

Durability of propex Geotextile

General

propex Geotextile are based on Polypropylene, a raw material inert and resistant to many environmental influences. This resistance is even increased by additives that even improve the performance in general. propex is therefore ideally suited for the use in Geotextiles. The overall durability of propex is being monitored on a regular basis.

Environmental Impact Resistance/ UV-Stability

propex Geotextile are regularly being tested (each 5 years, or at an additive change) on its UV-stability according to DIN EN 1224. In addition to that, a real-time external sample is tested each 3 to 6 months. A 3-months exposure in Spring/ Summer in Central Europe equals an exposure time given in the EN 12224. propex Geotextile with the Reinforcement functionality show with the 3-months real-time exposure as well as with the EN 12224, a residual tensile strength of greater than 90%. All propex Geotextile fabrics display under the before mentioned conditions, a residual strength of 80%. Therefore, the maximum allowable exposure time as cover is 3 months. These durability tests are complemented by a monthly check on additive content by means of a Differential Thermal Analysis, which allows monitoring of the correct function of the dosing device in the tape extrusion.

Oxidative Degradation

propex Geotextile are produced out of Polypropylene. All Polyolefins, and PP is one, show an oxidative degradation. This can be determined on lab-scale by exposure for 28 days at 100°C in an oven. Amoco Fabrics conducts on all relevant propex grades, this stability at an annual sequence. The residual tensile strength is than still at 100% and a continuation of the test up to 56 days shows a residual tensile strength of 90%. propex Geotextile are therefore well above the required target demand of 50% residual strength after 28 days at 100°C. The stabilisation content is also tested on a monthly basis by means of a DTA scan.

Chemical Resistance

Polyolefines are recognised for their chemical inert behaviour. propex Geotextile behave in such manner and the resistance to chemical substances according to DIN 14030 resulted in a residual strength of 100%. This test requires a Geotextile to be exposed at 60°C for 3 days a base as well as to an acid. For a strong acid exposure, a slight deterioration is expected, however in soil environments these are not to be expected. Since this chemical inert behaviour is related to the nature of Polypropylene and not affected by any means of processing, quality assurance tests are only conducted rarely and on specific request for special projects.

Microbiological Durability

Polyolefins are by nature hydrophobic and bacteria and fungi can hardly attack the surface. Nevertheless, the EN 12225 was conducted on our propex Geotextile in order to determine the effect. This EN 12225 test is conducted by exposing samples to microbiological active soil for 16 weeks. The residual tensile strength again is the measure for failure or resistance, which is for propex again 90%. Since this property is also related to the nature of Polypropylene, this test is only conducted rarely and on specific request.

Creep Behaviour

All Geotextiles made out of thermoplastic polymers, display an increasing deformation when exposed to force/ tension. Depending on the level of tension/ force, this can result in a final breakage of the Geotextile. This property is called creep-behaviour and is depended on the type of polymer used and their consequent processing. Polyolefins show, caused by the orientation of the macro molecular structure, a high creep level. This can be minimised significantly by processing technology. propex Geotextile tape fabric with the reinforcement function, have highly oriented tapes with low creep behaviour.

The creep behaviour is determined in accordance with DIN EN 13431 and concerns two performance methods of creep. **A)** The tensile creep is determined measuring the elongation after 1000 H for at least three (3) tensions/ forces. The deformation at a load of 30% of the tensile strength is 6.5 % in warp (machine) direction. Deformation measurements are conducted at 20, 30, 50 and 60% of the tensile strength. **B)** The second performance criteria of creep is measured by the creep rupture and this covers the breakage of the sample under various loads, this results in a curve which then can be extrapolated to real-time application and thus the behaviour can be predicted.

The tensile strength and the elongation at break are tested on an ongoing basis and are part of the daily QA routine. These properties correlate with the creep behaviour, therefore the creep behaviour is not regularly tested and it is assumed that the creep behaviour does not change if the tensile strength and the elongation at break do not change. The only condition is that the base raw material is not changed, which at Amoco Fabrics GmbH is not the case.

Damage during Installation

The resistance to damage during installation is related to fabric weight and fabric construction as well as the used tapes. In a field trial at Empa, propex Geotextile fabrics with the reinforcement functionality retained a residual strength of 90% after being installed. This accounts for use of sand (0-4 mm), rocks (0-60 m) and stones (0-22 mm). The degradation factor for damage after installation is thus 1.1 or less. Tests in accordance with the EN 10722, retained residual strengths of more than 80 %. Lab tests result in lower residual strength than in field trials; this is explained in that during lab test, the abrasion also is influencing the result. The lightweight Geotextiles perform well in their energy absorption i.e. toughness, and thus have low damage after installation due to the high elongation capability of the fabric and thus withstand the deformations during installation.

Temperature Stability

propex Geotextile can be exposed to temperatures up to 60 °C for a longer period of time. If the temperature exposure is limited, it can even withstand a temperature of 110 °C. Heavy weight propex Geotextile can withstand 46 days at 100 °C and only lose 10% of their tensile properties. It has to be taken into account that the tensile strength at elevated temperatures is affected and that it is at 110°C only 60% of the tensile strength at ambient temperatures. In general it needs to be considered that at elevated temperatures, the oxidative degradation is increased. In addition to that, the higher shrinkage level needs to be considered and will, depending on the type of fabric, be between 2 to 10% measured from the original state. Lightweight products have a lower shrinkage in general.

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