



**ADVANCED
SAFETY WITH
BENTOFIX[®] X**
The eXtra factor!



Coated BENTOFIX® X gives you the eXtra SAFETY

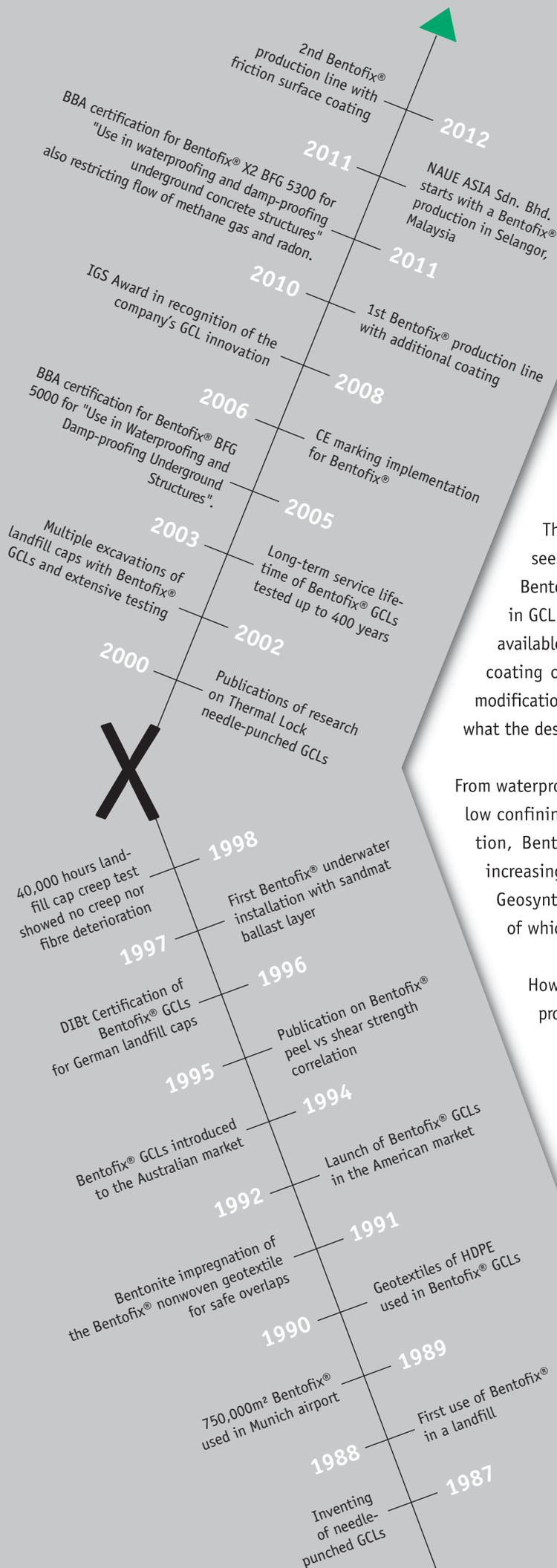
Engineers are always concerned with safety in design, and this applies equally throughout all product sectors. Automobiles utilize air bags and advanced braking systems. Computer data can be backed up and saved by cloud servers. Food packaging utilizes multi-layer constructions to prevent contamination and degradation.

The idea of safety and the final safety-improving element frequently seems simple, but the solution is always much more advanced. NAUE Bentofix® X coated geosynthetic clay liners (GCLs) represent the next stage in GCL design and performance, and they offer a considerable increase in the available factor of safety for GCLs. With the addition of a polyolefin polymer-coating on the woven side of the GCL, Bentofix® X coated exemplifies how modifications to geosynthetic product design can be made to anticipate exactly what the design engineer must anticipate: the challenges of a particular site.

From waterproofing in areas with radon gas present in the soil to applications with low confining stress to situations with the threat of desiccation or root penetration, Bentofix® X coated enables the designer to specify a sustainability-increasing GCL barrier with a higher factor of safety and longer service life. Geosynthetic clay liners are composite barrier materials, each component of which plays an essential, easy-to-understand function.

How these components are selected and combined in the manufacturing process, however, truly determines the longevity and performance of the GCL.

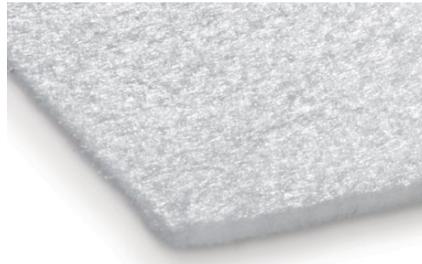
Bentofix® X is a needle-punched GCL comprised of a uniform layer of powder sodium bentonite that is encapsulated between a slit-film woven and a staple-fibre nonwoven geotextile. Powder bentonite provides extraordinary swelling properties to immediately seal after contact with fresh water. The needle-punching process - which NAUE invented in the 1980s and for which it was awarded the International Geosynthetics Society's highest honor, an IGS Award - firmly bonds the durable, nonwoven layer to the bentonite core and greatly increases the GCL's frictional properties.



