Your Water, Wastewater, & Materials Dewatering Partner

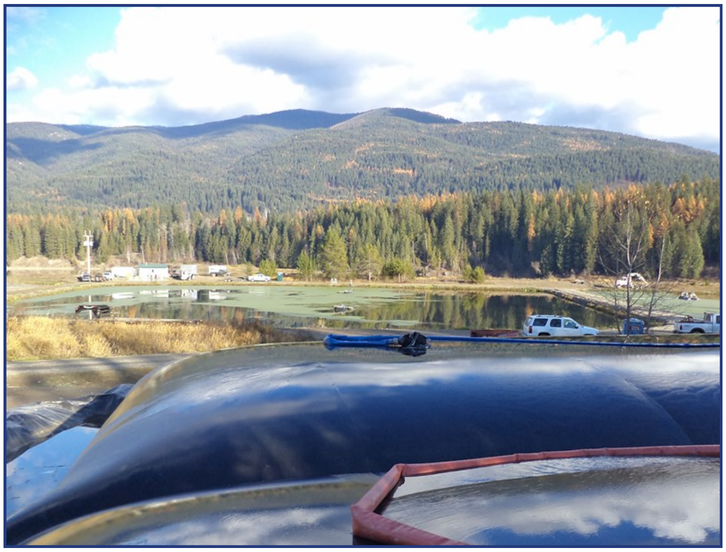
WaterSolve LLC

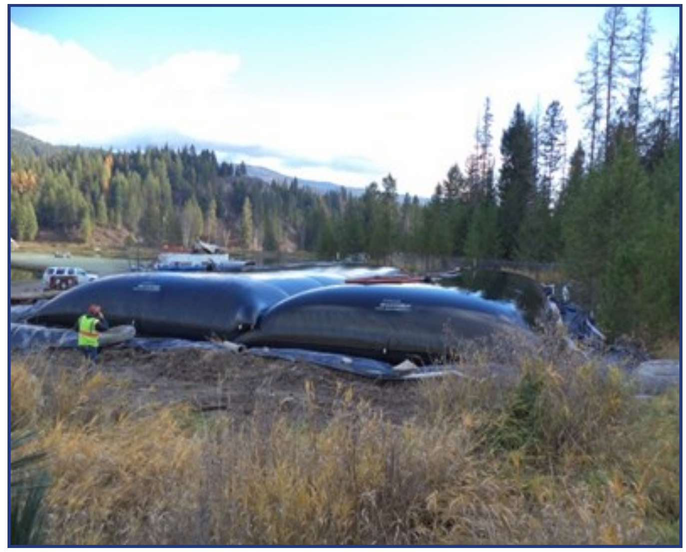
5031 68th Street SE, Caledonia, MI 49316 | (616) 575-8693 | Fax: (616) 575-9031

Dredging and Dewatering Biosolids

Volume 331

November 2013





Two 70' circumference by 100' long Geotube® containers were placed in containment to capture and dewater the biosolids at this Washington wastewater treatment facility.

Objective

This city in the state of Washington had a biosolids buildup in the first cell of their wastewater treatment facility's lagoon system. They were remote from any farmland or landfill to dispose of the material and preferred to use Geotube® dewatering to consolidate the biosolids before transferring them off site. The objective was to dredge the biosolids into the Geotubes, dewater the material to reduce the volume and pass a paint filter test, and then either apply it on farmland or dispose of it in a landfill.

Conditioning Chemical

A representative sample of lagoon biosolids was tested by a technician in the WaterSolve lab. Dewatering polymers were evaluated based on water release rate, water clarity, and flocculent appearance. In addition, dosing rate(s) were determined during bench-top dewatering experiments and recommendations were provided to the facility during this phase of the program. Solve 127 was the recommended polymer for dewatering this residual into the Geotube® containers. The WaterSolve technician performed a cone test in which 1500-mL of a 4.2% dry wt. solids sample was treated with Solve 127 and poured through a cone made from GT-500D fabric. The results of this test indicated the 4.2% dry wt. solids were raised to 15% in 1 hour of dewatering. This testing indicated the residual would successfully dewater in a Geotube® and the data collected was used to help estimate the supplies and cost of the project.

Geotube® Container Sizing

Geotube® containers are manufactured from high strength polypropylene fabric and designed to allow effluent water to escape through the pores of the fabric while retaining the chemically-conditioned solids. The city wished to remove 151 bone dry tons of the biosolids from the lagoon. The Geotube® estimator indicated two 70' circumference by 100' long Geotube containers would provide space for 986 cubic yards of 18% dry weight solids and meet the requirements for this project.

The Result

The dredging contractor decided to start the project without the assistance of WaterSolve. After a week of frustration and low production a WaterSolve technician was flown to the site to help get the project back on track. There were several challenges identified upon his arrival. The biosolids were being pumped too thick, the mixing manifold for the polymer was sheering it, the transfer hose filling the tubes was not large enough for the capacities they desired, the polymer supply was not gravity fed to the polymer make-down unit, the return pipeline from the sump to the pond was too small, the Geotube® containment area was too confined and did not let the filtrate water flow around the tubes and access the sump, and there was not a filter to prevent polymer slugs from clogging the pump on the make-down unit.

