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ADVANCED TECHNOLOGY FOAM MATERIALS

AZOTE®
high performance
polyolefin foams

ZOTEK®
advanced
polymer foams

the technology to develop superior foams

OUTSTANDING PROPERTIES

- Lightweight yet durable
- Pure and consistent
- Non-toxic and safe
- Extremely low odour
- Wide range of vibrant colours
- Regular cell size
- Soft and compliant to firm and rigid
- Good impact absorbing properties
- Low levels of in-built stresses
- Isotropic performance

Zotefoams produces an unparalleled range of closed cell, crosslinked, polyolefin foams using a unique, environmentally friendly, high-pressure nitrogen gas solution process.

The manufacturing process comprises three essential stages:

1. MIXING, EXTRUSION AND CROSSLINKING

The polymer is blended in-line and extruded into solid sheet form. This sheet is then crosslinked, a process that enhances material strength, durability and temperature resistance.

Crosslinking is effectively the formation of a lattice like structure at molecular level. It gives benefits in many areas such as thermal moulding. A high temperature window exists where crosslinked foams can be compressed or stretched and when cool they retain their shape. (Non-crosslinked materials would collapse and melt at these temperatures.)

The sheet is subsequently cut to size, ready for the gas solution process.

2. IMPREGNATION AND SATURATION

The plastic slabs are loaded into a carriage system that feeds into high-pressure autoclaves where they are heated above softening temperature in an atmosphere of pure nitrogen. Process temperatures of up to 250°C (482°F) and pressures of up to 10,000 psi (670 bar) combine to dissolve the nitrogen gas into the molecular structure of the softened plastic. Final cooling retains the nitrogen in the plastic.

3. FINAL EXPANSION

The nitrogen charged slabs are loaded into a low-pressure autoclave where the material is again heated above its softening temperature under moderate gas pressure. When this pressure is removed the nitrogen expands, physically foaming the soft plastic in a uniform manner.

PUSHING THE BOUNDARIES

The use of this unique manufacturing route enables foams to be produced from polymers such as HDPE and other technical polymers that could not be foamed easily using any other method.

The separation of these manufacturing stages allows very accurate control of the individual parameters that govern the production of these high quality foams and contribute so fundamentally to their performance properties, cell size uniformity and consistency.

ZOTEFOAMS
THE FOAM TECHNOLOGISTS

the ZOTEFOAMS difference

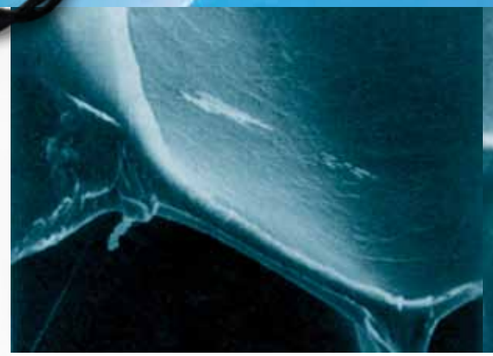
No other manufacturing route can produce foam with such a consistent cell structure as that achieved with the Zotefoams process. Cell size consistency is highly important for isotropic physical performance, optimum workability, colour uniformity, impact absorption and physical performance predictability.

THE FUNDAMENTAL DIFFERENCE

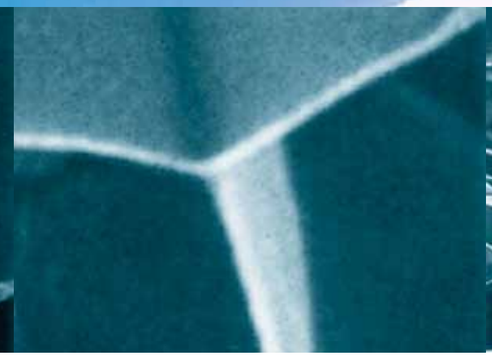
The superiority of Azote foams, compared with polyethylene foams made using other technologies, stems directly from the use of this high pressure gas technology.

It produces a pure, low odour, chemically inert foam without blowing agent residues and with a uniform cell structure and regular cell walls.

