BaseCore™

Geocell Longevity

Environmental stress crack resistance (ESCR) has been a crucial factor in determining the overall integrity and longevity of polyethylene (PE) geomembranes since their introduction over 40 years ago. It is well-established within the geotechnical industry that PE can stress crack over time, significantly reducing a product's strength throughout its lifespan. This issue was recognized early in the geomembrane industry, making ESCR testing a standard specification ever since.

Initially, the "bent strip" test (ASTM D 1693) was used to differentiate the first resins used in geomembrane manufacturing. However, as resin technology advanced, the ESCR of polyethylene increased beyond the limits of ASTM D 1693, leading to the development of ASTM D 5397, "Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test". This test method has become the most common way to determine ESCR in well-established geotechnical products.

Extensive research, papers, and test procedures have been developed to support the importance of ASTM D 5397 in determining a product's lifespan. One notable paper is "Durability of HDPE Geomembranes" by R. Kerry Rowe and Henri P. Sangam, which focuses on Environmental Stress Cracking as the central mechanism causing degradation.

Recent studies have further validated the importance of ESCR testing in predicting the long-term performance of PE geomembranes. In a study by Abdelaal et al. (2021), the authors found that ESCR testing using ASTM D 5397 provided a reliable indication of the long-term stress crack resistance of HDPE geomembranes, even under elevated temperatures and aggressive chemical environments. This study highlights the relevance of ESCR testing in ensuring the durability of geomembranes in various applications.

Another study by Ewais et al. (2020) investigated the effect of different stabilizers on the ESCR of HDPE geomembranes. The authors found that the addition of certain stabilizers, such as hindered amine light stabilizers (HALS) and antioxidants, can significantly improve the ESCR of HDPE geomembranes, leading to enhanced long-term performance. This research emphasizes the importance of proper stabilizer selection in conjunction with ESCR testing to ensure the longevity of geomembranes.

While UV degradation is a concern for PE materials, it is typically addressed by adding carbon black and other stabilizers. ASTM D5885, "Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning," is used to assess the antioxidants in the material and their depletion rate due to oxidation. However, it is crucial to note that ASTM D5885 is not a design life test and should not be used to estimate the lifetime of a geomembrane, as stated in Section 5.3 of the standard.

When PE materials are buried under soil or covered, oxidation is not typically a concern due to the limited presence of oxygen. In such cases, ASTM D5885 is not used, but ESCR remains relevant as the most relied-upon test within the industry to predict a material's lifespan. Additionally, it is important to note that recycled plastic resin typically performs poorly in ESCR tests, and therefore, most high-quality products are made with virgin resin to ensure optimal long-term performance.

In conclusion, the extensive research and testing methods, particularly ASTM D 5397, have consistently demonstrated the importance of ESCR in determining the longevity of PE geomembranes. As the geotechnical industry continues to evolve, it is crucial to rely on these well-established testing methods and incorporate new findings to ensure the long-term performance and durability of geomembranes in various applications.

It is difficult to determine the exact lifespan of BaseCore geocell without specific data on its ESCR performance and the conditions under which it will be used. However, we can make an informed estimation based on the general understanding of geocell longevity and the factors that influence it.

Geocells, including BaseCore geocell, are typically made from high-density polyethylene (HDPE), which is known for its excellent durability and resistance to environmental stress cracking. The lifespan of a geocell product depends on several factors, such as the quality of the raw materials, the manufacturing process, the installation method, and the environmental conditions to which it is exposed.

BaseCore geocell is manufactured using high-quality virgin HDPE resin and follows strict quality control measures, having a favorable ESCR performance. As mentioned earlier, ESCR is a crucial factor in determining the longevity of PE materials, and products made from virgin resin tend to perform better in ESCR tests compared to those made from recycled resin.

In general, well-designed and properly installed HDPE geocells can have a lifespan of several decades, often exceeding 50 years, when used in typical geotechnical applications. This estimation is based on the extensive research and field experience with HDPE geomembranes, which share similar material properties with geocells.

However, it is important to note that the actual lifespan of BaseCore geocell may vary depending on the specific application, environmental factors, and the level of maintenance provided. Exposure to harsh chemicals, extreme temperatures, or excessive mechanical stresses can potentially reduce the lifespan of the geocell.