TENCATE Geotube®

FYI
News Bulletin
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TenCate™ Recommends Alternative Testing Method to More Accurately Measure the Relative "Openness" of Textile

The Capillary Flow Pore Size Test provides a more precise representation of the openness of all pore sizes within a fabric.

Geotube® marine technology has protected shorelines, rebuilt beaches, and reclaimed land from the sea for more than 45 years. Geotube® containment technology is a proven, cost-effective method for a variety of shoreline protection and marine construction applications.

TenCate™, manufacturer of Geotube® materials, is the world's leading provider of industrial fabrics. Armed with an extensive background and knowledge of marine textiles, the company examined and analyzed many fabric testing methods and data measurements to better identify the "openness" of their woven Geotube® fabrics. TenCate™ determined that other criteria, beyond the traditional AOS value, should be taken into account when selecting a textile for a marine application. One of those key factors was the pore size of a fabric.

"We've identified a potentially better way of looking at a fabric," said Mark Gunzenhauser, Vice President Sales, TenCate™ Industrial Fabrics. "Rather than relying only on AOS, we strongly recommend that pore size be inspected. It plays a major role with issues of containment and structural integrity for a marine application."

TenCate™ develops and produces materials that function to increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

Geotextile Testing 101

The hydraulic properties (those directly related to filtration and drainage functions) of geotextiles are governed by the pore size, pore size distribution, and the porosity of the fabric. An optimum fabric must have a small enough pore size to retain the soil, while also being permeable enough to allow for water to escape freely from the soil. The testing and measurement of a fabric's porometry is inherently challenging due to the size and magnitude of pores within a textile.

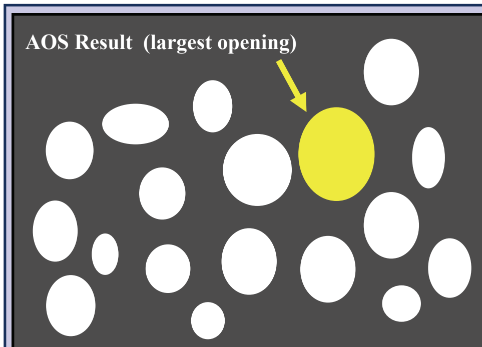
The AOS Standard

A widely accepted practice for determining the relative "openness" of pores in a textile is known as the Apparent Opening Size (AOS) Test, as described under ASTM D4751. The AOS test indicates the apparent ***maximum*** pore diameter of a fabric. It measures a geotextile's porometry in terms of particle retention ability.

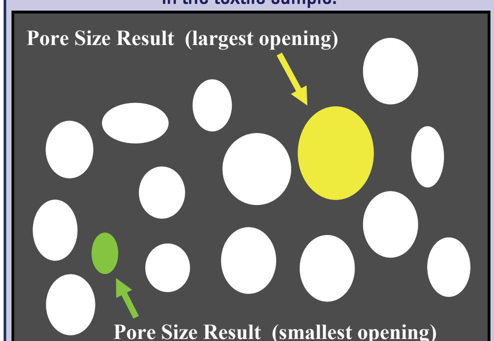
This test involves a sample of the geotextile being securely mounted in a sieve pan. Then 50 grams of glass beads (of a known diameter size) are placed on the fabric surface. For roughly 10 minutes, the geotextile and pan are shaken laterally so that the jarring motion will induce the beads to pass through the fabric test specimen. This procedure is repeated using a set of each known bead size until the AOS has been determined. The resulting value is based upon the size and quantity of beads that pass through (or do not pass through) the textile sample.

The apparent opening size of a geotextile is defined as the average diameter [in millimeters, or equivalent to a U.S. Standard Mesh Sieve] of that size glass bead for which 5% or more of the beads pass through the interstices of a geotextile. For a material to obtain a "pass" result for a given bead size, no more than 5% of the original 50 grams of beads are allowed to go through the fabric.

Although this AOS test is considered current and somewhat standard for geotextiles, it can also produce misleading results, since the AOS test does not distinguish how many openings or the consistency of the pore openings, but rather determines the ***largest single opening in a fabric***. For example, if there is one very large hole in the fabric sample (relative to the "normal" holes found in the fabric), then the results could be skewed as all of the glass beads will fall through this single large hole. This potential data distortion is illustrated in the graphic above.



Typical Results from AOS Testing
AOS only determines the largest opening in the textile sample.



