



KAYTECH CASE STUDY

PRACTICAL PROTECTION OF THE GCL LINING SYSTEM USING A GEOTEXTILE LAYER AT MAKHADO MINE

GEOSYNTHETICS USED

bidim®: A continuous filament nonwoven needlepunched geotextile manufactured from polyester.

bidim® A10: Used as a protection layer above the EnviroFix® GCL to reduce puncture risk from coarse backfill material.

EnviroFix®: Geosynthetic Clay Liner comprising sodium bentonite powder encapsulated between geotextiles.

EnviroFix® X800: Used as a low-permeability barrier within the coal stockpile containment system.



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PROJECT DESCRIPTION

During the development of a coal stockpile containment facility at Makhado Mine, the barrier system was required to achieve low permeability. This was accomplished through the installation of a Geosynthetic Clay Liner (GCL) by Edwin Construction. However, the available backfill/cover material consisted of coarse, highly angular granular material, presenting a significant risk of damaging the GCL during placement. Conventional solutions such as screening or crushing were considered but would have added cost, delays, and logistical complexity.

A BETTER SOLUTION

Protection layers are widely used in geosynthetic lining systems to reduce mechanical stresses acting on geomembranes and GCLs during construction and operation. According to Koerner (2012), nonwoven geotextiles provide effective cushioning by absorbing impact energy and redistributing concentrated loads imposed by coarse aggregates or construction activities. Their thickness, compressibility, and puncture resistance allow stresses to be dispersed over a wider area, limiting localised damage to sensitive liner systems. Giroud (1995) further notes that protection geotextiles play a critical role in maintaining long-term liner integrity where coarse fill materials are unavoidable.

At Makhado Mine, bidim® A10 was installed directly above the EnviroFix® GCL to function as a protective cushion layer. The geotextile reduced the risk of puncture from the coarse backfill while allowing the use of available site-won material without additional processing. Granular material was back-tipped onto the bidim® layer and spread forward using construction equipment, preventing direct trafficking on the GCL during placement. In addition to protecting the liner, the geotextile created a stable working platform for construction activities while preserving the hydraulic performance of the containment system.

The use of bidim® A10 as a protection layer enabled Edwin Construction to utilise existing site-won material without the need for screening or crushing, reducing both construction costs and programme delays. The geotextile layer effectively protected the EnviroFix® GCL from puncture and mechanical damage during backfilling operations, helping maintain the integrity of the containment system. The installation methodology also improved construction efficiency by creating a stable working surface for equipment while reducing risks associated with direct placement of coarse material onto the liner system.



bidim® A10 installed above the EnviroFix® GCL as a protection layer.



Protected liner system forming a stable working platform during construction.

Did you know?



Grade Selection

Higher bidim® grades provide increased thickness and puncture resistance, making them suitable for protection applications beneath coarse or angular fill materials.



Impact Mitigation

Nonwoven geotextiles absorb impact energy from tipped granular material, reducing the risk of puncture to underlying liners during construction.



Load Distribution

The compressibility of thick geotextiles allows loads to be spread over a wider area, limiting stress concentrations on sensitive liner systems.