



SELECTION AND DESIGN CONSIDERATIONS OF THE APPROPRIATE GEOTEXTILE USED IN TRANSNET® GEONETS/GEOCOMPOSITES IN LANDFILL AND MINING APPLICATIONS

1.0 General

Transnet® geonets are an extruded bi-planar core made from virgin HDPE resins. The geonet may have heat laminated to this core, a nonwoven polypropylene geotextile, in situations when a filtered drainage path is required. This product is called a Transnet® geocomposite. Dependent upon the application the geotextile may be affixed to either one side or both sides of the geonet core.

The needle-punched geotextile used in the Transnet® geocomposite is always manufactured from virgin resin polypropylene staple fibres. The geotextile can be provided across a wide range of mass dependent upon the specific application. Typically this mass range is 140 g/m² to 270 g/m² although geotextile outside this range are available for use.

The typical applications for these products are in all applications that require drainage /collection of gas and leachates (mining and landfill) and filtration of sediments contained within these liquids.

2.0 Specific Design Considerations

2.1 Landfills and Mining

- **Temperature**- Landfills can be subject to elevated temperatures. Elevated temperatures up to 70° C in comparison to local air and ground temperatures have been reported for wastes; leachate and landfill gas (Rowe 1998). In general, detailed spatial distributions or long term trends of temperature in such applications are not available. Some literature details even more extreme heat generation in landfills particularly associated with dumping of specific industrial wastes. Mining may involve significant heat in specific applications and geographical locations.
- **Leachates**- Landfills typically have a pH range from 6.5 to 9.0. Generally the pH of landfill leachate will increase with time and as the landfill ages. More extreme levels of pH have been reported in landfills. Mining application quite often use processes and the generation of leachates that are at extreme pH levels. Generally, mining processing applications such as coal, uranium, copper and gold produce leachates that are highly acidic. Processing applications involving bauxite production produce leachates that are highly alkaline in nature.
- **Imposed Loads** – Landfills and mining applications can involve very significant loading conditions. Heap Leach pads in the mining industry can approach 200m in height and landfills can be built to significant depths with increasing pressure to steepen side slopes in landfills to maximise waste capacities for a given landfill footprint.

2.2 Chemical Compatibility

Transnet® Geocomposites use a virgin polypropylene nonwoven geotextile when a long term drainage/ filtration function of the geocomposite is required in applications of landfills and mining. Some geocomposites use a polyester nonwoven geotextile to provide the drainage/filtration function.

In applications of highly acidic conditions then either the polyester or polypropylene will perform in a similar manner. However when used in landfills and in specific mining applications and where the conditions are alkaline then there is sufficient justification to assume that a potential mechanism for hydrolysis of the polyester geotextile could occur with the potential for significant degradation of the geotextile. This is particularly evidenced when using a “light weight” geotextile typically used in geocomposite manufacture.



Virgin resin polypropylene nonwoven geotextile, rather than polyester nonwoven geotextile has generally been found to perform well in alkaline conditions and particularly so when elevated temperatures and high loading conditions are combined, as is typically found in landfill and specific mining applications.

2.3 Permeability and opening size

The geotextile should have adequate opening size and provide a high permeability. The use of heat lamination to attach the geotextile in Transnet® geocomposites will ensure that geotextile will maintain maximum permeability. Using glue or adhesives to attach the geotextile to the core will reduce the permeability of the geotextile and geocomposite and increase the risk of clogging of the geotextile. The geotextile properties reported on the data sheets should be the properties of the geotextile before the lamination process. Specific site compatibility testing may be necessary to ensure that clogging of the geotextile is not an issue with specific leachate types.

2.4 Survivability

The geotextile should have a minimum strength and puncture resistance to provide adequate resistance against probable installation damage especially due to placing and spreading the gravel/soil on top of the geocomposite. Needle-punched nonwoven polypropylene geotextiles made from staple fibres have superior puncture and burst strength, which increases installation survivability.

The geotextile lamination should provide a minimum uniform Ply Adhesion (lamination) strength to protect the geotextile against delamination, especially during construction works.

3.0 Summary of Transnet Geocomposite Product

Transnet® nonwoven geotextile is made from virgin resin polypropylene. Polypropylene is highly stable in landfill and mining applications where pH conditions are alkaline, temperatures are elevated and subject to significant load. Polyester geotextile may be subject to hydrolytic degradation in such conditions.

Virgin polypropylene resin must be used in the production of the needle-punched nonwoven geotextile as the performance of re-cycled polypropylene products will be compromised in both acid and alkaline conditions.

Virgin HDPE is used in the core of the Transnet® product. Recycled HDPE materials used for the manufacture of alternative geocomposite core may not perform as well as virgin materials in an extreme pH range. Use of recycled polymers results in higher creep and in turn reducing lateral drainage in the long term.

The polypropylene geotextile is heat laminated to the core of the Transnet® product. The geotextile is not glue attached to the geonet and which may be subject to delamination in situations of extreme heat, loading and leachate and can also reduce the hydraulic performance of the attached geotextile. A minimum Ply Adhesion strength is required.

This Technical Note is part of a series that includes some discussion on the use of Transnet® geonets and Transnet® Geocomposites and the importance of ply adhesion, lamination processes of geonet geocomposites, creep and quality control of these products.

For detailed properties of the Transnet® geonet/geocomposite range please refer to the Transnet® Data Sheets.

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