

## Valuable Heavy Minerals Production and Remediating Froth Treatment Tailings

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Surface-mined oil sands bitumen production operations reject valuable resources, including heavy minerals, bitumen and solvent, via froth treatment tailings into impoundment facilities. Titanium Corporation has developed processes to recover these resources while providing remediative benefits to these tailings.

In producing valuable heavy minerals, including zircon and those bearing titanium dioxide, into a *heavy minerals concentrate*, the key technical challenges involve bitumen removal from their surfaces, rejection of fine guange and recovery of residual solvent. (Organics and fines contamination severely sours downstream heavy minerals production performance). This is accomplished in a manner that is both conducive and integral with current bitumen production and processing operations. The Company's research and development efforts are based on sophisticated variations of common unit operations, including flotation, solvent extraction and vapour-phase stripping. Key aspects of the developed technologies include adequate mass transfer, bulk oil phase viscosity reduction and ensuring thermodynamic equilibria are approached.

Following extensive experimentation, a commercial demonstration was completed with performance that has met or exceeded expectations and, after several months of operation, commodity and environmental benefits arising from these novel processes have largely been confirmed and validated. *Clean* heavy minerals concentrate with attractive mineralogy is produced containing residual bitumen values sufficiently low to effect high recoveries of zircon (and titanium-bearing minerals), while producing coker-feed quality bitumen. Co-production of bitumen from guange, with associated solvent removal, results in raffinates that are *favourably* amenable to fines-capture processing mandated under Directive 74 and significant reductions to VOC emissions.