

NANOPORE
INSULATION



FORMAN
BUILDING SYSTEMS

0800 45 4000 www.forman.co.nz



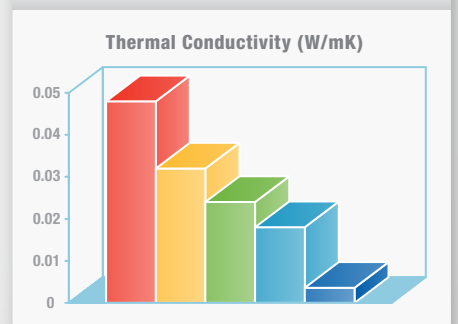
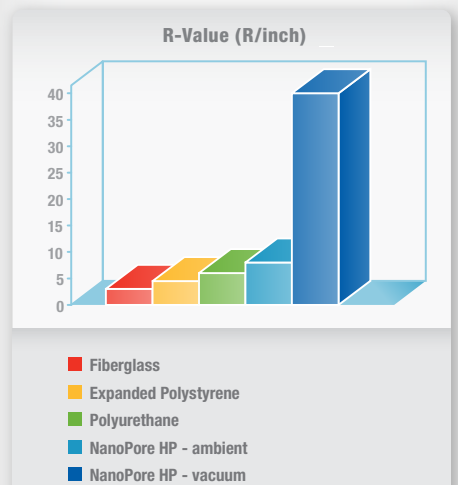
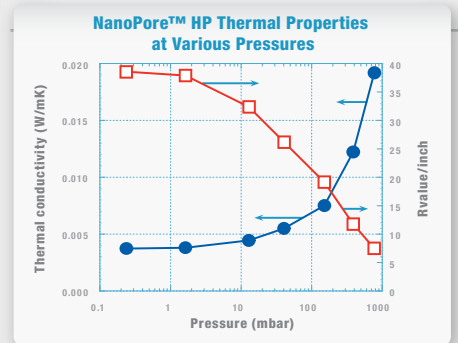
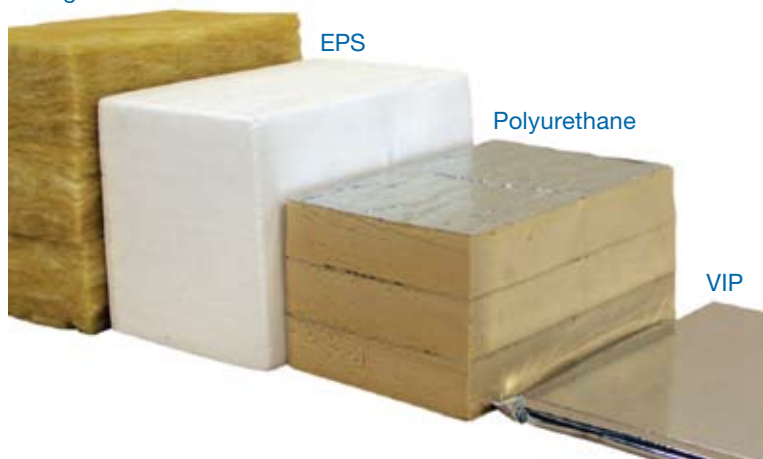
NanoPore™ VACUUM INSULATION PANELS

NanoPore™ Thermal Insulation

NanoPore™ ultra thermal insulation is a nanoporous solid with both low density and small pores. The composition is amorphous silica and carbon in a three dimensional, highly branched network of primary particles (2-20 nanometers) which aggregate into larger particles. It has 30 to 100 nm pore sizes which are >100 times smaller than conventional insulation. It is this nano-scale porosity that gives NanoPore its excellent thermal performance. Gas molecules within the insulation experience the “Knudsen effect” which virtually eliminates gas energy exchange as gas molecules have a higher probability of colliding with the pore walls than other gas molecules. Solid phase conduction is low due to the low density and NanoPore’s proprietary infra-red opacifier greatly reduces radiation.

Comparison graphs of NanoPore™ to other insulation such as polyurethane, expanded polystyrene (EPS), and fiberglass are illustrated to the right. Thermal conductivity and R value per inch are inversely related. The total resistance to heat transfer is the product of the R value per inch and the thickness. For example, a one inch thick NanoPore™ HP vacuum panel provides the same insulation value as over twelve inches of fiberglass or eight inches of polystyrene foam. The image below shows the equivalent thicknesses of these insulating materials to achieve equal thermal performance.

