

Expanded polystyrene can remain buried in a wet environment for decades without degradation. By its nature EPS is a closed-cell foam. Closed cells allow only minimal amounts of moisture to be temporarily absorbed.

Polymers are large molecular weight compounds with normally a non-reactive structure. Chemical resistance of expanded polystyrene: as a general rule is virtually resistant to all aqueous media including dilute acids and bases. It is non-resistant to organic solvents and aromatic hydrocarbons. It is not attacked or degraded by long exposures to either bleach, soap solutions, or common household products that are poured down the drain. For a more accurate data on chemical resistance check the following document: HUNTSMAN TEC-I-009 data 06/30/06

It is a thermoplastic that can be heated, melted and recycled. Energy efficient both in their manufacture & processing. Lightweight material. It is not attacked by fungi, mold and/or mildew.

EPS PARTICLES	STANDARD	UNITS	VALUES
Bulk specific weight	UNE 92120-2:1998	kg/m ³	10
Specific weight	UNE 83134	kg/m ³	20
Void space	-	%	50
Specific surface	-	m ² /m ³	~230
Particle number	-	units/m ³	~115.000
Water absorption 7 days	UNE EN 12087:1997	%	<2
Water absorption 21 days	UNE EN 12087:1997	%	<2,2
Working temperature range	-	°C	-50 to +65
Particle size distribution	UNE EN 933-1	% pass	<8 mm: 0 < 20 mm: 73 < 25 mm: 100
Color	-	-	Silver grey
Cell Structure	-	-	Fine, closed cell
Shape	-	-	Cubical with channels
Creep in compression	-	-	See C14XD619 & C15XD119
Life Span	-	-	> 100 years
Recycled content	-	%	>90

EPS geosynthetic particles have a particular design to achieve high water flow and void space. They are made with high content of post-industrial recycled material with a narrow molecular weight distribution from strictly sorted sources. Cell size structure suitable for a high compressive strength. It is not brittle at subzero temperatures.

- EPS recycling, raw material manufacturing and later multi-step expansion are Fumoso proprietary processes.
- drenotube® is a worldwide registered trademark.

All about the gravel substitute

Which is the gravel substitute surrounding the drenotube® drain water corrugated pipe?

It is a carbon hardened geosynthetic EPS aggregate. This raw material is produced in our Plant and supplied to different countries throughout the world. It is formulated to meet strict drainage quality requirements.

All of its properties make this product obvious choice for a drainage product:

Resistance to water, dimensional stability, temperature resistance (does not become brittle at sub-zero temperatures), chemical stability (because of the very long molecules – high molecular weight), it doesn't rot and it doesn't rust nor it decomposes. This compound is not a nutrient of microorganisms so it will not be affected by soil bacteria. Because of it is chemical stable, it is not a water pollutant.

Finally according to our records (60 years), and references from scientific literature the life-span for our carbon aggregate is more than 100 years.

Certified product under EOTA office European Assessment Document EAD 280001-00-0704  ETA 15/0201



Carbon hardened geosynthetic EPS aggregate

About gravel ...

The term gravel is also used when referred to crushed stone.

Because crushed stone mostly comes from quarries, there has been growing geological and environmental concern over the large number of quarries operating and their long-term effects.

Gravel is a useful material widely used in the construction of roads or highway structures, base foundations, concrete mixtures, etc.

Traditionally, sub-surface drainages has been build using gravel-filled trenches to enlarge the water collection surface.



Medium grade crushed stone

The term gravel is also used when referred to crushed stone

Gravel drawbacks in drainage construction when compared with drenotube

- Requires heavy equipment to the construction site.
- Normally gravel contain fine particles that can clog the grooves.
- Embebed stone reduce the permeability of soil.
- The heavyweight of the gravel contributes to increase the pressure in the corrugated pipe.
- Manual spreading along the bottom of the trench.
- Environmental impact of aggregate quarrying.
- Wider trench
- Geotextile wrapped all around the drain will be clogged over the years.
- The drainage construction needs more labour.

