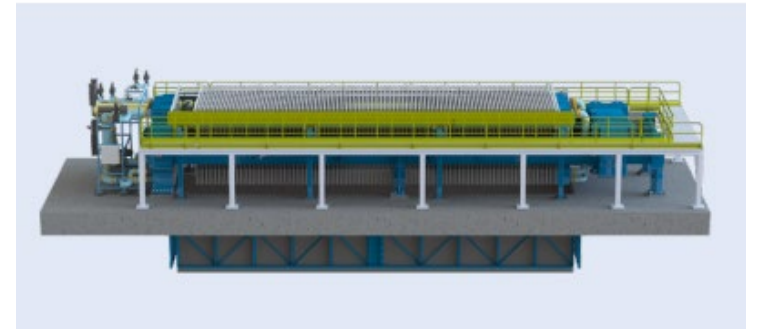
Larox[®] Metso
FFP3716 filter



Benefits

- 2000m² filtration area
- 44m³ chamber volume
- Up to 16 bars operating pressure
- Smart hydraulic system
- High reliability with reduced operating costs
- Readiness for remote production support

<https://www.metso.com/globalassets/campaigns/larox-ffp-filter/leaflet-3716-4234-03-24-en-mng.pdf>



Design envelope specifications

Filter cake dimensions (mm)	2500 x 2500
Max. quantity of chambers	170
Max. filtration area per filter (m ²)	2098
Max. filter volume (m ³)	38
Max. production (tpd)	8700
Max. filtration pressure (bar/psi)	16 / 218

https://www.flsmidth.com/-/media/brochures/brochures-products/filtration/fls-afp-2500-automatic-filter-press_flyer.pdf

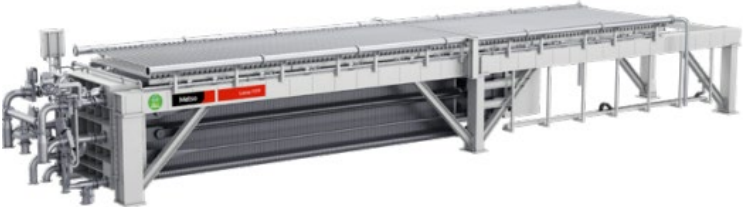
Response | 120,000 tons per day



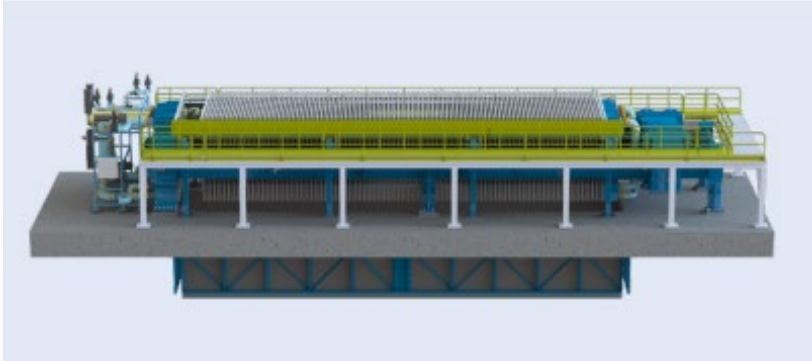
A brand of
Aqseptence Group



Chamber Volume	71 m ³
Filter Area	2850 m ²
# Filters needed	13



Chamber Volume	44 m ³
Filter Area	2000 m ²
# Filters needed	18



Chamber Volume	38 m ³
Filter Area	2098 m ²
# Filters needed	17

Response

Becoming Production Ready

Plan to Fail

Plan to Succeed

Out of Spec Stockpile

Temporary TSF



Cyclone
(Adjust Size)

Thicken
(Adjust feed %solids)

Adjust Technology
(one week change over)



Focus on how to divert feed when process variability impacts throughput and quality

Build testing facility focused on understanding impact of process variation on tailing's technologies

RTKC Testbed - Filtration Trials

Value

Position RTC to expedite implementation of filtered tailings solutions as they become commercially available at scale and shape filter trials at other locations

Challenge

Develop a small scale filtered tailings plant and trial several tailings filtration technologies with a particular focus on improving understanding of material variability impacts.



