TerraCure Chosen for Oil Site Remediation in Louisiana

BY JUDITH POWERS

Michael Behan developed the TerraCure process to the point where it is ready to be tested on a large-scale commercial soil remediation

Michael Behan's Harbor Resource Management Corporation (HRMC) is about to embark on a commercial demonstration of its TerraCure™ process on a contract in Louisiana to remediate approximately 500 cubic yards of soil contaminated by oil drilling in the early 20th century. The technology was developed for treating contaminated dredged material.

The material will be treated on-site, bringing it back to its historical, clean state, at or below the cost of hauling and disposing of the material elsewhere.

"If we are successful on this demonstration, the next site should be approximately 30,000 cubic yards," Behan said in late June. "The chlorides in the soil that were a byproduct of the water produced during the drilling process years ago are the primary target for this site," he said.

Behan's process works at the site of the contamination, using readily available particle size separation equipment and centrifuges to de-water and separate uncontaminated particles, leaving contaminated clays to be treated. His patented technology oxidizes or amends all organic contaminants by injecting strong oxidants such as potassium permanganate (KMNO4) and hydrogen peroxide (H2O2) into the slurry. While it will remove hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), oil and grease, it will not remove metals, which require alternate treatment technologies.

"Being in southern Louisiana, the soil is predominantly silt and clay and minimal sand. The chlorides in the soil that were a byproduct of the water produced during the drilling process years ago are the target of the treatment. These sites also have PAH-type contaminants that usually exceed the LA 29B standards. We will be performing particle separation that will allow us to more effectively treat the clay type particles by pulling aside non-contaminated particles," Behan said.

The TerraCure process involves excavating the contaminated soil, liquefying it, applying appropriate chemistries to treat the contaminants, then separating the water through clarifiers or other equipment, and returning the soil to the site in its historic condition. Overflow water is suitable for processing at local water treatment plants.

The plant being designed for the project is modular, and will be brought in on trucks and assembled

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Dredged material for use in HRMC's demonstration in 2005 is delivered by Great Lakes Dredge & Dock, which removed it from the Darling International site at 825 Wilson Avenue in Newark, New Jersey on January 22, 2005. The dredging was coordinated by the New Jersey Office of Maritime Resources (NJOMR).

Raw dredged material of about 35 percent solids is being diluted in the mixing tank to about 12 percent solids prior to treatment.

Final clean processed product of about 55 percent solids, ready to be transported for beneficial use on the golf course.

on a purpose-built pad. It will include tanks, pumps, screens and centrifuges, as well as excavation equipment.

There are up to 30,000 of these legacy contaminated oil sites in Louisiana, Behan explained. From the turn of the 20th century until 1986, oil companies could drill and dig an adjacent pit to store the brine water without protective liners, then bulldoze or close the pit when drilling was completed.

About 12 years ago, a landowner sued the oil company, claiming damages and winning the suit with an award of around $33 million. There are now about 360 of these lawsuits on the books, and the oil companies are looking for a solution to it, Behan said.

TerraCure is a viable solution because it treats the material on-site, an alternative to trucking long distance to a landfill, which would involve significant liability regarding damage to the roads as well as loss of human life that is inevitable with thousands of miles of road travel by heavily loaded semi trucks. Onsite restoration, rather than "dig and haul" is a trend in the sustainable management of these sites, Behan said.

TerraCure is one of five contaminated sediment treatment processes that were developed from 1995 to 2008 at the Port of New York and New Jersey. Dredged maintenance material traditionally had been placed offshore, and in the mid-1990s, environmental advocacy interest groups were pushing for more stringent testing to limit contaminated material placed in the ocean.

The U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers and the State of New Jersey committed to finding an alternate solution for significantly contaminated dredged material.

Under the auspices of congressional authorizations in the Water Resources and Development Acts (WRDAs) of 1990, 1992 and 1996, and appropriations by Congress and the EPA, the Port of New York and New Jersey conducted a program to discover sediment decontamination technologies with beneficial use alternatives. A request for proposals resulted in five major technologies being selected for development.

HRMC's TerraCure process was tested in 2005 on 300 cubic yards of contaminated sediment dredged from Newark Bay, New Jersey, under a contract from the New Jersey Department of Transportation (NJDOT). It had conducted a successful pilot test in 1999.

The demonstration took place at the Bayshore Recycling Center in Keasbey, New Jersey, and produced decontaminated sediment

that was placed on a local golf course as clean, natural dirt, instead of going to a landfill, as it would have without this treatment.

Eric Stern, principal of Environmental Adaptive Strategies, LLC, was at the time Regional Contaminated Sediment Program Manager for EPA Region 2 in New York, and Program Lead for the New York/New Jersey Harbor Sediment Decontamination Program.

Eric Stern was the Program Lead for the New York/New Jersey Harbor Sediment Decontamination Program from 2005 to 2008. "We saw the integrated application of some of these technologies, and continued refining these processes, even after the programs were over," he said.

Stern worked closely with NJDOT and the U.S. Department of Energy Brookhaven National Laboratory to bring sediment treatment technologies from bench through pilot and commercial scale applications. The results were beneficial use options such as construction grade cement, manufactured soil, lightweight aggregate and geotechnical fill.

"We spent $42 million on the regional sediment treatment programs (at EPA and NJDOT) from 1994 to 2010, and then it was over with," Stern said. "But we were not done; we saw the integrated application of some of these technologies, and continued refining these processes, even after the programs were over, waiting for the economics and volumes to catch up with the market," Stern said. The application of the technologies to contaminated sediments and soils from multiple programs such as navigation dredging, aquatic mega-tie Superfund projects and legacy contaminated sites can now be realized," he said.

"Furthermore," Stern said, "we hope that Mike's (Behan's) process that was developed for sediments will now process soils by demonstrating the mobile treatment process, and return the soil back to the project site for restoration and project closure at or below the cost of hauling and landfill placement."

Behan acquired one treatment patent in 2003, and continued to develop the process after the successful Newark Bay demonstration in 2005.

That year, Behan was approached by a sister company of Spanish dredging contractor Dragados to participate in a project in Catalonia Area of Spain, adjacent to an old chemical factory on the Ebro River.

"I went to Spain," he said, "where Dragados was designing a facility to dredge and treat contaminated material. The process had three parts: high temperature treatment, remediation using my oxidation technology, and stabilization of the resulting material."

Based on this project, Behan went back to the lab to further refine his process over three years, and then applied for a new patent, which was granted in 2013.

After the Gulf of Mexico oil spill in 2010, Behan went to Louisiana and formed an intergovernmental task force, working in collaboration with Stern, to look into treatment and beneficial use of the affected material.

"Louisiana is a perfect state for a sustainable treatment facility. They are losing coastline and have a use for the material," Behan said. He learned from this effort that Louisiana was also very concerned with the legacy oil sites, and that a commercial demonstration at one of the sites will be well received.

If the demonstration this summer is successful, the process of cleaning them up can begin in earnest.

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