TENCATE
Geotube®

Geotube® Dewatering Technology
For Municipal Sludge Dewatering

TENCATE
GEOSYNTHETICS

Municipal Sludge Dewatering

Domestic Wastewater and Sludge

Domestic wastewater is harmful to the environment due to the presence of high oxygen-demanding material, nutrients, suspended solids, pathogenic organisms, organic compounds and other contaminants.

Sludge is produced in large amount in the process of wastewater treatment. Sludge is typically subject to dewatering prior to disposal. Dewatering serves the following purposes:

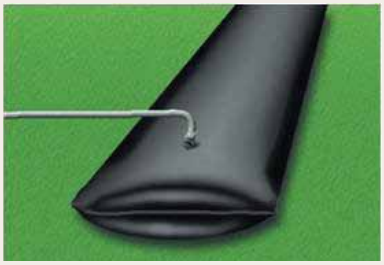
- Reduces volume, saving money on storage and transportation.
- Eliminates free liquids before landfill disposal.
- Reduces fuel requirements if the residuals are to be incinerated or dried.

Geotube® Dewatering Technology

TenCate Geotube® dewatering technology involves the use of TenCate Geotube® dewatering unit that functions as follows:

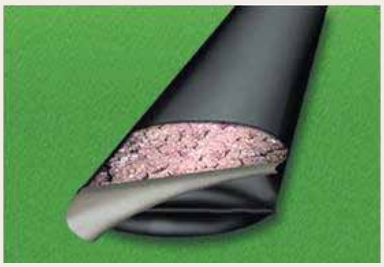
- Containment: Solids are contained inside the TenCate Geotube® dewatering unit.
- Dewatering: Water drains out of the TenCate Geotube® dewatering unit.
- Consolidation: Over time, allows further drying of biosolids to take place.

At the end of the dewatering use, the TenCate Geotube® dewatering unit can be cut open, exposing highly dewatered solids that can be easily excavated and transported away. TenCate Geotube® dewatering units are available in a variety of sizes, depending on your volume and space requirements. TenCate Geotube® dewatering units can even be mounted in mobile roll-off containers that can be transported around your property as necessary. It's one of the most versatile dewatering technologies available.

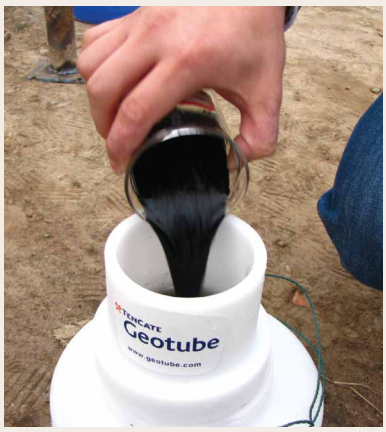


Containment.

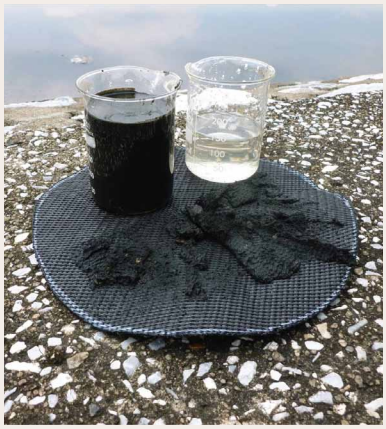
Dewatering.



Consolidation.



RDT test setup.



Sludge, effluent and dewatered solids.

Advantages of Geotube® Dewatering Technology

TenCate Geotube® dewatering technology has become the method of choice for wastewater treatment facilities around the world. The main advantages of the TenCate Geotube® dewatering technology are as follows:

- The TenCate Geotube® dewatering technology is simple. Unlike mechanical systems there are no mechanical or moving parts that can be subject to breakdowns and wear and tear.
- Does not require capital investment (this makes the system easy to adopt, especially when the plant needs to handle seasonal spikes).
- At plants that use drying beds for sludge dewatering, the use of TenCate Geotube® dewatering units on these drying beds can increase the sludge dewatering capacity of existing drying beds many fold.
- Able to achieve solids capture in excess of 98% (see Table 1).
- Able to achieve very high contaminant capture rates (see Table 1).
- The effluent is filtered water often of a quality that can be reused or returned for processing or to native waterways without additional treatment.
- Dramatically reduces odour problems.
- Operates relatively noise free, unlike mechanical systems.
- Does not require start-up and shut down time.

