

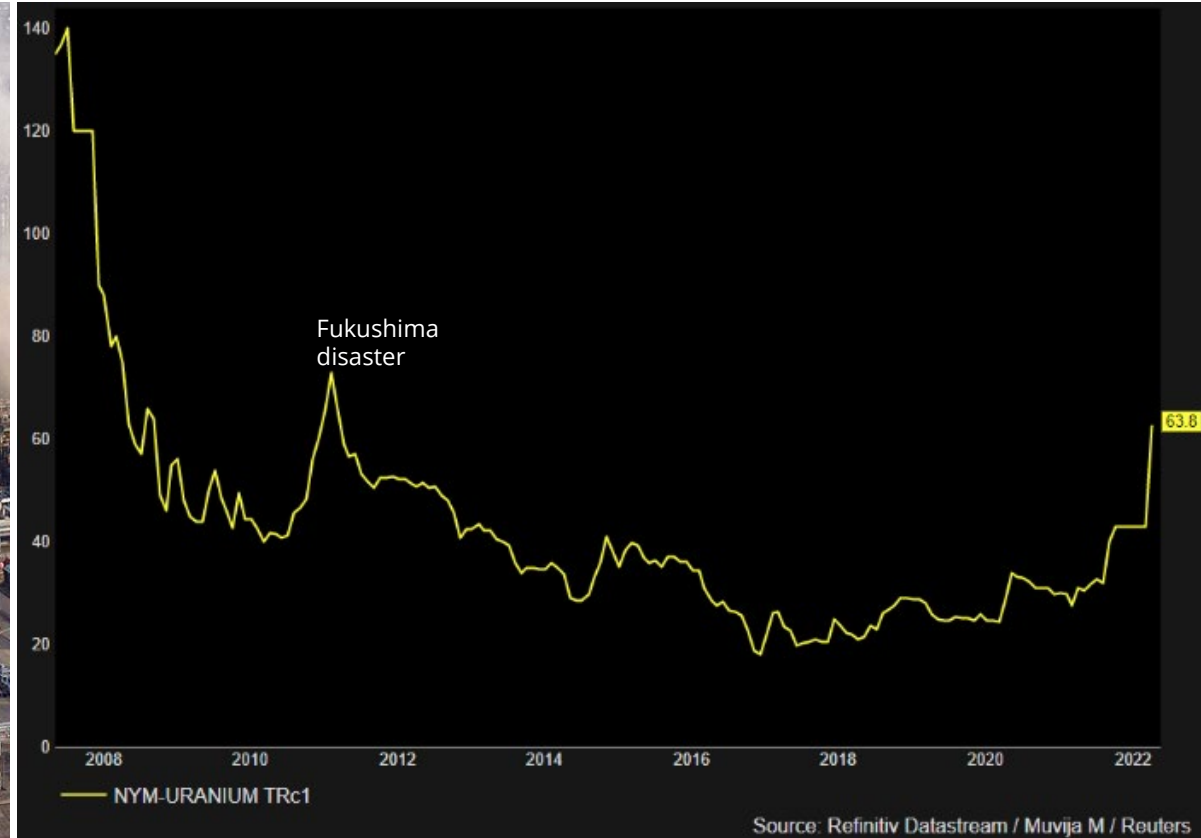


Filtered Stacked Tailings

New Industry Guide for Study Managers

A Tale of Two Miners

Why do we need collaboration?



<https://u.osu.edu/engr2367nuclearpower/files/2015/07/1-1x20sjo.jpg>

Catastrophic tailings facility failures present an existential threat to mining companies

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Vale dam disaster: \$7bn compensation for disaster victims

Dozens of people still missing after dam bursts iron-ore mine in south-eastern Brazil, with village destroyed by mudslides

Reports suggest that the Kolontar dam collapse was associated with foundation failure

Upstream tailings dams pose much higher stability risks, study finds

Kensington Gold Mine near Juneau reports 105,000-gallon tailings spill

UN calls for probe into Vale's tailings as waste heads to Brazilian river system

A tenth of the world's tailing dams have had stability issues

Contamination fears grow as Cadia confirms mine waste leak near Orange

The good news is that we can do better!

Tailings Management Consortium

Accelerate commercial availability of novel/unconventional tailings management capabilities/solutions:

- Reduce or eliminate catastrophic failure risk
- Enhance Social Value
- Facilitate availability of cost-effective solutions

BHP **RioTinto**
Tailings Management Consortium

Independent Expert Panel recommended implementing the following to assure physical stability:

- **Eliminate surface water** from the impoundment.
- Promote **unsaturated conditions** in the tailings with drainage provisions.
- Achieve **dilatant conditions** throughout the tailings deposit by compaction.

