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CONSULTING

# Considerations for Tailings Facility Design and Operation Using Filtered Tailings

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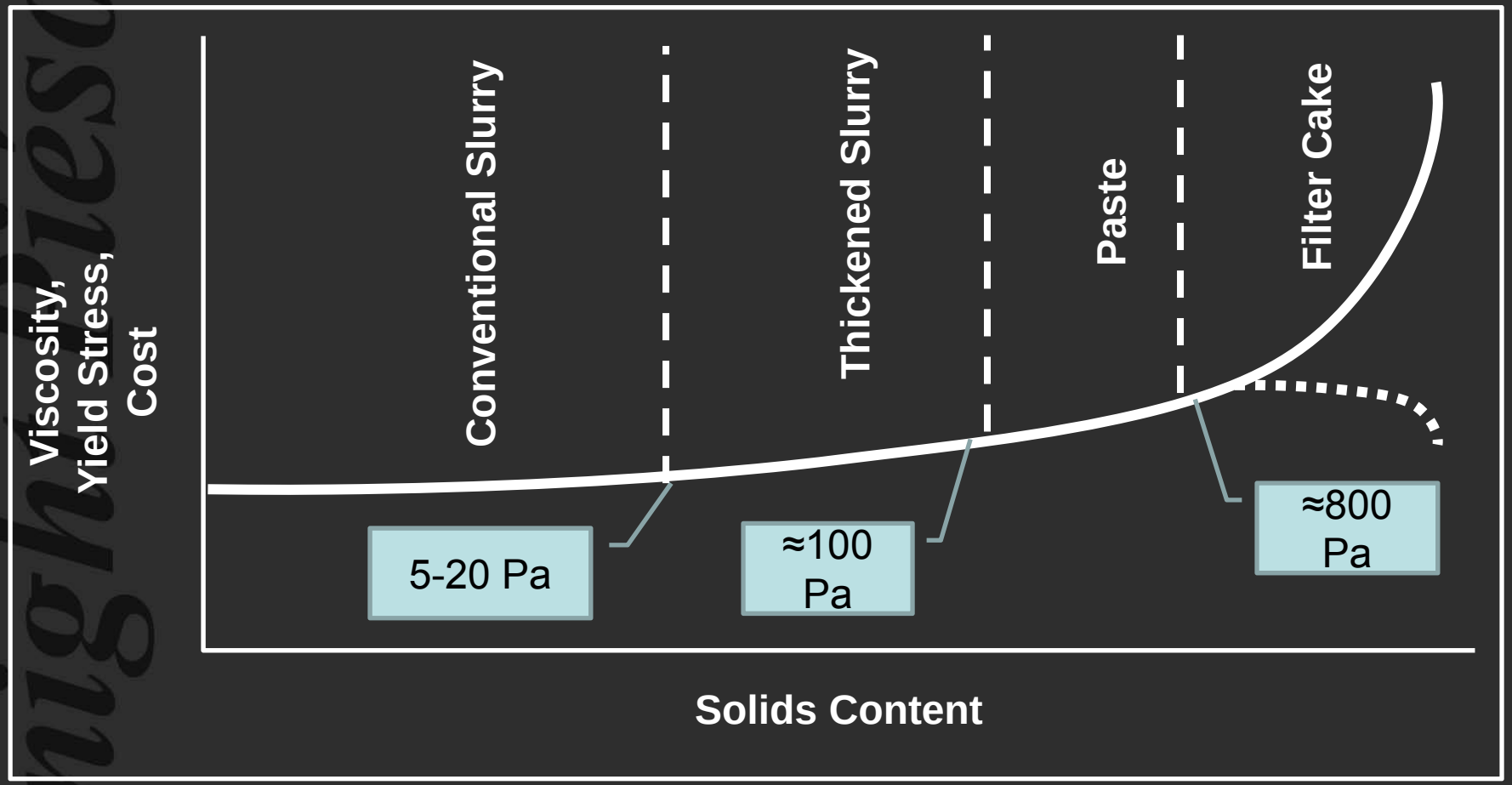
# Each Project Requires Its Own Technologies

