TENCATE Geotube®

Geotube® Systems for Waterways and Impoundments

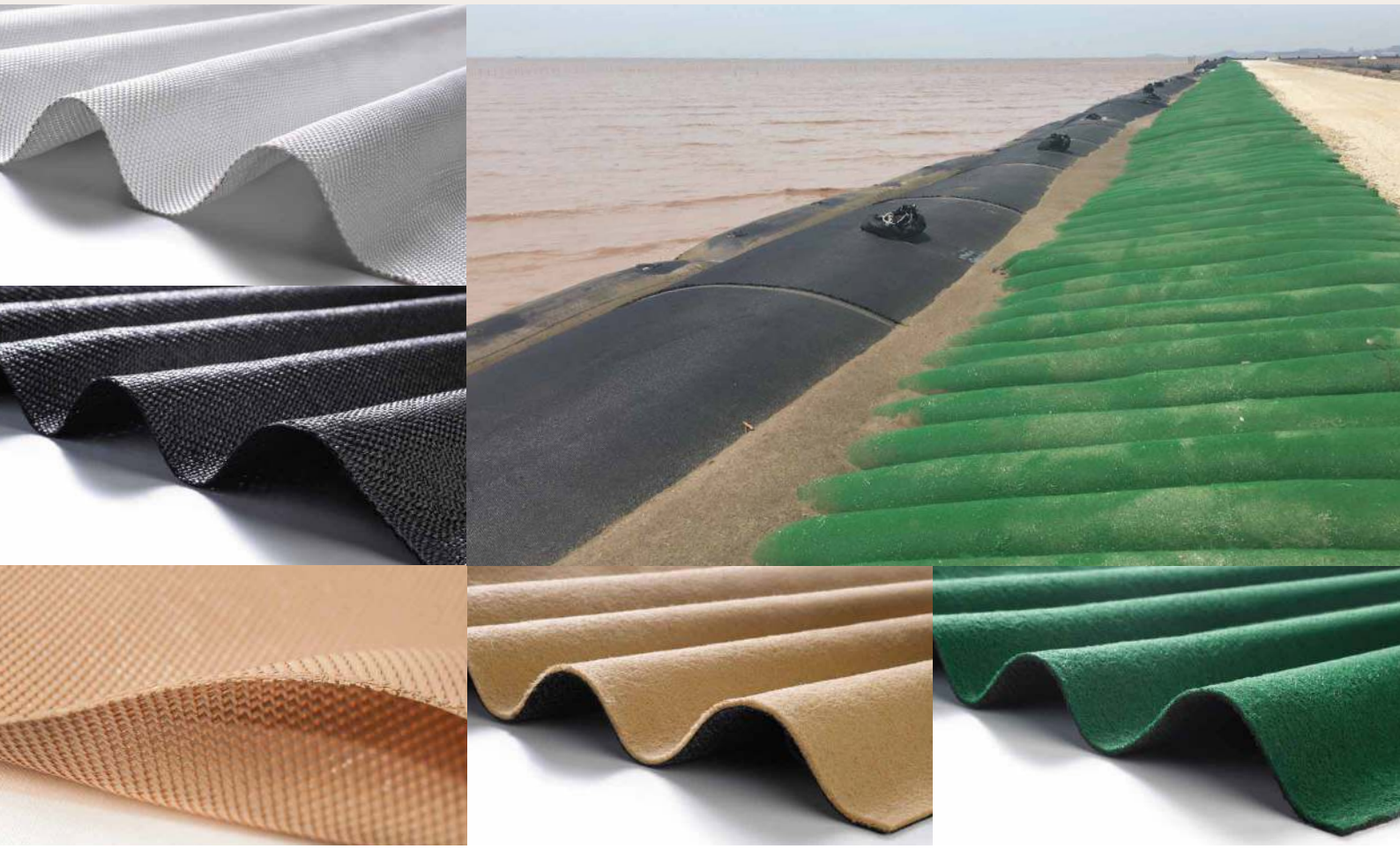
TENCATE GEOSYNTHETICS

TenCate Geotube® Systems for Waterways and Impoundments

TenCate Geotube® Systems are manufactured in our world-class production facilities, and these Geocontainment Systems replace rock in erosion protection works for waterways and impoundments. TenCate has the widest range of engineered fabrics and composites for the fabrication of Geotube® Geocontainment Systems. These engineered fabrics are designed for strength, robustness, abrasion resistance, UV resistance, etc. for the most demanding of site conditions.

