Thrace Nonwovens & Geosynthetics falls under the Thrace Plastics group of companies. It was founded in Xanthi, Greece over thirty years ago and has rapidly grown to become one of the leading groups of companies in the geosynthetics industry in the world.

The Group has manufacturing facilities in Greece, the United States of America, the United Kingdom, and Ireland, with distributors in more than 70 countries and about 1,600 employees worldwide. Annually, it converts over 100,000 tons of polymers resulting in a turnover of approximately 230 million Euros per annum.

Thrace Nonwovens & Geosynthetics (Greece), Thrace-LINQ (U.S.A.), Don & Low (Scotland), Synthetic Packaging (Ireland), and Lumite (U.S.A.), are part of the Thrace Group.

Thrace Geosynthetics, Thrace-LINQ, Polybrane, and Lotrak are brand names operating under the Thrace Group umbrella.

Thrace Group’s production meets the needs of the geosynthetics market with a wide range of geotextiles (woven, non-woven, knitted, highflow and high strength) and geogrids (uni-axial and bi-axial) using polypropylene (PP), polyester (PET), and polyethylene (PE) polymers. All products come with appropriate certificates for each market and are accredited with the ISO 9001 certification.

Thrace Group’s strategy is to sustain its growth through long term client relations and by the implementation of the latest manufacturing technologies.
PRODUCTION FACILITIES:

Thrace Nonwovens & Geosynthetics (Xanthi, Greece)
Thrace-LINQ (Charleston, South Carolina, USA)
Don & Low (Forfar, Scotland, United Kingdom)
Lumite (Yonah, Georgia, USA)
**INTRODUCTION**

*Thrace Nonwovens & Geosynthetics is a global manufacturer and supplier of Geosynthetics for a wide variety of applications.*

**Quality products to do the job**
At Thrace, we strive for excellence and that shapes every aspect of our procedures, our processes and our people. We consistently produce quality products by continuously conducting thorough quality control testing throughout the entire manufacturing process. This control starts from the raw material stage and is carried out through the extrusion, beaming, weaving, and leading to the final finished product stage. In conjunction with our quality control procedures, we continuously pursue the latest technological manufacturing innovations in order to be able to offer the latest solutions and competitive prices without affecting the final product quality. In addition to quality, we offer a wide range of geosynthetic products thus making us flexible in meeting the needs of any project.

**Customized service to do it right**
At Thrace, we recognize that personalized customer service can make the difference between success and failure when it comes down to selecting the proper product for the corresponding application. Thrace's dedicated staff follows a one to one relationship approach with our clients in order to understand their geosynthetic project needs and provide them with cost effective solutions backed up with technical support. No matter what your Geosynthetics needs are, we can help you get it done right.

**Excellence, with the service to back it up**
At Thrace, Geosynthetics is our main business, and it shows in every roll that we produce.

**Geosynthetics**
- Nonwovens
- Wovens
- Geogrids
- Asphalt Retention
- Geobags
- High Strength & High Water Flow Geotextiles
Geosynthetics

The term Geosynthetics is used to describe a range of polymers used in solving civil engineering problems. It comes from the Greek words “geo” meaning earth and “synthetic” meaning man made. Geosynthetics are used in civil, geotechnical, environmental, transportation, hydraulic and other applications including roads, railways, earthworks, foundations, retaining walls, drainage systems, erosion control works, reservoir and dams, canals, tunnels and underground structures, solid waste disposals, liquid waste containment, mining, and landscaping.

Numerous natural materials such as wood, cotton, and vegetation mixed with soil have been used for thousands of years to stabilize the sub base of roadways and steep slopes. A key problem with the use of natural materials in a buried environment was the biodegradation that took place due to the presence of microorganisms in the soil. With the discovery of polymers in the middle of the 20th century, a more stable material arose that offered a lifetime resistance to harsh environmental conditions, something that natural materials lacked.

Geosynthetics offer many advantages. Since they are manufactured in a factory environment, their quality and consistency is easily controlled. They can be installed rapidly in the field and since they replace soil and other construction materials, they offer project cost savings.

Geosynthetics are available worldwide and they consist of eight main categories, namely, geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geofoam, geocells, and geocomposites. Geotextiles are textiles consisting of synthetic fibers and come in two types, woven and nonwoven. Geotextiles always perform at least one of five discrete functions: separation, reinforcement, filtration, protection and/or drainage. Geogrids on the other hand are polymers formed into open, grid like configurations that are first punched then stretched in either two directions (biaxial) or in one direction (uniaxial). They have many application areas, but they function almost exclusively as reinforcement materials.
APPLICATION

Geotextile standards:
The geotextile product standards form a set of eleven standards, each of which specifies the requirements for geotextiles and geotextile-related products that are used in a given application.