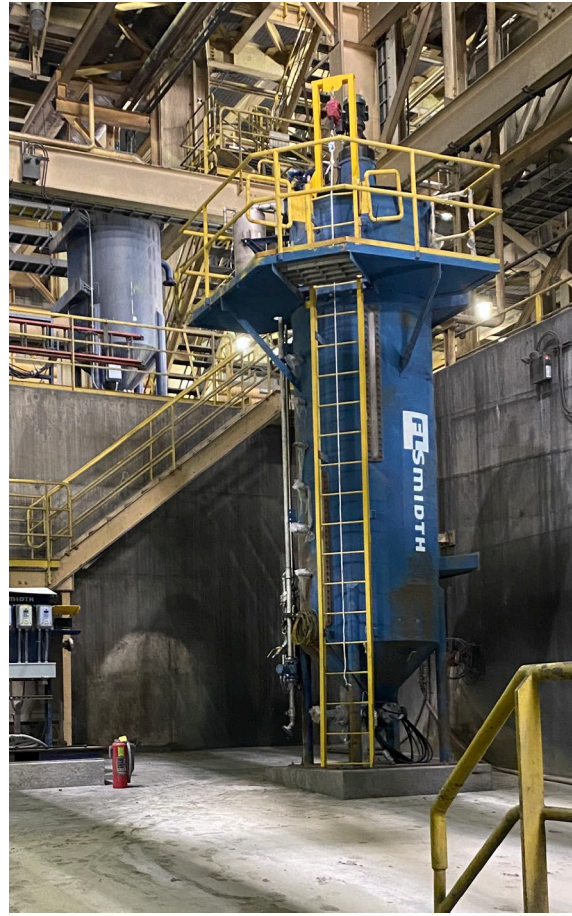
Plant within a Plant

RTKC Testbed Design

Cyclone
(Adjust Size)



Thicken
(Adjust feed %solids)



Adjust Technology
(one week change over)