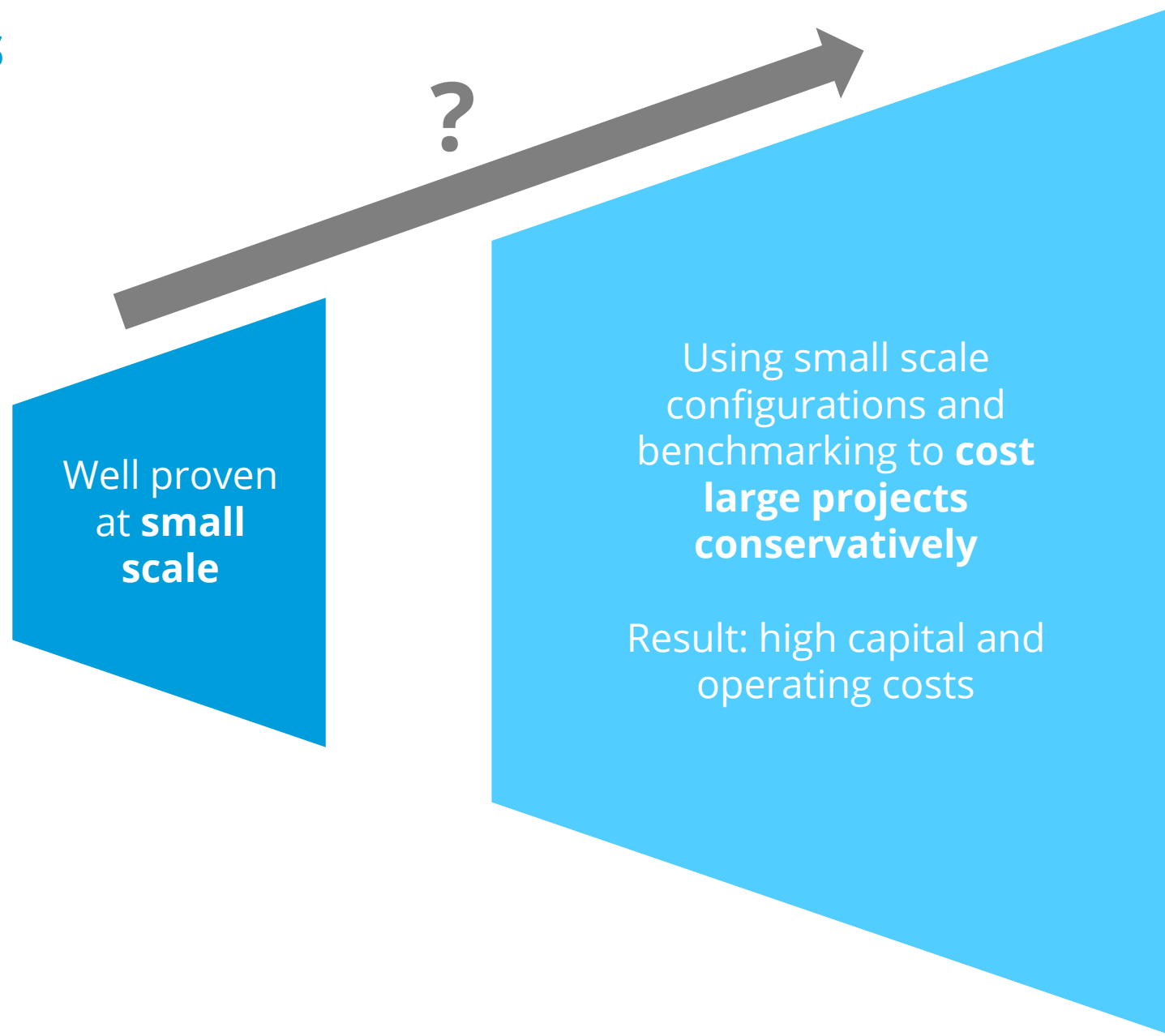
GISTM Requirement 3.2 also refers to minimizing the volume of tailings and water placed in external tailings facilities.



