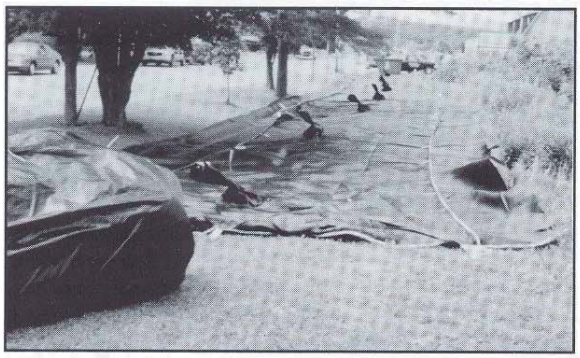
IDR

International Dredging Review

MAY 2001
Volume 20, Number 4

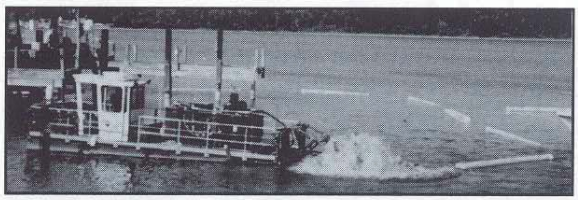
A geotube fills with dredged material from an adjacent marina in Elberta, Michigan. Page 6.

Michigan Marina Uses Geotubes As Dewatering Solution



The first bag has been rolled out on the old railroad right of way. Fill ports are visible along the top, tied off when not in use.

After sitting overnight, the bag is dry. The volume of material can shrink as much as 70 percent, so material can be pumped into the bags many times before they are filled.



North Bay Dredging used an IMS 4010 on the project.

North Star Marina is a medium-sized marina in Elberta, Michigan that has been affected by a drastic drop in lake levels. In May 2000, the owner solved a dredged material disposal problem by pumping 3400 cubic yards of material into geotextile tubes. The water filtered out of the tubes and back into the bay, and the solid material was trucked away for disposal and reuse elsewhere.

The marina is on Betsie Bay, which connects to Lake Michigan via the Betsie River. The area has been plagued with dropping water levels and increased sediment loads. In June, 2000, the water level was down three feet, and the marina had an accumulation of 3400 cubic yards of mud and sediment that was preventing boats from getting in and out. When the owners couldn't get a permit to finish their dredging project, they had to find an alternate solution fast.

Typical solutions were to construct an on-site upland containment area or to pump the material a long distance. However, a neighboring marina had just been shut down by the Michigan Department of Environmental Quality (DEQ) for 10 days because of sediment-laden runoff entering the bay from its containment cell, and there was no possible placement site within a feasible pumping distance.

"We couldn't find a place to put a settling pond," said marina owner Bob Danek. "We couldn't even find a place close by to pump to. We couldn't even find a trucker to haul the stuff off."

Since his retirement from dredge manufacturer IMS in 1996, Dean Wickoren has been installing and advising on the use of geotextile tubes and filter fabric for dredging solutions. He had been experimenting with dredging small amounts of material into the tubes. When North Star Marina was looking for a solution, Wickoren worked with Eric Strang of North Bay Dredging LLC and Matt Hagenauer of CSI Geotubes, a distributor for S.I. Geosolutions in Traverse City, Michigan, to use the tubes as a dredged material disposal option. Strang's IMS 4010 auger dredge was ideal for the project, having a discharge with a low enough energy that it would not damage the bag during filling.

Adjacent to the marina was a former railroad embankment that had been converted to a hiking trail. This was ideal because it was relatively level and had drainage back to the bay. The ballast and gravel used on railroad grades is an ideal drainage medium, the base is firm, and a plastic underlayment sheet was not needed.

Two 200-foot-long by 45-foot-wide Geotex® 46T tubes and one 100-foot-long by 45-foot diameter tube were rolled out and the drains underneath were established.

The marina sediment contained sawmill waste that contained some large slab wood and boards. The dredge chewed up some of this material and pumped it into the tubes, but the rest had to be picked out of the pump by hand. Because of the wood, the contractor did the job with a hard pan cutter instead of the soft material option. This caused a great deal of water to be pumped, and Wickoren recommended adding a polymer to the discharge at five parts per million before it entered the bag. This drastically reduced the settlement time, doing 24 hours worth of dewatering in three hours, according to Wickoren. The polymer produced a cleaner runoff by reducing the suspended solids. Runoff from Geotex tubes is normally less than 30 ppm suspended solids.

"The fabric doesn't care how much water it filters out," said Wickoren, so the additional pumping made no difference.

When the dredge begins, a few solids come out of the bag, but when the bag comes up about three to five inches, the discharge becomes mostly water. The tube de-waters from the top.

"As you pump it, the stress of the elevation on the sides makes the top taut, and this squeezes the water out," said Wickoren.

"Everybody was very pleased," said Hagenauer. "We introduced this system to the area and to the State of Michigan."

The project was done the week before Memorial Day, and that Friday afternoon, the DEQ representative drove 100 miles each way from Pontiac, Michigan to see it, said Wickoren. "He was very excited" when he saw how the tubes were working, he said.

