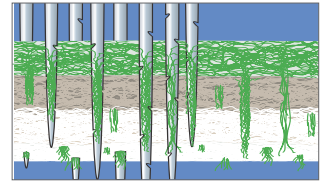
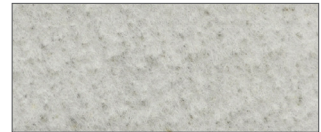


Needle Detection & Removal Manufacturing Process for Fabric Encased GCL Products

GSE BentoLiner fabric encased geosynthetic clay liners (GCLs) transmit internal shear stresses from the upper geotextile to the lower geotextile by needle punching the fibers from the nonwoven cap geotextile, through the bentonite layer, and lodge the polypropylene fibers into the lower carrier woven or nonwoven geotextile. This forms a composite GCL consisting of geotextiles which encapsulate, support, and provide internal shear strength to the low permeability bentonite layer (Figure 1). The geotextiles utilized in the production of all GSE BentoLiner materials are specially formulated polypropylene woven and nonwoven geotextiles manufactured to specification specifically for GSE BentoLiner GCL materials.



Needlepunched Manufacturing



GSE BentoLiner

THE NEEDLEPUNCH MANUFACTURING QUALITY ASSURANCE PROCESS

The 4 in (100 mm) long needles used in the needle punching process for GSE BentoLiner reinforced GCLs, consist of steel needles with spaced barbs, which grab fibers from the upper nonwoven geotextile, and pull the fibers through the bentonite and the lower woven or nonwoven geotextile (Figure 2). This transforms the random fiber arrangement of fibers in the upper polypropylene nonwoven geotextile into a 3-dimensional structure by the up and down moving needle boards during conveyance of the GCL material through a needlepunching loom. These looms punch the barbed needles, containing up to 13,800 needles/meter width, at up and down speeds ranging up to 1200 strokes/min (Koerner & Koerner, 2002). This is similar to the needlepunched process by which nonwoven geotextiles are manufactured and has been commonly used in the textile industry in the U.S. since the 1950's.

BROKEN NEEDLES IN GCLS

Due to abrasion, wear, and plugging of the needle boards during manufacturing, needles may be broken. Broken needles, if undetected, will remain in the GCL and, when the material is deployed in the field, present a serious problem associated with potential puncture and damage to adjacent geosynthetics. This would include geomembranes when GCLs are commonly deployed below geomembranes in composite (geomembrane-clay) liner systems (Figure 3). If a geomembrane is punctured by a needle, the resulting potential leakage could range from minimal up to a leakage rate more than 0.25 gal/hr (1 liter/hr) through the geomembrane with poor contact with the underlying GCL under 1 ft (300 mm) hydraulic head (Koerner and Koerner, 2002).

Thus, undetected broken needles in GCLs may pose a serious threat to the integrity of an installed geomembrane GCL composite liner system. This has also resulted in many specifications requiring quality control procedures to be conducted at the manufacturing facilities that reduce the potential for undetected needles, for both geotextiles and GCLs (Purdy & Yazdani, 1999).

The puncture resistance 01600 mm (2 lt) of compacted clay is obviously much higher than the puncture resistance of a thin GCL. However, careful CQC and CQA procedures are able to address the potential puncture problem. As noted in Table II, the advantages of GCLs over compacted clay offset its vulnerability to puncture.

THE NEEDLE DETECTION MANUFACTURING QUALITY ASSURANCE PROCESS

Due to the potential for broken needles, GSE BentoLiner has incorporated a highly effective and proprietary needle detection and removal system into the manufacturing process, which greatly minimizes the possibility of broken needles remaining undetected and lodged in the finished GSE BentoLiner GCL product.

The quality assurance process includes two quality controls to detect needles.

Thus, the primary and secondary manufacturing quality control systems result in continual 100% inspection and removal of any needles or metal debris within every manufactured square meter of GSE BentoLiner GCLs.

ADDITIONAL INFORMATION

If you have an upcoming project please give us a call. We will provide you with recommendations for material and installation.

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.

[DURABILITY RUNS DEEP] For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

