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Case Study

SINGAPORE, SINGAPORE

Debris Barrier for Offshore Floating PV Farm, along Straits of Johor

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Project:	Debris Barrier for Offshore Floating PV Farm, along Straits of Johor
Total length of Debris Barrier:	1.2km
Year Completion:	2021
Distributor & Contractor:	Hocklim Engineering Pte Ltd
Material:	TenCate Geotube ® Debris Barrier System

The Challenge

One of the world's largest solar farm (5MW peak floating solar farm) was set up along the Strait of Johor which housed 13,312 solar panels and over 30,000 floats spread over the area of seven football fields. Over the course of the construction of the solar farm, it was observed that marine debris have accumulated on the solar farm. Debris from the communities living close to the coast of the Straits of Johor floated towards the Solar Farm and were trapped between the floats.With the floating debris being cluttered around the floating module, the environment around the area would be hazardous to the maintenance crew. As a result, Hocklim Engineering Pte Ltd was tasked to design a system that could address the current issues faced by the client.

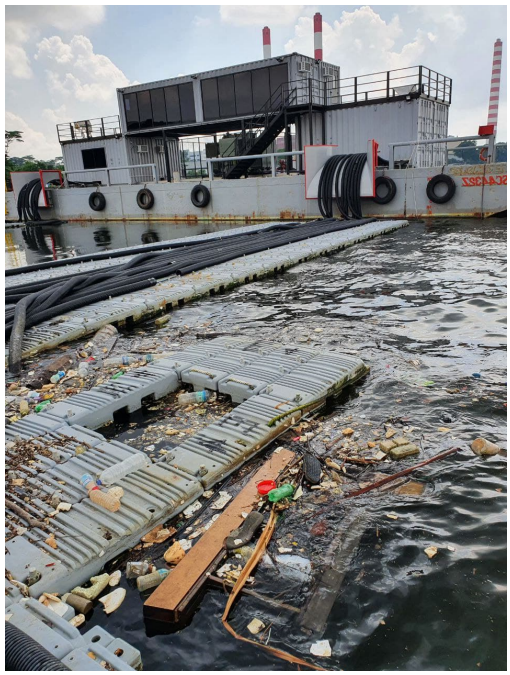

Figure 1: Debris accumulated onto the Solar Farm

Figure 2: Aerial view of Debris Barrier mockup installed in Sep 2020.

Design collaboration and Trial Mock up installation

After studying the site's situation, Hocklim Engineering and TenCate collaborated to discover 2 underlying issues comprising of floating debris and partially submerged debris. This led to the custom designed TenCate Debris Barrier as the system to remove not only the floating debris on the water surface but also the partially submerged debris, thereby improving the efficiency, environmental and safety issues faced by the solar farm.

To test that the custom designed Debris Barrier is effective in removing both floating debris and partially submerged debris , a mock-up Debris Barrier of 20m in length was installed on 21 September 2020. After a trial period of 6 months, it was observed that the Debris Barrier system had effectively separated the floating and partially submerged debris from the solar farm while maintaining its' shape. After the results were proven successful, Hocklim Engineering was awarded the contract to complete the protection of the entire 1.2km perimeter of the solar farm with TenCate Debris Barrier.

Figure 3: Debris Barrier installed around the solar farm

The Solution

The solution is a custom designed Debris Barrier that comprises of 2 components. The first component is a floatation system that is made up of high density Polystyrene Styrofoam cylinders. This Styrofoam ensures that the Debris Barrier stays afloat on the water surface, keeping the floating debris away from the solar farm. The floating system's Styrofoam cylinders is covered by high UV treated Polypropene Woven Geotextile ensuring that the Styrofoam does not degrade when subjected to extreme weather conditions.

The second component is a 1m length in depth polyester woven geotextile made of special weaved high tenacity geotextile that is underneath the Styrofoam floating system to prevent partially submerged debris from getting under into the solar farm.

In order for the Debris Barrier to be functional for the required product life, TenCate developed a special protective shield with high tensile strength and weathering resistance. The fabric used for the Debris Barrier protective shield has a tensile strength of 45 kN /m and strength retention of minimum 80% when subjected to 5 000 hrs of UV exposure in the UV chamber, which is equivalent to approx 7 months of outdoor exposure. This enables it to tackle the fluctuation of the wave tides and withstand the extreme weather conditions of the Straits of Johor which is subjected to frequent occurrence of thunderstorm and intense heat.

Figure 4: Debris prevented from entering the solar farm

In this project, the installation of TenCate custom designed Debris Barrier along the 1.2km perimeter of the solar farm had proven effective in preventing all floating debris and partially submerged debris from entering the solar farm, thereby creating ensuring a safe and clean environment for its' workers.

Figure 5: Debris Barrier installed along the perimeter the solar farm