# The Thickening Continuum



# The Thickening Continuum

Increasing Solids Concentration

Segregates on deposition — Non-segregating

"Freely settled" concentration

No bleed water

Soil behavior

**Conventional Tailings** | **Thickened Tailings** | **Paste** | **Cake**

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

Ketchup 15 Pa


Iron Ore Tailings, 64%m 100 Pa

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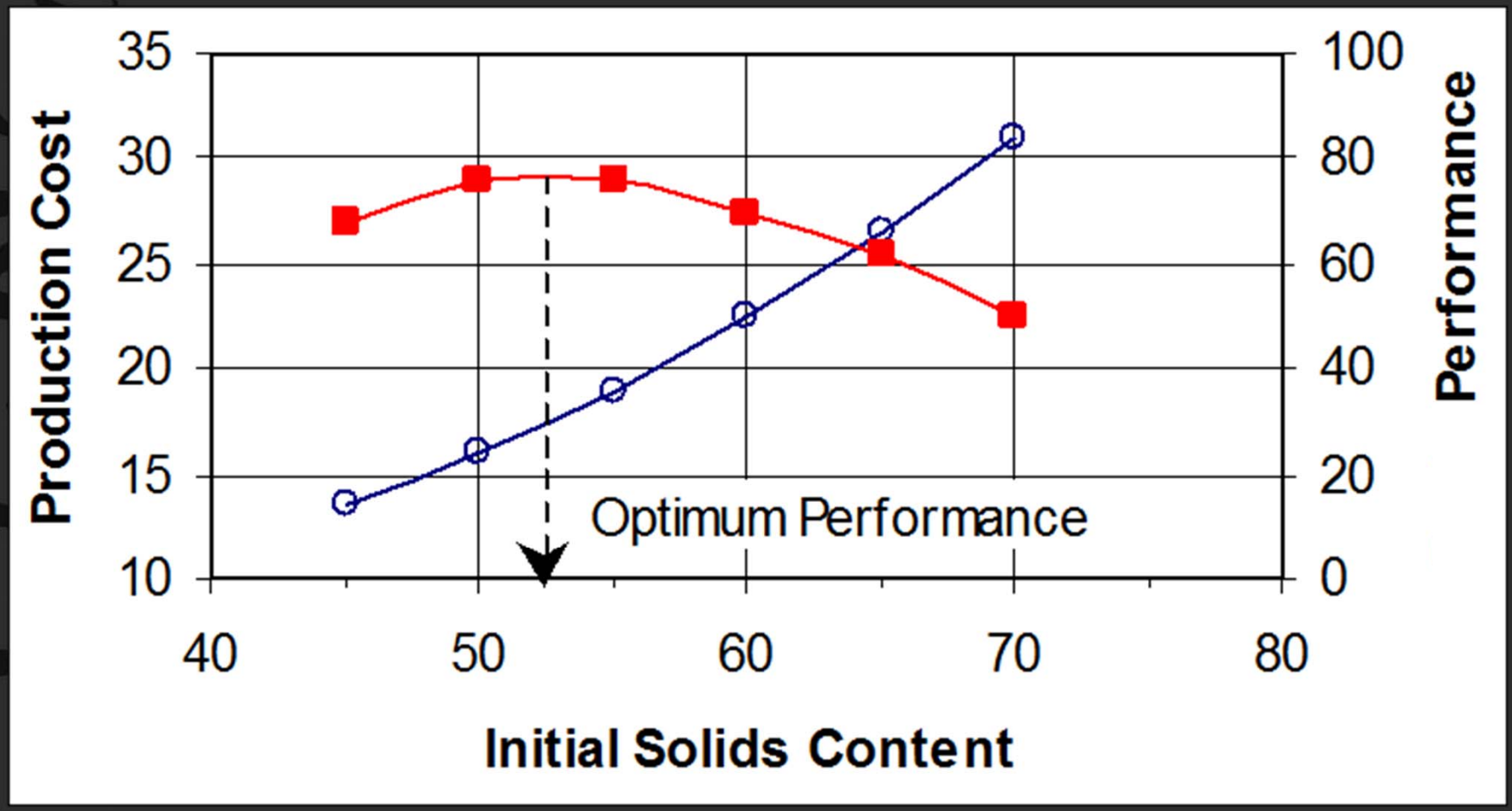
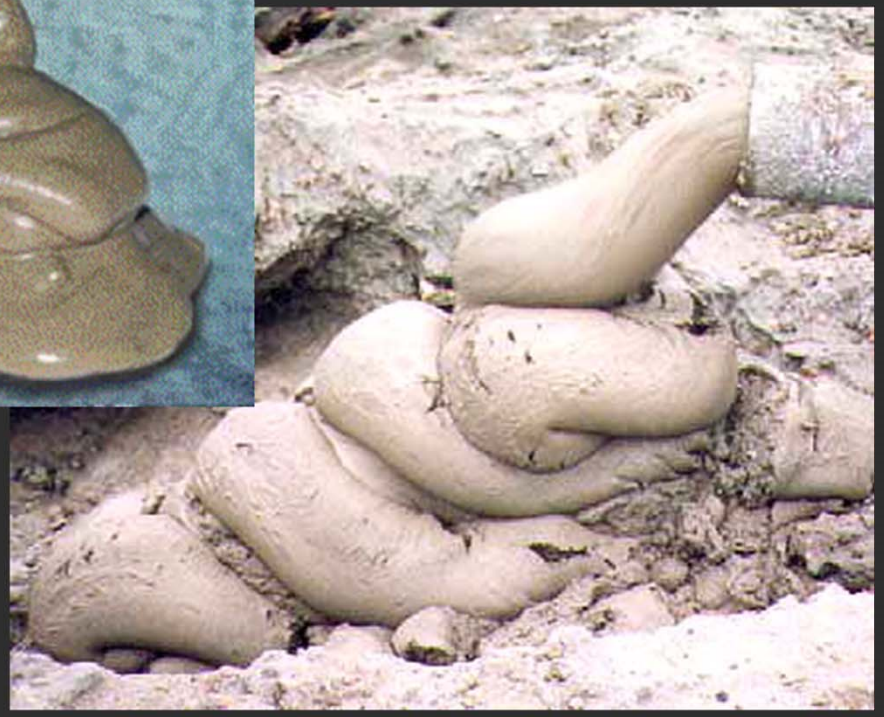
# Optimization