Most other crosslinked technologies use chemical blowing agents that react at temperature and release a gas into the plastic in order to create the foam. Residues of the chemical blowing agents remain within these materials and can be seen with a relatively low level of magnification. The presence of these residues within foams can detract from their physical properties and can sometimes act as reactive impurities or contaminants. They cause an unwelcome odour and may even continue to react upon subsequent heating, further expanding the foam. Non-crosslinked foams have been expanded using ozone depleting CFCs, HCFCs, HFCs and more recently, flammable volatile organic compounds (VOCs).



PLASTAZOTE® FOAM



EVAZOTE® FOAM

EVAZOTE® FOAM

PHOTOMICROGRAPHS

These photomicrographs show the cell structures of polyolefin foams made by different methods.

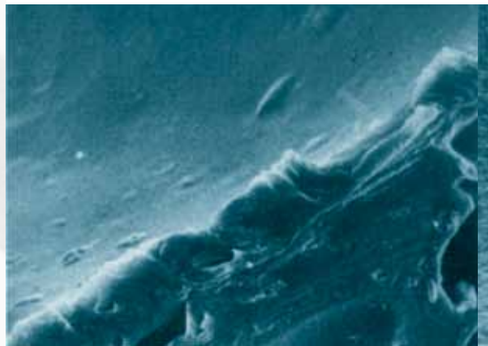
▲ Note the uniform and regular cell walls of the Plastazote and Evazote samples that give the foams their consistent and isotropic mechanical properties.

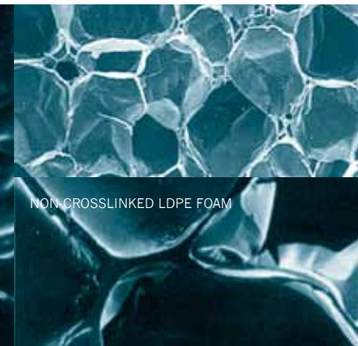
The small-scale imperfections in the chemically blown samples can seriously reduce the mechanical strength of the foam. Irregular cell structure can cause significant variation in density throughout these foams that, in turn, may lead to fabrication difficulties. ▼

CROSSLINKED AND CHEMICALLY EXPANDED LDPE FOAM

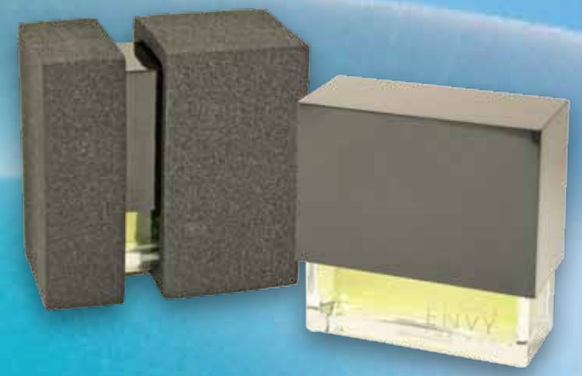
NON-CROSSLINKED LDPE FOAM

CROSSLINKED AND CHEMICALLY EXPANDED LDPE FOAM





the products to stimulate your imagination



Polymer	Nominal density in kg/m³																	
	15	18	24	25	26	29	30	32	33	35	40	45	50	60	65	70	80	115
LD	•[4]	•	•[4]			•	•[3]	•[2]	•[4]			•[1]	•[2]	•		•		
HD							•							•			•	•
MP	•[1]								•			•						
PK									•			•					•	
EV							•					•[2]	•			•[2]		
VA				•						•					•		•	
EM					•													
ZOTEK F										•	•							
ZOTEK N							•						•					

The grade nomenclature indicates polymer type:

- **LD.** Low density polyethylene;
- **HD.** High density polyethylene;
- **MP.** Metallocene polyethylene;
- **PK.** Higher rigidity polyethylene.
- **EV/VA.** EVA copolymers;
- **EM.** EMA copolymers;

[1] Available as Flame Retardant Grade **(FR)**
[2] Available as Conductive Grade **(CN)**
[3] Available as Static Dissipative Grade **(SD)**
[4] Available as Flame Retardant Grade to meet FMVSS specification **(FM)**

Azote® is the group brand for polyolefin foams produced by the unique Zotefoams nitrogen expansion process.

