

COMPARISON OF CLOSED CELL ELASTOMERIC INSULATION PRODUCTS TO FOAM GLASS INSULATION PRODUCTS

This Technical Bulletin focuses on a comparison of the physical properties of closed cell elastomeric insulation products with those of foam glass insulation products for below ambient applications such as chilled water through cryogenic application where moisture intrusion or condensation can be an issue. Elastomeric insulation products are an ideal choice for applications such as chilled water, Refrigeration, HVAC, domestic hot and cold water even cryogenic applications ranging from -297°F up to 220°F service temperature.

The following chart highlights the physical properties of the elastomeric and foam glass insulation products. The properties listed are common to industry published literature or are taken from ASTM standards.

Insulation Material	Units	Elastomeric	Foam Glass
Thermal (at 75°F mean) (at -256 F mean)	k	<0.27 0.16	0.33 0.19
Wvt	perm-in	0.05	0.01
Flammability ASTM E 84 Rating	25/50	25/50 1-1/2" and below	<25/50
Service Temperature Range		-297° to +220°F	-450* to 800°F
Density	pcf	4.0	8.0
Structure		Flexible	Rigid

RECOMMENDED WALL THICKNESS

Conditions - pipe size up to 3 IPS Ambient temp 80°F Wind Speed 0 mph Outer surface emissivity = 0.90**

	Fluid Temperature 35° - 49°		Fluid Temperature 50° - 70°	
Relative Humidity	Foam Glass	Elastomeric	Foam Glass	Elastomeric
50%	1"	½"	1"	½"
70%	1"	¾"	1"	½"
90%	3-1/2"	2.0"	2-1/2"	1 1/2"

Conditions - pipe size up to 3" IPS Ambient temp 80°F Wind Speed 0 mph Outer surface emissivity= 0.90 **

	Fluid Temperature -100°		Fluid Temperature -250°	
Relative Humidity	Foam Glass	Elastomeric	Foam Glass	Elastomeric
50%	1 ½"	1"	2 1/2"	1 ½"
70%	3"	2"	4 1/2"	3"
85%	6"	4 1/2"	4 9 ½"	7"

* FOAMGLAS IS GENERALLY ONLY OFFERED IN 1" WALL AND ABOVE

** Low emissivity jackets (reflective) will increase the thickness required to prevent condensation

Comparison Chart

	Closed Cell Elastomeric	Foam Glass
thermal k	excellent	Fair
wvt without jacketing	low perm material	low perm material
25/50 flammability rating	Yes	Yes
Available in white	Yes	No
Available with self seal closure	Yes	No
Closed Cell Structure	Yes	Yes
Fiber Free	Yes	Yes
Non-porous	Yes	Yes
Mold Resistant	Yes	Yes
Flexible	Yes	No
Withstands vibration / movement	Yes	No
Always requires a jacket	No	Yes
Thicknesses Available	3/8" to 1-1/2" Above 1-1/2" it can be sleeved	1" and above Not available below 1" thickness
Lengths	Sold in 6 foot lengths	Sold in 3 foot sections
In Field Fabrication	Yes	No
Cost	Good Value	High
Suitable for Burial Applications	Yes	Yes

- * Foam glass products always require a jacket, a metal jacket is usually used
- ** Foam glass products are only offered in 1" wall and greater

Differences in composition and structure, no jacket required

The key distinction between flexible closed cell elastomeric and foam glass insulation products is fundamental in their composition and structure. Closed cell elastomeric insulation products are comprised of individual cells filled with gas. These non-connecting cells resist moisture, compression and provide excellent thermal conductivity values. On indoor applications, no additional jacket or covering is necessary because of this closed cell structure. For outdoor applications with severe UV exposure, a protective coating or jacket is recommended to protect the product from the effects of UV and mechanical abuse. The elastomeric composition of the product creates the extreme flexibility and ease of installation of the product. The application temperature range of -297°F to 220°F allows it to be used on a wide range of applications well beyond chilled water.

Conversely, foam glass products have a rigid glass closed cell structure which creates a product with high structural strength but does not withstand vibration, movement or rapid expansion / contraction cycles. Foam glass products are ideal for above ambient temperature systems (up to 800F) or where a rigid product that has high compressive strengths (load bearing capacity) is required.

Excellent thermal conductivity

Table 1 highlights the fact that in regard to thermal properties elastomeric foam products are superior to foam glass even at cryogenic temperatures. In addition, elastomeric products are easy to install, insuring all seams and joints are sealed properly to eliminate condensation or ice formation in these locations. The integrity of the system is maintained even if exposed to vibration, movement or rapid expansion / contraction cycles.

Range of product offering can also play a role in thickness selection. Foam glass products are only offered in 1" wall thickness and above because the product is easily fractured at thicknesses below 1". Nomaco elastomeric products are offered in a wide range of factory produced ID and wall thicknesses (reduced fabrication scrap). In addition, the ability to sleeve products to attain a specific thickness allows for greater

latitude in product selection. The product is not susceptible to material handling damage (if pre-fabricated and shipped to the job site, there is no product loss due to breakage during transportation), as a result, you can be assured of having the correct product to complete the job. The product is offered in 6 foot tubular lengths and 48" rolls which reduces the number of seams. Using contact adhesive, the seams are water tight.

Inherent moisture vapor retarder

When comparing moisture vapor transmission values, it is important to note that materials with a wvt of 0.10 perms-in or less are considered to be moisture vapor retarders as defined by ASHRAE and ASTM. In the case of elastomeric products, this wvt value is achieved without the need of an additional jacketing. The wvt improves as the temperature is reduced to the point that at 0F it can be considered completely "water tight". Jacketing is usually only used on elastomeric insulation for outdoor applications. Its abuse resistant (yet non abrasive) outer surface is acceptable for most indoor applications.

Wide product offering, flexible, closed cell, light weight, non-fibrous, non-porous, excellent k factor and easy to install

Closed cell elastomeric materials are flexible, non-fibrous, non-porous and are able to withstand vibration and thermal shock without cracking. They can be used over heat trace lines. No special tools are necessary for their installation. They can be pre-fabricated in the shop or fabricated at the job site. They can be painted for aesthetics but are also available in white. Elastomeric materials are available with an easy-to-use self-seal closure system for quick, neat installation. Elastomeric pipe insulation is available in 3/8", 1/2", 3/4", 1" and 1-1/2" wall thicknesses up to 4" IPS size. Elastomeric material is also available in sheet and rolls up to 2" thickness. Most thicknesses are available with factory applied PSA which insures complete adhesive coverage and speedy installation.

Flexible closed cell elastomeric foams have been used for below ambient insulation applications for years and are the preferred product for this application. They have also been used for burial applications above the water table with or without the use of a conduit. Only recently (last 5 years) have they been considered for cryogenic applications as a result of further lab testing and field trials. The engineering community is very conservative and slow to change, perpetuating old materials despite the availability of newer materials which offer many advantages. Elastomeric materials have been used successfully by themselves or in conjunction with other insulation products i.e. Foam glass to meet the demanding needs of the oil, gas and chemical industry.