



QWIK GUIDE: Logical Thinking About Cryo Insulants – Recap

Dyplast recently completed its 3-part series of [Technical Bulletins](#) on Logically Thinking about performance of thermal insulants at very low and cryogenic temperatures. This Qwik Guide is just a small sampling of the many key points within those documents. We caution that because there are many complexities, readers may wish to familiarize themselves with the caveats elaborated in the Technical Bulletins:

Physical Property Testing

- Certain ASTM test protocols for physical properties may be irrelevant; long-term in-situ performance data is critical. Neither elemental analysis nor chemistry of insulants are good indicators;
- Many ASTM test protocols are performed at 75°F/atmospheric pressure and thus may be non-representative of the actual performance at cryogenic temperatures and installation practices (although testing protocols are increasingly requiring low temperature testing);
- Water Vapor Transmission & Water Absorption occur only in the outermost region of a cryogenic insulant, so may be less relevant ([take Quiz 1](#));
- Thermal performance (k-factor or λ) of an insulant improves as temperature decreases; yet the gradient varies with each insulant;
- Neither temperature gradients nor thermal conductivity gradients are linear across most insulants - - and must be considered; qualified insulation engineers and certain online computer software can sufficiently approximate ([take Quiz 2](#));
- ASTM test protocols that allow a factory-applied vapor barrier should not be used to compare to bare (unfaced?) insulants;
- Typically, ASTM standards do not reference international EN or DIN standards, so if materials have been tested according to such standards (maybe as 'equivalent'), the listed lambda values may not actually comply with ASTM.

Application Considerations

- Flexible insulants that do not wrap smoothly may leave small air gaps that reduce thermal performance;
- Any risks posed by insulants that must be glued together to achieve requisite thicknesses should be examined;
- Many insulant manufacturers do not indicate they use independent, third-party verified and audited test results;
- Several insulant suppliers do not fully disclose data and the assumptions/caveats behind the data (e.g. that k-factors may not be accurate at compressive loads >2psi);
- Certain insulant manufacturers use small-print caveats such as "The values were determined by evaluating a polynomial...";
- Ensure the product specification sheet represents the actual product delivered.

SUMMARY

Product formulations and standards are evolving quickly, so due diligence is increasingly required to ensure adequately informed decision-making. [Review this Series](#) of Technical Bulletins to engage in the subject material.