... a granular fill to meet leachfield requirements ...

Suitable to be used in soil infiltration of wastewater in compliance with CEN/TR 12566 and Norm DTU 64.1 used treated effluent.

Pour application dans les systèmes par infiltration des eaux usées traitées: Tranchées et lits d'épandage conformes à la norme DTU 64.1 et CEN/TR 12566

drenotube® particles surface are micro-rugged and coated to be able to fix and develop a bacterial biofilm. Bacteria digest organic materials purifying wastewater. Aerobic media is needed for bacterial and microorganism to grow.

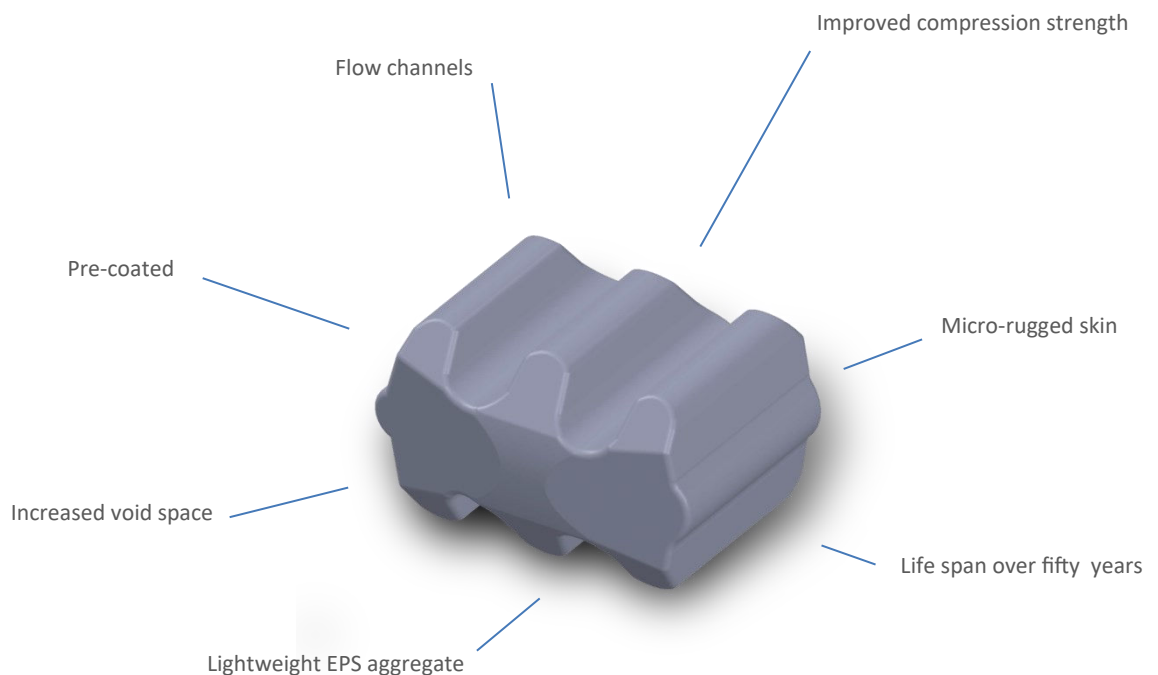
drenotube® particles are suitable for the treatment of water organic loads.

drenotube® is designed to meet the most stringent discharge quality standards for organic and/or nitrogen removal.

drenotube® system can in addition to infiltrate water, contribute to the additional treatment of the organic load of drained waters.

drenotube® is an environmentally friendly replacement to traditional stone in septic drainfields using an engineered geosynthetic aggregate modular design. The drenotube® system is designed to improve infiltrative performance by eliminating the fines and reducing compaction and embedment associated with crushed stone.

