TENCATE Geotube®

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Geotube® Marine Technology Offers Custom Solutions for Unique Marine Applications Around the Globe

Geotube® units are fundamental for distinctive marine structures using proven, innovative methods and techniques.

What does a Honduran mine debris dam have in common with an iconic cable-stayed bridge in Korea? Both structures were built using Geotube® marine technology, an important component in the design of these projects.

Geotube® marine technology has proven successful in the creation of many unique marine projects worldwide — from sand dune cores to breakwaters to marine structures.

TenCate™, manufacturer of Geotube® materials, develops and produces materials that function to increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

Unique & Versatile Marine Applications

Geotube® marine containment technology, first used in 1962, offers great flexibility and cost-effective methods for a variety of coastal and inland waterway applications. Often times these marine projects present a challenge in the design and construction phases. Geotube® containers have proven to be up to the test.

"TenCate™ has a solid history with marine construction projects" said Mark Gunzenhauser, Vice President Sales - Geosystems. "We have the resources and expertise to develop unique solutions for our customers. Our market managers provide exceptional creativity and innovation to address each situation."

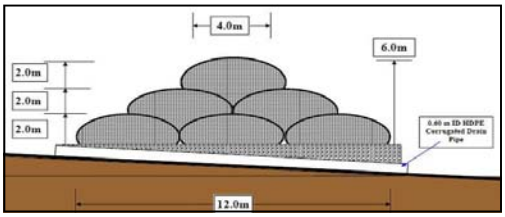
El Mochito Mine: Geotube® Debris Dam

This active zinc and silver mining operation in Honduras utilizes a tailings lagoon to contain large volumes of contaminated mine tailings slurry. The area directly above the tailing lagoon is a large, historically unstable zone. During heavy rain storms, this area has the potential to develop into an active landslide releasing large volumes of soil, rock, and debris into the tailing pond below. Such large volumes (400,000 cubic meters of debris material) could displace the contaminated tailings over the existing dam into an environmentally-sensitive, nature preserve or even cause a catastrophic failure of the mine's dam. A protective solution was needed.

El Mochito Mine, Honduras: *Two Geotube® debris dams provide protection from potential landslides in the area of the tailings lagoon (top of the photo.) Geotube® technology offered many benefits: shorter installation time, lower installation costs due to using local fill materials, and the environmental liner remained in place.*

After consideration of several mitigation options, Geotube® marine containment technology was selected for the construction of two Geotube® debris dams within the 10-meter deep HDPE-lined raceway above the tailings lagoon. Parallel drainage pipes were installed at the base of the two dam sites to prevent water retention behind the planned structures. Geotube® units, stacked two and three layers high, were filled multiple times with a locally-available mixture of course and fine mine tailings. Measuring 10, 12, and 14 meters in circumference, the Geotube® units properly contained the tailings — allowing the materials to fall out of suspension and form strong, dense, solid dam structures.

(More)



Above: Cross section of the upper Geotube® debris dam. Below: Drainage raceways lead into the tailings lagoon area prior to the Geotube® debris dam installations.

According to Ed Trainer, TenCate™ Market Manager, it was imperative that the Geotube® dam structures have the mass and integrity to resist the area's land slide debris. "The upper Geotube® dam weighed 3,000 metric tons when filled, and the lower Geotube® structure weighed 1,500 metric tons when finished," said Trainer. Both Geotube® dams have performed well, successfully controlling high volumes of rain-water runoff and debris from the side area.

Incheon Grand Bridge: Geotube® Bridge Platform

The landmark Incheon Grand Bridge connects the Incheon Int'l. Airport on Yongjong Island with Songdo City within the Incheon Free Economic Zone. This important transportation link measures 12.3 km long and has a 74-meter navigational clearance to allow ocean-going vessels to travel through the Port of Incheon. In addition to the symbolic cable-stayed section, the majority of the sea crossing (8.7 km) consists of concrete box girder viaducts.

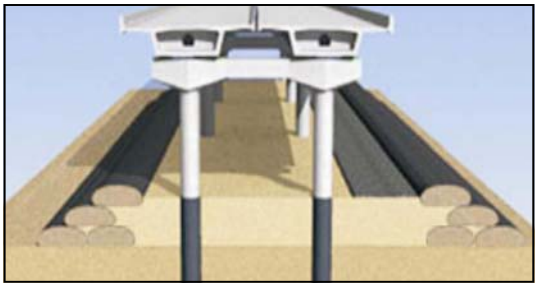
Engineers faced construction challenges in the harbor area. They contended with 9-meter tidal fluctuations while building the concrete viaducts in shallow water over 1-inch deep tidal mud flats. An artificial island was created to provide a construction platform over these shallow areas. More than 14 km of Geotube® units were used as reclamation dikes over the soft estuarial deposits. The containers were stacked in tiers up to seven meters tall.

Project managers took advantage of the daily tide cycles. Scour aprons and Geotube® containers were installed during low tide; and the units were filled during high tide when water was readily available. The Geotube® containers were filled with imported sand delivered by barges and using a slurry-mixing and pumping setup. This Geotube® structure formed the perimeter containment dikes for the artificial island that was constructed using residual soil backfill trucked to site. As a result, the construction of the island did not involve any dredging works on-site. The installation of the Geotube® units began in late April 2006 and was completed by the end of that year.

For More Information

A TenCate™ representative can recommend the best use of Geotube® marine technology for your situation. To learn more about Geotube® technology, call 1-888-795-0808 or visit www.geotube.com.

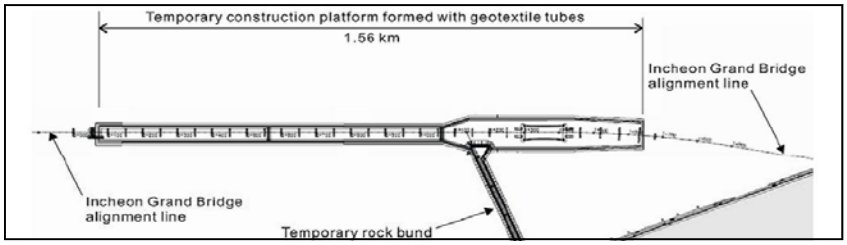
Artist rendering of the Incheon Grand Bridge



This illustration shows a cross section of the Geotube® bridge platform design for the artificial island.

Installation of the Geotube® reclamation dikes

The completed Geotube® bridge platform project



Right: Site diagram for the Incheon Bridge

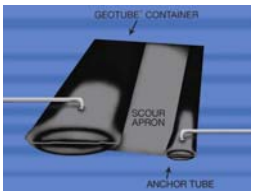
How Geotube® Marine Containment Structure Technology Works

Building a marine containment structure with Geotube® technology is a three-step process.

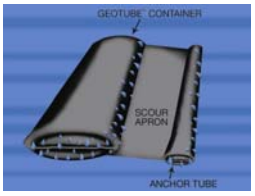
In the ***filling*** stage, the Geotube® container is filled with dredged sand or similar materials. The Geotube® containers are constructed of a unique fabric, specially engineered for a marine structure.

In the ***containment*** stage, the durable and high retention fabric allows the dredged materials to fall out of suspension and form a dense monolithic structure.

In the final stage, ***structural***, the contained and densified material serves as a structural mass. When utilized with an accompanying Scour Apron, the Geotube® container may be utilized as a sand dune core or other shoreline re-nourishment or erosion prevention medium.



Step 1: Filling



Step 2: Containment

Step 3: Structural

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