

Polyiso vs. Calcium Silicate Pipe Insulation for Temperatures up to 350°F (176°C)

BACKGROUND

Conventional wisdom has been that Calcium Silicate (CalSil) is used to insulate high-temperature pipes, while polyisocyanurate (polyiso or PIR) is used on cold pipe. The fact, however, is that there is a temperature range where the insulants overlap - - generally from *ambient temperature* to +350°F - - within the domain of condensate, hot water, low temperature steam, and chemical/pharma process. This Qwik Guide addresses the pros/cons of each insulant within that range.

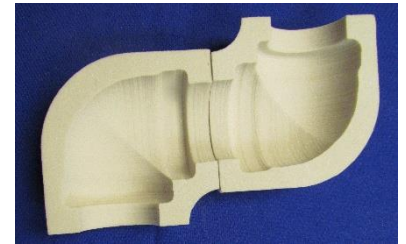


CalSil

CalSil is a rigid pipe insulant that is very heavy at 15 lb/ft³, typically applied on high-temperature pipe from 250°F to well over 1000°F. It has relatively poor thermal conductivity, but high compressive (>100 psi). CalSil also has an excellent rating for Flame Spread/Smoke Developed, and is considered noncombustible. It is relatively expensive, as addressed below, and since it is fragile breakage during shipping and handling must be considered.

Polyiso

Polyiso is a thermoplastic rigid foam manufactured as large bunstock and subsequently fabricated into pipe half-shells or special shapes for fittings and equipment. Polyiso has roughly 50% better thermal resistance than CalSil, allowing thinner pipe segments at substantially less weight. In fact, Dyplast ISO-C1 series products have densities from 2 to 6 lb/ft³ and Dyplast's ISO-C1/6.0 has compressive strengths exceeding >100 psi and Flexural Strength of 221 psi. ISO-C1 is effective from -297°F to +300°F, and ISO-HT can be used up to 350°F continuous and 375°F intermittent.



PRO/CON SUMMARY

- Polyisocyanurate (ISO-C1®) has 50% better thermal insulation properties than the best CalSil suppliers at 200°F
- ISO-C1/2.0 polyiso is roughly half the cost of CalSil pipe insulation per linear foot at the same thickness
- CalSil requires thicker pipe segments since it has poorer R-values, thus almost doubling the volume required
 - Thicker applications mean more shipping weight/volume and storage volume prior to installation, more jacketing, and tighter spaces between pipes
- The weight of CalSil is 7.5 times more than ISO-C1/2.0, and 6 times more than ISO-HT
 - CalSil insulation, 2 inches thick, on 3 linear feet of 3-inch IPS pipe, could weigh 15 lbs; while ISO-C1/2.0 may require only 1 or 1.5 inch thickness (depending on process temperatures), and would weigh only 1.2 to 1.8 lbs; thus, the polyiso would require fewer pipe hangars, less vapor barrier, jacket, etc.
- The weight of CalSil combined with its fragility make it subject to breakage, potentially further increasing installation costs
- At below-ambient temperatures there is a probability of condensation, so CalSil is problematic given its high water absorption and water vapor transmission properties.

CONCLUSIONS

Within the temperature range from ambient to +350°F, polyisocyanurate insulants (particularly ISO-C1® and ISO-HT®) have much better thermal insulating performance than CalSil, at a significantly lower material cost, dramatically less weight, and lower installation costs. Thus, the question is “why use CalSil in this temperature range”?