

### **POLYURETHANE ADVANTAGES IN COMPARISON TO POLYSTYRENE**

Main differences between PUR-cored and EPS-cored panels relate to their core properties. When it comes to selecting the best overall insulation product for walls; ceilings and roofs, polyurethane is the product of choice. No other foam insulation has the perfect combination of features which is vital for long term performance.

**The following are among the characteristics and advantages of high-pressured injected polyurethane panels in comparison to polystyrene insulated panels.**

<b>POLYURETHANE VS POLYSTYRENE</b>	
<b>POLYURETHANE</b>	<b>POLYSTYRENE</b>
<ul style="list-style-type: none"> <li>• Shorter manufacturing time, as our machines dispense the exact foam into panels skins immediately from large chemical mother tanks.</li> <li>• PU cost effectiveness: PU gives you more for money spent in energy saving, machines will work more efficiently because of limited temperature loss because of higher foam density;</li> <li>• Reduction in energy consumption;</li> <li>• Toxic to insects, pests and rodents;</li> <li>• Thermally stable - does not soften or melt;</li> <li>• Low thermal co-efficient factor;</li> <li>• Closed cell technology, superior in thermal / strength;</li> <li>• Resistant to flex fatigue and wear;</li> <li>• Moisture resistance to mildew, mould and fungus;</li> <li>• Highly resistant to most counter chemicals;</li> <li>• Excellent resistance to abrasion;</li> <li>• Delivers higher R and k-value;</li> <li>• Longer structural stable length spans;</li> <li>• Known for extra durability, stability and strength;</li> <li>• High load bearing capacity;</li> <li>• High density injected insulation for improved thermal properties. Starting from 40kg per m3;</li> </ul>	<ul style="list-style-type: none"> <li>• Longer manufacturing times. EPS suppliers have constant raw material shortages, hot wire cutting breakages, low manufacturing/supply capabilities;</li> <li>• More susceptible to invasion by insects, pests, and rodents;</li> <li>• Poor fire resistance – softens and melts;</li> <li>• High thermal co-efficient factor;</li> <li>• Open cell (voids between the beads);</li> <li>• More susceptible to moisture absorption;</li> <li>• Disintegrates to most solvents (petroleum-based products).</li> <li>• Absorbs moisture which leads to degradation in R-value;</li> <li>• Weaker against high temperatures (sun burning);</li> <li>• Low density insulation (lower thermal properties) Ex grade is 12 DV commonly used 14DV to 16DV;</li> </ul>

<b>HIGH THERMAL STABILITY</b>	
<ul style="list-style-type: none"> <li>• Thermal-set material rigid polyurethane foam is thermally stable. It does not soften or melt. Dissociation of chemical bonds begins at a temperature of approximately 200 ° C.</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded polystyrene begins to soften and change its properties at a temperature of approximately 90 ° C.</li> <li>• Once on fire EPS becomes a liquid flame igniting and reigniting itself and other combustibles</li> </ul>

