

## Mine Tailing Consolidation with Wick Drains

**F**or years, vertical wick drains have been used for the consolidation of soft, compressible soils. Mine tailings exhibit characteristics very similar to soft clays during consolidation (the settlement of a loaded soil over a period of years). When pore water is trapped in the soil, it has no path to allow it to escape, and consolidation cannot take place. Vertical wick drains can be installed to create a path for the pore water to escape, allowing the clay (or tailings) to consolidate.

Nilex Corp. has been installing wick drains in civil engineering applications throughout North America for over 10 years. Over the past three years, Nilex has taken this technology to the mining industry in an effort to utilize the cost-effective installation of wick drains for the consolidation of soft, compressible tailings.

Many mining operations look to use of upstream dams for tailings ponds when enlarging a facility. Construction of the dam usually takes place over the unconsolidated tailings. By installing vertical wick drains prior to dam construction, the tailings can be consolidated, and dam construction can proceed almost immediately—on a firmer foundation.

This technology is complementary to the standard preload-and-wait techniques that have been used for years. The time savings gained by the use of wick drains can be an enormous benefit to mines interested in saving capital construction dollars.

The installation of vertical wick drains has traditionally been done using a crane or hydraulic excavator with a vertical lead attached to the front at the boom point connection. The typical tailings pond, however, may not support a crawler crane or excavator, with a track pressure of 12 psi. Tailings ponds are generally very soft and in some cases may not even support the weight of a man walking on the shoreline.

To counter this, Nilex has combined its vertical wick drain expertise with the swamp buggy technology of the Louisiana bayou. An installation unit (barge) has been developed that is capable of walking over very soft wet tailings until it comes to float on the water surface of the tailings pond. A track pressure as low as 1 psi can be achieved with the barge.

With this innovative piece of equipment, Nilex can work anywhere in a tailings pond to install vertical wick drains to the design depth. It is possible to install wick drains in very soft tailings to depths as great as 140 ft. below the surface of the pond.



Once the installation barge has been walked into position, a casing or mandrel is driven vertically down into the tailings. The bottom of the pond is generally the design depth for tip elevation of the wick drain. When the mandrel reaches this depth (usually at the rate of one minute per 100 vertical ft.), the operator stops the downward drive motion and begins to extract the mandrel. As the mandrel is being extracted, a steel anchor plate covering the end of the mandrel and attached to the wick drain anchors itself into the tailings, and the wick drain is pulled out through the mandrel from the desired tip elevation to the surface.

The crew on board the barge cuts off the wick drain and staples it closed to prevent migration of any fines into the wick from the ends. Another anchor plate is placed over the end of the mandrel and attached to the wick drain, thus keeping the hollow mandrel closed for the next insertion. The entire operation takes less than two minutes, and the barge moves to the next location for a repeat of the installation cycle.



Vertical wick drains are generally installed on an equilateral triangular grid pattern over the surface area of the pond where construction will take place. Depth of the drains can vary from 20 ft. up to 140 ft. A normal rate of installation can be as high as 20,000 lin. ft. per day, making the cost of this system very economical.

Nilex has developed a number of new wick drain products specifically for the mining industry. The most recent is Mebra™ Drain MD-88, which has a very fine geotextile filter cloth wrapping the polypropylene extrusion. The filter cloth is extremely tough to withstand installation but has a very fine apparent opening size (AOS).

This small AOS will allow water to filter into the wick drain but not the very small clay-size particles of tailings. AOS sizes as small as 95% passing a No. 200 sieve have been filtered with this material.

Nilex recently opened its own manufacturing facility in Englewood, Colo., in joint venture with the original manufacturers of the Mebra™ Drain system, Geotechnics Holland BV. Vertical wick drains have long been used in Holland for the reclamation of land and construction of dikes on the country's soft, low-lying areas. Nilex has taken these and other unique and specialized technologies and brought them to the mining industry here in the Mountain States and throughout North America.

For more information on this or any other Nilex product or service, call (303) 766-2000.