By Moninder (Witty) Bindra

Dewatering industrial sludge

Geotextile tubes drastically reduce the time for solids separation

Incitec Pivot manufactures super phosphate at a plant in Geelong, Australia. A byproduct of manufacturing super phosphate is the formation of silica in fluorosilicic acid (H_2SiF_6). The silica and acid, along with any entrained super phosphate dust, are captured in the process pond for storage. The level of solids content in the process pond tends to increase over time, as the pond is not agitated. Every few years, the solids must be removed to reset the storage capacity. Due to the highly corrosive nature of the acid, the means of solids removal are expensive, messy and potentially hazardous.

Improving the process

The objective of the project was to separate the solids in the process pond (primarily silica and super phosphate) from the liquid (approx 20% fluorosilicic acid). Removed solids can be recycled into the product, while the liquid can be either bled back into the process or treated. To make the return of solids timely, the level of moisture in the solids must be minimized.

For the Geelong project, high-strength woven bags were used to remove the solids. The bags met the primary requirement of being able to separate the very fine solids from the process liquor while providing a high solids-content cake after only five to 10 days of drying. The heavy individual yarns are woven into a unique twill pattern to form a strong geotextile with excellent hydraulic characteristics.

A piping manifold was manufactured to supply sludge to up to six bags (10 m long x 4.5 m circumference). Sludge was supplied from the pond via a diaphragm sludge pump. This system enabled remote bag filling by only one or two operators.

After the bags were full (approximately 20 tons of 50% solids sludge), the supply piping manifold was disconnected and relocated to enable six other bags to be set up. The first set of bags was then left to dry for as long as possible. Drying periods varied from five days to three weeks. (A longer period is better.) However, due to the very high solids content of the supplied sludge, and the "pressure filtration" effect provided by the bag, the cake was spade-able almost from day one.

The bags were split open, following the drying period, and the sludge was picked up using a large front end loader. The sludge was further dried and conditioned before being returned to the process.

The results were excellent. An estimated 250 tons of sludge were removed using 14 of these sludge bags. The sludge removal was performed during normal operations and did not disrupt plant operations. Additionally, the high solids content after drying allowed the sludge to go to secondary conditioning within two weeks of removal; previously, this took up to six months. The bags also had a low visual impact. The high strength of the bags allowed a large volume of sludge to be removed at a high rate. Each bag acted as a pressure filter, with incoming sludge forcing liquor to be filtered out through the bag mesh, leaving behind solids.

It's difficult to quantify the cost savings using this method. However, the author believes that client has saved up to $100,000 (Australian dollars) by using this method over other sludge removal techniques. GFR

Photo 1. The switch to woven geotextile bags for sludge solids removal enabled secondary conditioning to begin after two weeks when previously the facility operators had to wait up to six months.

Project information

Contractor: Green Waste Environmental, Melbourne

Consultant: Permathene Pty. Ltd., Sydney

Geotextile: Syntex from SI Geosolutions

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