<ul style="list-style-type: none"> <li>• High thermal stability, its growth possibilities by changing the structure of the polymer. The use of flame retardants gives rigid polyurethane foams superior fire resistance, compared to expanded polystyrene.</li> <li>• Polyurethane is highly resistant to most counter chemicals. Polyurethane foam has good resistance in a chemical environment and does not easily change its properties.</li> <li>• Because the thermal conductivity of the foaming agent used in polyurethane is much lower than air (good thermal insulation performance), the thermal insulation performance of polyurethane rigid foam is better than those of air-only materials such as polystyrene. Its unique closed cells and high resistance to gas diffusion ensure a superior long-term insulation performance.</li> <li>• Its structure contains more than 90% closed cells.</li> <li>• Polyurethane panels have better fire safety and can withstand temperatures (without side effects) up to 250 ° C.</li> <li>• Longer lengths have superior strength and rigidity. Strength: The panels have high compressive and tensile strength, making them suitable for load-bearing applications.</li> </ul>	<ul style="list-style-type: none"> <li>• Good thermal stability, however it has a poor fire resistance and does not withstand heat well. It softens and changes its properties. It can melt or burn and produce toxic smoke through combustion.</li> <li>• Expanded polystyrene is more sensitive to the action of oil or gasoline-based solvents, certain adhesives, and some insecticides.</li> <li>• EPS is not a thermal-set plastic and will begin to soften and melt. Melting can fuel a fire. Polyurethane has a distinct advantage.</li> <li>• Polystyrene is an open-cell insulation foam. Air pockets can occur between cells.</li> <li>• Polystyrene withstands to temperatures at approximately 80 ° C.</li> <li>• Roof or ceiling panels are susceptible to UV degradation, due to sun burning or heat making the Polystyrene panels used in this application weaker.</li> </ul>
<b>WATERPROOFING</b>	
<ul style="list-style-type: none"> <li>• Due to their closed cell nature and no voids between the cells, Polyurethane has an excellent permeability rating and superior moisture resistance and rigidity.</li> </ul> <p>Polyurethane insulation is made up of individual cells that are either open or closed. Open cell insulation tends to be softer and more flexible as the cells are not completely encapsulated. However, with closed cell, the cells are completely closed and firmly pressed together which adds structural strength and drives out air and moisture (does not retain, nor transfer water) and will protect the building for a long period.</p>	<ul style="list-style-type: none"> <li>• Polystyrene has spaces between the cells through which moisture can easily permeate through.</li> </ul> <p>Expanded polystyrene is hygroscopic/open cell, which means it retains water, which over time can lead to the appearance of bacteria; mildew/mold and fungus. There is more susceptibility to water absorption, which can reduce insulation performance and potentially cause structural damage.</p>

<p>The closed-cell structure of the anti-corrosive polyurethane rigid foam and the surface material used, ensure superior air and water vapor resistance. Possesses dimensional stability.</p>	
<b>R-VALUE</b>	
<ul style="list-style-type: none"> <li>Higher R-values than other panel types. An R-value is the resistance to heat flow in an insulating material. The higher the R-value, the greater the insulating power. Polyurethane offers a higher R-value than most other options and meets the requirements for walk-in coolers and freezers.</li> <li>Low thermal co-efficient factor. 0,022 W/MK to 0,028 W/MK. This makes it one of the most efficient insulation materials available on the market.</li> </ul>	<ul style="list-style-type: none"> <li>The R-Value of polystyrene panels is far below that of polyurethane panels. Stable unless exposed to moisture. Expanded polystyrene will absorb moisture which can cause degradation in the R-value.</li> <li>High thermal co-efficient factor. Thermal conductivity varies between 0.029 and 0.039 W/MK depending on bearing strength/density and the average value is ~0.035 W/MK.</li> </ul>
<b>WIND LOAD</b>	
<ul style="list-style-type: none"> <li>180-200 MPH</li> </ul>	<ul style="list-style-type: none"> <li>140-160 MPH</li> </ul>