Every component is the architect of the success of Bentofix®



Slit-film woven



Needle-punched Secutex® nonwoven



Polyolefin coating



Sodium bentonite powder



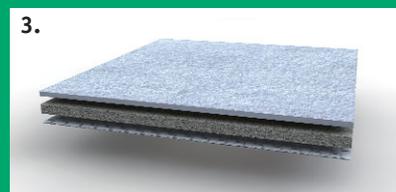
Typical needle for the needle-punching process

Finally, the low-permeability polyolefin coating is firmly attached, without the need of bonding with an additional adhesion, e.g. glue, to the slit-film woven on Bentofix® X GCL types. This side can actually be installed up or down, depending on the application's need. The coating increases the GCL's gas barrier performance, reduces root penetration, prevents bentonite pipe under high-water gradients, decreases desiccation risk, guards against ion exchange, etc.

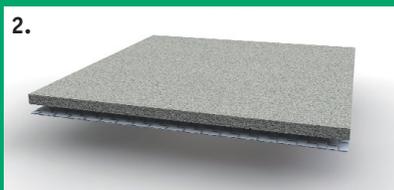
IN SHORT: Design safety increases, and service lives are extended.



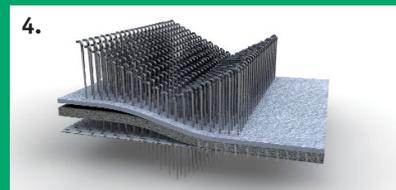
1.



3.



2.



4.



5.

1. The slit-film woven is the base for the bentonite core and the fibre reinforcement.

2. High-swelling powder sodium bentonite as the barrier component is uniformly distributed over the slit-film woven.

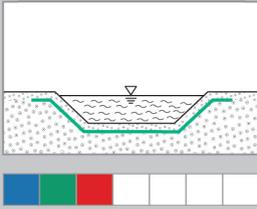
3. The nonwoven geotextile provides the bentonite encapsulation and the high internal friction characteristics.

4. The needle-punching (over 2 million fibres/m²) with the fibres firmly bond these layers for a long, sustainable service life.

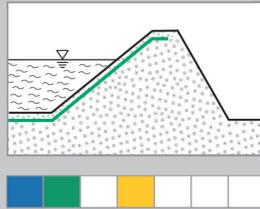
5. The polyolefin polymer-coated woven provides resistance and a durable barrier.

Bentofix® Applications

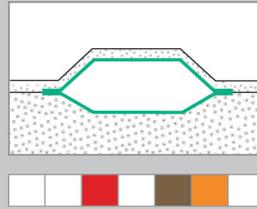
Ponds



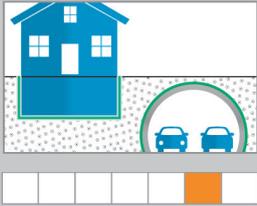
Waterways/Canals



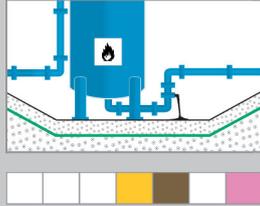
Landfills



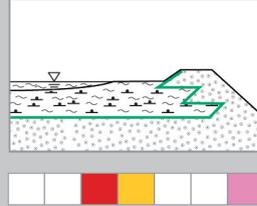
Waterproofing



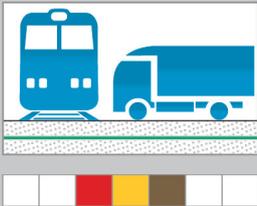
Tank farms



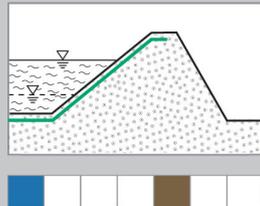
Mining



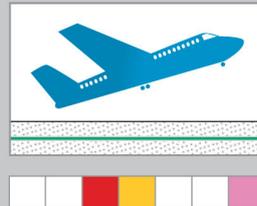
Roads and railways



Dikes/Levees



Airports



Design Issues

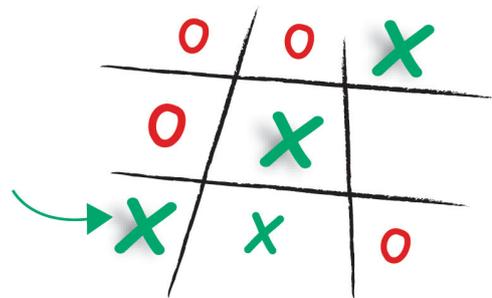
- Hydraulic head
- Gas permeation
- Piping
- Ion exchange
- Desiccation
- Roots
- Barrier against critical liquids

In general, polymer coated, needle-punched GCLs can be used in all applications where sealing barriers are requested. The polymer coated GCL is most effective, though, when at least one of the described design issues is an important project criterion. Then, coated Bentofix® GCLs have an add-on effect to the overall GCL performance.

Advantages for user

- X eXtra factor of safety
- X eXtends design life
- X eXceptional performance
- X eXpands possibilities

The winning X
BENTOFIX® coated



Bentofix® X is a polyolefin polymer-coated GCL and exemplifies how modifications to GCL product design can be made to anticipate the special challenges of a particular site. The woven fabric is coated with a low-permeability polymeric polyolefin coating to achieve an immediate barrier prior to hydration and give the GCL several add-on values. Bentofix® X is an advance for GCLs in some specific applications, such as waterproofing, oil and gas tank farms, landfill capping and cover systems or where high hydraulic gradients are present.



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