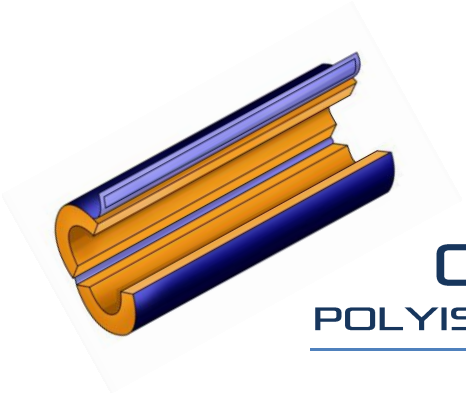

QWIK GUIDE:
POLYISOCYANURATE AND EXTRUDED POLYSTYRENE

BACKGROUND

Polyisocyanurate (PIR or polyiso) and Extruded Polystyrene (XPS) are each used in mechanical equipment applications such as chilled water, cooling water, refrigeration, and process applications operating at temperatures below ambient. There are a number of manufacturers of each worldwide, with five each or less in North America. Physical properties of PIR and XPS are quite different, and indeed the properties vary among manufacturers of the *same* class of insulant.

THERMAL CONDUCTIVITY

Insulation over pipe and equipment has a singular purpose - - *to insulate*! Thus when an engineer/specifier selects an insulant, the most obvious parameter to examine is thermal conductivity (k-factor) - - the lower the better, and ideally measured at the temperature of the application since k-factor varies with temperature. The aged k-factors of the leading 2 lb/ft^3 (pcf) density PIR brands range from 0.18 to 0.19 Btu·in/hr·ft^{2}·°F as tested per ASTM C518 at 75°F.

The table below indicates the k-factors advertised by the three leading XPS manufacturers, measured at 75°F per ASTM C518. A PIR product is added in the last row for comparison. Note that the Foamular pipe billets are Type IV per ASTM C578 (a minimum density of 1.45 and minimum compressive strength of 25 psi). The other XPS products are Type XIII, with a minimum density of 1.6 and minimum compressive strength of 20 psi.

COMPANY	PRODUCT	DENSITY	COMPRESSIVE STRENGTH	K-FACTOR
Owens Corning®	Foamular® pipe billets	1.55 pcf	25 psi	0.200
Dow®	Styrofoam® pipe billets	1.6 pcf	20 psi	0.259
ITW	XPS PIB	1.6 pcf	20 psi	0.259
Dyplast®	ISO-C1®/2.0	2.04 pcf	25 psi	0.180

PIR's k-factor thus maintains a significant advantage over the latter two suppliers of XPS (44%), yet less compared to the former (11%).

XPS is indeed an often-specified, and often-used product in chilled water and ammonia refrigeration applications. Yet polyiso has lower initial and life-cycle costs, delivers superior thermal conductivities with comparable or better properties such as strength, water absorption, and so forth. Thus our conclusion is that polyiso is the superior product for refrigeration and chilled water applications.

XPS is rarely used in lower temperature applications, and exceedingly rare in cryogenic applications such as LNG. Polyiso on the other hand is extensively utilized in LNG facilities, and has decades of successful performance.

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