# Conventional to Thickened Slurry

# Paste Tailings



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# Filtered Tailings

# The Thickening Continuum

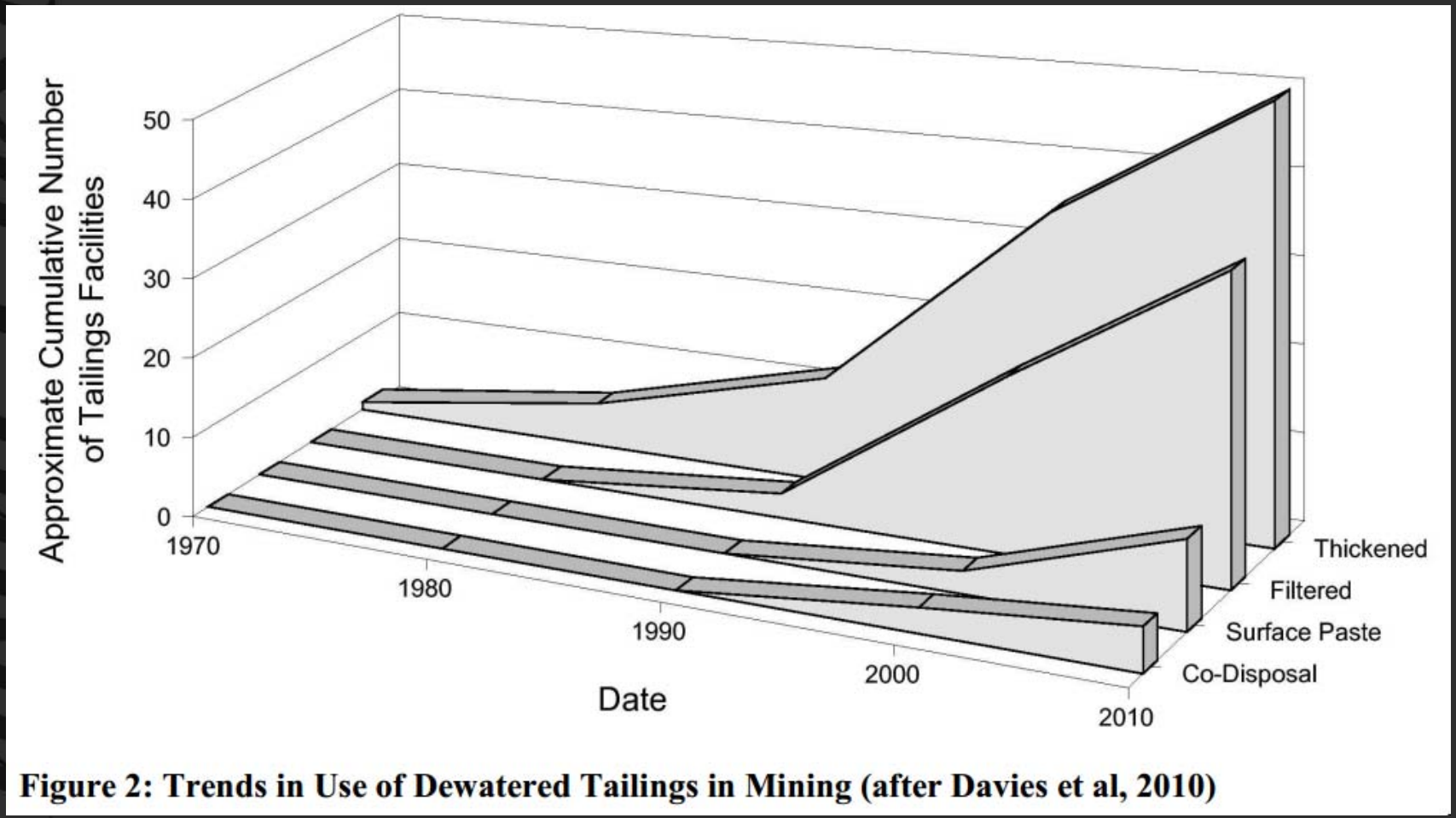


**Figure 2: Trends in Use of Dewatered Tailings in Mining (after Davies et al, 2010)**

# 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



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# Filtration Equipment
# Belt Filter

http://cdn.delkorglobal.com/asset/cms/Brochures/Filtration/English/Delkor_Belt_Filters_English.pdf

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# Filtration Equipment
# Plate and Frame

http://www.flsmidth.com/~/media/PDF%20Files/Liquid-Solid%20Separation/Filtration/AFP%20Filter%20Press%20brochure.ashx

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# Filter Plant
# Plate and Frame

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# Filtered Tailings - Transportation and Placement

