

Case Study

Landfill Sealing System with **CARBOFOL[®]**





Shenzhen is one of China's many cities on a fast modernisation track. Not unexpectedly, the city's rapid industrial and residential growth has created numerous environmental quality challenges. The Hong Hua Ling Landfill is a unique piece of Shenzhen's development, for the landfill exemplifies not only the challenges of the city's past waste practices but how its future is being protected.

Hong Hua Ling has operated for years, accepting many types of waste streams, including types of wastes considered more sensitive (e.g., medical wastes). To correct this old approach, a modern expansion was called for. The subsequent 140,000m² expansion design has enabled the site to handle nearly half of the total waste disposal of Shenzhen's Longgang area, including accepting 1,600 tonnes of waste daily.

The expanded area's lining system was initially designed with a double-lined base, but geological analysis found that an existing clay layer of 2.3m – 5.9m with low permeability could act as a secondary barrier. The primary liner, though, needed to be a high-quality geosynthetic solution.

A HDPE geomembrane was specified, with 1.5mm and 2.0mm thick geomembranes selected for use in various zones. The project engineers used numerous guidelines in making their material characteristic and thickness decisions, including the CJ/T- 234 Guideline on High Density Polyethylene (HDPE) for Landfills and the GB16889-2008 Standard for Pollution Control on the Landfill Site for Municipal Solid Waste.

Carbofol® HDPE geomembranes were utilised throughout the site. At the base, a smooth Carbofol® liner was selected while an embossed, structured surface Carbofol® geomembrane was chosen for the sloped areas over a co-extruded or sprayed-on structured surface geomembrane. The advantages of interface friction performance is i.a. due to structure and homogeneity of the membrane surface. The use of this HDPE geomembrane also provided the operational and construction benefits that the design engineering team wanted: high stress crack resistance, a high Melt Flow Rate to enable strong welding performance, excellent chemical resistance, etc.

Drainage netting was used as the leak detection layer and as a drainage layer below the aggregate. These drainage layers also have a dual function of protecting the Carbofol® HDPE geomembrane from potential puncture damage. Additional protection was provided by a robust geotextile layer situated between the HDPE geomembrane and the thick clay subgrade.

The construction works at the Hong Hua Ling Landfill were executed on a very tight schedule, due to the pressure for the fast-growing area to have the massive expansion in operation as soon as possible. The initial works were performed with 50,000m² of geomembranes from another manufacturer, but then the remaining 250,000m² of required geomembranes were supplied by NAUE GmbH & Co. KG. This created a point of caution where the differing manufacturer HDPE formulations needed to be welded together. The

agreement in the Melt Flow Rate was critical, and analysis found the MFRs of the materials to be similar enough to prevent panels breaking apart.

Furthermore, air pressure tests were conducted on the panel joints to verify weld tightness. Another area on which the contractor and consultant had to pay extra attention was the construction methodology used with the curved slopes. The budget was constrained, which meant strict control of materials.

The team found that constructing the slope with panels parallel to the slope could save on material, by using remaining pieces of cut rolls in the curves.

The downside of this approach was that it required greater field welding of materials, but these welds were all monitored and verified by the construction and CQA team to ensure weld quality.

The Hong Hua Ling Landfill expansion will provide a total capacity of 2,080,000 tonnes of waste storage.

Project Name:
Hong Hua Ling Landfill, Shenzhen, China

Engineer:
China Nerin Engineering Co. Ltd.

Product:
Carbofol® geomembranes



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