

Spray Foam Insulation Helps Building Owners Save on Energy and Improve Air Quality

Buildings account for 40 percent of the annual energy demand in the United States and generate 40 percent of the nation's greenhouse gas (GHG) emissions. Recently, spray polyurethane foam (SPF) has emerged as one of the fastest growing insulation products in the U.S., and it is making a major impact on lowering energy usage. As a leading global producer of MDI (methylene diphenyl diisocyanate), which is used to make SPF, Huntsman plays a key role in conserving energy and contributing to a sustainable planet.

"According to the U.S. Environmental Protection Agency (EPA), the average homeowner spends close to \$1,300 annually on heating/cooling utility costs. Studies show that 40 percent of that energy is lost due to air infiltration. SPF is the only insulating material that provides both an air and moisture barrier, and it greatly reduces outside noise. Buildings insulated with SPF have shown a 30 to 50 percent reduction in energy costs," says Monica Karamagi, Manager, Regional Marketing and Industry Affairs, citing customer feedback and internal case studies.

Compared to traditional fibrous insulation products, fewer inches of insulation are required to meet the government's R-13 wall insulation code. "With SPF you can either use less wall space than other materials to meet codes, or completely fill the wall to save even more energy and money" she says.

SPF is made by reacting MDI with a polyol blend resin. These components are pumped through heated hoses into a mixing spray gun. The liquids are mixed and spray-applied to walls and roofs using pressurized spray equipment.

Once the reacting liquid hits a surface, it expands 30 to 120 times to completely fill the void space and solidifies into a lightweight, yet highly durable polymer foam matrix. SPF seals and protects the interior environment from infiltration of hot air, cold air, moisture and sound. Its R-value reduces conductive heat transfer. Additionally, it creates a seamless air barrier and lowers the impact of radiant heat transfer. Various studies have shown home or building owners recover their initial costs within one to five years.

Applying SPF to the roof deck either during construction, or when replacing a roof provides a complete air seal with many benefits. When applied in homes on the underside of a roof deck to create an unvented attic, a building owner can reduce the size of the heating and cooling system up to 50 percent, and double or triple the life of the equipment. Air leakage between living space and attic is essentially eliminated, and dust and other allergens are reduced, creating healthier indoor air quality.

While SPF is the fastest growing product for insulating residential attics, walls and roofs, other types of polyurethane products are also making a difference in energy conservation. Polyiso sheathing is used on the exterior of structural sheathing to insulate entire walls of homes, including the framing, which accounts for at least 20 percent of the total wall area and often is uninsulated.

In commercial buildings, boardstock and insulated metal panels are typically used. It is estimated that 60-65 percent of all new or re-roofing commercial applications in the U.S. use polyiso boards. Insulated metal panels (IMPs) are made by injecting polyurethane between two metal face sheets like steel or aluminum and are installed on exterior walls and roofs of mainly cold storage and industrial buildings. IMPs are now being designed with a variety of aesthetically attractive facers, and are being featured as claddings in more traditional commercial and institution buildings.

Huntsman has the largest MDI plant in the Americas in Geismar, Louisiana, and Karamagi says the market for polyurethane insulation products continues to grow. "Green building programs like LEED (<http://www.usgbc.org/>), energy standards like the Ashrae 90.1 (<http://www.ashrae.org/home/>) and more stringent building codes such as the 2012 International Energy Conservation Code (<http://www.iccsafe.org/Store/Pages/Product.aspx?id=3800X12>) will lead to increased demand for polyurethane insulation."

Life Cycle Assessments (LCAs) conducted by industry associations have demonstrated the sustainability of PU insulation. LCAs assess environmental impact associated with all the stages of a product's life from raw material extraction through

materials processing, manufacture, distribution, use, repair and maintenance and disposal or recycling. "For both polyiso and SPF, much more energy is saved when these products are used in buildings, compared to the energy used to make the products. The LCAs have also shown that the environmental impact on other categories, such as eutrophication, acidification, and ozone depletion are all minimal," Karamagi says.

Benefits of polyurethane insulation

- Reduction of GHG emissions
- Reduction of energy usage to heat and cool buildings
- Reduction in construction material
- Reduction in size and extended life of heating and cooling units
- Elimination of air leakage between attic and living space
- Healthier indoor air quality