

GEOfabrics®

TrackTex™
Anti-Pumping Geocomposite



High-performance geosynthetics

About GEOfabrics

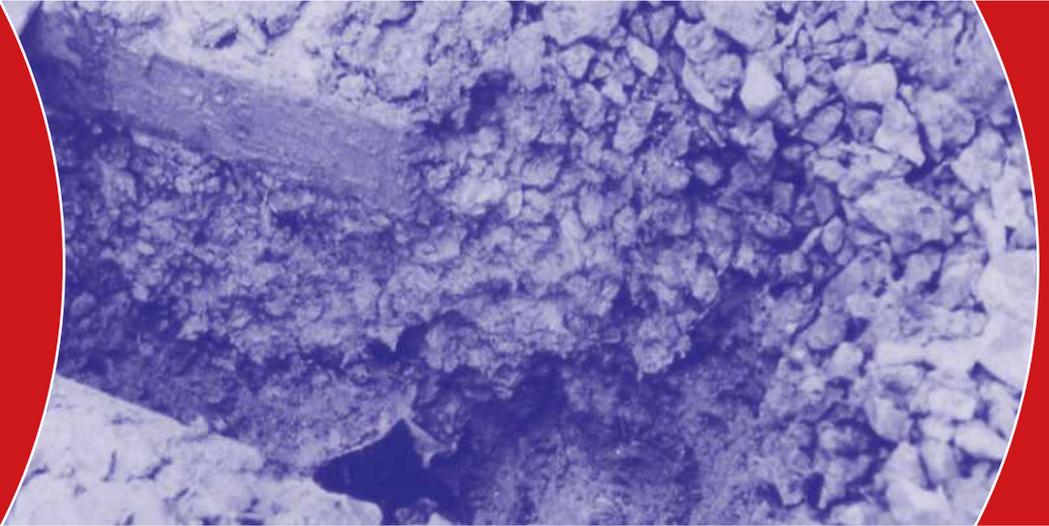
GEOfabrics Limited is a British manufacturing company established in 1992. From the outset the objective was to manufacture high-performance geosynthetics to the highest possible standards and provide engineering support to ensure a value engineered solution to complex problems within civil applications.

The company's ethos is to exceed the expectations of our customers with our products and support services. Product development is achieved by analysing the customer's application, determining the properties that are required, manufacturing the solution and testing it to prove it meets those performance criteria. Today the company manufactures a diverse portfolio of class leading geotextiles and geocomposites supplied into a wide range of civil engineering applications.

GEOfabrics have been supplying the rail industry with track rehabilitating geotextiles and geocomposites for over 20 years. We work directly with Rail Authorities, Contractors and Designers and with our comprehensive R&D program have developed leading geosynthetics to provide significant cost benefits to the rail industry.

Geosynthetics have been employed to perform a number of functions in track construction and rehabilitation for almost half a century. When properly specified and installed, the use of geosynthetics has been proven to significantly enhance the performance of the trackbed in a number of ways, often reducing maintenance costs and increasing the lifetime of the design.

Pumping Failure



Subgrade pumping has always been a problem in ballasted track, particularly on weakly cemented mudstones or over consolidated clays. These soils have a high shear strength and as such do not need a deep trackbed to support track loading, yet if unprotected the upper surface degrades easily to a slurry when exposed directly to water.

The open texture of ballast allows free water to come into contact with the exposed formation/subgrade surface. When the exposed surface contains fine grained particles, these can be readily eroded by the water accumulating in the voids, forming weak, highly mobile slurry. This slurry is then 'pumped' up into the overlying ballast by each passing axle load. Contamination of the clean ballast layer by the fine soil particles in the slurry very quickly reduces the load-bearing properties of the ballast and leads to loss of track alignment in the affected area.

A small amount of slurry can considerably reduce ballast life. Under extreme conditions the ballast will become unmaintainable within a very short time post-installation.



