

What's New in Insulation?

Improved materials and hybrid systems make it easier to build energy-efficient houses

by Tom O'Brien

Back in the early '80s, when I started building houses, choosing insulation was as easy as picking your favorite color: Pink, white, or yellow? It was understood that the word "insulation" referred to fiberglass batts. Super-insulation — the buzzword of the era — meant stuffing thicker walls full of thicker batts. Back then, it was all about R-value. Today we know that no insulation scheme can be successful unless it addresses air infiltration, moisture transport, and thermal bridging as well as heat transfer — and it must do so without breaking the bank.

Often what's called for is a systemic approach, in which the best qualities of two or more products are combined for maximum cost-effectiveness.

Recently some insulation companies have come out with so-called "hybrid systems" that purport to take the guesswork out of insulation planning. Others have introduced improved — or more environmentally friendly — versions of old stalwarts that can be used by themselves or as building blocks to assemble a superior insulation system.

Spray-On Air Barrier

There are plenty of hybrid insulation packages out there, but the *Energy-Complete System* has a foam compartment that sets it apart, says the maker. "The system combines a new latex-based sealant with our tried-and-true pink fiberglass insulation to deliver superior thermal and air-infiltration performance," says Owens Corning business development manager Chad Fenbert.

Most hybrid systems rely on a substantial coating of polyurethane foam to provide both insulating and air-sealing properties. Energy-Complete, however, takes a

minimalist approach and uses only what amounts to a sprayable caulk as an air stopper. Before the fiberglass goes in, every seam and joint that could provide a path for air leakage is coated with this minimally expanding (5-to-1 ratio) sealant, which Owens Corning calls the Air Infiltration Barrier.

Unlike conventional foams, the sealant remains flexible after it cures — so much so that it can actually be sprayed on top of stud faces to stop air movement through tricky wood-to-wood joints like corners and double top plates. "One of the unique features of this system," says Fenbert, "is that the material stays pliable through the life of the product, and when you install the drywall over the top, it actually has a gasketing effect." According to him, the



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sealant is so easily compressible even a 3/4-inch layer will have no effect on the drywall installation. The sealant is also well-suited for filling gaps around doors and windows without adversely affecting the frame, Fenbert says.

Compared with polyurethane foam, the EnergyComplete Air Infiltration Barrier appears to be remarkably nontoxic. Instead of head-to-toe coveralls and full-face respirators, installers are advised to wear long-sleeved shirts, gloves, and goggles; a dust mask is not needed unless the job site is particularly dusty. Other trades can continue with business as usual — they can even work in the same room — while the spraying takes place.

After gaps are sealed, the wall cavities can be filled with standard fiberglass

batts, high-performance batts, or blown-in fiberglass.

Owens-Corning does not claim any R-value for the Air Infiltration Barrier. In 2x4 construction, the company's standard batts are rated R-13; its high-performance versions and blown-in fiberglass are rated R-15.

EnergyComplete is available nationwide through certified contractors. Insulators who wish to join the program must complete a day-and-a-half training program and purchase proprietary spray equipment for the sealant. Fenbert says an EnergyComplete job typically costs twice as much as a standard fiberglass insulation package but 50 percent less than a premium insulation system. For more details, visit ocenergycomplete.com.

Soy-Based Spray Foam

Polyurethane foam is a first-class insulation, but it's expensive and its production gobbles up boatloads of petroleum. Since 2003, BioBased Technology has been working to lessen at least one of those drawbacks. "Our commitment is to increase the sustainability of spray foam without reducing the performance," says brand manager Jennifer Wilson.

BioBased Insulation products are unique, Wilson says, because of how the company makes the "polyols" — the key ingredients in the "B side" that react with the isocyanates in the "A side" to unleash the chain reaction that creates polyurethane. Whereas most polyols are made entirely from petroleum, BioBased Technology's formulations are heavily soy-based. Its Agrol polyol, which was introduced in 2006, contains 96 percent soybean oil

and only 4 percent petroleum, according to the company.

BioBased Insulation also uses water in place of chemical blowing agents, Wilson says.

Once the foam has cured, its "bio-content" ranges from 3 percent to 16 percent, depending on the product. Highlights of the product lineup include BioBased 501w, a 1/2-pound open-cell foam introduced in 2003, and BioBased 1701S, a 1.7-pound closed-cell foam released in 2006 — the first product formulated with Agrol polyol. In January the company launched BioBased 502, a second-generation open-cell foam that uses the Agrol polyol and has the highest bio-content of all BioBased products.

Installation can be arranged through a nationwide network of certified installers. Pricing is competitive with petroleum-based foam insulation. For more information, visit the company's Web site (biobased.net).



A Greener Batt



Cellulose is widely regarded as the green standard of insulation, but fiberglass may be catching up. *Sustainable Insulation* from CertainTeed is a brand-new fiberglass batt that's manufactured using organic binders and a high percentage of post-consumer recycled glass. Unveiled at this year's IBS, it's been on the market only since March.