PLASTAZOTE® FOAM

Closed-cell, crosslinked polyethylene foam.

A wide range of polymer combinations is available to give increased stiffness, improved temperature resistance and improved mouldability. Foams are produced in a wide density range from 15kg/m³ up to 115kg/m³ and several grades are available in a range of attractive colours. Metallocene based grades that exhibit greater durability are also produced.

Special grades are available with flame retardancy (for the construction and aerospace industries) and conductive or static dissipative properties (for electronics manufacturing and packaging). Other application areas include automotive manufacture, packaging, marine and protective padding in contact sports, while the purity and inert qualities of Plastazote® foam have led to its widespread use in healthcare applications.

These foams are characterised by light weight, their consistent cell size and structure, their outstanding purity and their exceptional, isotropic physical performance.

EVAZOTE® FOAM

Closed-cell, crosslinked ethylene copolymer foams.

Evazote® is a range of crosslinked ethylene vinyl acetate (EVA) copolymer foams. More durable than polyethylene foams, Evazote® grades have a “rubbery” feel. Selected grades are available in a range of colours and conductive grades are also produced. Evazote® is produced in densities from 25kg/m³ to 80kg/m³.

Evazote® foams are tougher and more resilient than Plastazote® foams and applications are to be found in sports, leisure and footwear industries. Evazote® is also used widely in the construction industry where its enhanced durability, along with its sealing properties and chemical resistance qualities, make it ideal for expansion joints.

SUPAZOTE® FOAM

Closed-cell, crosslinked ethylene copolymer foams.

The softest foam in the range, Supazote® is recommended for ‘soft touch’ applications, with and without covering. Available in black or white it is both light-weight and tactile. It can be used in conjunction with other foams to provide a more responsive surface and has been used in the manufacture of a variety of sports and leisure equipment as well as for the protective packing of fragile items.

ZOTEFOAMS special products

ZOTEFOAMS
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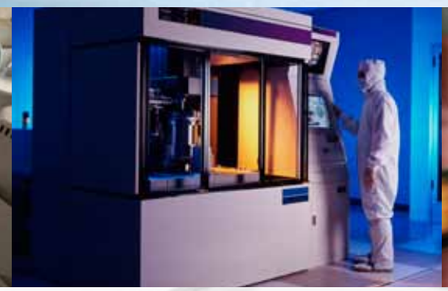


ZOTEK® grades are based on advanced materials such as PVDF fluoropolymers and polyamides (Nylons) and have unique performance characteristics.

ZOTEK® F

FLUOROPOLYMER (PVDF) Foams

ZOTEK® F is a new range of lightweight, closed-cell, PVDF (polyvinylidene fluoride) foams based on Kynar® fluoropolymer, a remarkable material that offers a unique balance of properties including excellent UV, nuclear radiation and ageing resistance, high dielectric strength and outstanding resistance to a wide range of solvents and aggressive chemicals. It is biologically inert, thermally stable across a wide temperature range (to 160°C) and has a very low order of toxicity.

ZOTEK® F is inherently flame retardant releasing very little heat and only small quantities of smoke during combustion, making it suitable for use in aerospace and aviation applications. The compliant nature and chemical resistance of ZOTEK® F make it ideally suited to applications such as high and low closure force seals in chemically harsh environments or where high purity essential.

ZOTEK® N

POLYAMIDE (Nylon) Foams

ZOTEK® N is a range of lightweight, closed-cell, crosslinked foams based on polyamide (nylon). They are tough, strong and durable materials with outstanding high temperature tolerance, up to 170°C and excellent resistance to a range of chemicals, particularly hydrocarbons, such as oils and fuels, alcohols and ketones.

