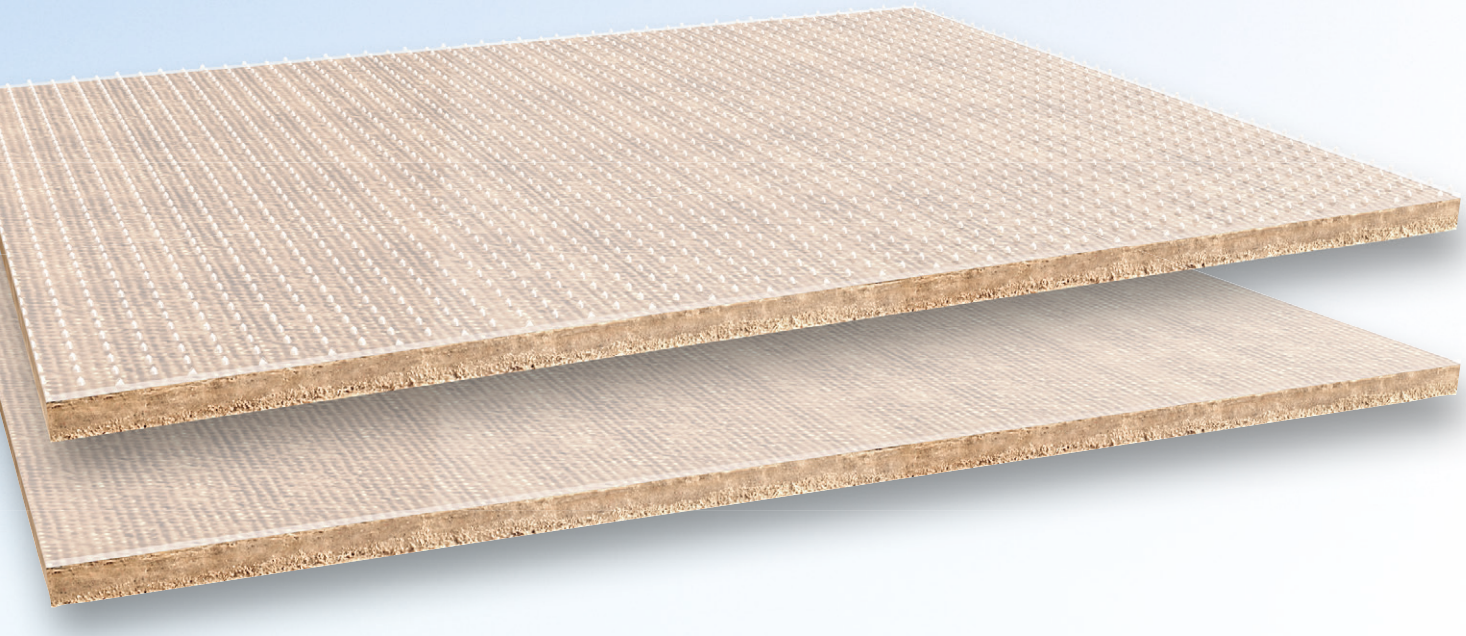
Advantages of needle-punched, PE-coated

BENTOFIX® X

Geosynthetic Clay Liners (GCL)



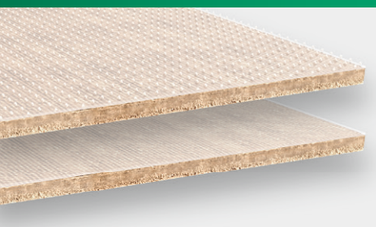
The Inventor of needle-punched Geosynthetic Clay Liners.
Material science - Engineering - Innovation

BENTOFIX® - The Original!

NAUE

BENTOFIX® X

Bentofix® X geosynthetic clay liners (GCLs) - also known as geosynthetic clay barriers (GBR-C) - are needle-punched, reinforced composites that combine two durable geotextile outer layers and a uniform core of high-swelling powder sodium bentonite clay, with an additional polyethylene extrusion-coated barrier. This forms a uniform, multi-directional, shear-resistant, hydraulic, multi-component barrier with self-sealing and re-healing characteristics.



- Versatile sealing applications possible
- Immediate sealing and long-term performance with high-swelling sodium bentonite powder and durable PE coating
- Desiccation barrier
- Protection against ion exchange
- Barrier against roots
- Gas and radon barrier
- Improves the protection against bentonite erosion from high water pressures and gravelly subsoils
- Direct coverage with concrete and lime possible
- Shear resistant overlapping possible with special adhesive tapes
- Cost-saving alternative to compacted clay
- Robust and durable geosynthetics encapsulate the bentonite sealing core
- The uniform needle-punching improves multi-directional shear strength and internal friction angle
- Self-sealing length overlaps; with BFG types all overlaps self-seal
- Quick, easy and cost-efficient installation

Bentofix® geosynthetic clay liners (GCL) exemplify how geosynthetics perform best: by interacting with natural elements to create something stronger or more secure.

Needle-punching revolutionised

The needle-punched manufacturing technology greatly increased the internal and external shear strength of GCLs and expanded the range of applications in which GCLs could be used. The needle-punching process firmly bonds the three unique layers of Bentofix® – two outer encapsulating geotextiles and the core of sodium bentonite. This bond creates a single, engineered barrier that utilises the best of both synthetic and natural materials.

