Saving Energy And Money With Spray Polyurethane Foam (SPF) Insulation
SPF Saves Energy

- ~40% of the overall US energy demand goes into the building sector
- ~40% of the energy used in buildings goes into heating and cooling
- SPF in the building envelope can reduce heating and cooling energy load by 30-50%

Source: EIA
How it Works

SPF Systems are 2 liquid components:

- Isocyanate (A-side)
- Polyol system (B-side)

Mixing the Components

“A” + “B” = SPF

These components are pumped through positive displacement proportioning pumps, through heated hoses to a mixing spray gun.
How It Works

- The liquids are mixed and applied by professionals using pressurized spray equipment.
- The two components react while being sprayed to form a urethane foam.
- The foam expands 30-120X to completely fill the void space, and solidifies into a light weight yet highly durable polymer matrix.
The Majority Energy Costs Are Lost From Poor Insulation

According to the U.S. Dept. of Energy (DOE), the average home spends $1,300 annually on heating/cooling utility costs. Studies show that 40% of that energy is lost due to air infiltration!

Source: 2007 Building Energy Databook, Table 4.21, 2005 Energy Cost Data
Residential And Commercial Building Envelopes

- Energy loss in a building is caused by both heat loss and air leaks
- Moist air that penetrates the wall system can result in mold, wood rot and pre-mature wall failure
- SPF provides greater thermal insulation than any other material
- SPF is the only insulating material that provides an air and moisture barrier, and it greatly reduces outside noise

**SPF Insulation**
- Outside: Keeps winter heat in, saving on heating bills
- Inside: Keeps summer heat out, saving on A/C cost
- No gaps, Seals air leaks, Keeps moisture out, Reduces noise

**Other Insulations**
- Outside: Leaves gaps, Air leaks in
- Inside: Less insulating value, higher winter heating costs and summer cooling costs
- Does not provide a moisture barrier
- More noise gets through
SPF Yields A Higher R-Value Per Inch

“R-Value” is a measure of insulating value. closed cell SPF has the highest insulating value.

SPF needs fewer inches of insulation to meet an R-13 wall insulation code. With SPF you can either use less than other materials to meet codes, or completely fill the wall to save even more energy and money.

R-Value per inch of Wall Materials

Source: 2007 Building Energy Databook, Table 4.21, 2005 Energy Cost Data
Residential SPF Applications
SPF Has Applications Throughout a Residential Building

- Window seal
- Door seal
- Exterior wall insulation
- Utility entry seal
- Attic/crawl space insulation
- Interior wall insulation
SPF insulation is professionally installed for an even and consistent thermal barrier. Insulated wall cavities with SPF provide not only thermal protection, but moisture and air barriers as well.
SPF On Residential Walls:
Saves Money By Saving Energy

- SPF applied to interior or exterior walls saves on energy costs by providing thermal insulation and sealing gaps and spaces in walls, lowering utility bills
- SPF acts as an air and vapor barrier, blocking moisture infiltration and condensation inside wall cavities
- SPF avoids thermal bridging between the outside environment and inside air, providing year-round air leakage and moisture/vapor protection

Exterior Wall SPF Insulation Schematic
Interior Wall SPF Insulation Schematic
SPF In Unvented Attics Saves Significant Energy

SPF insulation of the attic creates a total building seal for energy savings.
SPF Provides A Complete Air Seal When Applied to the Roof Deck

- **SPF Insulation in closed attic** can double or triple the life of HVAC equipment.
- **Air leakage between occupied space and attic** essentially eliminated.
- **Humidity controlled to levels below 50% with moisture barrier**.
- **Closed attic temperature** only few degrees higher than conditioned space.
- **Healthier indoor air quality** by reducing dust and other allergens.
- **Reduce HVAC system size** up to 50%.