Fiberglass

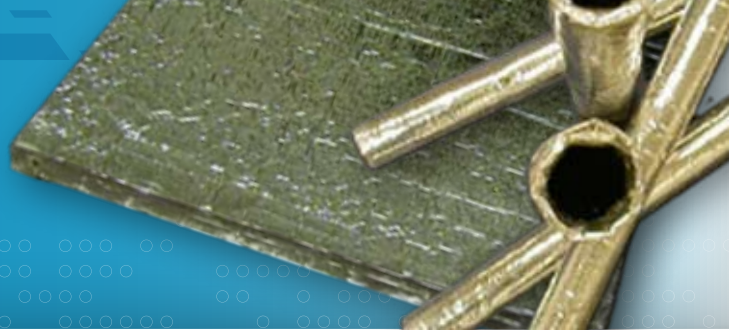


Sealed Air



NANOPORE™

VACUUM INSULATION PANELS



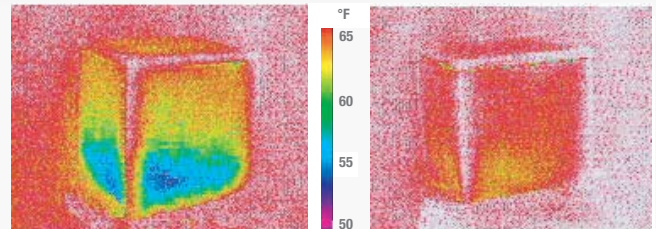
Vacuum Insulation Panels

NanoPore™ insulation begins as a powder which is pressed into a board of the desired thickness. These are cut to size, encased in a barrier film, and sealed under mild vacuum. The completed product is a Vacuum Insulation Panel (VIP). Thickness can range from ~1/16" (2 mm) to over 1" (25 mm), and panel size from less than 1" (25mm) square to a maximum of 24" (600mm) x 36" (900 mm). Standard thicknesses are 1/8" (3.2 mm), 1/4" (6.3 mm), 1/2" (12.7 mm), and 1" (25.4 mm). A standard NanoPore VIP can operate in a temperature range from cryogenic temperatures of -330°F (-200°C) to 360°F (180°C), the maximum continuous working temperature of our normal barrier film. For higher temperature applications, custom vacuum enclosures made from metal or another impermeable skin may be used.

Applications for NanoPore™ Thermal Insulation

- Products that Require High Energy Efficiency
- Applications where the Lowest Conductivity Insulation is Critical
- Space Critical Projects
- Products Requiring Close Thermal Tolerances
- Weight Critical Applications

Current applications include shipping containers, pipe insulation, refrigeration, coolers, and many others in such diverse industries as consumer and industrial appliances, electronics, pharmaceuticals, cryogenics, aerospace, and automotive.

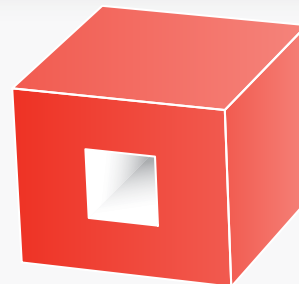


30mm thick Polystyrene insulated box filled with dry ice.

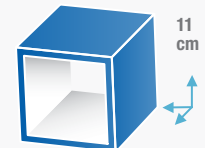
The same box lined with 6mm thick NanoPore® HP vacuum panels and filled with dry ice.

The NanoPore™ Advantage

- Performance Unmatched in Conventional Insulation Materials
- Reduction in Device Size
- Shipping Containers Smaller package = Less shipping costs.
- Environmentally friendly and recyclable
- No CFC's or HCFC's. Nonflammable.
- VIPs – Cryogenic to 360°F (180°C)
- NanoPore core – Cryogenic to > 1470°F (800°C)



50 mm thick expanded polystyrene
Insulation volume = 7000 cm³
External heat transfer area = 0.240 m²
Internal volume = 1000 cm³



Equivalent VIP thickness = 5 mm
Insulation volume = 330 cm³
External heat transfer area = 0.072 m²
Internal volume = 1000 cm³



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