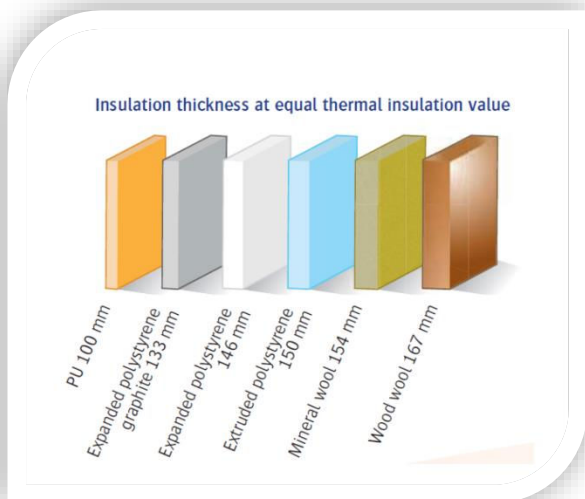
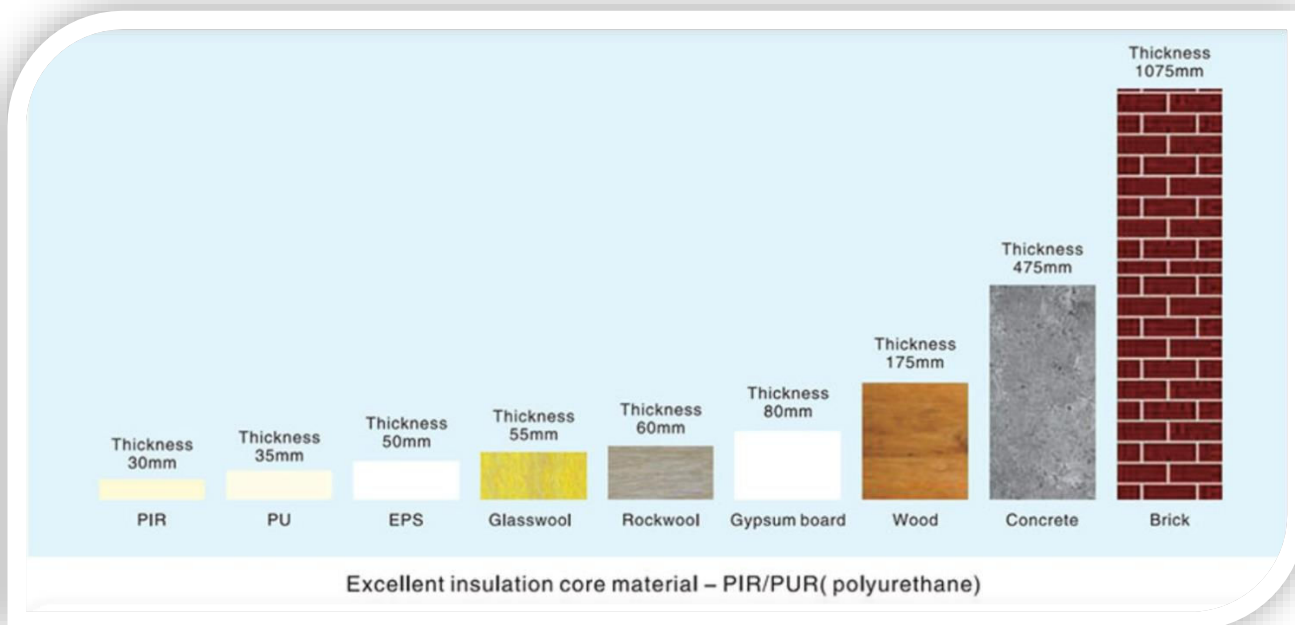
### In conclusion

Polyurethane panels have many advantages over polystyrene. The material covers the entire interior of the panel and prevents energy loss. It has excellent mechanical, chemical and adhesive properties. Polyurethane panels are water-resistant, chemical resistant and do not normally catch fire. Polyurethane is a versatile material for any type of building. It's high thermal transmittance and elasticity makes it an excellent choice for roofs and other structural applications. Polyurethane foam withstands physical attacks and stresses more than polystyrene and performs better in load bearing and thermal control applications.

***Polyurethane is also highly recommended in the food industry due to its efficiency and safety.*** Preserving the cold chain is key for energy efficiency in the food industry, along with the correct preservation of food. To achieve both objectives, polyurethane is used as a thermal insulator throughout the entire process: from transport to storage, through the conservation and distribution of the products. It is a cost-effective solution which is one reason why polyurethane is the most specified insulation for cold storage applications. Polyurethane insulations greater heat resistant properties mean a refrigeration system does not have to work as hard to retain inside air cold which leads to energy saving and in turn, operating costs.

Polyurethane plays an essential role both in food and beverage processing and in its storage at a controlled temperature. Its application (either indoors or outdoors) serves to achieve effective insulation, which allows maintaining optimal temperatures.

**DIAGRAMS**



PANEL EFFICIENCY RATING						
		R10	R20	R30	R40	R50
4" Thick (Standard)	Polyurethane Panel	[Progress bar]				
	Polystyrene Panel	[Progress bar]				
5" Thick (Optional)	Polyurethane Panel	[Progress bar]				
	Polystyrene Panel	[Progress bar]				