The product is made at two CertainTeed plants, one in California and one in Alberta, Canada. Interestingly, the recycled-glass content of the Canadian product is a whopping 70 percent, while the American version is an unremarkable 35 percent. Why the huge difference? "It's because the Canadian culture is more prone to recycle," says Rob Brockman, a marketing manager for CertainTeed. "In Canada, high-quality recycled cullet — the technical term for crushed, post-consumer glass — is readily available and it's available everywhere. We don't want to have to ship cullet from Georgia to California just to make our product. That's not a very sustainable practice."

According to Brockman, both plants were completely redesigned to signifi-

cantly reduce energy consumption and incorporate the latest glass-spinning technology. He also points out that the new batts — which are a creamy tan color — have won praise from workers in the field because they cut cleanly on the first stroke, don't dull knife blades, and are significantly less dusty and itchy than their compatriots in the company's "yellow" line.

Sustainable Insulation is manufactured in all standard sizes, thicknesses, and facings, but in this country it's available only in California and parts of the West Coast. (The Canadian version is available in Manitoba and the western provinces.) As part of its commitment to sustainability, CertainTeed confines shipping of raw materials and finished products to within 500 miles of the factories, Brockman says. The company plans to retool enough plants to eventually make the product available throughout North America.

U.S. purchasers should expect to pay about 5 percent more for Sustainable Insulation than for CertainTeed's comparable yellow products. Go to certainteed.com for further details.



Superior Cellulose



These days, no one whose opinion matters denies that cellulose is a first-rate insulation material. But if you want to start an argument, just bring up the subject of quality control. Unlike the fiberglass industry — which is dominated by a handful of large manufacturers whose uniform offerings are available coast-to-coast — cellulose producers tend to be small local operators, not all of whom are equally meticulous about turning out a consistently high-quality product.

Installers routinely complain about clogs and equipment malfunctions caused

by roughly processed newsprint ("It's no good if you can still read the headlines," one installer told me) or contaminants like mixed paper, plastic bags, and who knows what else.

In recent years, several manufacturers have tried to address these problems. The latest is FiberAmerica, a startup operation that opened its doors last September in a brand-new \$5.5 million factory in Allentown, Pa. Under its *Green Seal* brand, the company offers a variety of formulations for loose-fill and damp-spray applications.

FiberAmerica marketing specialist

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George Day says that in addition to producing cellulose in what he calls “the most technically advanced production facility in the country,” the company benefits from hiring managers with extensive field experience. “With our guys having installer backgrounds, they know from experience how an inconsistent or contaminated product can really screw things up,” he notes.

To assure a superior product, Day says, FiberAmerica purchases only clean, sorted newsprint — primarily “over-issued” news (unsold newspapers that get returned from retailers) — for its raw

material and sorts the papers a second time after taking delivery. The company also has an extensive testing program that includes an outside testing service as well as in-house quality-control procedures: “On an hourly basis we pull bags out of the line and test a sample in our on-site laboratory.”

Green Seal cellulose insulation is available throughout New England and the Mid-Atlantic as well as in a portion of the Midwest. Prices vary based on volume, but Day says they’re on par with those of the company’s regional competitors. More information is at fiberamerica.us.

Blow-In Plus Foam



The Blow-In-Blanket System (BIBS) was introduced in 1983. For the first time, builders could pack their walls with custom-fit high-performance insulation. The key ingredient in a BIBS job is the mesh fabric stapled onto the stud faces, which allows cavities to be uniformly packed with loose-fill fiberglass to a density of 2 pounds per cubic foot.

According to Dan Stoner, the brand manager for Blow-In-Blanket, this high-density fill (it’s two to four times denser than batt insulation) yields an R-value of 4.2 per inch and compares favorably with cellulose in stopping air movement.

Recently the company started offering the *BIBS HP (Hybrid Performance) System*, which is designed for builders in extreme hot or cold climates whose buildings may require an extra measure of air-sealing. Using what’s known as the “flash and fill” method,

BIBS HP installers coat the wall cavity with a thin layer of high-density closed-cell polyurethane foam before applying the mesh and blowing the fiber. Builders who choose the minimal 1/2-inch-thick layer of foam can expect an R-16 rating for a typical 2x4 wall. One inch of foam boosts the R-value to 17 and serves as an air barrier.

Although pricing is set by individual BIBS dealers, Stoner estimates that the cost for BIBS HP generally runs about halfway between a standard BIBS installation and a full polyurethane foam job. He also says that fiberglass insulation delivers better sound control than foam. “We believe that BIBS HP provides the best qualities of fiberglass and foam at a price that’s more affordable than foam alone,” he says.

BIBS installations can be performed only by authorized contractors. The company says it has a network of 600 contractors throughout North America who have insulated more than 2 million homes since 1983. About 50 of those contractors are authorized to install BIBS HP. Go to www.bibs.com to find out more.



Structural Foam Sheathing

Placing rigid foam on the outside of a building is a proven technique for boosting R-value and reducing air leakage and thermal bridging. But foam is not a structural component, so it must be applied over wood sheathing or let-in bracing. Until now.