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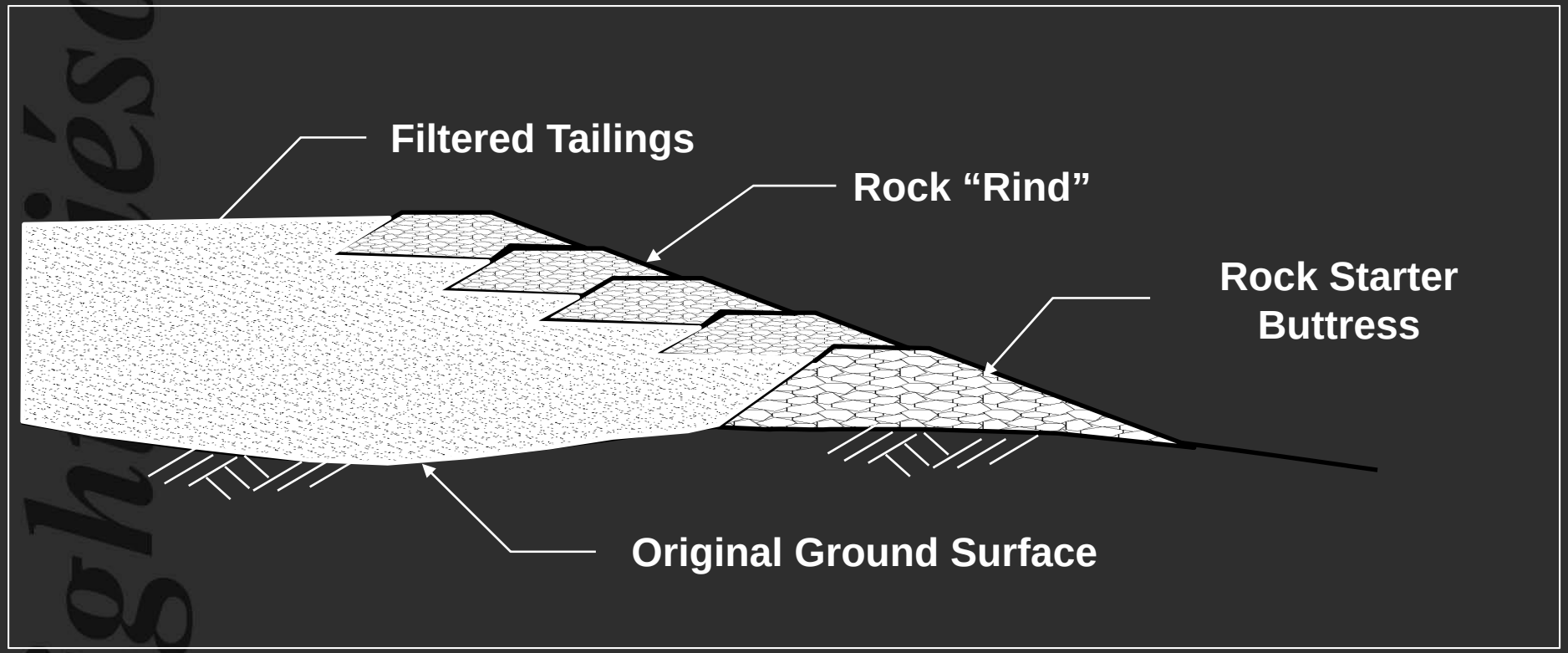
# Filtered Tailings - Transportation and Placement

# Great Opportunities for Compaction

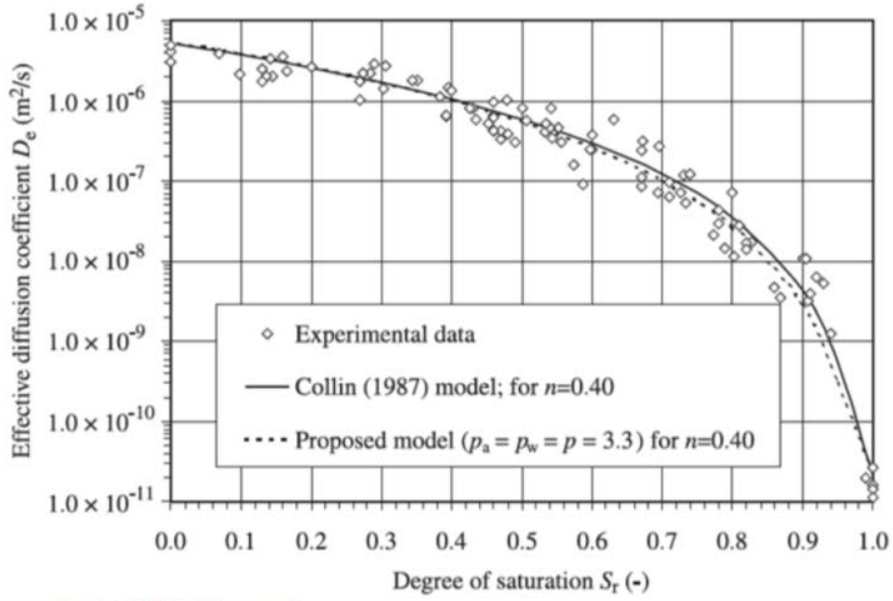
# Erosion protection



# Closure and Reclamation

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

**Fig. 2.** Comparison between diffusion coefficient values measured on different materials (soils, tailings, and geosynthetic clay liners; data taken from Aubertin et al. 1999, 2000*b*; and Aachib et al. 2002[4]) at various $S_r$, with predicted values obtained with the model of Collin (1987) and the proposed eq. [16].




From: Mbonimpa et al., 2003, Figure 2.

- 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

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**Thanks!!**