

## Tailings

- Tailings are a by-product of all mining operations. Tailings are made up of natural materials including water, fine clays and silts, left-over bitumen, salts and soluble organic compounds. They also include solvents added to bitumen during the separation process
- Tailings are discharged and contained in large earthen structures above ground – known as tailings ponds – or in former mine pits awaiting reclamation.
- The larger sand particles in the tailings settle to form a stable deposit very quickly, while the finer clay particles take years to settle and are known as fluid fine tailings. Through treatment, tailings ponds can be reclaimed and the water reused.
- Ponds are used to manage tailings while they settle over the initial 3-5 year period, and are a safe alternative to having tailings enter the watershed.
- Research on ways to treat fluid fine tailings continues, with the goal of developing technology that will help the fine clays settle quicker or eliminate the need for storage ponds altogether.
- Tailings ponds provide up to 90% of a company's water needs for oil sands extraction through the re-use of pond water, significantly reducing the amount of fresh water used. Comprehensive monitoring programs have not detected impacts from tailings ponds seepage on surface water or potable groundwater.
- There are currently more than 170 square kilometres of tailings ponds in the oil sands region.
- It takes time before space is available for reclamation, but the industry is now at the stage where some of the original ponds – like Suncor's Pond 1 – are seeing considerable reclamation.

## Monitoring and management

- As an initial step in reducing the inventory of fluid tailings, the Energy Resources Conservation Board developed new tailings management regulations and released them on February 3, 2009.
  - Companies are required to reduce tailings and provide target dates for closure and reclamation of ponds.
  - From 2010 onwards, companies must implement plans that significantly reduce growth in fluid tailings by consolidating fluid tailings and forming deposits of consolidated tailings that are ready for land reclamation.
  - The criteria require industry to stem growth of fluid tailings.
- The province is also developing a Tailings Management Framework that will lay the groundwork for an assertive plan to deal with pre-existing, or legacy, tailings. Performance criteria will be used to minimize environmental impact of tailings storage and to encourage quicker reclamation of legacy tailings.
- Any proposal to construct a new tailings pond is examined by technical experts from a number of provincial regulatory bodies including Alberta Environment, Alberta Sustainable Resource Development and the Energy Resources Conservation Board (ERCB).
- The proposed design and location of a pond is reviewed to ensure it is suitable from environmental, resource conservation and economic points of view. All ponds are constructed with groundwater seepage-capture facilities, and are closely monitored.

- Oil sands mine operators must provide a reclamation security bond (\$916 million held as of March 31, 2010) to ensure reclamation will occur. The new directives require annual reports demonstrating compliance with requirements.
- Effective bird deterrence is also an important part of government's approval requirements for tailings ponds.
- Ponds are monitored and where water seepage is detected, government requires a recapture system to return that water to the pond. No process water may be discharged into water courses.

## Research and development

- The Government of Alberta is working with industry and researchers to develop new tailings performance criteria, management technologies and practical solutions to reduce and potentially eliminate tailings ponds as we know them today.
- Alberta has allocated \$32 million to support clean energy research being driven by the University of Alberta, including \$7 million allocated specifically to support tailing research at the university's School of Energy and the Environment.
- New technologies will also further reduce freshwater consumption associated with oil sands extraction.
- Tailings management research has been underway for decades at Alberta Innovates – Technology Futures (formerly the Alberta Research Council), the CANMET Energy Technology Centre and the University of Alberta, and by industry in the oil sands area.
- Current and ongoing research at the government and industry supported Oil Sands Tailings Research Facility includes projects in sensor technology, characterization of tailings particles, filtration methods, tailings thickening methods, chemical separation of tailings and more.
- A national network of researchers are collaborating on a method of injecting flue gases such as CO<sub>2</sub> into tailings ponds to feed the growth of micro-algae, which can then be processed into products such as ethanol, bio-diesel and fertilizer.
- Alberta Innovates – Energy and Environment Solutions, through the Water Research Institute, is also leading or collaborating on a number of science and research projects focused on better managing water resources through reducing, re-using or recycling water used in oil sands extraction and processing.
- Alberta Environment is working on a provincial tailings management framework – an integrated management approach for reducing tailings inventory while addressing environmental issues like long-term containment and reclamation.

## Technology

- Technology, innovation and collaboration are key factors in the next generation of tailings management. A number of oil sands companies recently announced plans to work together in a cohesive effort to advance tailings management practices. The collaboration is in response to the Energy Resources Conservation Board's Directive 74, which sets strict guidelines for mining operators for the timely reclamation of tailings.
- New oil sands plants are expected to generate fewer tailings, and new tailings technologies will speed up the transformation of tailings into reclaimed land.
- Suncor currently uses consolidated tailings technology, but is adopting a new approach called Tailings Reduction Operations (TRO). The implementation of TRO involves converting fluid fine tailings more rapidly into a solid landscape suitable for reclamation. TRO uses a mature fine tailings drying process, which results in a dry material that can be reclaimed in place or moved to another location for final reclamation.

- Shell's Albian Sands project uses an innovative tailings management method to recapture water before the fine tailings are released to the tailings pond. Shell is testing and plans to apply several tailings treatment technologies including consolidated tailings, thickened tailings and dewatering/drying. These tailings treatment technologies allow the company to withdraw less river water and reduces the size of the tailings pond.
- Syncrude is also taking a multi-pronged approach to manage its tailings that includes three main technologies: composite tails, water capping and centrifuge technology. Syncrude has successfully piloted the use of centrifuges to dewater the fine tails that will be used in developing dry landscapes. Syncrude is also developing other tailings technologies such as accelerated dewatering.
- Canadian Natural Resource Limited's Horizon tailings plan is to use cyclones, thickeners and dewatering/drying technologies to reduce fluid tailings. The project will capture CO<sub>2</sub> emissions and pipe them to its extraction plant. The CO<sub>2</sub> reacts with silts in tailings to become a solid. This permanently traps the CO<sub>2</sub> and silts and will result in smaller tailings ponds, as water is recycled more quickly.

For more information, visit [www.oilsands.alberta.ca](http://www.oilsands.alberta.ca)

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