Considerations for Tailings Facility Design and Operation Using Filtered Tailings

- Each Project Requires Its Own Technologies
The Thickening Continuum

Conventional Slurry: Viscosity ≈ 5-20 Pa, Yield Stress ≈ 100 Pa
Thickened Slurry: Viscosity ≈ 800 Pa
Paste and Filter Cake:
- Cost increases
- Solids Content increases

Viscosity, Yield Stress, Cost

Solids Content
The Thickening Continuum

Increasing Solids Concentration

Segregates on deposition  Non-segregating

Conventional Tailings  Thickened Tailings  Paste  Cake

“Freely settled” concentration  No bleed water  Soil behavior

Fully sheared yield stress:  5 to 20 Pa  100 Pa  800 to 1000 Pa

Ketchup 15 Pa

Iron Ore Tailings, 64% m 100 Pa

PATERNSON & COOKE
Optimization

![Graph showing production cost and performance vs. initial solids content]

- Production Cost on the Y-axis
- Performance on the Y-axis
- Initial Solids Content on the X-axis

The graph indicates that there is an optimum solids content where the production cost and performance are balanced. The dotted line marks the optimum performance point.
Conventional to Thickened Slurry
Paste Tailings
Filtered Tailings
The Thickening Continuum

Figure 2: Trends in Use of Dewatered Tailings in Mining (after Davies et al, 2010)
When Filtering May Be Considered

– When the tailings are amenable to filtration
– When dam building material is scarce
– When operational controls can be assured
– When adequate compaction can be achieved
– When seasonal/climatic variations can be accommodated
– When maximum water recovery is needed
– When closure opportunities can be brought forward
– When maximum environmental protection is needed
Laboratory Filtration Testing
Filtration Equipment
Belt Filter

http://cdn.delkorglobal.com/asset/cms/Brochures/Filtration/English/Delkor_Belt_Filters_English.pdf
Filtration Equipment
Plate and Frame

http://www.flsmidth.com/~/media/PDF%20Files/Liquid-Solid%20Separation/Filtration/AFP%20Filter%20Press%20brochure.ashx
Filtered Tailings - Transportation and Placement
Filtered Tailings - Transportation and Placement
Great Opportunities for Compaction
Erosion protection

- Filtered Tailings
- Rock “Rind”
- Rock Starter Buttress
- Original Ground Surface
Closure and Reclamation

- Low (or reduced) chance of ARD (and metals mobilizing)

- Keeping the air out will keep the Fe from going ferric
Closure and Reclamation

– Adequately compacted and stable landform (if things went well)?
– Ease of re-shaping for closure (if not completed during operation)?
– Provides a possible walk-away closure solution?
– Improved public buy-in?
– Improved permitting?
Conclusions

– As with all project developments, the technologies presented here should be considered as alternatives

– Viability and advantages of filtered tailings should be evaluated on a project specific basis

– Climate, operational preferences, material characteristics, site layout, and economics should all be considered when evaluating tailings technologies, such as filtering
Thanks!!