

QWIK GUIDE: AEROGEL INSULATION

This Qwik Guide is a summary of Dyplast’s [Technical Bulletin 1215](#). Aerogel insulation has been advertised as the latest/greatest advance in insulation technology. “Generic” aerogel (not Cryogel® Z) has been described as:

- 99% porosity; extremely low density solid
- the world’s most effective thermal insulator
- 97% of the volume is composed of air in extremely small nanopores.

Aspen Aerogels® is an aggressive advocate of their Cryogel® Z aerogel insulant, described as “aerogel integrated into a fibrous batting reinforcement”, and its physical properties are very different from those described above. In fact, Cryogel Z:

- is the heaviest insulant (10 lb/ft³) offered for cryogenic (e.g. LNG) applications,
- purportedly has excellent thermal conductivities under specific conditions, yet the k-factor of ISO-C1®/2.5 polyiso is actually better at -265°F (-165°C),
- has k-factors measured under a compression of 2 psi, which begs questions regarding: 1) the actual compressive load on the inner-most layer of a multi-layer installation of Cryogel Z, and 2) the k-factors under higher loads,
- is fibrous, and thus depends upon an integral vapor barrier for water/moisture intrusion,
- does not reference independent, third-party verification or audit of its physical properties.

So! Is Cryogel Z a revolutionary insulant that will eventually dominate “cold” mechanical insulation applications? Or at the other extreme does Cryogel Z have fatal flaws? A study of aerogel insulation at LNG temperatures conducted by Kaefer (with offices, subsidiaries and joint ventures in more than 50 countries, the world's largest provider of complete insulation solutions) concluded “The moisture ingress results in a degradation of the thermal properties as expected and should be considered in the design.” [Contact Dyplast](#) for a copy of the Kaefer paper. Dyplast’s [Technical Bulletin 1215](#) addresses the effectiveness of Cryogel Z, with some comparisons to ISO-C1/2.5.

Since there continues to be considerable misinformation about aerogels on the internet that is not at all representative of the Cryogel Z product, it may be instructive to note that Aspen Aerogels has evolved their statements on their website to presumably more accurately represent the product:

Old literature Claims still on the internet	Current Statements on aerogel.com
“Lowest k-value of any cryogenic insulation material”	“Extremely low thermal conductivity” (i.e. k-value)
“Cryogel® Z and Pyrogel® XT are lighter than other insulation materials”	“Maximum thermal protection with minimal weight and thickness” [note Cryogel Z is nominally 10 lb/ft ³ while ISO-C1/2.5 is four times lighter at 2.5 lb/ft ³]
“Hydrophobic with excellent resistance to moisture. (Its nanopores form a tortuous network of “dead end” clusters that resist vapor penetration, condensation, and ice.)”	“Factory-laminated vapor retarder provides moisture protection”
“Remains totally flexible” [in cryogenic applications]	“Resilient Flexible” per ASTM C1101 [whether at cryogenic temperatures is not clear]
“Aerogels pose no chemical threat to the environment”	“See SDS for complete health and safety information”
“No respirable fibers”	Not referenced

[Contact Dyplast](#) for more information.

