U.S. COOLER

Customers are saving thousands of dollars with high-tech insulation.

SAVE ENERGY SAVE MONEY

What's Important?

When buying a walk-in cooler or freezer, the initial cost of the walk-in is almost always the deciding factor. The cost to operate the walk-in is rarely considered. You may think all walk-ins perform about the same, but this mistake can cost you dearly.

You pay for the walk-in once, but if the insulation is inefficient, you will pay much higher operating costs over the life of the walk-in. In the following, you will find an evaluation of two types of insulation that are being used in walk-in coolers and freezers.

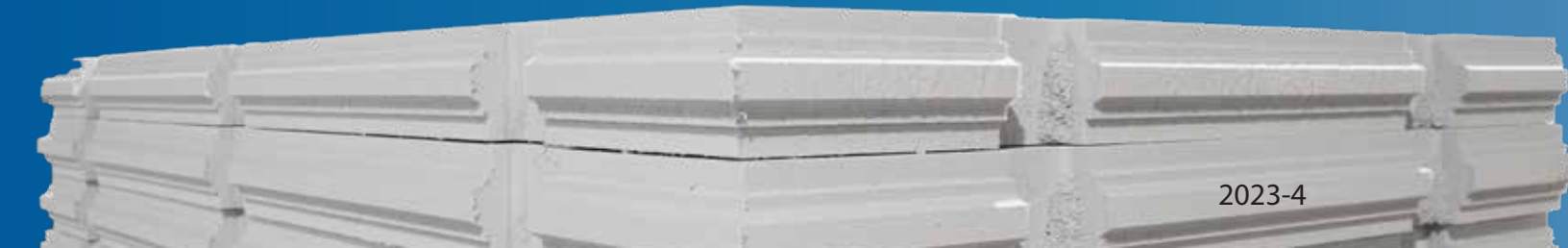
Construction

Walk-in coolers are generally constructed of modular panels made of insulating material and protective skins. The protective skins can be made of metal or fiberglass. The purpose of the skin is to protect the insulation, which is fragile and cannot be used independently.

The insulation is usually plastic foam material that is either injected or bonded between the metal skins. The insulation material provides the walk-in with resistance to heat flow, which allows the walk-in to be refrigerated and hold cold temperatures.

Types of Insulation

In the walk-in cooler and freezer business, there are two common types of plastic foam insulation, polyurethane and extruded polystyrene. Extruded polystyrene is not to be confused with expanded polystyrene, which is also used in walk-in coolers. Expanded polystyrene is white and has different structural and insulating properties.



Extruded Polystyrene

The newest insulation to be used in walk-in coolers and freezers is extruded polystyrene foam. It has been used very successfully for years in insulating areas of high moisture exposure and high R-value requirements, including low temp warehouses, underground concrete insulation and house sheathing. This insulation is planned to exact tolerances of width, thickness, and length. The finished foam is then bonded between two sheets of metal and run through an automated press to form the walk-in panels.

Extruded Polystyrene Insulation is Ecofriendly

- **LOW GWP FOAM**
  Currently, 11 states and Canada have implemented a phase-down in hydrofluorocarbons in an attempt to reduce the emission of greenhouse gases. At US Cooler, we are phasing in the more sustainable Low GWP foam across all territories, even in those states that haven't adopted the stricter standard.
- **2009 ENERGY ACT COMPLIANT**
  U.S. Cooler's Products conform to all regulations set forth in section 312 of the "Energy Independence and Security Act of 2007". This document can be reviewed at www.uscooler.com.
- **ENERGY EFFICIENT INSULATION**
  The goal of U.S. Cooler's high quality walk-ins is to obtain and maintain the highest possible R-value, ultimately resulting in energy and cost savings.
- **MOISTURE RESISTANCE**
  The closed cell structure of Extruded Polystyrene increases the foam's resistance to moisture penetration, allowing it to sustain a high thermal opposition through the life of the walk-in.
- **CONTAINS NO CFCS**
  CFCS contribute to global warming; Extruded Polystyrene does not contain CFCS.
- **100% RECYCLABLE**
  U.S. Cooler's Extruded Polystyrene panels are 100% recyclable - by using recycled materials in the manufacturing of the panels, U.S. Cooler is protecting the environment.

Polyurethane

Polyurethane can be applied two different ways in the construction of walk-in coolers or freezers. One method is to pour or inject the two-part plastic foam between two sheets of metal in a mold and produce a walk-in panel. Another method, less frequently used, is to box pour a block of foam 4 feet x 20 feet, then cut the block to panel thickness to be laminated between two sheets of metal to form a walk-in panel.

What difference does it make?

Insulation is NOT all the same. Each type of insulation brings with it pros and cons that must be evaluated for each individual application requirement. The two factors that can affect the insulation's performance are temperature and moisture.