**Huntsman**

Enriching lives through innovation.
Typical Insulation Weatherization Applications

- Attic Roof
- Garage Walls
- Basement Walls
- Window Seals
- Door Frames
- Vents and Fans
- Crawl Space/Storage
- Gaps/Crevices
- Electrical Outlets & Switches
- Window Seals
- Plumbing and Utility Access
- Outdoor Water Faucets
Commercial SPF Applications
SPF Provides Value In Many Different Commercial Building Applications

- SPF on built-up roofing
- SPF on metal roofing
- SPF in wood frame walls
- SPF in metal frame walls
SPF Can Be Applied To Either The Interior Or Exterior Walls

Interior Wall Application

Exterior Wall Application

Masonry Wall w/ Brick Veneer

Metal Stud Frame Wall w/ Brick Veneer
### Energy Efficiency, Building Comfort, And Structure Durability

#### SPF: Thermal Insulant
- Higher R-value than competitive insulants
- SPF completely fills the cavities and will conform to irregular shapes, slopes, and penetrations such as pipes, windows, doors and sheathing fasteners
- Elimination of thermal bridging through studs and gaps with exterior application

#### SPF: Moisture Barrier
- “Moisture poses the biggest threat to structural integrity and durability, accounting for up to 89% of damage in building envelopes”*
- Exterior application of SPF creates a seamless, monolithic vapor barrier

#### SPF: Air Barrier
- NIST estimates that effective air barrier systems could save up to 83% leakage in nonresidential buildings, which would save more than 40% on gas bills and more than 25% on electricity
- SPF meets / exceeds ABAA standards
- Advantages vs. other air barriers
  - Ease & speed of application (lower installation, labor costs)
  - Dual role as a thermal insulation material

#### SPF: Structural Enhancement
- SPF improves racking strength in frame wall constructions up to 300% (NAHB)

*Source: Construction Canada Journal, 1993*
Retrofitting With A SPF Roof Can Reduce Air, Heat And Moisture Infiltration

**Traditional Dark-colored Roof**

- Roofing membrane
- Board insulation
- Roof deck
- Fastener
- Gaps in board insulation

**Light-colored Spray Foam Retrofit**

- Light colored elastomeric coating
- SPF

<table>
<thead>
<tr>
<th>No additional R-value</th>
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<tbody>
<tr>
<td>Gaps in insulation at seams and joints allow air infiltration</td>
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<tr>
<td>Thermal bridging across fasteners can reduce effective insulation value by 1.5% to 31.5% depending on spacing</td>
</tr>
<tr>
<td>Moisture ingress occurs at seams and joints. Moisture can cause structural degradation and mold</td>
</tr>
<tr>
<td>2&quot; of 3pcf SPF can add additional thermal insulation of R-value 15</td>
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<tr>
<td>Seamless, closed cell SPF roofs minimize energy lost from air infiltration improving energy performance</td>
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<td>Thermal bridging across fasteners is eliminated</td>
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<tr>
<td>SPF roofs provide a seamless moisture barrier reducing the potential for moisture induced structural damage</td>
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SPF Roofs  Increased Versatility And Durability, Lowering Maintenance Costs

- SPF roofs can be installed in a number of situations
  - New roofs
  - Re-roofing (tear-off previous roof)
  - Re-cover (apply directly over existing roof)
- Versatility
  - Complex shapes and roof penetrations are easily managed
- Speed of installation lowers up-front cost
  - Minimal disruption to occupants during retrofit installations
- Durability
  - Service life of closed cell SPF roof >30 years*
    - 10, 15, 20-year recoating intervals are typical
- Low maintenance costs
  - Essentially leak-free performance
- Enhanced wind uplift resistance

Source: National Roofing Foundation
SPF Contributes to Sustainable Building
SPF Helps Meet Building Codes and Contributes to Green Building Certifications

- LEED®-H for homes and LEED® for commercial buildings
- ASHRAE Standard 90.1
- ENERGY STAR®
- IECC
- US Army Corps Building Air Tightness Requirements (ECB 2009-29)
- National Association of Home Builders Green Building Standard™ for homes