"It's nice for a change to show up at a job site and be pleasantly surprised," the DEQ representative remarked.

The tubes were cut open and 3400 cubic yards of material hauled off 11 days after the dredging was finished. The material was the texture of soft clay. The area where the tubes were placed was not disturbed, and the grass was greener than it had been before the project.

This summer, there are at least eight contractors doing similar projects in Michigan, and Eric Strang, whose headquarters are in Traverse City, Michigan, has expanded to the East Coast with this method.

"The bags are more work," said Strang. "However, most marinas are on limited property and can't build a pit or lagoon. With the tubes they can de-water in a smaller area, usually on a parking lot, and can dredge any quantity of material, he said.

The process takes planning ahead of time. When the bags are filling, they have a tendency to roll, and don't always fill evenly. About one in 30 bags might burst while filling, he said. If they are dredging sand, the material stays in place, but silt will require emergency cleanup measures. Therefore, the operation requires constant attention, he said.

"The demand for this technology is growing, and there is quite a market for it," said Strang.

"Everybody thought we were fools to do it, but once we had a successful project, the DEQ wanted to use the bags as much as possible," he said.

If contaminants such as heavy metals and PCB's are present, they stay with the solids in the tube, said Wickoren. The smaller the job, the better the tubes work, he said.

The tubes are made of high strength textile of polypropylene or polyester, with a 15-foot width as the common denominator in sizing the tubes. Size is designated by circumference –

from 15 to 45 feet. Larger than that, the cost/benefit ratio goes up, said Wickoren.

When flat, the tube is 22 feet wide, and it expands to up to eight feet tall when filled. Each linear foot of tube will contain about four cubic yards of material. Wickoren provides a tube capacity chart to aid in estimating amount of tubing needed.

Wickoren started working with geotextiles when he left IMS in 1996, first with T.C. Mirafi, and then with Synthetic Industries, de-watering industrial sludge with geotubes instead of belt presses.

He recently set up a project at a golf course in Dallas to dredge 30,000 cubic yards of material from the ponds on the driving range. Because the material will all be used for landscaping on the golf course, there are no permits necessary.

The fabric cannot be re-used for de-watering, because it stretches, much like the flexible plastic holders on soft-drink six-packs, said Wickoren. However, it is useful in bank stabilization, and as an underlayment when placing gravel in driveways, and a demand for this used fabric is growing.

Use of geotextile tubes is spread over a number of applications, said Wickoren. The major kickoff project was to build a peninsula on the Missouri River in South Dakota, where conventional methods would not work. He worked with contractors in Asia until the economy ended that market, and has done sludge de-watering, shoreline protection and small dredging projects for urban lakes.

Two years ago he managed a job at Galveston State Park in Texas, where more than 1000 acres of wetlands were salvaged using 14,000 feet of tubes to protect the area from wave action.

Geotextiles have been used to contain soils since the 1950's, when the Dutch used large impermeable nylon sandbags to close a sea arm of the North Sea. In the 1970's, patented Longard tubes were used in the Netherlands for coastal stabilization. Nicolon B.V. of Holland introduced permeable, woven geotextile tubes that allowed de-watering through the walls of the tube.

Tests made by the Nicolon Corporation and the U.S. Army Corps of Engineers in 1991 proved that when slurries containing fine-grained material were pumped into the bags, only clear water emerged. This opened the way for using the tubes for de-watering contaminated dredged material. The first geotextile container project for contaminated material disposal took place in 1994 at Marina Del Rey, California, where 57,000 cubic yards of material was removed and placed at sea in geobags.

The technique has been used effectively in recent years by a number of small dredging contractors. In 1999, Midwest Dredge and Excavating, Inc., of Clarksville, Indiana performed a major project at Old Hickory Lake on the Cumberland River near Nashville Tennessee, a lake that had been formed in 1957 and had silted up over the years. Geotubes were used to create a 2100 linear foot dike for a 13-acre sub-embayment, and 22,000 cubic yards of material was dredged and de-watetered using geotubes.

As dredging contractors gain experience with this technique, they will be able to address the problems of handling agricultural, industrial and municipal waste, and thousands of small recreational ponds and lakes will have a chance at renewal that was not there when only traditional de-watering methods were available.

Publications of interest: *"The Future of Geotextile Tubes and Containment Systems"*, by Douglas A. Gaffney, Dana H. Toups and Jonahtan R. Wynn of Synthetic Industries, Chattanooga, Tennessee, presented at the Geosystems Research Institute Conference, December 14 – 15, 1999, Philadelphia, Pennsylvania; *"Environmental Benefits of Dredged Material Contained in Geotextile Tubes – Drakes Creek, Tennessee"*, by Douglas A. Gaffney, P.E., presented at the 32nd. International Erosion Control Association Conference, February 2001, Las Vegas, Nevada. For copies of these papers, contact Gaffney at Synthetic Industries, 1500 Walnut Ave; Voorhees, NJ 08043; phone 856-566-2651; fax: 856-566-2652; email: doug_gaffney@sind.com.