ACE Geosynthetics

CASE STUDY COLLECTION

Marine and Coastal Structures Construction

Marine Structures

Beach Nourishment with ACETube® in the UAE

The Background

In 2007, the fierce tropical cyclone, Gonu, hit Al-Fujairah, UAE, wreaking havoc on the coastline of the emirate. The cyclone's attack caused severe erosion and washed away kilometers of the beach. Though the drifting sand could supplement the loss of the beach, it was unlikely for the beach to fully recover in a short time. This situation might well get worse when other cyclones came.

The Problem

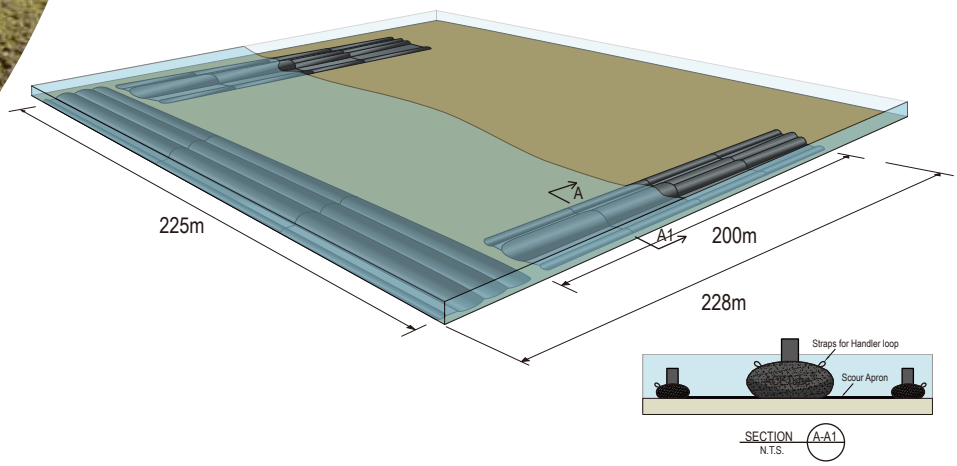
The project owner, Le Meridien Beach Resort, located right on the beach was under the threat of the washout and sand loss which not only jeopardized its very existence, but also kept tourists from visiting this place. Therefore, the resort owner tried to build two breakwaters with riprap to protect the beach, but without a solid foundation, the breakwaters sunk and vanished in the sea because of continuous wave impact and cyclone attacks.

The Solution

The ACE engineering team proposed using ACETube® as the main components to build a U-shaped submerged breakwater with its opening towards the beach. The whole structure formed a zone of 228m × 225m underwater to reduce wave energy and nourish the beach in the meantime.

The Contribution

With the filling of in-situ sand, the project cost was brought down and the construction time was substantially shortened. Furthermore, the flexibility and permeability of the geotextiles allowed ACETube® to adapt itself under the influence of the waves and go with the currents. Such qualities greatly increased the service life and the effectiveness of the structure.



Marine Structures

ACETube® - The Project of an L-Shaped, Sand-Containing Breakwater in the UAE

2013 IFAI OUTSTANDING ACHIEVEMENT
INTERNATIONAL ACHIEVEMENT AWARDS

The Background

This project was at a coast in Ras Al Khaimah, UAE, where there was a groin for the protection of the navigation channel. The local authority planned to build a fishing port right there where the groin was and decided to make use of it as a part of the port.

The Problem

An L-shaped breakwater of about 700m long was designed to be attached to the groin to make a port. The newly-built breakwater of 147m would reach from the coast with a right-angular turn to the northeast and another 524m to be connected with the groin. The whole structure should be 9m high, 2.5m of it under water and 6.5m above the sea level on account of the tidal range being 3m. Cost-effectiveness, fast construction, and optimal safety were the requirements for this particular project. However, most breakwaters in the UAE are built with rubble which is costly. Other materials, such as concrete boxes (caisson), concrete blocks are also expensive. Therefore, the local authority wished to look for a more economical option for the project.

The Solution

After a thorough assessment, ACETube® was chosen for the proposed breakwater. ACETube® filled with sand was used to be the core of the breakwater.

Externally, ACETube® was covered with an under-layer of aggregates and further protected by a layer of armor rocks. The final look was similar to a rubble-mound type breakwater.

The Contribution

The use of ACETube® for breakwater construction significantly reduced the cost and minimized environmental disturbance. The result turned out to be better than expected. The project even won 2013 International Achievement Award from IFAI for its outstanding performance.