Table 1: Test results from Bonnechere Valley Study in Canada

Item	Capture rate in Geotube® dewatering unit (%)
Suspended solids	99.6
Phosphorus	98.2
Nitrogen	82.3
E.coli	99.9
Arsenic	100
Lead	98.8
Mercury	99.9

Case Study

project	Digested Sewage Sludge Dewatering
location	USA

In 1999, 1700 m^3 of digested sewage sludge was dewatered using Geotube® dewatering technology at the Kansas City Municipal Sewage Treatment Plant. Ten Geotube® dewatering containers of 9.1 m circumference and nine of 13.7 m circumference, of lengths 9.1 to 45.7 m were used. The Geotube® dewatering containers were placed on an asphalt parking area that was covered with a geomembrane for the collection of the effluent water which was returned to the plant for treatment. A 100 mm diameter submersible pump that was equipped with water jets to loosen the material was used to pump the sludge into the Geotube® dewatering containers. The Geotube® dewatering containers were allowed to drain to more than half of their initial height and then re-filled 3 to 4 times.

The initial solids concentration of the sludge in the digester was about 20%. The sludge was pumped at a diluted solids concentration of about 9%. At the end of dewatering process the top of the Geotube® dewatering containers were cut open. The dewatered residue that was hauled to the landfill had a relative density of 1.2 and a solids concentration of 25%.