Filtered Stacked Tailings



Challenges



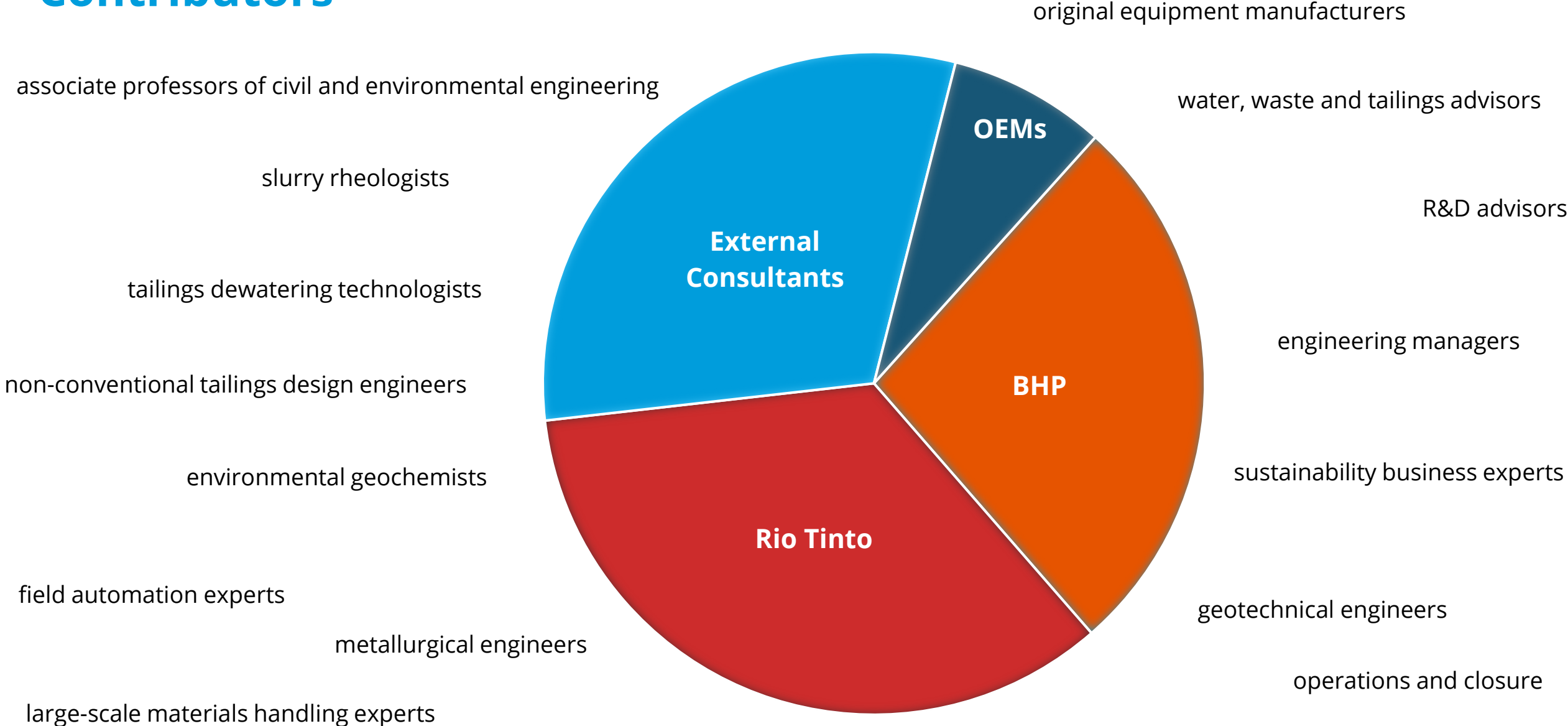
Filtered Stacked Tailings Guide

Publicly available document sponsored by BHP and Rio Tinto Tailings Management Consortium.

- Guide for study managers (leads) evaluating filtered tailings systems, specifically pressure filtration technology, to produce a self-supported (“dry”) filtered tailings stack
- Summarizes the technology, key threats and opportunities
- It is not a detailed textbook



Contributors



Holistic Approach

The goal is to create a geotechnically and geochemically stable landform that meets closure requirements and minimizes the associated capital and operating costs by optimizing the upstream processes and mine plan.