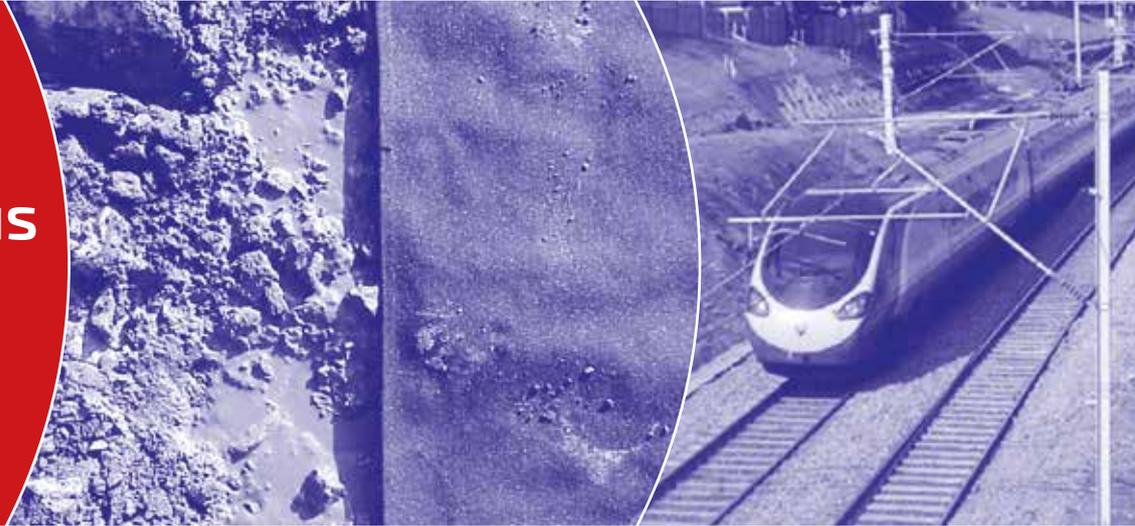
Severe subgrade erosion (wet spots)



Movement of fines to track level

TrackTexTM
Anti-Pumping Geocomposite

Microporous Composite Solution

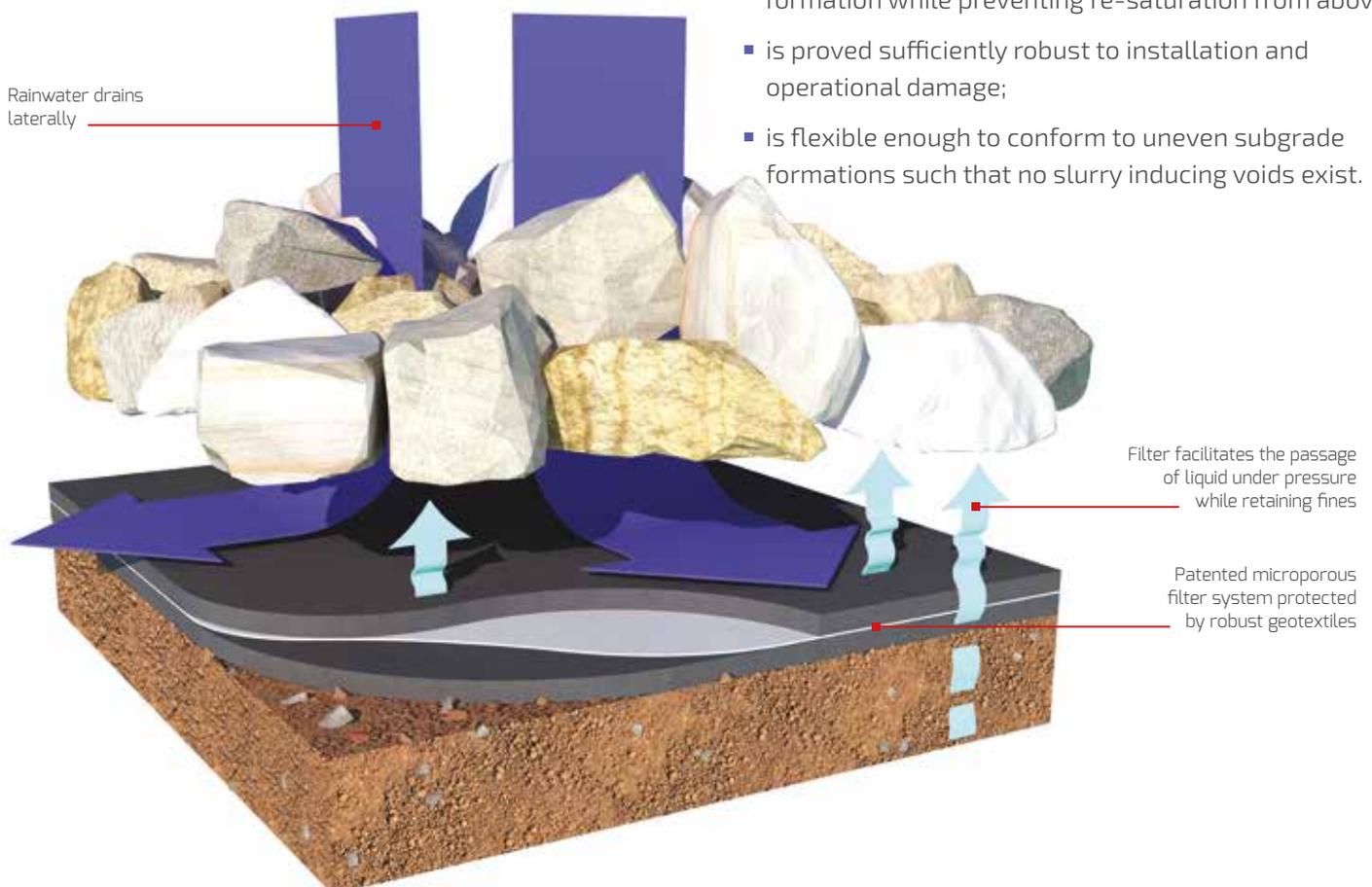


TrackTex is a multilayer composite with a unique microporous filter media protected by specially engineered protective nonwoven geotextiles. The filter is an orientated microporous polymeric film with a series of microcells and interconnecting pores, characterised by its relative strength, and ability to transmit vapour.