Being crosslinked, ZOTEK® N can be thermoformed into complex shapes that provide mechanical functionality in addition to sealing and thermal and acoustic insulation properties. Applications include temperature resistant seals, 3-D gaskets, space fillers and acoustic and thermal insulation panels in automotive manufacturing. ZOTEK® N is also a beneficial core material in composite construction and can withstand higher temperature curing cycles.

PebaxFoam® is a range of crosslinked thermoplastic elastomer (TPE) foams while MicroZote® is a range of microcellular, high purity roll foams expanded by the patented MuCell® process.

PEBAXFOAM®

PebaxFoam® ultimate light-weight foam

PebaxFoam® is a light weight closed-cell crosslinked foam based on Pebax®, a thermoplastic elastomer (TPE) from Arkema. PebaxFoam® combines the outstanding mechanical properties of Pebax® with the benefits of the unique Zotefoams nitrogen saturation foaming process. Applications for these new unique materials are to be found in footwear, sports and leisure, clothing and medical markets.

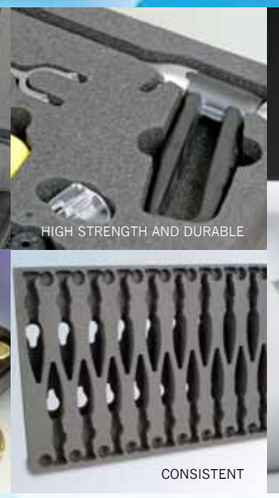
MICROZOTE®

Closed-cell, microcellular, polyolefin roll foams

MicroZOTE® roll foams are manufactured using patented MuCell® extrusion technology. The process uses high purity, supercritical CO_2 or N_2 to foam polyethylene, polypropylene and copolymer materials in a single stage extrusion process without the use of chemical or solvent blowing agents. The foams are characterized by their very fine and uniform cell size and their inherently sealed surfaces.

the performance to develop your product potential

ZOTEFOAMS
THE FOAM TECHNOLOGISTS



LOW WEIGHT

Weighing as little as 1.5% of the solid polymer, Azote® foams are ideal for many applications where weight is a cost penalty, from automotive to marine and aerospace.

PURE

The purity of Azote® foams makes them ideal for a range of hygienic applications in the healthcare field. It also makes Plastazote® the material of choice for protecting valuable artworks and museum pieces during storage and transit.

WATER AND CHEMICAL RESISTANT

These inherent properties make Azote® foams ideal for a range of applications from automotive gaskets to expansion joints and eaves fillers for the building and construction industry.

INSULATIVE

Azote® foams' thermal and acoustic insulation properties are of benefit to the automotive, building and aircraft industries and encourage its use in cold weather camping mats.

NON CORROSIVE

The use of pure nitrogen for expansion ensures Azote® foams (unlike chemically blown foams) have no corrosive residues, encouraging its use for long term protection of munitions and weapons.

CONDUCTIVE AND STATIC DISSIPATIVE

These special grades are highly suited to the protection and packaging of electronic equipment, assemblies and components for EMC/RFI shielding and gasketing.

HIGH STRENGTH AND DURABLE

Much re-useable packaging depends on the durability of Azote® foam for its longevity. From dunnage to protective inserts for cases and boxes, Azote® foams are the natural preference.

CONSISTENT

The high consistency and stress free nature of Azote® foams enables extremely complex shapes to be produced with great accuracy. Processing is easy and economical. Sheet material can be cut to 1.0mm thickness.

GOOD AESTHETICS

Outstanding aesthetic properties add a further dimension to retail packaging protection. The colour depth and uniformity of Azote® foams are unmatched.

GOOD ENERGY ABSORPTION

Sports protection benefits from Azote® foam's energy absorbing properties as does a whole range of returnable packaging applications.

EASY TO PROCESS

The consistency and crosslinking of Azote® foams makes them easy to manipulate and fabricate. Azote® foams are ideal for conversion using common thermoforming techniques.

BUOYANT

Suitable for many buoyancy applications from floating oil pipelines and boats to personal flotation devices.

FLAME RETARDANT

Flame retardant grades are used in many aerospace applications such as aircraft seating.