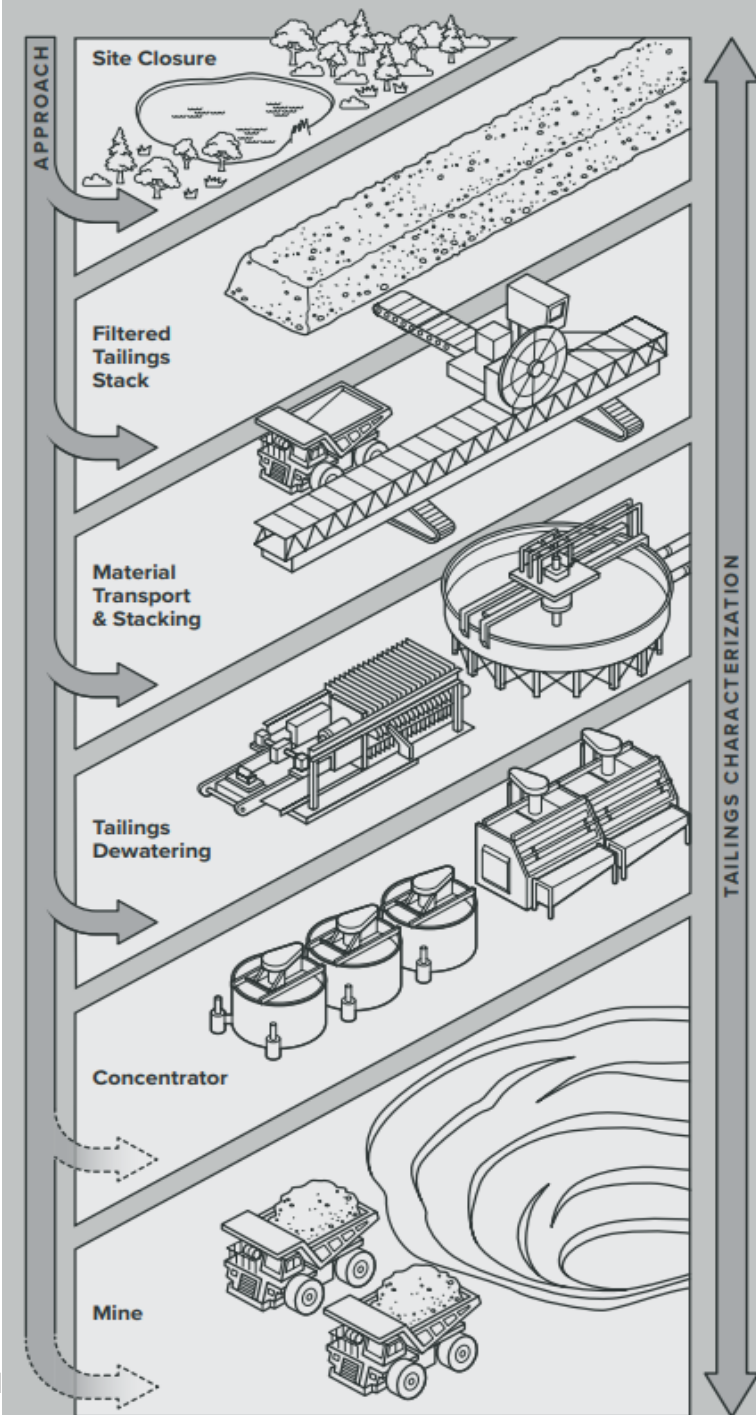
Define the stack (and site) closure objectives...include community impact...

Develop a stack design...Define the compacted stacked threshold moisture...

Assess filter cake transport requirements...to optimize the filter plant location...

Conduct filter performance tests...Size and cost the filtration plant...

Alter upstream processes and mine plan to optimize filtration performance and costs...