The Power of Powder Bentonite

Bentofix® GCLs outperform significantly thicker layers of compacted clay. The exceptional, immediate swelling characteristic of powdered sodium bentonite provides a long-term barrier that can “self-seal and re-heal” (e.g. swell to fill potential punctured/damaged zones) and rehydrate to renew the barrier even if it has been exposed to desiccation. The highly engineered geotextile outer layers provide outstanding protection against piping of the bentonite, durability to resist damage, and strength to manage the challenges inherent in barrier designs, such as for security on slopes and against fluctuating heads.

Bentofix® X Coating – the add-on value

The polyethylene coating is attached uniform and firmly onto the woven Bentofix® X component creating a durable bond with the needle-punched fibres. This ensures a very high fibre pull-out resistance and increases the long-term internal shear strength.

The Bentofix® X polyethylene extrusion coating ensures an immediate and enhanced barrier to gas and radon while protecting against desiccation and critical substances. In applications wih high hydraulic gradients over coarse soils the additional Bentofix® X coating prevents bentonite piping. In other applications the barrier acts as a possible root barrier.

ADVANTAGE 1: BETTER DESICCATION PROTECTION

Bentofix® X GCLs are coated with a polyethylene layer on the slit-film woven side. Installed with the coating facing up, impermeability and performance against desiccation improve. In a test Bentofix® X was placed over a sand layer with the PE coating faced up. Bentofix® X was saturated for 3 weeks with water through the sand layer under a confining stress of 18kN/m² prior to the desiccation period at a temperature of 40°C and air humidity of 40%. During a period of 250 days the moisture content of the bentonite layer was monitored. The results show that a relative water loss of less than 10% occurred. Therefore it can be stated that Bentofix® X-types do not desiccate under these conditions.

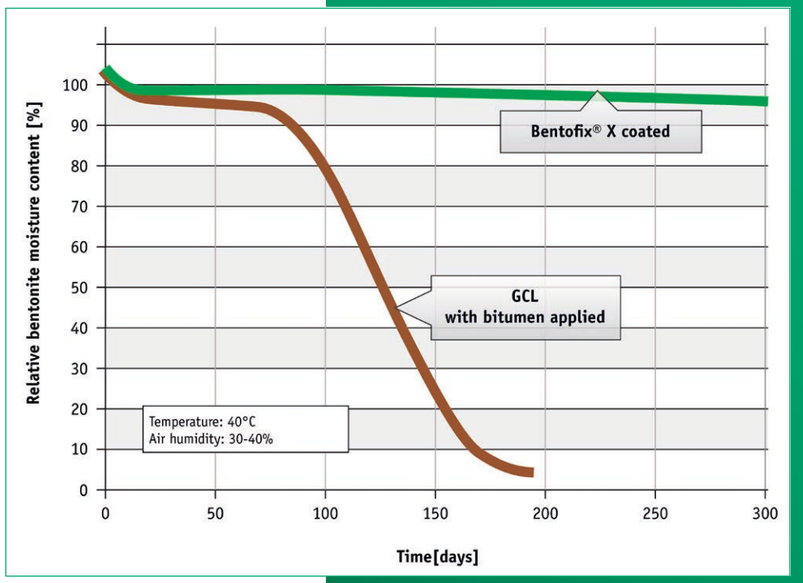


Figure 1
Desiccation behaviour of geosynthetic clay liners in a laboratory test

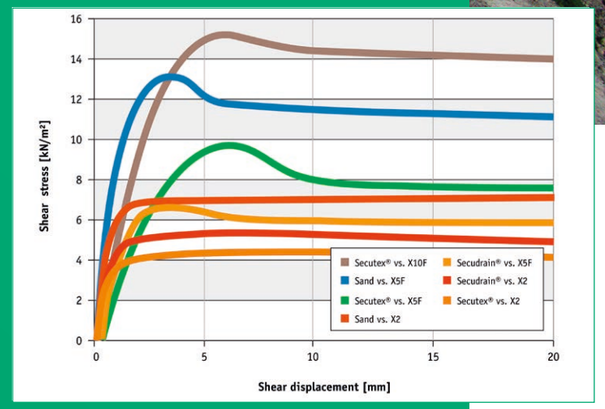


Figure 2
Example of shear stress of Bentofix® X coating against various materials at 20kPa confining stress

ADVANTAGE 2: SHEAR STRENGTH

The interface friction angle also plays a major role in slope applications. The mechanically bonded nonwoven of Bentofix® provides high interface friction angles. The structure of the polyethylene coating of Bentofix® X geosynthetic clay liners varies according to the thickness of the coating. Therefore, project-specific friction angles should be specified. For slope inclinations up to 2.5:1 (h:v) the extruded friction structure of Bentofix® X-types is typically suitable.

ADVANTAGE 3: CHEMICAL RESISTANCE

The polyethelene coating of Bentofix® X-types is manufactured from high-quality resins, which are comparable to those used in certified geomembranes. This gives the coating the necessary chemical resistance for long-term bentonite protection against critical substances.

BENTOFIX® X

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Bentofix®-X binder

Bentofix® X Sealing Applications:

- Landfill caps, closures and base seals
- Environmental protection under roads, railways, airports
- Dams and dykes
- Water containment and pond applications
- Structural waterproofing
- Secondary containment
- Mining applications
- Tunnels

BBA certified waterproofing systems (Bentofix® BFG 5000 + Bentofix® X2 BFG 5300)

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