

## **Optimization of cyclohexane Extraction of Alberta Oil Sands**

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Non-aqueous extraction of bitumen from oil sands has the potential to overcome the shortcomings of the current aqueous extraction process. In particular, it reduces the fresh water demand of the extraction process and eliminates tailing ponds. In an earlier solvent study on extraction of Alberta Oil sands, cyclohexane was selected as a candidate solvent, giving high recovery (94.4%), low content of fine solids in the recovered bitumen (1.4%), and low residual solvent in the extracted tailings compared to other studied solvents. Optimization of bitumen extraction using cyclohexane, and removal of cyclohexane from extracted tailings were studied in this investigation. We hypothesized that the drying rate of cyclohexane will increase and residual cyclohexane will decrease if the tailings are dried under high relative humidity and high temperatures. The addition of water during the extraction was also expected to reduce residual solvent in the tailings. Three different grades of oil sands– low fines, medium fines, and high fines concentration– were extracted by cyclohexane. Extracted tailings from low-fines oil sands were dried under different conditions of controlled relative humidity and temperature. The extraction of low-fines oil sands with added water was also carried out. The drying curves had two initial (for about 20 min) and secondary constant rates for cyclohexane and water removal, respectively. The initial drying rate of tailings in an environmental chamber was 2.7 fold faster than drying under fume hood due to convection currents in the chamber produced by its fan. Three values for relative humidity of 30, 60 and 90% did not show any significant effects on the initial drying rate or the residual cyclohexane values after 20 min drying. However, the secondary drying rate depended on the relative humidity and was slower at higher humidity. The initial drying rate at 30% relative humidity in the environmental chamber increased 17% when the temperature was increased from 24 to 30°C. The indigenous water of oil sands was found to be an essential factor for binding fine clay particles with tailings and for decreasing particle levels in the extracted bitumen. The addition of more water did not decrease residual cyclohexane levels in the extracted tailings.