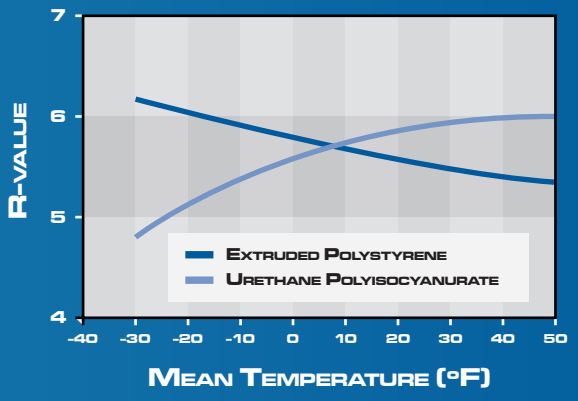
Temperature

Insulation performance is usually rated in what is termed R-value. The higher the R-value, the more resistance to heat flow, therefore the better its insulating properties. Some insulation performs better the lower the mean temperature and some perform better at higher temperatures. Therefore, the operating temperature of the insulation can affect its performance.

When looking at Foam-In-Place Polyurethane and Extruded Polystyrene at -10°F to 50°F mean temperature, Foam-In-Place Polyurethane has a lower R-value the lower the mean temperature and extruded polystyrene has a higher R-value the colder the application.

Therefore, extruded polystyrene performs better at lower temperatures and polyurethane R-value actually performs worse at lower temperatures.

R-value vs. Mean Temperature



Moisture

The largest factor that can affect the insulation's performance is moisture. Usually insulation is expected to keep something warmer or colder than the other side of the insulation. This temperature differential (TD) causes, in many cases, a dew point to form inside the insulation. Once the dew point is reached, moisture is trapped. As water has a much lower R-value than insulation, the water reduces the R-value of the insulation. The more water resistance the insulation has, the better the insulation performs in high TD situations.

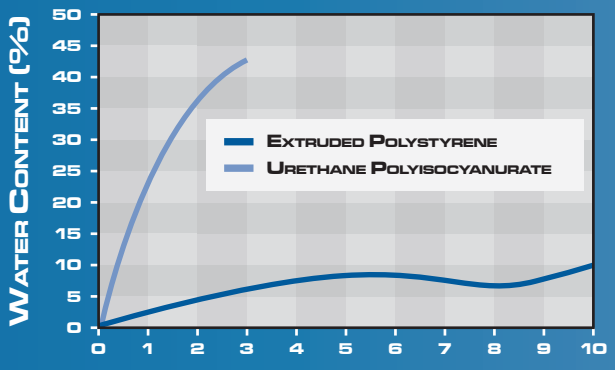
Since walk-in coolers and freezers are high TD applications, sometimes 110°F on the outside and -20°F on the inside, the higher the moisture resistance of the insulation, the better. When looking at the water vapor permeance of the different foams, it is found that polyurethane allows more water vapor permeance and extruded polystyrene the least. Since water lowers the R-value of insulation, extruded polystyrene retains its R-value better than polyurethane.

Why are some companies claiming polyurethane has the highest R-value?

When some companies quote R-values of 32 to 34 for polyurethane walk-ins, they are quoting what is called fresh R-values, the R-value you have when you first take the insulation out of the mold. The operating temperatures of the insulation are not being considered. They are quoting R-32 to R-34 at 75°F mean operating temperature. The 32.5°F mean temperature of a walk-in freezer and the effect of moisture penetration, as in real life applications, are not being considered.

To find the actual operating R-value of any insulation, you have to look at how it performs in real life applications. Since a walk-in freezer usually operates at -10°F inside and 75°F outside, a 32.5°F mean temperature needs to be used. Since moisture and aging mostly occur up front, a 60-month decreasing R-value needs to be considered. In 5 years, the R-value of 4" polyurethane will drop to an R-value of 6, making 4" extruded polystyrene nearly 3 times that of urethane.

Water Vapor Absorption

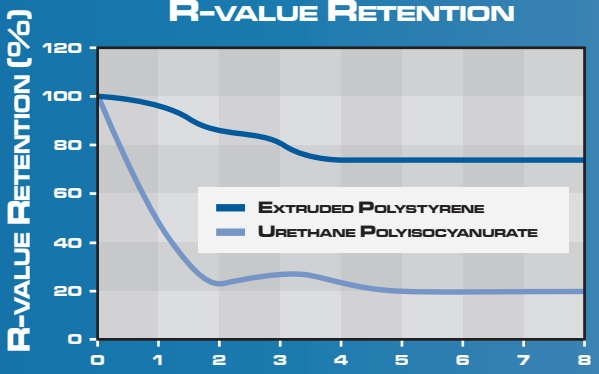


(40°F mean at .65 psi driving force)

see reference 1

As you can see in the following graph, polyurethane loses over 75% of its R-value in five years and extruded polystyrene loses only 25% of its R-value. Therefore, extruded polystyrene's performance, in actual walk-in conditions when moisture is considered, is over three times that of polyurethane.

R-value Retention



see reference 2

What does this all mean to you?

Extruded polystyrene can provide thousands of dollars in energy saving during the life of the walk-in.

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