Energy-Saving Products for Energy-Efficient Homes

by J.D. Ned Nisson

The following collection of new and notable energy-related products is well suited for today's energy-efficient homes. Though none is as revolutionary as low-e windows or condensing gas furnaces, each offers practical advantages to the builder and greater value to the homeowner.

Triple-Integrated Heat Pumps

In 1989, *Popular Science* magazine gave one of its top-ten "Best of What's New" awards to the Carrier Hydrotech 2000 — a sophisticated "triple-integrated" heat pump that provided year-round high-efficiency water heating in addition to high-efficiency space heating and cooling. Unfortunately, Hydrotech's high price tag (roughly $7,000) was too much for the market to bear and Carrier withdrew the system from production in 1993. Now three manufacturers have revived the concept with less expensive systems.

The Nordyne *Powermiser* is an air-source system and the other two — the *Hydroheat*, manufactured by HydroDelta Corporation, and the *Hydro-Temp*, produced by Hydro-Temp Corporation — are both ground-source systems. All have special refrigerant circuits that allow high-efficiency, year-round water heating, regardless of whether the unit is heating or cooling.

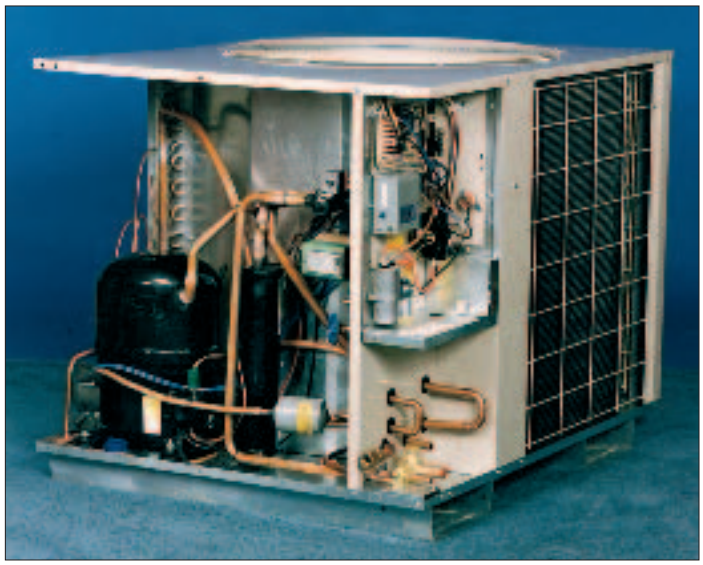
The Nordyne Powermiser is the only air-source heat pump that can provide year-round, high-efficiency water heating.

Compared with conventional heat pumps used along with electric-resistance water heaters, these systems are hands-down winners, providing essentially "free" water heating during summer, and extremely high efficiency (200% to 300%) during winter. One independent study showed that a triple-integrated heat pump with a rated Seasonal Energy Efficiency Ratio (SEER) of only 12 will outperform a conventional 15 SEER system that relies on conventional electric-resistance water heating. (Note: These systems should not be confused with "desuperheaters" that are available as options with most central air conditioning systems. Unlike triple-integrated systems, which supply year-round water heating, desuperheaters work only when the air conditioner is running.)

Economical Ground-Source Heat Pump

Ground-source heat pumps are an example of an energy-efficient technology that does not always make sense for energy-efficient homes. The incremental cost of the ground-loop heat exchanger — typically between $3,000 and $10,000 — is hard to justify for a home with reduced heating and cooling loads. Enter the *Environs*.

Invented by the brother team of Tom and Ted Hebert of Conservation Products International (CPI), the Environs is a "dual source" heat pump that uses a combination of an aboveground air coil plus a very small, optimally sized ground loop. The result is a system efficiency that is comparable with the best ground-source heat



The Environs "dual source" heat pump uses both air and ground heat exchangers to get the efficiency of a ground-source unit at a much lower cost.

pumps and better than the best air-source systems.

CPI says that the ground loop cost for a typical 3-ton Environs system is about $500 — 60% to 90% less than the cost of a conventional ground-source system. This puts the Environs in direct competition with top-of-the-line conventional heat pumps.

Sealed Combustion

Sealed-combustion appliances are tailor-made for tight, energy-efficient homes since they avoid hazardous flue-gas spillage and backdrafting. Two noteworthy additions in this arena are the A.O. Smith *Sealed Shot* water heater and the Lennox *CompleteHeat*.

The Sealed Shot is the first moderately priced gas water heater that fits the bill. Using a unique manifold design, the Sealed Shot can vent combustion gases up to 40 feet through ordinary schedule 40 PVC pipe. The unit costs under $800 and has an efficiency (energy factor) of 0.66, typical of a high-end gas water heater.

The CompleteHeat goes a step further and uses a sealed combustion water heater to heat both domestic water and the house air, using a space-heating fan coil. The fully integrated "combo heater" has a combined efficiency (CAE) of 0.90 and is available in capacities from 40,000 to 120,000 Btu/hour.

More details on both these systems can be found in the December 1994 issue of *JLC* ("Heating With Sealed Combustion").