All of these issues were addressed in the following manner:

* Jar testing was performed on the biosolids being pumped to the Geotubes. The biosolids were so thick that there was no way to visually see a proper floc. The sample was diluted 1 to 1 with site water from the biosolids pond. By diluting the sample the polymer was quickly dispersed throughout the jar and it made it easy to see a proper floc. They promptly diluted the % solids being pumped by adding pond water to the frac tank they were mixing and they continued pumping thinner throughout the project.

*The mixing manifold had eight 90 degree bends in it and was causing the treated biosolids to radically tumble over and over in a very short time. The jar testing showed a gentle tumbling for 15 seconds was making a good floc and clean filtrate. All the 90 degree bends were eliminated and the polymer was injected directly into the supply line.

*The transfer hose to the tubes was only 4” in diameter and had a maximum capacity of 325-gpm. A 6” pump and pipeline was brought in to replace the 4”and could operate at 650-gpm.

*The barrel of polymer was sitting vertically and the polymer pump had to pull the polymer up and out of the barrel creating the risk of collapsing the hose and starving the pump. The barrel was placed horizontally, on its side, on 2 bales of hay above the polymer pump so the polymer could gravity flow to the pump.

*The sump area collecting the filtrate water from the Geotubes only had a 4” outlet and pipeline returning the filtrate to the pond. Another pump was positioned to assist in removing the filtrate.

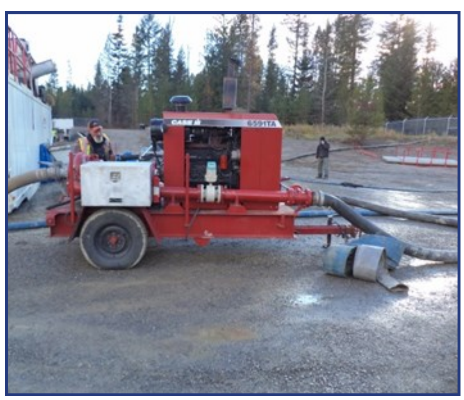
*The Geotube® containment pad did not allow extra room between the berms and the tubes for the filtrate water to move around the sides and ends to access the sump. The berms had to be moved back 2’ to allow the water to move around the perimeter of the pad and access the sump.

*There was not a filter to collect polymer slugs that plug the polymer pump between the polymer supply and the pump. Outdoor Geotube® applications have more weather related challenges and polymer will develop slugs from water condensation in the supply containers dripping into the polymer and forming the slugs that can plug the pump. There was no filter readily accessible to the site and sure enough the polymer pump eventually collected enough slugs to stop pumping and caused a stoppage to clean out the pump. They will incorporate a filter in their next project.

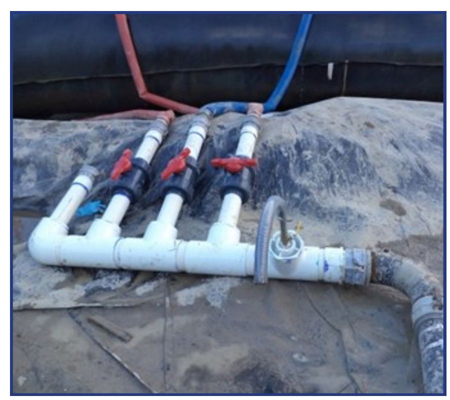
With all these items addressed there was still a nagging issue of the high polymer usage. The WaterSolve technician determined more polymer jar testing was necessary to try and diagnose the problem. 0.5% concentrations of Solve 127 polymer were made-down using pond water (which was currently being used), well water, and distilled water in 3 separate jars. A gallon sample of bio-solids was drawn from the frac tank and used for the testing. A 150-mL biosolids sample jar was treated with the pond water jar of polymer and required a 2-mL dose to flocculate. Another 150-mL sample of the same biosolids was treated with the well water poly-mer and it required 1.5-mL to flocculate. A third 150-mL sample of the biosolids was treated with the distilled water jar of polymer and it required 1.5-mL to flocculate. Arrangements were then made to switch from using the pond water to using well water on site to make-down the Solve 127 polymer. This produced some immediate and obvious results. The polymer feed rate using the pond water was 8-gph, and the feed rate for the well water was 5.5-gph. The samples taken from the sample port showed better clarity and a tighter floc using the well water. The filtrate water exiting the tubes began getting clearer and the whole operation was performing better. More questioning revealed there is manganese backwash entering this pond as well as some biosolids discharged from com-panies that service port-a-johns. All these items have the potential to change the makeup of the pond water.

There were some very expensive costs incurred for expediting some supplies and equipment to correct the challenges for this pro-ject. Consulting with WaterSolve to preplan the project and have a technician on site from the start could have alleviated many of these issues. Sites may be similar but it seems no two ponds are alike. In the long run this project could have run more smoothly and more profitable using the knowledge of the team at WaterSolve.

This 50-hp electric dredge sent the biosolids to a frac tank where they screened for debris and mixed.



A 6” diesel pump transferred the biosol-ids from the frac tank on the left to the manifold near the Geotubes via a 6” pipeline. The pump has a flow meter and a valve to limit the flow if needed.



The 6” hose connects to a manifold with a sample port and a series of 4” laterals that can be directed to fill ports on the Geotube® containers.