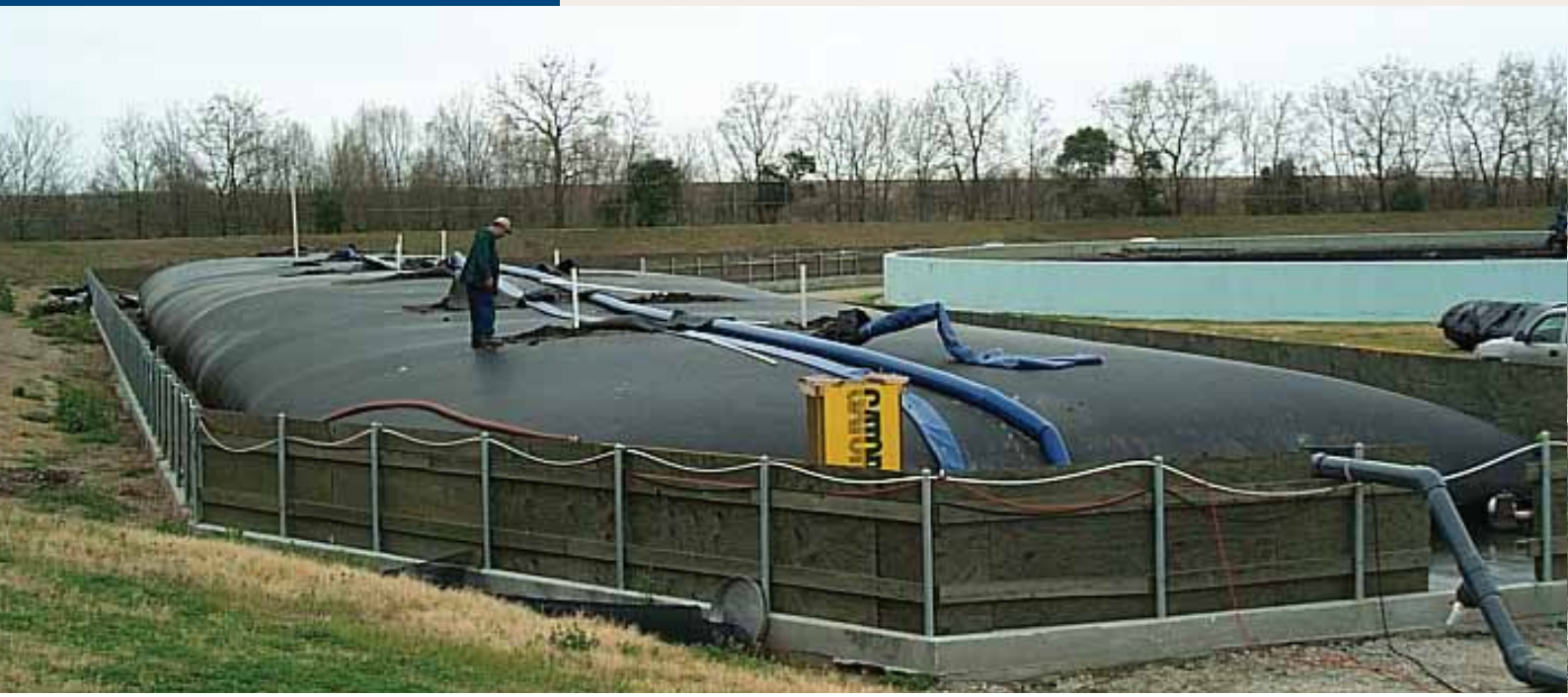
Municipal Wastewater Treatment Plant

A common problem at small wastewater treatment plants, where sludge is dried on drying beds, is that the limited capacity of the beds can easily be exceeded. This could be due, for example, to an increase in sludge quantity resulting from an increasing population.

The TenCate Geotube® dewatering system is increasingly being used as a means of both simplifying the sludge dewatering process and effectively increasing the volume of sludge handling capacity of the drying beds. Whereas in the past the drying beds had to be emptied at regular intervals, the time for a complete fill of the TenCate Geotube® dewatering unit can be increased to several months. A significant saving can then be made in terms of handling and transportation.

After the sludge has been treated with a flocculant it is pumped into the TenCate Geotube® dewatering unit where the solids remain while water seeps through the pores of the TenCate Geotube® dewatering unit. This process can be repeated over and over again until the TenCate Geotube® dewatering units reaches its solids containment capacity.

Larger wastewater treatment plants can also utilise the TenCate Geotube® dewatering unit for sludge containment and dewatering as an alternative to belt-presses and/or centrifuges. It can also be used as an emergency kit if the available mechanical dewatering equipment is out of order.



Septic Tank Systems

Many dwellings may not have access to municipal wastewater treatment plants and generally rely on onsite treatment systems. The predominant onsite treatment system is the septic tank system which always includes a septic tank, a distribution box and an absorption field or an equivalent process for effluent treatment. The main function of the septic tank is to remove large particles and grease, which would otherwise clog the effluent treatment process. Heavy solids settle to the bottom as a sludge layer and undergo biological decomposition.