RTKC Filtration Trial

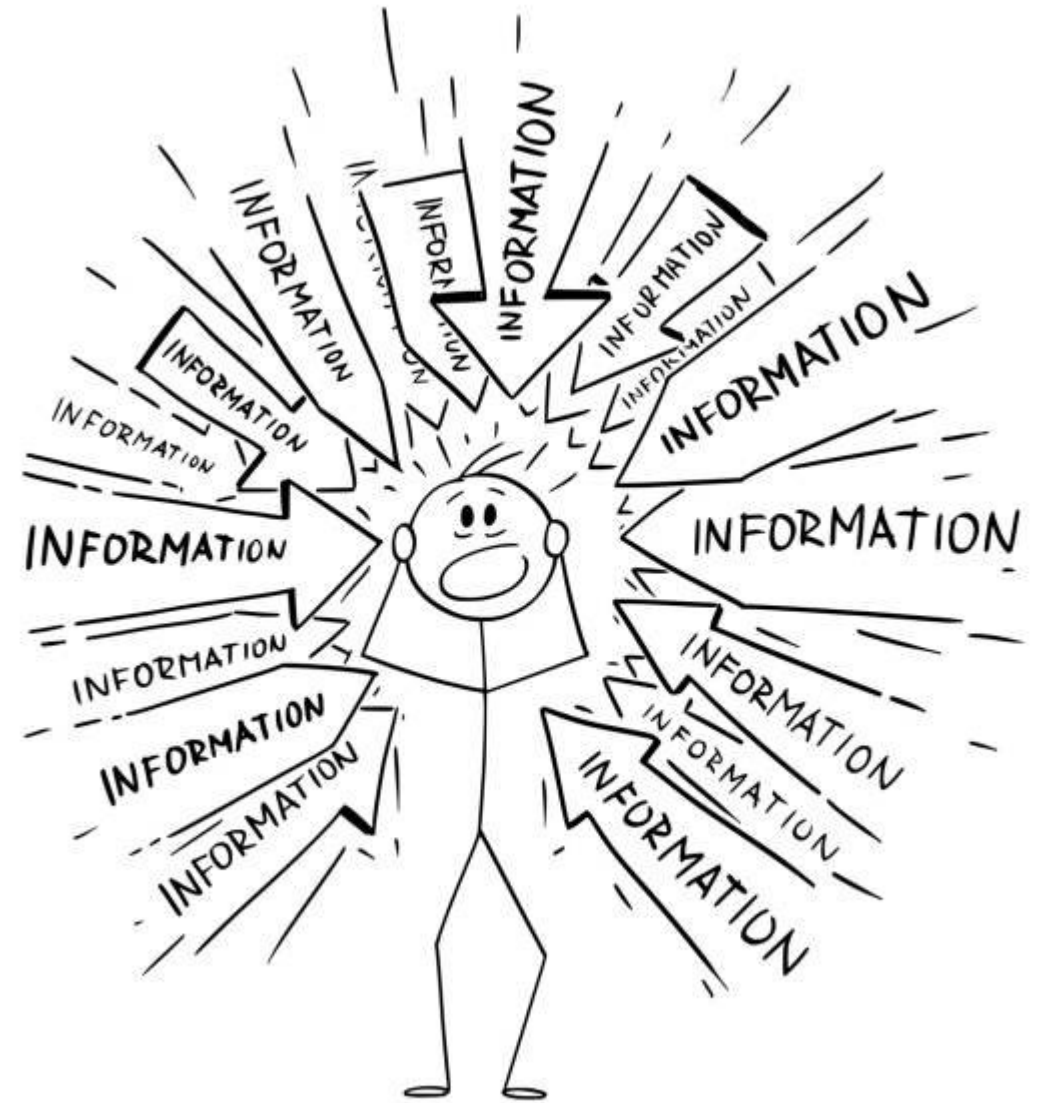
Stats

Lab Scale Study

- Full design of experiment
- 80 tests completed

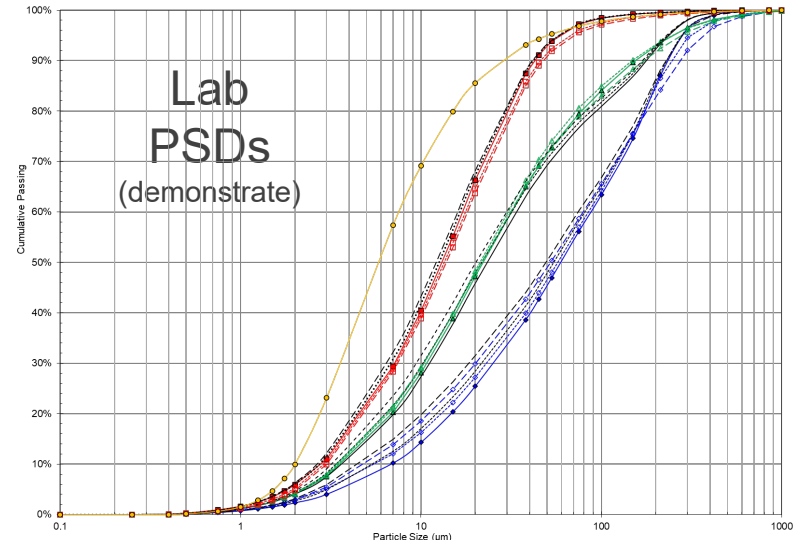
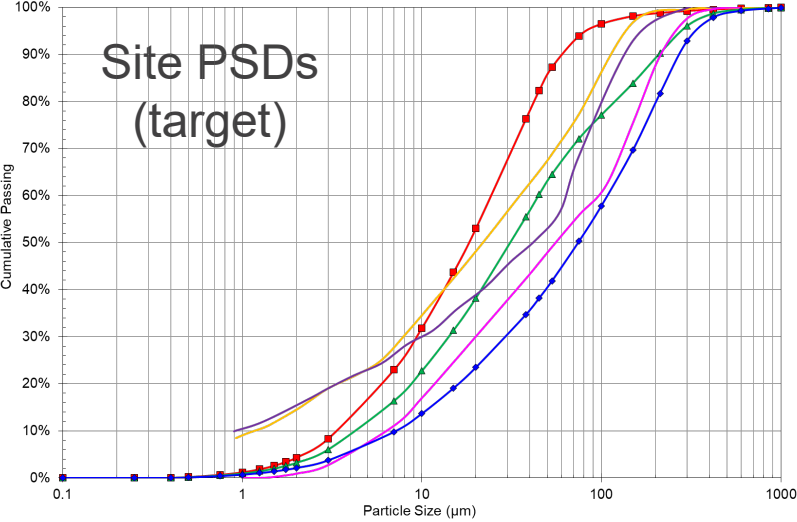
Pilot Study

- Full design of experiment completed
- 65 tests completed in triplicate with automated FLS filter
- 87 tests in duplicate completed with manual Diemme filter
- Minerology completed on all individual, thickened feeds
- 155 Particle Size Distributions (PSDs) completed
- Data analysis in progress

