USE OF GRAVITY DRAINAGE AND QUASI-HOMOGENEOUS DYKES FOR CONTAINMENT OF OIL SAND TAILINGS

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The Oil Sand Industry in northern Alberta, Canada, disposes of the by-products of bitumen extraction into tailings ponds. The mix of tailings sand and mature fines, with gypsum added as a flocculent, constitute a waste stream called Consolidated Tailings or Composite Tails (CT). The two main challenges of the tailings disposal process are a chronic shortage of economical containment and the potential mobility of CT deposits in the event of breaching by, for example, long term erosion, which makes abandonment of tailings ponds more complicated. Thick deposits of CT do not consolidate in adequate time to provide reassurance for abandonment of the CT containment facilities and that is why the containment must be adequately robust or the properties of CT improved for long term stability.

This paper addresses potential solutions to these problems by applying the gravity drainage of CT and quasi-homogeneous construction for containment facilities.

Gravity drainage is suggested as a mechanism to facilitate the consolidation of CT in critical areas of the ponds by inserting internal sand layers within the body of the deposit. Critical CT areas are defined as areas around the perimeter of containment. The advantages of this solution are long-term stability of the disposal area by creation of stiff deposits around its perimeter and facilitation of reclamation efforts on its surface.

The present solution for containment of CT deposits is not favourable from a materials balance point of view. In general, sand has become a valuable resource as it both forms the primary component of the CT matrix and becomes the containment building material. If sand is required for CT, less is available for dyke construction. This puts additional pressure on the industry as a whole to maximize the use of overburden and interburden for construction of tailings containment structures. Typically, only 50 percent of dry mine waste (overburden + interburden) is incorporated into dyke construction. The remainder of dry waste is stored either in waste dumps or in tailings ponds, consuming valuable in-pond space originally allocated to CT material. Quasi-homogeneous dykes are proposed to contain CT deposits rather than traditional minimum cross-section dykes built of overburden and/or cell sand. The quasi-homogeneous dyke may change the unfavourable material balance and lessen the construction constraints that are presently imposed on the mine/waste disposal process.