Decanting of Tailings Supernatant

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Decanting – Unique Oil Sands Challenges
1. Very large scale
2. Exceptionally large volumes of water
3. Bitumen, sometimes in considerable quantities and concentrations
4. High percentage of clay and fine material in the tailings, leading to challenges in separating solids from water

5. High levels of debris, typically woody vegetation, especially immediately after facility start-up

6. Weak dyke and dam foundation materials

7. Contamination from process affected water which limits options for water management
8. Rigorous environmental and regulatory control, also subject to ongoing revision

9. The need to keep process affected water separate from environmental or release water

10. A relatively long and harsh northern winter climate, with a lack of solar radiation for evaporation and desiccation
Potential Benefits from Fixed Decants

- Reduction in the depth and area of pond
- Increase in subaerial deposition (BAW) and reduction in subaqueous deposition (BBW)
- Improvement in
  - Phreatic surface
  - Consolidation
  - Slope stability
- Reduced risk of tailings liquefaction
- Reduced cost of recycling tailings supernatant
Impact of Pond Size on Dyke Slope Stability

Floating decant above

Fixed decant below
Decant Design Overview

- Key to geotechnical safety - management of water
- Key to management of water - decant system
- Worldwide tailings - many successful examples of gravity and fixed decants over the past century
- The design of decants is a well-established competence, contributing to the management of dam safety

Decant design:
- robust, efficient, fit-for-purpose, and cost effective

Optimal solution may be a hybrid design – leveraging the benefits of a number of alternatives
Fixed Decant System Objectives

- Robust and reliable design
- Simple construction
- Operationally friendly
- Minimize pond size
- Capable of handling off spec material & bitumen
- Keep supernatant pond away from embankments
- Handle precipitation events
Fixed Decant System Key Elements

- Decant Structure
- Pipeline
- Pumps
- Debris Screens
- De-icing Systems
- Access
- Protection
Fixed Decant System Design Variables

- Topography
- Surface storage vs in-pit
- Solids throughput/deposit rate of rise
- Tailings properties
- Seasonal vs year round operation
Decant Structures

- Range from simple steel pipe to more sophisticated reinforced concrete structures with adjustable weir
- Oriented vertically or installed on an incline (on original ground or in an embankment).
Decant Structures - Examples

- Decant structure installed on incline.
Decant Structures - Examples
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- Towers can be installed to their full height initially.
- Structure can be progressively raised as the deposit rises.
Decant Pumping - Example

- Submersible slurry pump
Codelco Chile, Chuquicamata, Rail Mounted Pump Station

- Side hill arrangement to accommodate a rise rate of 1 m/year
- 2500 m³/hr
- Pumps installed on a cart over rails
- Rails are located in a channel which serves as a sump
- The sump channel has a weir to prevent slimes from entering the suction
- The system is lifted with a winch
Chuquicamata – additional photos
Fixed Decant Concept
Fixed Decant Concept
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