A septic system has two components: a septic tank and a leachfield or drainfield. Primary treatment occurs in the septic tank, where bacteria digest organic materials in the wastewater. The effluent then flows into the leachfield for secondary treatment. Here, bacteria complete the digestion and purification process as the wastewater slowly leaches or infiltrates into the soil.



Why geosynthetic particles instead of gravel?

- Superior water flow and higher storage capacity compared with gravel.
- It is clean and fines free.
- About 100 times lighter than gravel.
- **CE** certified product under EOTA office European Assessment Document EAD 280001-00-0704 ETA 15/0201
- Durable. Expected life span is over 100 years.
- High compression strength.
- It is not brittle at subzero temperatures.
- Chemical resistant HUNTSMAN TEC-I-009 data 06/30/06
- Reduces embedding associated with crushed stone.
- The lightweight of the drenotube® contributes to reduce the pressure in the corrugated pipe
- Easier cleanup at jobsite.
- Recycled content >90%
- 100% recyclable non-toxic and inert for the environment.
- Do not decompose. It is not a water pollutant.
- Easier and cheaper transport.
- Negligent failure rates
- Avoids environmental impact of aggregate quarrying, preserving the landscape.
- Contribute to low the carbon dioxide emissions.
- Resistant to microorganism and soil bacteria.
- Doesn't rot and it doesn't rust nor it decomposes.

Tests & Certifications

drenotube® has been tested in many external laboratories and has the following certifications:

Aggregate determination of water flow capacity in their plane	AITEX nº 2010GT0187
Preassembled drainage line unit determination of compressive properties	AITEX nº 2010GT0206
Preassembled drainage line unit determination of compressive properties after a hydrolysis ageing	AITEX nº 2010GT0207
Preassembled drainage line unit determination of compressive properties after oxidation ageing	AITEX nº 2010GT0208
Preassembled drainage line unit determination of compr. properties after microbiological ageing	AITEX nº 2012GT0052
EPS aggregate Geometrical properties and particle size distribution UNE-EN 933-1	CECAM nº C10XF680-R2
Preassembled drainage line unit Water flow under load (custom made test)	CECAM nº C11X7622-R2
Preassembled drainage line unit determination of compressive properties UNE-EN 13286-47	AITEX nº 2014GT0039
Aggregate determination of bulk density UNE-EN 1602	CECAM C14X3774
Aggregate determination of bulk density UNE-EN 1602	CECAM C14X3775
Aggregate compressibility module UNE-EN 13286-47	CECAM C14X5779
Aggregate compressibility module UNE-EN 13286-47	CECAM C14X5780
Preassembled drainage line unit creep in compression UNE-EN 1606:1997	CECAM C14XD619
Preassembled drainage line unit creep in compression extended UNE-EN 1606:1997	CECAM C15XD119
Preassembled drainage line unit flow under load (custom made test)	CECAM C15X0524
Aggregate compressive strength (according to Q30 quality control device Fumoso)	CECAM C15X0953

European Assessment Document EAD 280001-00-0704  ETA 15/0201

TECHNICAL NOTICE (Avis Technique—France) Reference 17.2 / 19-346_V1

Life Cycle Assessments (LCA) in accordance with standard NF EN 15804 + A1 and its national supplement NF EN 15804 / CN

Verification No: 7-418: 2019



Cradle-to-Grave is a model used in the scientific footprint method Life Cycle Assessments (LCA). It assesses the complete environmental footprint of products. From raw material extraction, production, and product use, until the end of its life.

How drenotube® stands the compression under load?

We have done a 3-year creep in compression test in which it has been proven that it could stand a soil load of 5 m during a 50 years long term with a geosynthetic deformation that does not reduce the flow capacity of the slotted / perforated pipe.

Preassembled drainage line unit creep in compression UNE-EN 1606:1997 CECAM C14XD619

Preassembled drainage line unit creep in compression extended UNE-EN 1606:1997 CECAM C15XD119