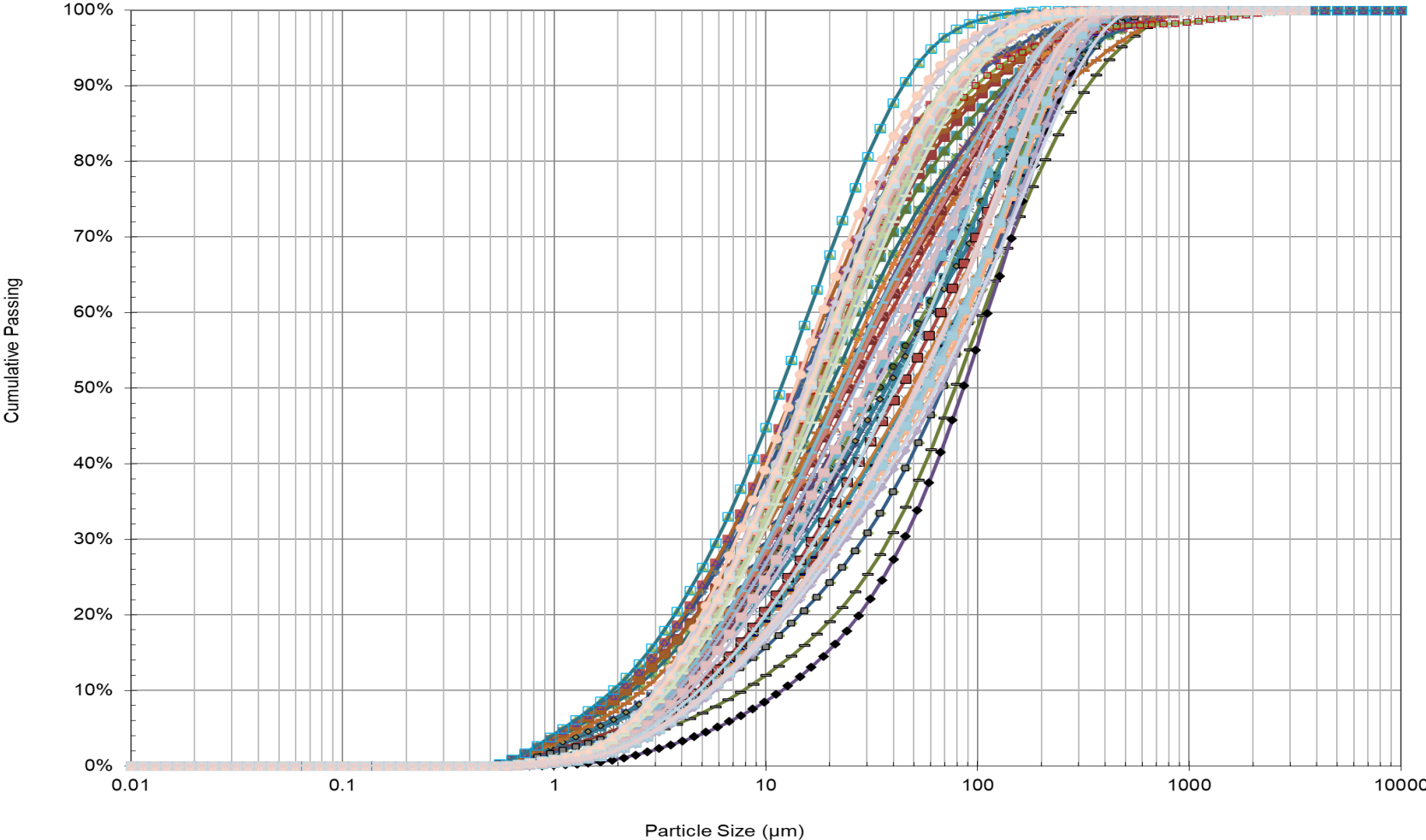


RTKC Filtration Trial

Asset Focused



Pilot PSDs (Actual)