TrackTex is able to effectively facilitate the passage of liquid under pressure, but the pores are such that the passages of clay fines are prohibited. Without pressure, water cannot pass through the filter, therefore any underlying clay formation will, over time, dry out and have an improved modulus.

TrackTex

- prevents subgrade fines and slurry from migrating up into the ballast;
- facilitates desiccation and drying of the existing subgrade slurry by allowing pore pressures to dissipate under loading, improving the quality of the formation while preventing re-saturation from above;
- is proved sufficiently robust to installation and operational damage;
- is flexible enough to conform to uneven subgrade formations such that no slurry inducing voids exist.



10 Years' Pioneering Research



TrackTex has been tested to conditions simulating mud pumping failure in a full-scale purpose-built test facility. The completed facility comprised a 4.5m x 1.5m tank, deep enough to accommodate 200mm of subgrade, 300mm of ballast, 7 half width sleepers (ties) and a length of rail. This state of the art facility allows materials to be tested to the most extreme conditions found in trackbed.

TrackTex was shown to function effectively in preventing the migration of clay into the upper ballast, yet without acting as a barrier. The filter facilitates the passage of liquid under pressure, but the pores are such that the passages of fines are prohibited.

Testing without TrackTex identifies a pumping failure at approximately 400k cycles, or 7.8MGT of trafficking. This is consistent with the early trackbed failures that are viewed on live track where, in some cases, we see trackbed failure requiring ballast replacement within two years.

TrackTex has been tested to 10 million cycles (approx. 190MGT of traffic) without any sign of degradation to the material or passage of slurry. Following the 10 million cycles, the clay showed a further reduction in moisture content.



Failed pumping test using standard geotextile separator



Successful pumping test using TrackTex

In the full-scale test facility, the inclusion of TrackTex has been shown to increase maintenance intervals relating to pumping failure by a factor of more than 25

Proven Performance



TrackTex has been actively used in live rail since 2010, providing significant maintenance savings to Rail Authorities and contractors alike. So far, over ½ million m² of TrackTex has been installed in live track within Europe, Australia and the United States, with no reported failures. Site monitoring has been performed on a number of key sites and the benefits of TrackTex over traditional maintenance systems are clearly evident.

Case Study 1: Network Rail UK (Bradley Junction)

In 2009 Network Rail decided that the Up Line through Bradley Junction was life expired and would not be able to carry the proposed increase in annual tonnage from 6 million to 11 million. An investigation undertaken in 2010 (AECOM, 2010) described the track bed as variable, with very dirty waterlogged ballast, and evidence of upwards migration of clay formation which had caused track geometry to deteriorate rapidly.

A recent evaluation of the project was conducted; a series of test pits were excavated to determine the effectiveness of the rehabilitation. A test pit in the same location at the area shown (pre-rehabilitation), demonstrated there to be no evidence of subgrade pumping or ballast contamination above the geocomposite microporous filter.

Case Study 2: Norfolk Southern USA (Virginia Division/Christiansburg District)

TrackTex was installed at three locations on the Virginia Division / Christiansburg District during September and October, 2014. All three had been undercut within the previous two years, and, because of pumping failure, needed undercutting again. Following the installation of TrackTex there has been no further contamination of the ballast and the trackbed has continued to perform well to this day.



Benefits



TrackTex is a unique patented geocomposite and the result of over a decade of research by trackbed engineers and materials scientists. Its specialist filter system improves trackbed quality over time and has been proven to significantly increase maintenance intervals.

The use of TrackTex is the most cost-effective way of preventing and correcting mud pumping failure. Rainwater is unable to penetrate the microporous filter and is drained laterally to the side of the track. Pore water below the TrackTex is relieved upwards under cyclic loading which aids residual slurry to dry out as the pore water is dissipated.

TrackTex conforms to surface depressions in the formation layer and prevents the creation of slurry pockets. Fast installation rates reduce construction costs and possession time.

TrackTexTM Anti-Pumping Geocomposite

Advantages

- Proven performance in full scale testing and live track
- Improves track quality and geometry
- Faster installation rates than alternative systems which will reduce the likelihood of overruns and increase the coverage for a given possession time
- Durable in extreme conditions found in ballasted track
- No specialist equipment required to install
- Can be used with geogrids where required

Shown to increase trackbed maintenance intervals due to pumping failure by more than 25 times, providing significant savings over any available alternative

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