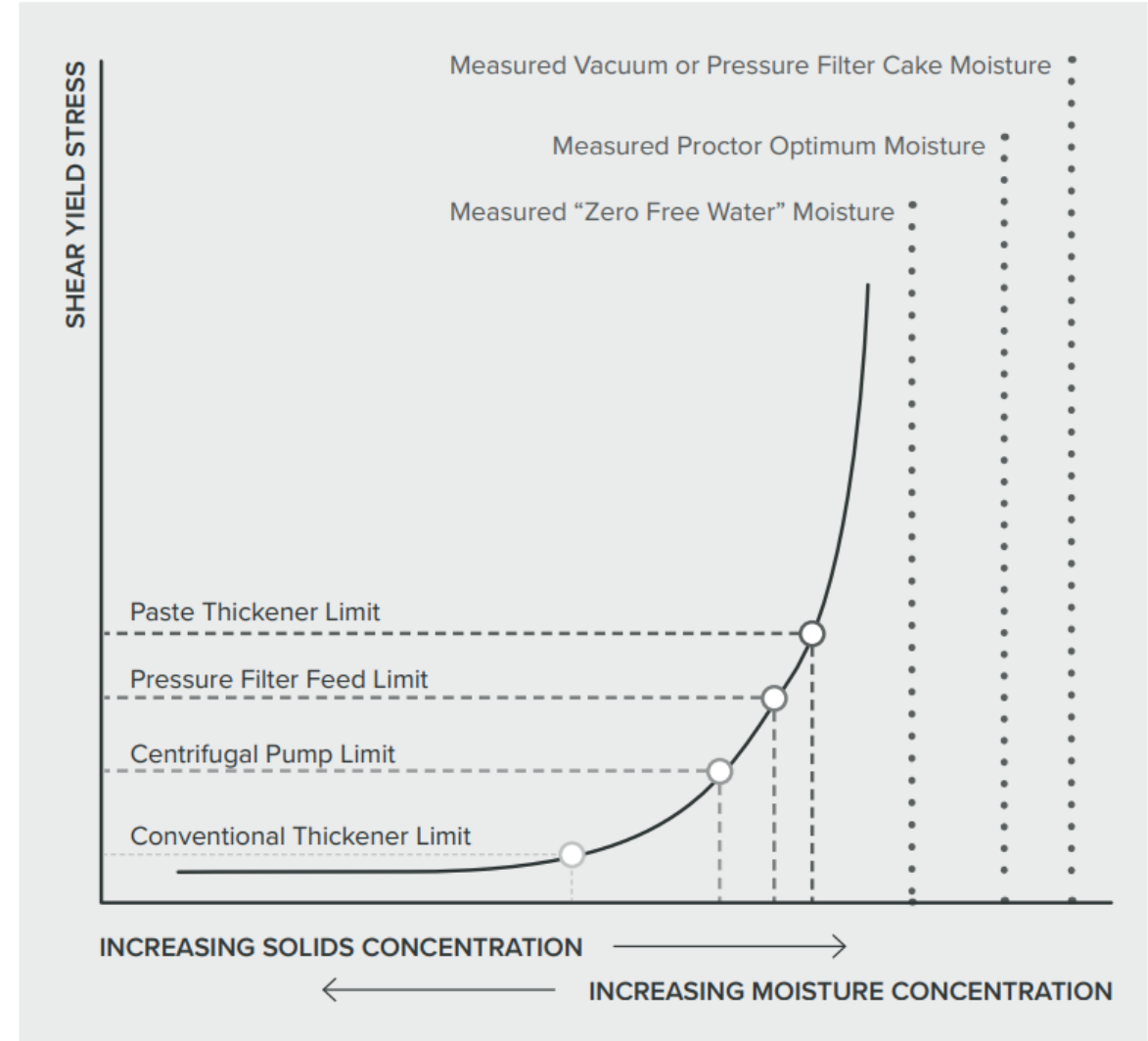
Key Point

2.1 Key Points

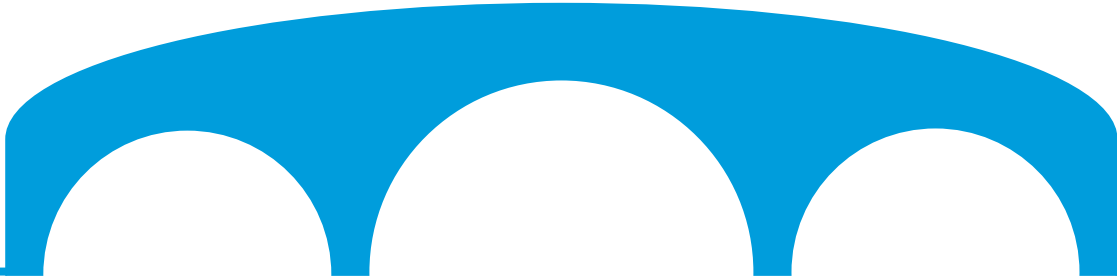
Tailings characteristics can vary with ore source, upstream processing steps and water quality. Thus, it is important to validate the key filtration study assumptions by completing a **preliminary filtration assessment**.

Delay comprehensive characterization programs until the process flowsheet and tailings facility options are defined, and regulatory data requirements are known.

Only characterize representative tailings, site raw water and process water samples.



Gaps



CURRENT STATE OF PRACTISE

Filtered tailings operations up to 35,000 tpd.

Higher initial capital and operating costs than conventional tailings.

KEY STEPS

- Appropriate costing models
- Demonstration of large-scale dewatering technologies
- Construction methodologies for large-scale facilities
- Ongoing knowledge sharing

WHERE WE WANT TO BE

Filtered tailings operations up to 100,000 tpd or more.

Significant risk reduction with acceptable capital and operating costs.

BHP RioTinto

Tailings Management Consortium

Thank you

Digital copies of the guide available at: KnowledgeBaseFeedback@visionippm.com

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