

Case Study

Oak Ridge National Laboratory

One of the major differences between spray foam insulation and traditional insulation is that it seals the building envelope to help prevent air leaks. But just how effective is it? BioBased Insulation[®] was part of a test to help quantify this.

A 1,200-square-foot home constructed by the Women Build Program of the Loudon County Habitat for Humanity in Loudon, Tenn. was insulated using BioBased 501[®], an open cell spray polyurethane insulation. Oak Ridge National Laboratory's Buildings Technology Center tested the home using a blower door to measure how well the building's shell or envelope prevents outside air from getting inside. The home insulated with BioBased Insulation[®] experienced only 0.08 air changes per hour (ACH) at 4 pascals of pressure.

As a point of comparison, a similar home in size was built by the Habitat group in 2005 with the same floor plan, and it was insulated with fiberglass. Upon completion, a blower-door test showed that the fiberglass-insulated home experienced 0.16 ACH at the same pressure conditions.

"The lower the number; the better the building envelope," said Jeff Christian, director of ORNL's Buildings Technology Center.

These results help quantify the effectiveness of BioBased Insulation[®] in air sealing a structure. According to EnergyStar, air leaks are responsible for 20 to 40% of the energy that is used in a home. Properly sealing a home's thermal envelope will increase its energy efficiency.

As another point of comparison, ORNL also worked with the local Habitat chapter to construct zero energy homes using Structurally Insulated Panels. SIPS are made by sandwiching a core of rigid foam plastic insulation between two oriented strand boards or OSBs.

"In those homes, the rate of natural air changes ranges from 0.04 to 0.08 ACH, which is very good," Christian said. "These most recent test results suggest that a well-built stick construction home with an envelope of polyurethane foam insulation such as BioBased Insulation[®] can come close to a SIP-constructed home in air tightness."

The air tightness of a home might not seem like an important detail, but according to the American Society of Heating and Refrigeration Engineers, most houses experience 0.35 air changes an hour at natural pressure. When the outside conditions include winds of 15 to 25 miles per hour, the number of air changes can increase drastically. What does this mean to a homeowner? Each year more than \$13 billion worth of energy leaks from houses through holes and cracks. That equates an average of \$150 per family in the United States each year.

Tight, energy-efficient homes save homeowners money, and with proper mechanical ventilation, they can have better indoor air quality than a leaky home. The home insulated with BioBased Insulation[®] included a supply-side ventilation system to provide fresh, filtered air into the home. By filtering and conditioning the air instead of counting on air infiltration through duct work or holes in the building envelope, homeowners are able to reduce moisture problems which could lead to mold and to block outside irritants and allergens.