Geotextile functions:
Geotextiles that are used in various applications fulfill one or more of the following functions:

Geotextile functions and their corresponding applications:
Geotextile application correspond to a group combination of functions as shown here:

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>APPLICATION</th>
<th>F</th>
<th>D</th>
<th>R</th>
<th>S</th>
<th>P</th>
<th>STR</th>
<th>B</th>
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<tbody>
<tr>
<td>EN 13249</td>
<td>Roads &amp; Other Trafficked Areas (excluding railways &amp; asphalt inclusion)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<td>EN 13250</td>
<td>Railways</td>
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<td>EN 13251</td>
<td>Earthworks, Foundations &amp; Retaining Walls</td>
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<tr>
<td>EN 13252</td>
<td>Drainage Systems</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>EN 13253</td>
<td>Erosion Control</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN 13254</td>
<td>Reservoirs &amp; Dams</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>EN 13255</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>EN 13256</td>
<td>Tunnels &amp; Underground Structures</td>
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<td>Solid Waste Disposal</td>
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<td></td>
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<tr>
<td>EN 13265</td>
<td>Liquid Waste Containment</td>
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<td>X</td>
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<tr>
<td>EN 15381</td>
<td>Asphalt Overlays &amp; Pavements</td>
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</table>

NOTE: The function “Separation” is never specified alone and hence shall only be used in combination with other functions (Filtration, Reinforcement) with regard to testing and to attestation of conformity.
Quality Control

Our Geosynthetics are manufactured under a quality management system which is certified in accordance with the most comprehensive standards set by the International Organization for Standardization; namely ISO 9001:2008. This has been implemented throughout the business to give our clients greater reliability and improved product quality.

Accreditation

Thrace’s Geosynthetics are CE marked to demonstrate conformity to the Construction Products Directive (CPD 89/106/EEC). The CE marking also indicates the stringent testing and certification of Factory Production Control (FPC) that Thrace Nonwoven & Geosynthetics has gone through to meet the highest European Standards.

The Laboratories

Thrace’s Geosynthetics are tested at modern in house laboratories as well as at well-known European Institutes. This allows us to continuously assure the efficiency of our services and measurements. Our geosynthetics are carefully monitored from the raw material stage to the final product stage by qualified and experienced personnel in accordance with the European (EN), American (ASTM), Australian (AS), British (BS), and International (ISO) standards.
Thrace Nonwovens & Geosynthetics manufactures two types of extruded Geogrids; the Biaxial and Uniaxial series. Due to their structural tensile strength, Geogrids fulfill a reinforcing function in the ground structure of cohesive, noncohesive, and coarse grained soils. Geogrids when combined with other geosynthetics can be used for asphalt overlay, waterproofing, separation and stabilization. Geogrids can also be used to construct mattresses to be placed on soft soils.
BIAXIAL Geogrids
Thrace's biaxial geogrids are manufactured from polypropylene (PP) sheets using the extrusion method of punching a pattern of holes, followed by stretching under controlled temperature in both directions in order to increase the material's tensile characteristics. The apertures of the biaxial geogrids aid in aggregate interlock thus allowing for effective reinforcement and soil confinement. The purpose of this geogrid system is both to decrease the fill material thickness and to increase the bearing capacity of the underlying soil material. The use of biaxial geogrids also offers time savings due to its ease of installation and cost savings resulting from the reduction in the required fill material.

UNIAXIAL Geogrids
Thrace's uniaxial geogrids are manufactured from high density polyethylene (HDPE) sheets using the extrusion method of punching a precise pattern of holes, followed by stretching under controlled temperature in the longitudinal direction in order to increase the material's tensile strength and stiffness. The main characteristics of Thrace's uniaxial geogrids are high strength and low creep. They are used mainly in applications were the load is expected to act in one main direction of the material. It is therefore suitable for reinforcing walls, slopes, abutments, and earth embankments under long term high loading.

Reinforcement
The good tensile mechanical properties of Thrace's geogrids in conjunction with the soil's good compressive but poor tensile properties improve the total system's strength interaction. The high strength and low elongation of the geogrids are ideal for reinforcing sub grades of roads and railroads, as well as slopes of embankments and retaining walls.
Trace's Nonwoven geotextiles are produced on both sides of the Atlantic with the latest state-of-the-art fiber extruders and needle punching lines. The vertical integrated production not only guarantees quality consistency, but allows us to provide lead times that satisfy our customers’ needs. The main difference between nonwoven geotextiles and woven geotextiles is that nonwoven geotextiles are more likely to stretch under the same conditions and have the ability to let water flow along the plane of the geotextile more effectively.
Reinforcement
The good tensile mechanical properties of Thrace’s geotextiles in conjunction with the soil’s good compressive but poor tensile properties improve the total system’s strength interaction. The high strength and low elongation of the geotextiles are ideal for reinforcing embankments of roads, slopes, and retaining walls.

