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. Service temperature upper limit can be extended to 300°F with K-Flex ECO.

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.

<table>
<thead>
<tr>
<th>Insulation Material</th>
<th>Units</th>
<th>Elastomeric</th>
<th>Foam Glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal (at 75°F mean)</td>
<td>k</td>
<td>0.25</td>
<td>0.33</td>
</tr>
<tr>
<td>(at -256 F mean)</td>
<td></td>
<td>0.16</td>
<td>0.19</td>
</tr>
<tr>
<td>Wvt</td>
<td>perm-in</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>Flammability</td>
<td></td>
<td>25/50</td>
<td>&lt;25/50</td>
</tr>
<tr>
<td>ASTM E 84 Rating</td>
<td></td>
<td>25/50</td>
<td></td>
</tr>
<tr>
<td>Service Temperature Range</td>
<td></td>
<td>-297°F to +220°F</td>
<td>-450°F to +800°F</td>
</tr>
<tr>
<td>Density</td>
<td>pcf</td>
<td>3.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td>Flexible</td>
<td>Rigid</td>
</tr>
</tbody>
</table>

**RECOMMENDED WALL THICKNESS TO PREVENT CONDENSATION**

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

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>Fluid Temperature 35° - 49°</th>
<th>Fluid Temperature 50° - 70°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foam Glass</td>
<td>Elastomeric</td>
</tr>
<tr>
<td>50%</td>
<td>1”</td>
<td>3/8”</td>
</tr>
<tr>
<td>70%</td>
<td>1”</td>
<td>½”</td>
</tr>
<tr>
<td>90%</td>
<td>3-½”</td>
<td>1-½”</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>Fluid Temperature -100°</th>
<th>Fluid Temperature -250°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foam Glass</td>
<td>Elastomeric</td>
</tr>
<tr>
<td>50%</td>
<td>1-½”</td>
<td>1”</td>
</tr>
<tr>
<td>70%</td>
<td>3”</td>
<td>1-¼”</td>
</tr>
<tr>
<td>90%</td>
<td>6”</td>
<td>4-½”</td>
</tr>
</tbody>
</table>

NOTE: FOAMGLAS IS GENERALLY ONLY OFFERED IN 1-1/2” WALL AND ABOVE AND NEVER RECOMMENDED IN THICKNESS BELOW 1”.

*THICKNESS CALCULATION FOR ELASTOMERIC INSULATION BASED ON K-FLEX ISOCALC PROGRAM AVAILABLE ONLINE AT WWW.KFLEXUSA.COM. THICKNESS CALCULATION FOR COMPETITIVE MATERIAL BASED ON TYPICAL K-FACTOR LISTED OF THE MATERIAL AND INDUSTRY RECOMMENDATIONS, SUCH AS 3E PLUS.

** LOW EMISSIVITY JACKETS (REFLECTIVE) WILL INCREASE THICKNESS TO PREVENT CONDENSATION
**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. Both products have closed cell structures that are a key factor in their excellent performance properties. The key difference is in their composition. Elastomeric products, as the name implies, are elastic and are very flexible, adding to the product’s performance and ease of installation. The product is suitable for slide on and field fabrication applications. The application temperature range of –297°F to 220/300°F allows it to be used on a wide range of applications well beyond chilled water. The non-abrasive skin does not require a jacket on most indoor applications.

Conversely, foam glass products have a rigid glass closed cell structure that 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 800°F) or where a rigid product that has high compressive strengths (load bearing capacity) is required.

**EXCELLENT THERMAL CONDUCTIVITY**

The above table highlights the fact the thermal properties of elastomeric foam products are superior to foam glass even at cryogenic temperatures. In addition, elastomeric products are easy to install, ensuring 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 typically offered in 1-1/2” wall thickness and above (never below 1”) because the product is easily fractured at thicknesses below 1”. K-FLEX USA 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 3 and 6 foot tubular lengths and 48” roll widths, reducing 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. Jacketing is usually only used on elastomeric insulation for outdoor applications. If a moisture vapor retarder jacketing is used, it offers a secondary level of protection against moisture and moisture vapor. 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 non-friable, making them able to withstand vibration and thermal shock without cracking. They can be used over heat trace lines. No special tools or protective clothing are necessary for their installation. They can be pre-fabricated by the manufacturer (K-Fit® fittings) or fabricated at the job site. They are available in black or white, or can be painted for aesthetics. Elastomeric insulation products are available with a wide range of pre-applied claddings (Clad® AL, WT or IN) in both sheet and tubular forms as an option to metal jacketing, resulting in substantial cost savings and ease of maintenance. 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”, ½”, ¾”, 1”, 1-½” and 2” wall thicknesses up to 8” IPS size. Elastomeric material is also available in sheet and rolls up to 2” thickness. Most thicknesses are available with factory-applied PSA that ensures 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 that 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. We will be glad to assist you in reviewing your specification requirements.

For more technical information, particularly on condensation control, please contact K-FLEX USA Technical Services at 800-765-6475.