RTKC Filtration Trial

Cake Differences

Whole Tailings



50/50 Blend



Cyclone OF



RTKC Filtration Trial

Whole Tailings
18% moisture



Whole Tails @ 18% Angle of Repose



Whole Tails @ 18% After 6,000m



Whole Tails @ 18% FMP test Before & After

50/50 Blend
18% moisture



50/50 Split @ 18% Angle of Repose



50/50 Split @ 18% After 10,000m



50/50 Split @ 18% FMP test Before & After

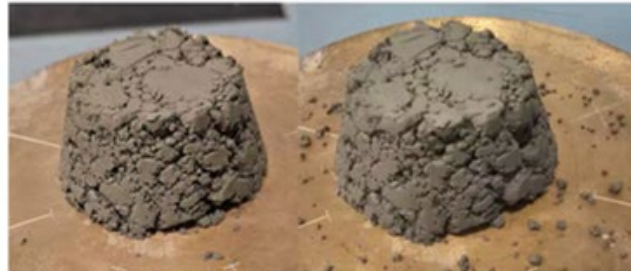
Cyclone OF
21% moisture



Cyclone Overflow @ 21% Angle of Repose



Cyclone Overflow @ 21% After 10,000m

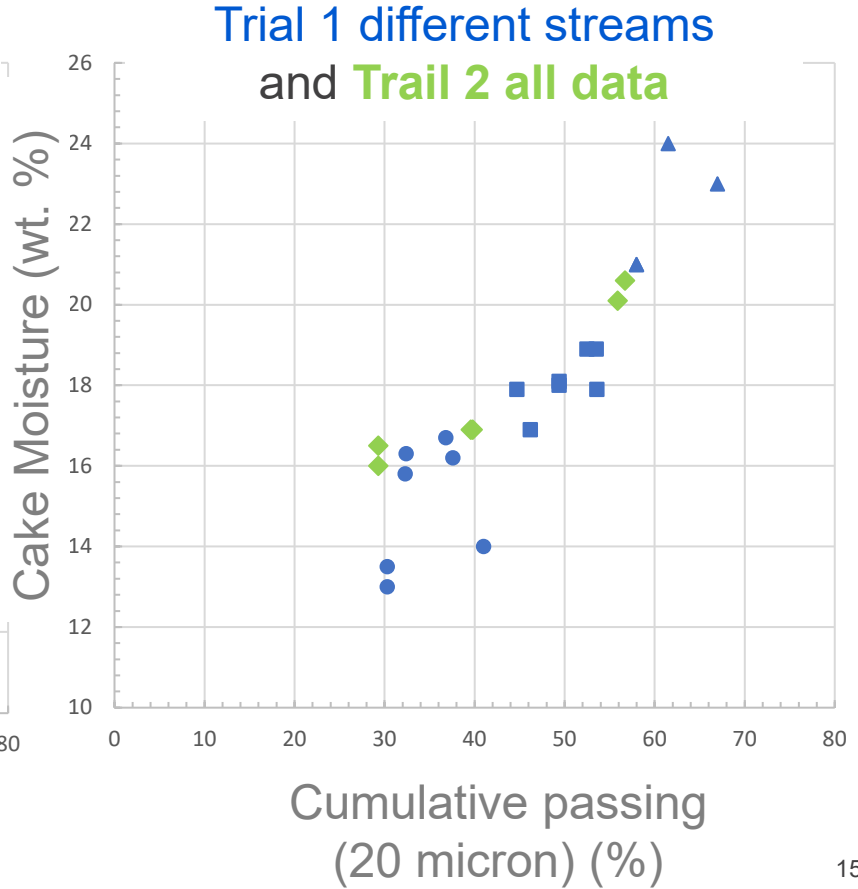
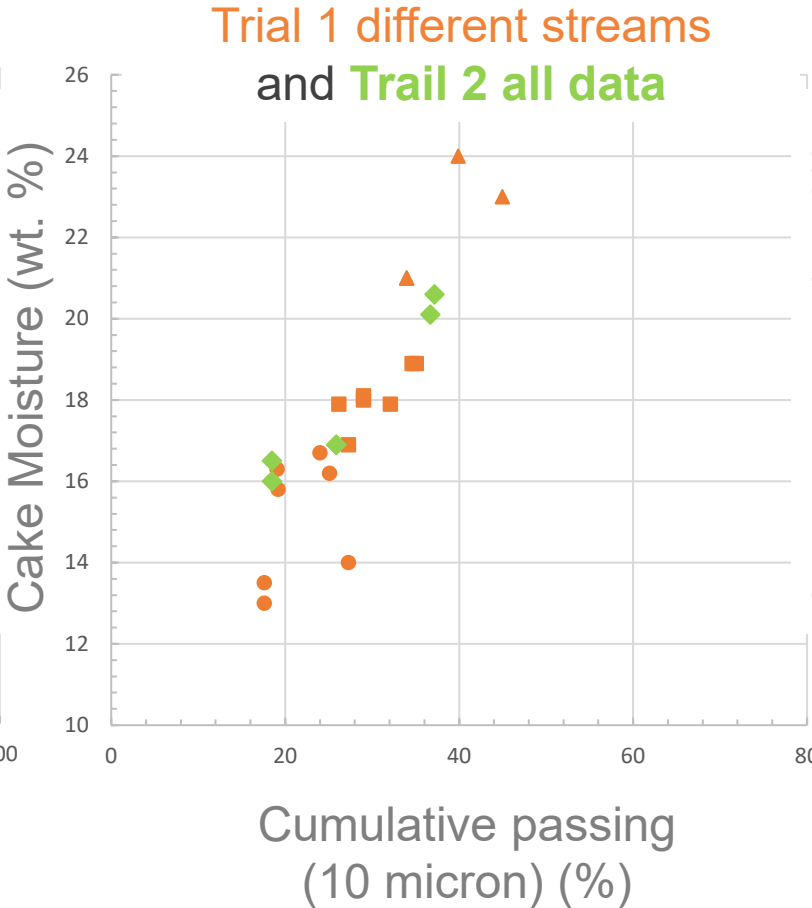
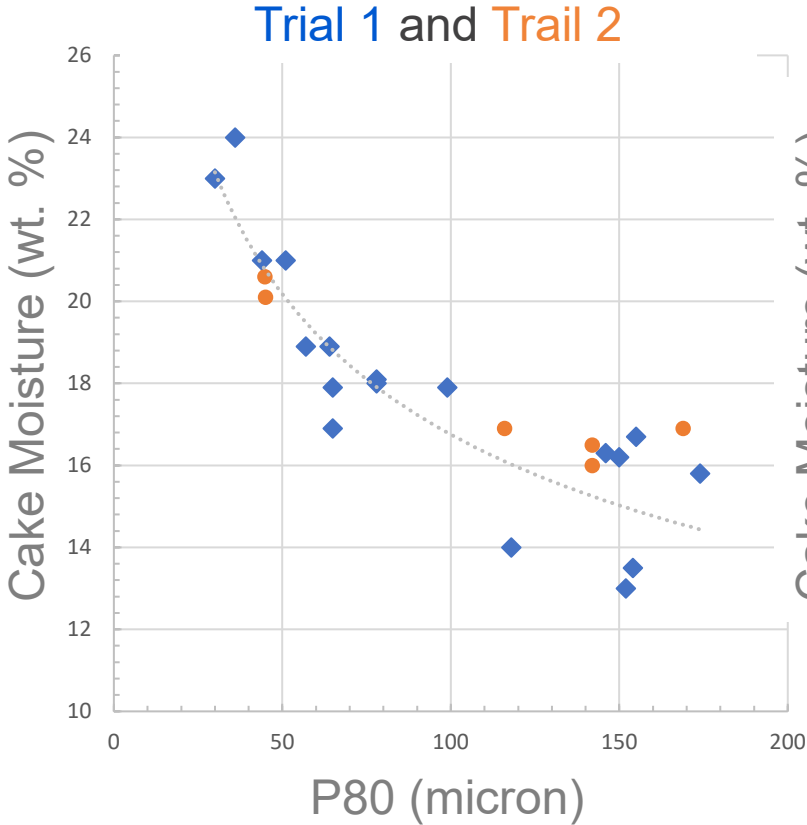


