Physical Properties

Reduced Damage Rates

EPS protective packaging offers a broad range of physical properties to the designer and user. These properties, in combination with satisfactory engineering considerations provide the design flexibility required to create truly cost-effective protective packaging.

With the average package handled by up to nine different people and with more than 445,000 packages a day per distribution facility, the risks of the distribution environment can be great. Millions of manufacturers over the past 40 years have relied on EPS transport packaging because of its exceptional cushioning properties and high tensile strength.

When choosing EPS, original equipment manufacturers realize cost savings across the board. Beyond its competitive material pricing, EPS – because of its versatility and lightweight characteristics – can offer savings in design and development, product assembly and distribution costs.

Mechanical Properties

The mechanical properties of molded EPS depend largely on density. Generally, strength characteristics increase with density. However, variables such as the grade of raw material used, geometry of the molded part and processing conditions will affect package properties and performance. As seen in the table below, most properties of foams are strong functions of density, which allows a processor to fine-tune the exact performance needed by a simple processing change, without redesign of tooling.

Typical properties of EPS foams

Property	Values		
Density, lb./cu.ft.	1.0	2.0	3.0
Compressive strength, p.s.i.	12-17	31-37	52-56
Tensile strength, p.s.i.	22-27	58-61	92-95
Thermal resistance, R/in.	3.8	4.2	4.3

Superior Insulation Value

Many temperature sensitive pharmaceutical and medical products use EPS because comparable packaging materials can rarely offer the same level of thermal insulation. Strongly relied upon in the food distribution industry, EPS is ideal for long distance shipment of perishable foods.

EPS is highly resistant to heat flow. Its uniform, closed cellular structure limits radiant, convective and conductive heat transfer. The thermal conductivity (k factor)

of molded polystyrene varies with density and exposure to temperature, as shown in the table below.

Typical Thermal Conductivity (k Factor)

Density (pcf)	Mean Test Temperature (F)	K Factor (BTU-In./Ft.^{2}HR F)
1.0	0	.22
	40	.24
	75	.26
	100	.28
2.0	0	.20
	40	.21
	75	.23
	100	.25

Substantial Cost Savings

When choosing EPS, original equipment manufacturers realize cost savings across the board. Beyond its competitive material pricing, EPS - because of its versatility and lightweight characteristics - can offer savings in design and development, product assembly and distribution costs.

Water Absorption & Transmission

The cellular structure of molded polystyrene is essentially impermeable to water and provides zero capillary.

However, EPS may absorb moisture when it is completely immersed due to its fine interstitial channels within the bead-like structure.

While molded polystyrene is nearly impermeable to liquid water, it is moderately permeable to vapors under pressure differentials. Vapor permeability is a function of both density and thickness. Generally, neither water nor vapor affects the mechanical properties of EPS.

Electrical Properties

The volume resistivity of molded polystyrene within the 1.25-2.5 pcf density range, conditioned at 73° F and 50% r.h. is 4x1013 ohm-cm. The dielectric strength is approximately 2KV/mm. At frequencies up to 400 MHz, the permittivity is 1.02-1.04 with a loss factor less than 5x10-4 at 1MHz and less than 3x10-5 at 400 MHz.

Molded EPS can be treated with anti-static agents to comply with electronic industry and military packaging specifications.

Chemical Resistance

Water and aqueous solutions of salts, acids and alkalis do not affect molded polystyrene. Most organic solvents are not compatible with EPS. This should be taken into consideration when selecting adhesives, labels and coatings for direct application to the product. All substances of unknown composition should be tested for compatibility. Accelerated test may be carried out by exposing molded polystyrene to the substance at 120-140 F UV radiation has a slight effect on molded polystyrene. It causes superficial yellowing and friability, but does not otherwise affect physical properties.