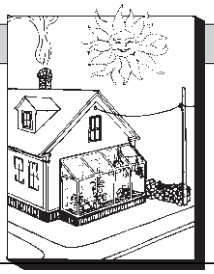
Cavity Fill Insulation: Alternatives



by Alex Wilson

Concern about ozone depletion is proving to be a boon for manufacturers of cavity-fill foam insulation products that do not use CFC as the foaming agent. Tripolymer Foam, Icynene, and Air-Krete are three such products, and while very different, they all produce a rigid or semi-rigid cavity-fill insulation and offer an alternative to spray urethane, cellulose, and fiberglass.

Tripolymer Foam, Icynene, and Air-Krete do not use CFC as the foaming agent...a plus with all the concern about ozone depletion.

Tripolymer Foam

Tripolymer foam, manufactured by the C.P. Chemical Company in White Plains, N.Y. is a phenolic-based foam, chemically similar to Koppers' phenolic foam. The primary difference is that air rather than CFC is used as the foaming agent. There is no harm to the ozone, but the R-value is quite a bit lower (R-4.8 per inch, vs. R-8.3 for Koppers).

Tripolymer has been installed in about 150,000 homes over the past 15 years. The company has a network of 50 or 60 dealers nationwide, each of whom has invested around $7,000 for equipment and training, according to Clare Reinbergen of the company. During installation, the two components–resin and catalyst–are mixed in the truck and foamed with compressed air.

The foam is recommended primarily for closed-cavity installations. It can be foamed into open cavities as long as the cavities are to be closed in relatively quickly. It cannot be left exposed like spray urethane because it does not adhere as well. Tripolymer can be used in both new construction and existing buildings. Unlike urethane, Tripolymer foam can be installed at any temperature–it does not depend on any reaction occurring at the installation site.

The major advantage of Tripolymer is its fire safety (see table). It is less burnable than urethane foams. A new foam the company is developing–Fire Guard–promises even better fire performance. Company President Walter Hasselman, Sr., hopes to achieve a two-hour fire rating, suitable for party walls, with 3½ inches of insulation and a single layer of 5/8-inch drywall on each side (rather than the double layer generally required).

The major disadvantage of Tripolymer foam seems to be its shrinkage, which will range from .5 to 1.5 percent. While Hasselman claims this slight shrinkage is important in letting the home breathe, that argument runs counter to conventional wisdom among energy-efficient building experts. I consider the shrinkage a significant drawback to the product.

Icynene

I was first introduced to Goldseal Icynene insulation last January at a conference on "Substitutes and Alternatives to CFCs" in Washington, D.C. Icynene is a urethane-type insulation, but it is foamed with carbon dioxide (CO_2) rather than CFC. As might be expected, the R-value is quite a bit lower than urethane (4.3 per inch vs. about R-7), but Icynene's chemistry produces a remarkable property that helps to compensate for the lower R-value: flexibility.

As the foam is sprayed into an open cavity (like spray urethane), it expands into cracks and gaps, curing in about 20 seconds. It adheres very well to studs and sheathing but, unlike urethane, it remains flexible after curing. If studs shrink, the foam will stretch, maintaining a tight seal. No gaps will open up at the edges of cavities. Unlike urethane, however, Icynene will not add any structural strength to a wall system.

Fire safety is adequate with Icynene, but not as good as that of the other two products discussed here. Icynene's burning characteristics are similar to those of isocyanurate (a type of urethane), which is superior to some other rigid insulation materials, such as polystyrene.

While Icynene looks like a very promising product, it is still quite new. Only about 200 homes have been insulated with it so far, and all are in Canada. This year, Icynene Inc. (Ontario, Canada) began looking for U.S. dealers in New England and the Pacific Northwest and they hope to expand into the Upper Midwest relatively soon. According to Chuck Johnson, Vice-President for Marketing and Sales, interest among insulation constractors in the U.S. is very high.

Air-Krete

Air-Krete, produced since 1983 by Air-Krete, Inc. of Weedsport, N.Y. is very different from the other two products covered. Rather than an organic foam plastic, it is a completely inorganic foam produced from magnesium silicate. Air-Krete is foamed with air and injected into closed cavities. It does not adhere to surfaces, so cannot be used in open cavity installations. While it does not shrink at all, it is not flexible either.

Air-Krete's major selling points are its total non-flammability and the absence of any organic vapors. In fact, as I described in my June 1987 column, Air-Krete is just about the only insulation material acceptable to builders specializing in chemical-free homes. Some people with chemical sensitivities cannot live in homes with products that give off organic vapors—including almost all insulation materials, manufactured wood products, and most standard home furnishings.

The Air-Krete technology is licensed out to eleven manufacturers around the country, most of which have separate dealers. According to vice-president Jack Norris, a company must invest about $35,000 to set up as manufacturer, and $10,000 to $12,000 to set up as a dealer. Douglas Palmer of Palmer Industries in Frederick, Md., the Air-Krete's largest manufacturer, has insulated 500 homes, though his work is about 60 percent commercial.

Conclusions

The primary insulations competing with these products are spray-in-place urethane and cellulose. Simple cost comparisons are very difficult to make between the different systems. With spray-in-place insulations, you have to factor in the size of the job (insulating an entire housing development will be a lot cheaper per square foot than a single house), distance from the plant, and construction techniques of the building being insulated. Costs are quoted on a per-project basis by insulation contractors, taking these factors into account.

In general, you can expect to pay in the range of $.80 to $1.60 per square foot for insulating a 3½-inch wall cavity. Again, depending on the distance from the plant and other factors, cellulose tends to be at the lower end of the range and Air-Krete at the higher end. Tripolymer is in the middle with urethane, and Icynene is not yet available in this country (although the company expects costs to be around a dollar a square foot).

From discussions with builders and insulation contractors in recent months, I believe we will be seeing greater use of spray-in-place insulation over the coming years. Air blowing through batt insulation and the settling of loose-fill insulation make sprayed-in materials more attractive from an energy standpoint. Many builders use them in conjunction with boardstock materials. With urethane contractors already being told that their access to CFC foaming agents will be restricted, we can expect to see a brighter future for products like Tripolymer, Icynene, and Air-Krete. ■

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Cavity-Fill Insulations: A Comparison of the Alternatives

Product	Composition	R-Value (per in.)	Fire Safety		Fuel Contributed	Cost/Ft 2x4 cavity
			Flame Spread	Smoke Developed		
Tripolymer Foam	Air-blown Phenolic Foam	4.8	5	0	0	$.85-1.25
Icynene "Goldseal"	CO_2-blown Urethane Type Foam	4.3	<25	292	0	≃ $1.00
Air Krete	Air-blown Magnesium Silicate	3.9	0	0	0	$.80-1.60
Spray Urethane	CFC-blown Urethane Foam	≃ 7.0	30	300-400	25	$1.50-2.10 (nominal 3")
Spray Cellulose	Air-blown Cellulose with binder	3.5	15	0	5	≃ $.85