Horizontal Belt Filter Bests Competing Technologies

Economically, Reliably, Dewaters Processed Oil Sands

CASE STUDY

Location: **Western Canada**
Owner: **Large Energy Company**

Problem

A Canadian energy company that produces bitumen wanted to decrease its carbon footprint and simultaneously enhance its capacity. To this end, the company launched an experimental project that involved moving its bitumen-extraction process from a stationary location directly to the mine face. The project required mobile equipment on a grand scale, including a mobile processing unit that was multiple stories high. If the project is successful, these massive mobile units will eventually process 750 metric tons (MT) of sand and bitumen per hour.

The company vetted several technologies to dewater the barren sand on location, which would enable the company to immediately backfill extraction areas and so begin the reclamation process even as the mine face advanced. The targets for the project's initial phase included reducing 300 MT per hour (MT/h) of sand, clay fraction, and bitumen; advancing the recoverable oil; and dewatering the remaining sand. The filter was to dewater 160 MT/h and obtain 15-percent moisture.

Analysis of Alternatives

The company evaluated several technologies to determine which could most economically and efficiently reach its initial target production and quality specifications – including (but not limited to) horizontal belt filters (HBFs), filter presses, screw presses, and centrifuges. It extended bid opportunities directly to equipment manufacturers in each category.

The company quickly ruled out filter and screw presses, which entailed batch processes that could not economically meet the company's initial production goals owing to the number of units that would be required.

Centrifuges yielded positive results but weren't capable of handling the type of sand that occurred in the oil-sands fields. The operators couldn't keep the centrifuges running for longer than 12 hours at a stretch. However, when HBFs took the coarse fraction (90 percent of the tonnage), the company found that the centrifuges performed much better at dewatering the fines.

Recommended Solution

The company selected HBF technology for its sturdiness, resiliency, and economy. It reached out to WesTech and our competitors for bids, asking for both price and proposed delivery time. Time proved to be a significant factor. Only WesTech was able to provide an HBF within the timeframe the company had in mind. We delivered a pilot unit to the site in less than three months. This 10 m^2 HBF met the company's initial testing needs until WesTech could fabricate and transport a much larger (75 m^2) filter capable of processing the target volume of 300 MT/h.

Fabrication of the 75 m^2 HBF took 14 weeks with fabricators working 80-to-90-hour weeks.

WesTech®

Fabrication of this larger HBF took 14 weeks with fabricators working 80-to-90-hour weeks.

Maneuvering the huge unit through the neighborhood of the fabrication shop required a number of unusual preparations – including removing fences on properties adjacent to the shop and trimming trees. It also required hyperawareness of power lines. Upon entering the northbound freeway, however, delivering the unit to the site went smoothly.

Implementation

With WesTech's HBF, the plant was able to operate 72 continuous hours for the first time, proving the HBF to be the best technology for handling the area's processed oil sands.

The company used hydrocyclones to separate the feed and optimize performance. Fully implemented, WesTech's 75 m^2 HBF processed 300 MT/h of slurry, and the hydrocyclones processed 10 to 11 MT. The solution included adding a coagulant-and-polymer aid to help bind

WesTech replaced the filter cloth with a version that had larger pores for longer runtime.

unrecoverable oil that remained in the sand after processing.

Though HBF technology was an immediate success compared with other options, it took a summer of dedicated troubleshooting to reach the company's target objective. WesTech offered continuous site support. However, the company opted for less support owing to the HBF's reliability.

Unrecovered oil in the processed sand caused the cloth to blind and required extended troubleshooting. WesTech engineers and the site's operators tried a number of solutions to reduce the blinding. Cleaning chemicals worked well but came at unacceptable financial and environmental costs.

The team experimented with less expensive and more environmentally sound solutions and quickly learned that an old-fashioned hot-water wash was ideal. By replacing the filter cloth with a version that had larger pores for increased runtime, and additional wash bars and nozzles to speed the washing cycle, the operators were able to increase the HBF's production from 80 MT/h to 100 and then 150 MT/h. Adding the hydrocyclones enabled the filters to reach almost 250 MT/h.

WesTech's HBF dewatered more tonnage than other technologies.

Results

Immediately after installation, WesTech's HBF dewatered more tonnage than the other technologies – and more reliably. After adding hydrocyclones and experimenting with the filter cloth and washing, the operators were able to dewater 300 MT of slurry per hour at cake moisture levels of less than 15 percent and filtrate less than 1 percent solids.

WesTech's HBF was more reliable than equivalent technologies, producing clean, beach-quality sand that could go right back in situ and quality effluent that the company could reuse in its plant. While the project did not operate at zero discharge, it did eliminate the need for tailings ponds and prove its potential to reduce reclamation time from decades to years. The company's carbon footprint decreased because haul trucks could stay in the pit rather than traversing to the refinery.

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