Inner Space Services Optimizes and Automates Water Treatment Process

BY ANNA TOWNSHEND

The filled geotextile tubes are stacked for dewatering in the limited lay down area.

Inner Space Services, Inc. (ISSI) is a hydraulic dredging and marine contractor that specializes in dredging, treatment and dewatering of contaminated and non-contaminated dredge materials. From its work dredging and treating contaminated sediment, ISSI developed the Optimizer system, a self-contained, portable PLC controlled slurry processing system. The fully automated system analyzes the dredge slurry as it passes through the pipeline to determine the exact percent of solids in a slurry mixture and interreads with other parameters including flow and trending to calculate and dose the dredge slurry with the correct amount of polymer to treat and dewater the specific sediment.

This Inner Space Services dredge Miss Thalia, a DSC Shark dredge, was frozen in the ice during a project last winter in Barnstable, Massachusetts. Support vessels were able to free it up so dredging could continue on schedule.

ISSI is based in Massachusetts, and began in the late 1970s as a commercial diving business, before settling primarily into hydraulic dredging and marine construction. As the years progressed, there became more of a need for containing and dewatering dredge materials in smaller and smaller footprints., which introduced the use of Geotextile tubes and slurry treatment to maximize their use. Robert Mason, superintendent and consultant with ISSI, developed the Optimizer Treatment System in 2009. Allan Cameron of SpinPro, Inc. was an integral part of the development team. SpinPro's vast knowledge in dredge slurry chemistry and testing for proper polymer and treatment options, was invaluable.

The Optimizer system trailer is where the treatment process takes place, analyzing and mixing the polymer, added to the dredge materials and then pumped to the geotextile tubes.

ISSI rents or leases its treatment system, along with an operator, to dredging contractors, or the company performs both dredging work and treatment and dewatering on-site.

The small company is hands-on. "We're onsite at every job, and I think that's why we've been so successful," Laurie Mason, ISSI owner, said.

The company works on projects up and down the East Coast, from the Bahamas to New England, including many projects for the U.S. Army Corps of Engineers, private clients and other government agencies.

After treatment and dewatering, the effluent water was tested to make sure it met water quality standards before the water was returned to the East Bay.

The Optimizer system works most efficiently with hydraulic dredges, but R. Mason said it can work with mechanical dredges. From a clamshell bucket, which is often preferred by the Corps of Engineers, Mason said, the material goes to a barge, where it's pumped to the Optimizer system on another barge for treatment.

With a hydraulic dredge, the Optimizer system can more efficiently dose the slurry. A light sensor in the pipeline, downstream of the Optimizer system, reads the dredge slurry parameters, including the ratio of process water to sediment and feeds that information in real-time to the computerized Optimizer dosage controller. The Optimizer system automatically feeds the correct amount of polymer into the pipeline, depending on the information it has received and analyzed.

After the sediment sits and dewaters a few weeks in the geotextile tubes, the tubes are cut away. The original sediment was a marine clay and organic silt with very high water content. Without polymer treatment, it would not have been effective to dewater the materials in the geotextile tubes

The amount of solids in a pipeline can vary significantly, depending on how much dredge material is being pumped through the pipeline at any given time. The Optimizer is set up to receive slurry from dredge pipelines up to 12- inch diameter. Mason said the operation prefers between 10 to 30 percent solids, to pump around 2,500 to 3,000/gallons per minute.

With the automated system providing instantaneous polymer solution adjustments, the final sediment won't be overdosed or underdosed. The system constantly monitors the effectiveness of the polymer and autocorrects the mixture. With a steady and accurate polymer content, the sediment will not vary across the job, which can lead to poor dewatering.

An on-site operator from ISSI will monitor the slurry and the operation. If the percentage of solids in the pipeline gets too high, the technician can advise the dredge operator to slow down. Additionally, the on-site operator takes water samples after it has been dosed with polymer, as a quality control check, to make sure the system is functioning optimally.

From the pipeline, the sediment is pumped into geotextile tubes for dewatering. If the sediment is overdosed with polymer, the geotextile tubes will “blind off” and the water will not drain properly. Underdose the mixture, and materials in the dredge water column will not drop out and the water that leaches out of the tubes will end up dirty.

With hundreds of polymers available, each project needs the correct treatment chemistry and dose for the specific type of sediment. ISSI works with SpinPro to test materials from each project site to determine the most effective chemical treatment, then ISSI will simulate the dredging and dewatering processes with different polymers to decide which one works best.

Hanging bag and pillow bag tests will then be performed. Treated and dosed dredge sediment will be pumped into the bags, which simulates sediment delivery from the dredge and treatment center. As the bags dewater, the dewatering capabilities, including percent moisture, water clarity and other parameters are determined.

The ISSI system tries to optimize cost, too. Geotextile tubes and polymer are expensive, Mason said. By calculating the optimal amount of polymer it saves money in the long run. Computerization takes the guess work and lag time out of the treatment piece of the project.

Geotextile tubes are also a one-time use product, so the Optimizer system helps maximize the capacity of the tubes. ISSI also prefers liquid polymer. Its dry powder counterpart must be mixed on-site, adding another step to the process. Consistent operations give consistent results, saving money and time, Mason said. Barnstable, Massachusetts Project

In Barnstable, Massachusetts, ISSI completed a project earlier this year for the county, using the Optimizer system to treat contaminated sediment in a highly environmentally sensitive area. This was the first time the Optimizer processing system, along with geotextile tubes, were used to treat sediment on Cape Cod. The dredge work, around 4,000 cubic yards, took place in the channel and boat launch area.

While Barnstable County owns its own dredge for maintenance dredging of sand inits channels and harbor, including the channel entering East Bay, Osterville, this project needed a different process because of the difference in the dredge sediment characteristics.

The project started in October 2013 and was completed by January 2014, enduring a brutal winter. The dredging window was not dictated by the weather but by the environmental window. The winter timeframe presented

additional challenges with ice, freezing temperatures and Nor' Easters. Pipes, hoses and pumps had to be drained at night to prevent them from freezing, as ISSI could not work 24 hours a day on the project site.

At more than one point during the project, the dredge and pipeline were frozen in the bay but could continue work after the support vessels cleared the ice around them.

It's a challenge for personnel too, who must be concerned with frost bite and hypothermia. ISSI focuses a great deal on safety, Mason said, including training, PPE, and a buddy system around the water.

After treatment and dewatering through the geotextile tubes, the discharged water was tested first to make sure it met water quality standards for clarity. The discharge water required no additional filtering before it was released back into the East Bay. As part of the treatment plan, ISSI said if there were periods of elevated turbidity, of which there were none, the project would have had to shutdown and readjust the process.

The sediment in the Barnstable project was marine clay and organic silt with a very high water content. Without treatment, it would not have separated out of the water column and could not have been contained and drained properly in the geotextile tubes. On this project, there was a limited treatment and dewatering area. Fortunately, the treatment and dewatering process used by ISSI required a small footprint, as geotextile tubes could be stacked as the project progressed.

This article appears in the November-December 2014 issue of International Dredging Review