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# Advanced Fines-Dominated Tailings Dewatering

## Background

Fine dominated tailings, defined as over 50 wt% of <44 µm size fraction in tailings, are challenging to manage. Fine tailings usually contain significant amount of clays, which make them difficult to dewater and consolidate due to low permeability. Over four decades chemical aids (e.g. flocculants/coagulants) have been used to improve fine tailings dewatering with or without mechanical (e.g. centrifuge, etc.) enhancement. Many technologies have been tried without much success in commercial operations. For example, some operations manage to produce a centrifuge cake with 55 wt% solids for the flocculated mature fine tailings, but still ready for reclamation.

Extensive research has been conducted to understand the fundamentals of fines tailings dewatering and consolidations, including the topics:

- Characterization of fluid fine tailings and their interaction with bitumen/organics
- Evaluation of the effects of different flocculants, coagulants, modifiers of surface hydrophobicity/rheological properties on settlings and centrifugation and filtrations in laboratory, pilot testing and commercial operations
- Impact of bitumen in tailings settling and consolidation, and
- Effect of mixing and shearing on fluid fine tailings flocculation and transportation

These studies have improved our understanding of both fundamental mechanism and operation performance. No breakthrough has yet been made to achieve dewatered the fines tailings with over 60 wt% solids economically.

## Statement of Research Opportunity

The new solution is expected to treat the fluid fine tailings produced from the conventional minable bitumen extraction process to obtain fines tailings with >60 wt% (+/-5 wt%) solids consistently through a combination of chemical and mechanical processes. The process is expected to use commercial readily available technologies or a technology to be deployed within five years.

## Desired Results

Better understanding of surface modification mechanisms of fines tailings particles must ultimately result in practical ways of dewatering fine dominated tailings to reach over 60 wt% solids. This allow the fine tailings to be disposed along with coarse tailings to a dedicated deposition area economically. This would reduce and eliminate the needs for fine tailings impoundments.

## Works Cited

- [1] An introduction to oil sands clays. CMS Workshop Lecture Series, vol 22. Omotoso, O., and Hockley, D. eds. 2018
- [2] Proceeding of fine tailings simposium (1993), Fine Tailins Fundamentals Consortium (editor Joseph Liu), Oil Sand-Our Petroleum Future Conference. Edmonton, Alberta, April 4-7, 1993.
- [3] Yuan X.S. and Shaw W. (2007)" Novel Processes for Treatment of Syncrude Fine Transition and Marine Ore Tailings," Canadian Metallurgical Quarterly, 2007, Vol 46, p 265-272.
- [4] Yuan X., Bara B., and Siman R., (2013). "Development of Success Criteria for High Density Fluid Fine Tailings Flocculation in Oil Sand Industry," Mine Waste and Tailings Conference, Banff, Alberta, November 3-6, 2013
- [5] Huang, K., Pan, L., Yoon, R.H., "A capillary flow model for filtration," Mineral Engineering, No.v115, pp. 88-96, 2018.