For TenCate Geotube® Geobag Systems, Sand Filled Mattress Systems and Dyke Systems high tenacity woven polypropylene is used. Special fibres and yarns may be incorporated to form engineered composites for additional engineering functions. For example, TenCate Geotube® Sand Filled Mattress Systems uses a special "mulch-integrated" composite on the exposed surface to provide a surface environment that will speed up vegetation growth. TenCate Geotube® Dyke Systems can also be manufactured with a coarse grain fibre substrate that enhances resistance to sand abrasion, debris impact resistance, etc.

For TenCate Geotube® Concrete Mattress Systems and Silt Curtain Systems, special pore size and high strength woven polyester fabrics which give good drape properties are used. When it comes to protecting your waterway and impoundment surfaces, TenCate Geotube® Systems have you well covered.



Geotube® Geobag

Rapid mobilisation and easy to use erosion protection units

TenCate Geotube® Geobag units are manufactured from engineered fabrics combined with high capacity seams to produce bag or pillow shaped containers. When filled with sand or other soils, the bags are used as basic armour units for erosion protection works. They are engineered to provide strength, durability and soil tightness to perform during installation and during the operational life. They come in a wide variety of sizes and shapes that can suit practically any site handling conditions. TenCate Geotube® Geobag units are site-filled, closed and placed using standard construction equipment. They are easy to use and can be rapidly mobilised if necessary for emergency works. They are either lifted into position or dropped into water. TenCate Geotube® Geobag Systems are very versatile; they are used to construct revetments and other hydraulic structures, including filling of scour holes and closing of breached dykes.

Lifting and positioning Geobag unit.

Deploying Geobag units by dropping into water.

Case Study

project	Taguibo River Channel Improvements
location	The Philippines

TenCate Geotube® Geobag Systems were used for the Taguibo River channel improvement works. These works were part of the flood control projects of the Lower Agusan Development Project in Mindanao. Suitable rock was hard to come by in this area. TenCate Geotube® Geobag Systems were used to replace rock as the building blocks for the channel improvement works. A total of more than 2,400 Geotube® Geobag units, with nominal dimensions 1.4 metres by 2.4 metres, were used for the project. Construction began in May 2009 and was completed in October 2009.

Case Study

project	Pedu Lake Shoreline Revetment
location	Kedah, Malaysia

Pedu Lake is a big man-made lake in Kedah, near the border with Thailand. The lake is retained by the construction of Pedu Dam and fed by the water of Pedu River, subsequently allowed to fill to the current level, turning some of the hills into mere islets in the water. Covering an area of 75 square kilometres but fluctuating according to season, it is one of the biggest lakes in Kedah. The lake and vicinity has also seen developments in eco-tourism. Chalets and other facilities were built along the lakeshore as part of these developments. TenCate Geotube® Sand Filled Mattress was used as revetment to protect these developments.

Geotube® Sand Filled Mattress

Revetments with vegetated surface

TenCate Geotube® Sand Filled Mattress is the ideal choice when riverbanks, waterway sections and impoundment slopes require erosion protection with a long term vegetation cover in place. It is economical, easy to install and uses simple equipment without the requirement for skilled labour. Sand Filled Mattress is manufactured with a special substrate integrated to the upper surface for instant green effect, providing a surface texture that enhances the rapid establishment of vegetation and shielding UV attack.

The Sand Filled Mattress is delivered in rolls which can be easily transported to site. Laid with parallel tubular sections running down the slope, each are hydraulically filled with sand through the top openings. The sand is introduced through a small hopper and washed down with water pumped from the waterway or impoundment. Adjacent rolls of Sand Filled Mattress are joined by seaming on site. Finally, the Sand Filled Mattress is anchored in a trench at the top of the slope.

Laying Geotube® Sand Filled Mattress *over prepared slope.*

Geotube® Sand Filled Mattress *hydraulically with sand.*

Geotube® Concrete Mattress

Revetments with hard durable surface

TenCate Geotube® Concrete Mattress is manufactured using a double layer of specially engineered fabrics structured such that cement mortar can be pumped in to form a variety of concrete mattress form and shape for use under different site conditions. The net result is a completely rigid mattress or a flexible articulated matrix of blocks. The mattress can then be used as revetments with hard durable surface and can replace concrete slabs and blocks or rip-rap revetments.

Alternatively, a hybrid system with concrete cellular sections that contain soil and vegetation within the cells can give a softer appeal. TenCate Geotube® Concrete Mattress Systems are economical and can be easily installed at site. They are ideal solutions for areas with poor accessibility and handling of precast concrete units and rip-rap.

Typical close up of Geotube® Concrete Mattress.