Marine Structures

ACETube® for Beach Erosion Problem at Tabasco, Mexico

Location : Paraiso, Tabasco, Mexico

Application : Coastal Protection; Facility Support

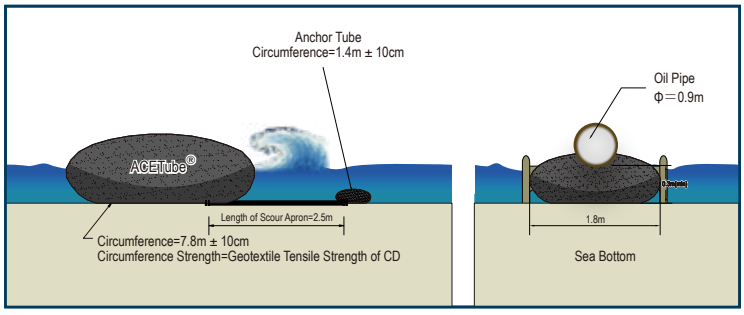
Product : ACETube® of 7.4m in Circumference

The Problem

Dos Bocas PEMEX marine facilities suffered progressive beach erosion which resulted in the loss of the sand foundation under the pipelines that lay within the surf zone. Such problem jeopardized oil conduction and infrastructure's integrity and increased the potential risk of pipeline failures which would have catastrophic economic and environmental consequences because the oil production and conveyance in the country highly depended on these pipes.

The Solution

To deal with the said situation, ACETube® was used as the main material. Filled with in-situ sand, ACETube® was put underneath the pipelines to support them and was installed in the sea along the coastline of 1.9km as a submerged breakwater to reduce the wave energy and, therefore, nourish the beach. Thanks to ACETube®'s flexibility and adaptiveness in the marine environment, it gave the pipelines a complete support and also showed good quality acting as a breakwater without being damaged by the wave impact. The result of beach nourishment came out to be just as expected as the beach evolution surveys indicated.



Marine Structures

Dredged Materials Disposal, Wan Chai Development Phase II Project, Victoria Harbor, Hong Kong

The Problem

Victoria Harbor is a natural landform harbor situated between Hong Kong Island and Kowloon in Hong Kong. About 220,000 ships visit the harbor each year averagely, including both oceangoing vessels and river vessels, for both goods and passengers. The maintenance of normal operation of shipping determines the success of the service. One of the major managing difficulties for port authority will be the clean-up and disposal of sediments originated from oil mixed settlement of suspended solids and fluvial sediments from upstream rivers. Environmental concerns have been expressed about the disposal of these dredged sludge materials, in terms of water quality and loss of natural habitat.

The Solution and Innovation

To execute the dredging and disposal of the sludge materials, the designer adopted ACEContainer™ for the Wan Chai Development Phase II project for Victoria Harbor. ACEContainer™ is suitable for environmental needs and it has been widely used for marine and hydraulic constructions as maintenance dredged material containment for further treatment and disposal. For this particular project, ACEContainer™ has a custom made dimension of 28m in circumference and 12m in length with a filling capacity up to 300m³. ACEContainer™ technique took place on a split bottom hopper barge and the sludge was filled into the container using clamshell bucket. Once the ACEContainer™ was filled, its openings were sewn shut and reinforced with rope ties. The barge moved to the designated location, the bottom opened and dropped the ACEContainer™, which settled to the bottom of the sea. ACEContainer™ has been designed to withstand the hydraulic impact in the marine environment with time. Monitoring after the construction has observed no damage and leakage for the installed ACEContainer™. Use of ACEContainer™ to hold the dredged materials and drop it into the sea has shown successful to avoid the spreading of suspended solids in the water and thus it is indeed beneficial for the treatment of dredged materials.

The Contribution

ACEContainer™ delivers high performance and achieves rapid and effective solution for dredging constructions when compared to those of traditional techniques. It is helpful for the improvement and maintenance of ports, harbors and waterways as well as to avoid environmental pollutions during disposal. Moreover, after ACEContainer™ is laid down on the seabed, it can be also adopted as the core of marine structure underwater as breakwater or shoreline protection.

ACE Geosynthetics, established in 1996, is a leading geosynthetics manufacturer and solution provider headquartered in Taiwan. We develop, manufacture and supply a wide range of reliable geosynthetic products that are approved and certified by CE, BBA, NTPEP. We also customize products to meet clients' various needs. In our company are more than 40 experts in civil, geotechnical, marine, hydraulic and environmental engineering who provides professional technical service and cost-effective solutions that help clients realize projects with success and efficiency.

What We Offer

Structure design and analysis

Our experienced engineers design and conduct analysis with professional engineering software such as MSEW, ReSSA, Reslope, Stedwin and GeoCoPS, and provide drawings or advice to help clients install materials properly.

Technical Consultation

We work closely with clients and provide advice in every stage throughout the entire process, including selecting optimal products, proposing solutions and giving advice on material installation.

Product customization

We customize products for clients. Many of our products including ACEGrid®, ACETex®, ACETube®, ACEFormer™ and ACEBag™ can be made according to individual specifications to fulfill particular requirements.

Construction Assistance

We offer on-site technical support on request during construction to ensure proper installation of products and structural stability.




Our experience and achievements:

- Reinforced walls and slopes
- Soil stabilization
- Ground stabilization
- Pavement reinforcement
- Erosion control
- Sewage and sludge dewatering
- Shoreline remediation
- River / wetland remediation
- Coastal protection
- Harbor dredging



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