Separation
The placement of Thrace’s flexible and porous geotextile between dissimilar earth materials allows for the integrity and functioning of both materials so that they can be improved or remain intact.

Filtration
Thrace’s nonwoven geotextiles work in equilibrium with the soil to allow for adequate liquid flow with limited soil loss across the plane of the geotextile while avoiding pore clogging.

Drainage
The equilibrium between the soil-to-Thrace’s geotextile system allows for adequate liquid flow while maintaining limited soil loss within the plane of the geotextile. The hydraulic properties of the geotextile are suitable to establish structural stability by controlling excess amounts of water during and after construction.

Protection
Thrace’s nonwoven geotextiles offer perfect damage protection to geomembranes and other coated materials that may occur from contact with sharp soil surfaces such as stones or sub grade unevenness. The geotextiles’ thickness and mass are directly proportional to the amount of protection that they can offer.

Erosion Control
Thrace’s nonwoven geotextiles can be used independently or in conjunction with Thrace’s woven geotextiles for creating geobags that can be utilized for erosion control of slopes, shoreline protection, and at river bank flood control.
WOVEN

Geosynthetics

Thrace is one of the largest woven geotextile manufacturers worldwide. Woven Geotextiles are produced in our facilities in Greece and Scotland. When compared to nonwoven geotextiles, woven geotextiles provide higher tensile strength and CBR puncture resistance for the same mass per unit area.

Weave patterns come in a virtually unlimited variety which in turn affect certain properties of the woven geotextile fabric. However, woven geotextiles are not specified by weave patterns but by properties such as porosity, strength, and elongation. In general, woven geotextiles are less likely to stretch under the same load conditions and do not let water flow as freely as nonwoven geotextiles.
**Reinforcement**

The good tensile mechanical properties of Thrace’s geotextiles in conjunction with the soil’s good compressive but poor tensile properties improve the total system’s strength interaction. The high strength and low elongation of the geotextiles are ideal for reinforcing embankments of roads, slopes, and retaining walls.

**Separation**

The placement of Thrace’s flexible and porous geotextile between dissimilar earth materials allows for the integrity and functioning of both materials so that they can be improved or remain intact.

**Filtration**

Thrace’s woven geotextiles work in equilibrium with the soil to allow for adequate liquid flow with limited soil loss across the plane of the geotextile while avoiding pore clogging.

**Drainage**

The equilibrium between the soil-to-Thrace’s geotextile system allows for adequate liquid flow while maintaining limited soil loss within the plane of the geotextile. The hydraulic properties of the geotextile are suitable to establish structural stability by controlling excess amounts of water during and after construction.

**Erosion Control**

Thrace’s woven geotextiles can be used independently or in conjunction with Thrace’s nonwoven geotextiles for creating geobags that can be utilized for erosion control of slopes, shoreline protection, and for river bank flood control.
Thrace Nonwovens & Geosynthetics manufactures high quality, custom made, and long lasting geobags for the following applications:

- Erosion Control
- Flood Control & Protection
- Embankment Reinforcement
- Coastal & Riverbank Protection

**Geobags**

**High Strength & High Water Flow**

- Monofilament
- Multifilament
- Tapes
- 3 Dimensional
- Polyester
- Polypropylene
- HDPE
- LLDPE

Erosion Control
Waste Management
Embarkment Reinforcement
Water Management
Thrace’s nonwoven needle punched geotextile Asphalt Retention series (AR) is made of 100% polypropylene fibers with optimum bitumen retention capacity characteristics.

It is mainly used in asphalt overlay applications, where it acts as a moisture barrier and functions by delaying the formation of reflective cracking by performing three main functions, namely, sealing, bonding between layers, and stress relief.

**Sealing**

The bitumen retention capacity of the geotextile prevents the passage of oxygen into the pavement structure by forming an air impermeable seal.

**Bonding**

The geotextile acts as a bonding surface for both the old road surface and the new asphalt overlay.

**Stress Relief**

Using Thrace’s asphaltic retention geotextile allows for the delayed progress of differential stresses between the new asphaltic overlay and the old road surface. This translates to a reduction of reflective cracking and crack propagation between old and new road surfaces.