Typical Results from Capillary Flow Pore Size Testing
This test determines the largest opening as well as the smallest opening, and an average distribution between the two.

Capillary Flow Pore Size Test

The TenCate™ team recognized the need for an alternative testing method. "We determined that a more accurate test method should be used in conjunction with the AOS standard to gauge the relative "openness" of a textile," said Mark Torre, TenCate™ Project Manager. "The largest single opening size in fabric is not the *only*

(More)

Glass beads for AOS testing.

Fabric Sample for AOS testing.

Sieves for AOS testing.

valuable, measurable characteristic. Additional properties such as pore size, pore size distribution, and porosity of fabric also need to be taken into account when selecting a fabric."

In order to determine the full scope of relative "openness", TenCate™ now recommends the improved testing method known as the Capillary Flow Pore Size Test as described under ASTM D6767-02, a standard testing method in the general filtration industry. Using a Capillary Flow Porometer, the pore size (or hole size) of a textile is more accurately understood, allowing for the overall "openness" of the fabric to be accurately determined and reported.

For this pore size test, the sample textile is cut to size (1 sq. inch) and saturated with a liquid of known surface tension. The sample is then placed into a sealed chamber in the porometer device so that air only flows *through* the material and is not allowed to escape around the edges. Air is forced toward the sample at increasing pressure until the largest pore opens under the pressure (also called the bubble point opening size). The test continues by incrementally increasing the pressure until all pores in the sample are opened. During the test, each pressure level is recorded by the porometer. From this pressure data and the surface tension of the liquid, each pore opening size is calculated using a known equation that describes the flow of a fluid through a porous medium (known as Darcy's Law.)

The results of TenCate™'s porometer test provide graphical distribution of *all* pore sizes (i.e., illustrates if there are many small pores, few large pores, etc.) in the geotextile sample, and also provides numerical values for the largest pore diameter, the smallest pore size, and the mean pore diameter. These results are represented using a bar chart histogram. TenCate™ is equipped to record their test data in multiple ways, including the largest opening (measured in microns) and the average pore size distribution range (presented both in microns and percentages.)

Torre pointed out another benefit of the pore size data "These results match up with the grain size distribution, and more accurately projects what the distribution curve is for the fabric," said Torre. "We can overlap the grain size distribution curve with a fabric's pore size report."

Looking Ahead at Testing Standards

This testing method, in combination with the AOS standard, is currently being used on a case-by-case basis to help change the way people view AOS testing. "We need to get away from looking solely at an AOS test," said Gunzenhauser. "Our experience shows that pore size is as important, if not more important in marine applications to contain and retain sand. We have the facility to test fabric pore size, and our data collection certainly backs up this position."

TenCate™ is constantly finding ways to improve industry standards and testing, as well as get the word out about their results. "We are in the process of educating people about the benefits of this testing method combination," said Gunzenhauser. "The Capillary Flow Pore Size Test allows us to better account for the issue of pore size. This provides us with yet another tool to ensure proper containment with Geotube® technology."

A TenCate™ representative can work with an organization on a case-by-case basis to evaluate the pore size needs for their project and recommend the best Geotube® fabric. To learn more about Geotube® technology, call 1-888-795-0808 or visit www.geotube.com.

Sample being prepared for testing in porometer.

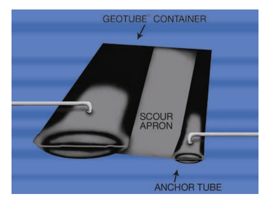
How Geotube® Marine Containment Structure Technology Works

Building a marine containment structure with Geotube® technology is a three-step process.

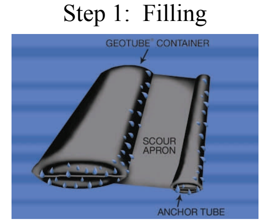
In the ***filling*** stage, the Geotube® container is filled with dredged sand or similar materials. The Geotube® containers are constructed of a unique fabric, specially engineered for a marine structure.

In the ***containment*** stage, the durable and high retention fabric allows the dredged materials to fall out of suspension and form a dense monolithic structure.

In the final stage, ***structural***, the contained and densified material serves as a structural mass. When utilized with an accompanying Scour Apron, the Geotube® container may be utilized as a sand dune core or other shoreline re-nourishment or erosion prevention medium.



Step 1: Filling



Step 2: Containment

Step 3: Structural

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