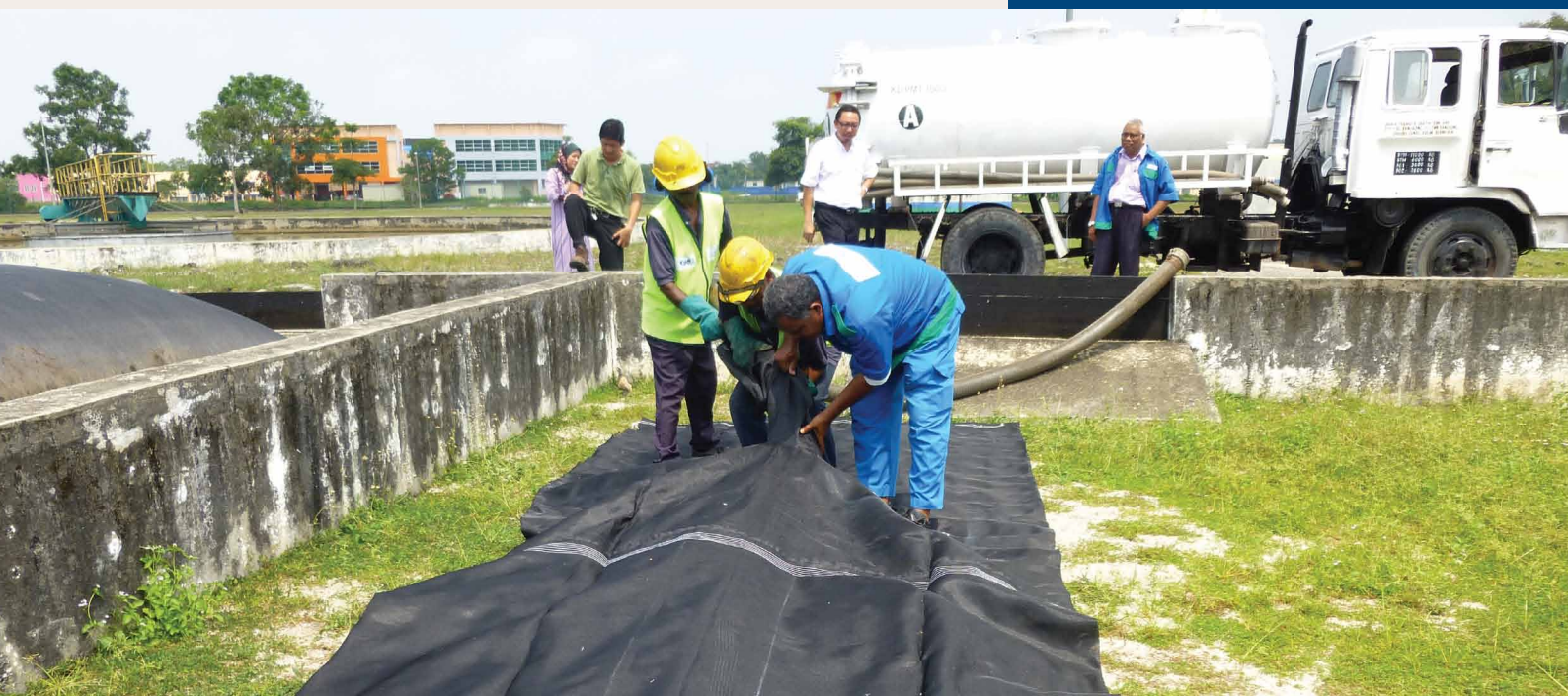
Sometimes, a septic tank is used to treat the domestic wastewater while the effluent may be piped to a centralised treatment plant. This sewage effluent treatment system is a hybrid of the conventional septic tank system and a municipal wastewater treatment system with the advantage that small pipes are required to transfer the effluent and cheaper to construct.

These septic tanks need regular sludge or septage removal, usually carried out by a specialised contractor or service provider. The sludge is pumped from the septic tanks into sludge transportation tankers and taken to a centralised location with sand drying bed facility for dewatering. The TenCate Geotube® dewatering system is ideal for dewatering septic tank sludge. The septic tank sludge can be pumped directly into the TenCate Geotube® dewatering unit, often without the need for polymer addition. The solids remain within while water seeps through the pores of the TenCate Geotube® dewatering unit. This process can be repeated over and over again until the TenCate Geotube® dewatering unit reaches its solids containment capacity.

Case Study

project	Septage Disposal
location	Canada

In 2002, in Ontario, Canada a policy paper was produced to eliminate the land application of untreated septage. While 90% of residents in Ontario had access to sanitary sewers, there were still one million residents in rural areas using septic tanks. Haulers across Ontario were left in a bind, scrambling to find methods to treat and dispose of the septage. In 2004, the TenCate Geotube® Dewatering Technology was presented to the Eganville Wastewater Treatment Plant in Bonnechere Valley. A trial was carried out which showed the septage of 3% solids concentration increased to nearly 40% in the TenCate Geotube® dewatering unit. Laboratory test results showed excellent solids and contaminant capture (see Table 1 of Page 3). A permanent dewatering and processing facility with an underground storage tank for receiving septage was constructed in 2008. Haulers would simply empty the tanker trucks directly into the underground storage tank. For the dewatering process, septage was pumped from the underground storage tank into the TenCate Geotube® dewatering unit. Test results on the dewatered residuals showed that they can be suitably used as a soil amendment nutrient.



Case Study

project	Pantai 2 Project
location	Malaysia

The Pantai Sewage Lagoons were constructed many decades ago when the area was still undeveloped. The rapid urban development of Kuala Lumpur saw houses and apartments built closer and closer to the sewage lagoons. The Pantai 2 Sewage Treatment Plant Project is a green transformation project. A new modern municipal wastewater treatment plant would be constructed in place of the lagoons. The sewage that the old lagoons were receiving was diverted to other treatment plants while the lagoons were cleaned out. Geotube® dewatering technology was used to dewater the sludge accumulated in the lagoons. The site lacked area to place the Geotube® dewatering units. Firstly, a small segment of the lagoon was dedicated for the construction of the Geotube® dewatering platform. This was done by placing an earth berm across the lagoon before the sludge in the segmented area was pumped into the main lagoon. Geotube® dewatering units were then placed over the dewatering platform created. As sludge dewatering works progressed more dewatering platform area was created and the whole process was repeated until all the sludge in the lagoons were dewatered.

