

# Stable foundation over soft marine clay with **COMBIGRID**<sup>®</sup>







Fig.1: Installation of Combigrid® with trench for collector pipe and regulating sand backfill

### Problem

The coal fired power plant Manjung 4 or Sultan Azlan Shah power station is considered to be one of the biggest Independent Power Producer (IPP) projects in Asia. Located 4.5m above sea level on 320ha of reclaimed land on the coast of Perak in Malaysia, the Manjung 4 consists of 5 units, with a total capacity of 4.1GW. An average of 30,000 tonnes of coal per day or 15 million tonnes of coal per year are consumed for electricity generation.

As a part of the Manjung 4 expansion project in 2015, the client requested an additional ash pond to accommodate the coal residue. Three new ash ponds were proposed to be constructed above 0.65m to 1.8m thick soft marine clay with an undrained shear strength of around 10kPa.

Site investigations and stability analyses were carried out by the consultant. The result showed that the soft marine clay did not have an adequate shear resistance to withstand the weight from the future ash deposit.

### Solution

In order to achieve a stable foundation, the consultant proposed to utilise two layers of Combigrid® as a reinforcing element on the ash pond foundation. This composite is made of stretched, monolithic polypropylene (PP) flat bars with welded junctions and a mechanical bonded and calendered filter geotextile welded within the geogrid structure. The high strength mobilisation at low strain of Combigrid® conforms to the project conditions to provide stabilisation and reinforcement of the soft in-situ ground. The nonwoven geotextile of Combigrid® provides separation to prevent mixing of the fill material with the in-situ soil. Its geogrid component provides interlocking of the granular fill material and friction on both sides to increase the shear resistance. This composite product also helps to distribute the vertical load more evenly, ensuring the stability of the structure and reducing the tendency of having differential settlement.

The first layer of Combigrid® was installed on a horizontally levelled platform at the base of the seabed. Regulating sand was utilised as fill material for the installation of collector pipes. A second layer was subsequently installed to achieve a minimum design factor of safety of 1.3 for the bund stability.

A total of 100.000m<sup>2</sup> of Combigrid® was supplied to the project with the support and assistance of NAUE Asia. With the success of this solution, the newly constructed ash pond is ready to effectively accommodate and assure the operation of Unit 4 at the Manjung coal fired power plant.



Fig.2: Water from saturated soft marine clay reflected on Combigrid® layer

**Project Name:**  
Manjung Coal Fired Power Plant, Malaysia

**Client:**  
TNB Janamanjung

**Main Contractor (power plant expansion):**  
CMC Machipex Sdn Bhd

**Sub-Contractor (ash pond construction):**  
Mudajaya Corporation Berhad

**Consultant:**  
HSS Engineers Berhad (main company)  
HSS Integrated Sdn Bhd (subsidiary company)

**Product:**  
Combigrid® 80/80 Q1



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