Though it looks like a typical polyisocyanurate panel, *Styrofoam SIS Structural Insulated Sheathing* from Dow is laminated with compressed fiberboard, which provides a solid backbone for withstanding racking shear and transverse wind loads.



The IRC and the IBC have approved the insulation board for use in most areas as either continuous sheathing or as braced-wall panels with nonstructural rigid panels in between. (In seismic and high-wind zones, an engineered solution is still required.) Instructions for a code-approved installation are exacting. Framers must follow a precise fastening schedule using specially approved nails or staples. They must also install the sheets vertically and provide blocking on all edges.

Builders who grumble about the complex fastening process may find other features much to their liking. The exterior face of the panel is a code-approved water-resistive barrier that eliminates the need for housewrap as long as the seams are carefully sealed with Dow's Weather-mate construction tape. "You put it up and tape the seams, and you eliminate one trip around the house," says Dow marketing manager John Hammer.

"Another thing that guys in the field tell us they really like about the product," he adds, "is the fact that it's only about 16 pounds for a 4x8-by-1/2-inch board. Compare that to a 45-pound sheet of OSB and you can imagine that framers going up and down ladders all day really appreciate the weight savings."

Styrofoam SIS panels are manufactured in 1/2-inch (R-3) and 1-inch (R-5.5) thicknesses. Due to the fiberboard content, these R-values are slightly lower than those of corresponding thicknesses of nonstructural polyisocyanurate. Panels come in 8-, 9-, and 10-foot lengths. A 4x8-by-1/2-inch sheet size sells to builders for around \$18. To find out more, go to building.dow.com.

Blow-In Fiberglass That Sticks Like Glue

Originally developed as an alternative to damp-spray cellulose, Johns Manville *Spider Custom Insulation* is a unique spray-applied fiberglass product that's manufactured using 25 percent recycled content. Unlike cellulose, which needs plenty of water to adhere to cavity walls, Spider gets sticky with only a light misting of adhesive. It requires no open-cavity drying time, so drywallers can start hanging board as soon as the insulators have packed up and moved on.



According to JM research engineer Francis Babineax, the insulation adheres to vertical surfaces "like a spider" because its glass fibers are much finer (less than 2 microns in diameter) and more flexible than the 4- to 5-micron fibers that make up conventional insulation. These miniscule fibers clump together to form BB-sized "nodules," the bundled fibers that give fiberglass insulation its air-trapping ability. "We've known for some time that a finer fiber would give you great thermal and acoustic performance," he says. "And when provided as small nodules, these

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fiber bundles have the ability to easily fill complex cavities and hold together far better than larger ones.”

Because of its adhesive qualities, Babineax adds, Spider can be sprayed overhead (between floor joists or rafters, for example) without the need for netting, and it will never settle, no matter where it's applied. He says that the insulation offers a unique advantage for closed-cavity fills because the tiny nodules can pass through a hose as small as 1/2 inch in diameter. Some installers, he says, have

successfully insulated brick houses by drilling through the mortar joints.

Babineax also claims that Spider's tiny, flexible fibers are significantly less itchy and dusty than conventional fibers.

Spider is designed to be compatible with existing fiberglass blowing machines. According to the maker, it has an R-value of 4.2 per inch and must be installed by a certified contractor. Installed costs are comparable to those for cellulose and at least 30 percent less than for open-cell foam. For more information visit specjm.com.

High-Tech Gaskets



Not too long from now, the hottest insulation on the market might be something you've never heard of: aerogel. This high-tech material is made of granules of silica that — to put it simply — have had the moisture sucked out of them, creating tiny “nano-bubbles” that are little more than cell walls and air (95 percent air, in fact). Trapping air on a microscopic level such as this gives aerogel a huge R-value (as much as 10.3 per inch) and an equally huge price tag. For years NASA has used aerogel to insulate space shuttles and the Mars lander against the extreme conditions of space. Now a number of manufacturers are working on ways to make aerogel insulation cost-effective for buildings.

“Aerogel is the highest insulating material ever known, and it couldn't be better for the environment because it's almost entirely made from sand,” says Lahnne Johnson, president of Acoustiblok. His company gets around the cost barrier by producing aerogel in thin strips that function as

thermal blockers rather than insulation. *Thermablok Thermal Strip Insulation* is a 1/4-inch-thick by 1 1/2-inch-wide peel-and-stick membrane that's applied between framing members and the drywall, or beneath the sheathing.

According to Johnson, testing performed at the DOE's Oak Ridge National Laboratory in Tennessee has shown that Thermablok reduces energy loss by 38 percent when used with metal framing and 19 percent when used with wood framing. He says that the thermal blocking capability of the skinny material is roughly equivalent to that of a 1 1/2-inch-thick layer of rigid foam. He also claims that the strips are completely unaffected by moisture and will not off-gas or degrade over time.

Thermablok Thermal Strip Insulation has been on the market since the middle of last year. The manufacturer is working with the federal government to qualify the material for energy-conservation tax credits. It's sold in 4-foot-long strips and can be ordered directly from the manufacturer (acoustiblok.com) for \$0.98 per lineal foot.

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