Waste Stabilisation Ponds

Ponds, lagoons or impoundments are used for biological treatment of wastewater. The types of ponds, collectively termed as waste stabilisation ponds, include aerobic ponds, facultative ponds, anaerobic ponds, polishing ponds and aerated lagoons. They are either formed by excavation or earth perimeter bunding and can reduce BOD and SS to the same levels as mechanical treatment plants. In addition because of the longer residence time of wastewater in the lagoon, removal of pathogenic bacteria and viruses by natural die-off is greater than in an activated sludge treatment plant (residence time usually several hours).

Sludge forms at the bottom of waste stabilisation ponds and periodic desludging may be necessary. Urbanisation and developments that come into close proximity with existing waste stabilisation ponds often require closeout of these ponds and a municipal wastewater treatment plant may be constructed as a replacement system.

The TenCate Geotube® dewatering technology is ideal for onsite dewatering of waste stabilisation pond sludge, be it periodic or pond closeout desludging. Sludge is dredged from the waste stabilisation ponds and after the sludge has been treated with a flocculant it is pumped into the TenCate Geotube® dewatering unit where the solids remain while water seeps through the pores of the TenCate Geotube® dewatering unit. This process can be repeated over and over again until the TenCate Geotube® dewatering unit reaches its solids containment capacity. Stacking of TenCate Geotube® dewatering units can reduce the footprint area required for the Geotube® dewatering platform.

Geotube® Tests and Softwares

TenCate Water & Environment Group can help you engineer the TenCate Geotube® dewatering operation. The TenCate Geotube® RDT is a simple rapid test that can be used to select the ideal dewatering fabric and determine if a chemical accelerant is required and at what optimum dosage. The TenCate Geotube® GDT is a test that will determine the final dewatered and consolidated solids concentration achievable. The TenCate Geotube® Simulator software will help determine the safe filling height of the TenCate Geotube® dewatering unit while the TenCate Geotube® Estimator software will determine the quantities of TenCate Geotube® dewatering units needed, the filling time required and the final dewatered mass and volume.

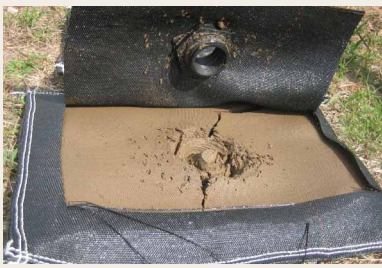
Geotube® GDT test setup.

Geotube® Dewatering Operation

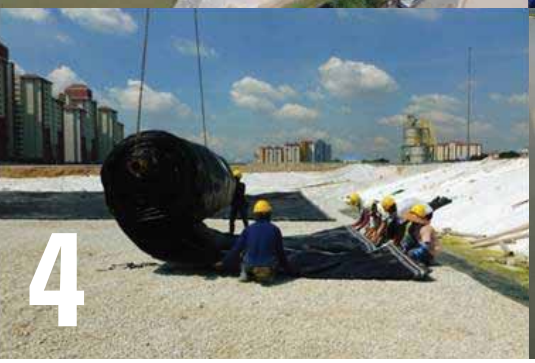
The TenCate Geotube® dewatering operation is simple and can be summarised as follows:

1. Select a level strip of land to use for the dewatering platform.
2. Lay a layer of geomembrane with nonwoven protection layer (this is not necessary if a sand drying bed is used).
3. Place a thin layer of drainage aggregates (this may not be necessary in some cases).
4. Place the roll of TenCate Geotube® dewatering unit on top of the dewatering platform.
5. Layout the TenCate Geotube® dewatering unit as required and set up the chemical dosing system (if necessary) and piping system.
6. Pump the sludge into the TenCate Geotube® dewatering unit.

Effluent.



Consolidated material.



TenCate develops and produces quality products that increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

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