Cyclone Overflow @ 21% FMP test Before & After

RTKC Filtration Trial

Observations

Understanding what factors influence filter press performance can help us think differently on how to design robust systems



RTKC Testbed

Next Steps

Complete

Aug 2024

Oct – Dec 2024

FM Technologies



FLS 12 chamber filter



LENSER
The Heart of Filtration®



Outcomes

Proactively identify and deliver solutions to mitigate current and future risks to our people, systems, and business strategy

Outcomes

Forward Looking Strategy – Positioned to Pivot

- Cataloguing options for growth opportunities and being poised to implement new solutions as ore grades decline and tailings volumes increase.
- Not all tailings are created equal. Equipment options give flexibility.
- Permitting process for new facilities has tightened. Increased unease with every subsequent failure can lead to new regulations as in other countries. Need to be able to adjust if required.

Operational Tailings Technology Testbed – Positioned to Advance

- Rapid design and development of technology utilizing a state-of-the-art test bed.
- First-principle understanding of material variability impacts on tailings dewatering.
- Accelerate scaled evaluation of dewatering technologies and implementation.

Production Ready – Positioned for Success

- Focused on decreasing commissioning time of filtered tailings, which is currently 9 to 12 months to on average.
- Improved process flow sheet designs based on understanding of factors that influence performance.
- Improved system designs that consider process variability and its effect on filter throughput.

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