

## Geotextile Tube Solution for Barrier Island's Inlet Restoration Engineering in Taiwan

Felix Tseng<sup>1</sup>, Amy Tang<sup>1</sup>

<sup>1</sup> ACE Geosynthetics, No.33 Jing 3 Rd., C.E.P.Z. Wuchi, Taichung Hsien, Taiwan, R.O.C.;

Email : sales@geoace.com

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### ABSTRACT

The west of Taiwan is belonged alluvial plain, and had rich sediment delivery in early stage. Based on river sediment transport, sea wave, and wind affected, huge amount of sediment deposited in the river outlet to the sea. Coupled with the longshore sediment transport resulted, gradually to the formation of many small barrier island along the coast. With the passage of time, there was more and more sediment deposition thus the formation of a watershed which we called lagoon as the inside sea. The lagoon connectivity within outside sea by the tide inlets which made inside sea water exchanged with outside sea water, not only refreshing the water quality but also enriching the ecosystem.

The port facilities construction in light of the active and increasing demand of marine transit and international trading business, coupled with upper stream reservoirs construction and the down stream sand and gravel mining, create the river sediment transport declining and directly impact on coastal change and erosion problem. The barrier islands in Tainan coast have seriously eroded and decrease the elevation, gradually loss of natural flood detention function. The ecology and fishery resources of the lagoon face threats and coastal areas occurrence of flooding. The barrier islands shift to the land make the lagoon serious siltation; the elevation decreasing of the barrier islands make new tidal inlets whenever the typhoons pass. The tidal current velocities changes due to the tidal movement, not only make the barrier island sand loss, but also expand the width of tidal inlet. This project is barrier island's inlet restoration engineering in Wang-Yeh Port, Beimen, Tainan, and the construct changes the traditional beach nourishment construction method, and applying the geotextile tubes which donated by ACE Geosynthetics.

The barrier islands are in the south side of Jishui River's outlet to the sea, the total length about 6.5 km. From 1962-2002, a comprehensive erosion situation in the Beimen's coastline, 460m width beach disappear in north of Wang-Yeh Port, the average annual erosion up to 5.3m/year. The sea meteorological in Wang-Yeh Port has average tidal range of 1.03m, the average wave height about 1.1m, the 50-year return period of storm wave height is about 6.0~6.7 m. The width of tidal inlet from 150 becomes to 200 m in half a year (see Figure 1), and the velocity of tidal inlet is about 2m/s. The traditional sand-fixed hedge and sand-dune vegetation engineering method can't resolve the issue of enlargement in the tidal inlet. Coupled with the tidal current velocity with the tidal change in inlet, the restoration work must race against time to avoid new tidal inlet formation due to the necking effect of inlet

containment. In the past, people used geotextile bag which volume was  $1\text{m}^3$  to implement of restoration engineering. Low strength and less weight caused damage after the typhoon attacked. At present, we suggest using geotextile tube which circumference of 8.6 m and 50 m in length, not only the weight is 200 times to the original sandbag, but also is an efficient construction method. With the 400 horsepower dredge boat, 10 inch HDPE sediment transport pipes and link geotextile tube with 8 inch hose. A 50m long geotextile tube installation can be completed within two hours under the sediment transport efficient is about  $150\text{m}^3/\text{hr}$ . After the installation of the geotextile tube, the bamboo piles in both side of geotextile tubes then backfill the sand, the total duration about one month. As a result, the backfill area has reached the total filling volume of  $9500\text{m}^3$  of sand source which is from the lagoon.

The construction period, due to the tidal inlet width gradually reduced, the seaward side of the beach has significant sediment deposition phenomenon (see Figure 2). The lagoon known as the natural protective barrier has the call of marine reservoir, the tidal inlet closed can completely solve the barrier island shift to the land and caused the inside sea siltation. The barrier islands play a natural detention flood, prevention disaster function. Results to corroborate the geotextile tube not only is applicable to solving the lagoon siltation and tidal inlet closed but also offers speedy and friendly solution to deal with environmental and reinforcement barrier island without effecting the livelihood of fishermen and Oyster farmers'.



Figure 1. Before Construction



Figure 2. After Closed the Tidal Inlet

## REFERENCE

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