Case Study

project	KLIA 2 Drainage Channels
location	Sepang, Malaysia

The Kuala Lumpur International Airport 2 (KLIA 2) Project is an extension project to KLIA. KLIA 2 is slated to be the largest purpose-built dedicated terminal for low-cost carriers in the world and is located two kilometres away from the KLIA Main Terminal Building. KLIA 2 is designed to accommodate up to 30 million passengers annually, and could be upgraded to serve 45 million passengers a year. The KLIA 2 Project involves the construction of an integrated complex that includes infrastructure works (earthworks, road works, drainage works, etc.). TenCate Geotube® Concrete Mattress Systems were used extensively to line the drainage channels and impoundments of the KLIA 2 Project.

Case Study

project	Ilsan Grand Bridge Project
location	Seoul, Korea

The bridge was constructed across Han River to provide an improved direct link between Gimpo and Goyang, effectively shortening the travel time between the two cities. Additionally, it reduces the distance between Goyang and Incheon Airport. TenCate Geotube® Dyke Systems were used to construct a temporary island across half of the river to enable land-based construction over a substantial portion of the bridge. One hundred Geotube® Dyke units of lengths ranging from 30 to 75 metres were used for the project. This amounted to a total of 4,540 metres of Geotube® Dyke Systems. Sand was dredged from the riverbed to fill the Geotube® Dyke units. Upon completion of the bridge, the Geotube® Dyke units were cut open, allowing the fillings to be washed back to the riverbed and the fabrics were removed from site.

Geotube® Dyke Systems

Dykes for river training, reclamation and water control

TenCate Geotube® Dyke Systems are manufactured from high modulus polypropylene engineered fabrics combined with high capacity seams to produce large tubular containers with ensured integrity during filling and over the operational life. These units have specially designed and spaced filling ports which enable the uniform hydraulic filling of sand, while water is drained through the permeable skin of the tubular units. This results in a compact sand-filled mass-gravity structure.

TenCate Geotube® Dyke Systems utilise locally available sand for the construction of dykes in waterways and impoundments. The Dyke Systems either reduce the use of rock or completely replace rock as material for construction of dyke structures. TenCate Geotube® Dyke Systems are ideal for use as river training dykes, reclamation dykes and dykes for water control. They are more economical and often have lower carbon footprints than the rock dykes they replace.

Geotube® Dyke *for wetland engineering.*

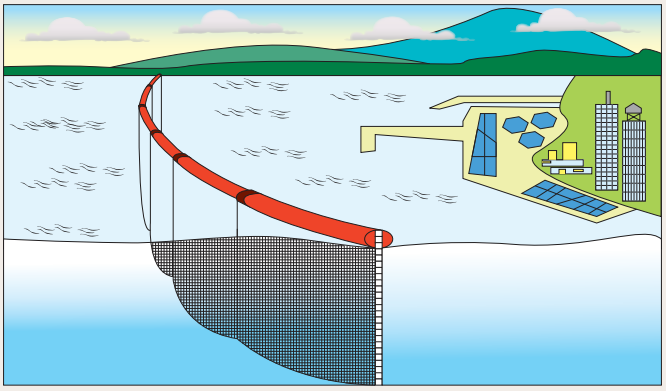
Geotube® Dyke *for lakeshore reclamation.*

Geotube® Silt Curtain Systems

Turbidity control and sediment pollution prevention

TenCate Geotube® Silt Curtain is an assembly of floats, curtain screens and bottom weights that hangs from the water surface. The function of TenCate Geotube® Silt Curtain is to confine turbid water within a work area and prevent sediment pollution outside the work area. The use of TenCate Geotube® Silt Curtain is usually mandated by environmental regulations related to water pollution control in riverbanks and shoreline constructions, dredging and reclamation works in waterways and impoundments.

The curtain screens are made of special grade high strength woven polyester geotextile that offers excellent water permeability whilst confining sediments and other materials within the silt curtain barrier. The vertically suspended silt curtains are stabilised with a floatation and mooring system. Complete with the necessary accessories, the silt curtains are easily deployed during installation. TenCate Geotube® Silt Curtain Systems are custom designed and manufactured to meet project requirements.



Geotube® Silt Curtain *deployed to prevent the dispersion of suspended solids.*

Case Study

project	Marina Barrage Project
location	Singapore

The Marina Barrage Project is uniquely designed to achieve three objectives: to act as a tidal barrier for flood control, to create a new reservoir to augment the water supply, and to maintain a new body of freshwater with constant levels in the city as a major lifestyle attraction. The barrage comprises of nine segmented hydraulically operated steel crest gates, built across the 350 metre-wide Marina Channel to isolate the reservoir from the sea. During rains, the steel gates will open to release excess storm water to the sea when the tide is low and pumps will be used during high tides. Tencate Geotube® Silt Curtain Systems were used extensively for turbidity control during construction which also included dredging and beach restoration works.

TenCate develops and produces quality products that increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

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