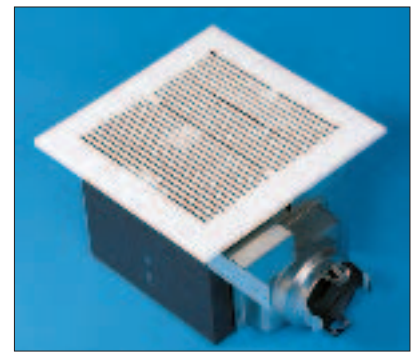
The sealed-combustion CompleteHeat provides efficient hot water and forced-air space heat from a single unit. The heat exchanger and storage tank are long-lasting stainless steel.

Quiet, Efficient Exhaust Fans

One item that tops the energy-minded home builder's wish list is a quiet, efficient exhaust ventilator that is suitable for continuous operation. Panasonic and Fan America have recently introduced four new fans that fit the bill.

First introduced in 1993, with new models in 1994, the Panasonic *Quiet Vents* are the first exhaust ventilators with certified noise levels below 1 sone. (One sone is roughly equivalent to the noise level of a quiet refrigerator.) Perhaps even more impressive than the low sound level is their remarkably low power consumption. The Model FV-08VG, for example, draws only 17 watts while delivering 90 cfm of air (0.1 inch w.g. static pressure). For comparison, typical top-of-the-line bathroom exhaust fans with similar capacity draw 80 to 90 watts.

Fan America's *Model SMV 80* is the newest super-quiet exhaust ventilator on the market, with roughly the same noise levels, though not the same low power requirements, as the Panasonic line.



Panasonic's Quiet Vent fans are the quietest and most efficient exhaust ventilators on the market.

When comparing power consumption and efficiency of exhaust fans, it is important to maintain a realistic perspective. The difference between the "super efficient" Panasonic fans and "moderately efficient" Fan America fan is only about 20 watts. Even with continuous 24-hour, 365-day operation, the total annual difference in electricity consumption would be only $14 per year at 8¢/kwh.

Warm-Edge Windows Cut Condensation

The big news in windows is "warm-edge" technology. The aluminum "edge spacers" that have traditionally been used to separate the two glass panes in sealed insulated glass units are being phased out in favor of new insulating "warm edge" spacers.

Made from a variety of materials including stainless steel and silicone rubber, warm-edge spacers keep the interior glass surface warmer and thereby reduce moisture condensation around the edges. With warm-edge windows, homeowners can enjoy healthy indoor humidity levels (30% to 40%) during winter without dripping windows.

Warm-edge spacers are not new. Three companies — Tremco, Edgetech, and Southwall Technologies — have

Marvin Windows was the first major window manufacturer to adopt warm-edge technology into its entire product line. The stainless-steel spacer raises the inside temperature of the glass near the edge, reducing condensation at the window perimeter.

had insulating edge spacers on the market for more than seven years. But during the past two years, the concept has taken off. In 1991, two large window manufacturers — Peachtree and Alcoa — completely switched over to Tremco's Swiggle Strip edge spacer. In 1992, Marvin Windows switched over completely to a new stainless steel spacer sold by PPG.

The big news came early in 1994 when Andersen unveiled windows with its new stainless-steel warm-edge spacer. Designed by Cardinal Glass, which produces most of the glass in Andersen windows, Andersen's spacer is made of thin stainless steel that conducts heat at only 1% the rate of the aluminum in conventional spacers. Cardinal claims that, depending on glass and frame type, the new spacer will increase the interior surface temperature at the glass edge from 5°F to 7°F, compared with an aluminum spacer.

Dry-Spray Cellulose

This is the first truly practical system for installing dry cellulose insulation in open stud cavities. For builders who like the advantages of wet-spray cellulose — full coverage and resistance to air movement — *ParPac* will provide the same benefits without the water.

Developed by Parco Inc. of Norfolk, Neb., the ParPac system is simple. Dry cellulose insulation is blown into stud cavities behind a tightly applied string-reinforced plastic vapor barrier. Because the reinforced plastic resists stretching, the cellulose can be packed in at sufficient density to prevent settling without excessive bulging.

ParPac provides the benefits of spray-applied cellulose without the water. For good performance, the installer must pack the cellulose at sufficient density to prevent settling, but not so much that the vapor barrier bulges excessively.

Researchers at Tennessee Technological University in Cookeville submitted ParPac test walls to vibration "torture tests" and concluded that when installed to a density of 3 pounds per cubic foot, the cellulose should never settle. The R-value at that density is about R-3.6 per inch.

Like most blown and spray-applied insulation systems, ParPac is only as good as its installers, and there have been a few horror stories where novice contractors either overfilled or underfilled stud bays. But the company appears determined to eliminate that type of problem through proper training and quality control and is quickly building a track record of successful installations.

Foam Insulation for New Homes or Retrofits

The most attractive aspect of *Icynene* spray foam (also marketed as *Insealation*) is that it provides three components — insulation, air barrier, and vapor retarder — using only one material and one installer.

Icynene is a non-CFC foam that provides insulation plus an air and vapor seal, eliminating the need for separate air and vapor retarders.

First introduced as a spray-applied foam for open cavities, the original Icynene is a liquid that expands quickly to about 100 times its original volume when applied to a surface. Since it is self-adhering and self-supporting, it can be applied to flat surfaces like band joists as well as to open stud cavities.

In 1993, the company introduced a modified version of the foam for filling cavities in retrofits. Cavity-fill Icynene is quite different from the original wall spray. Whereas the wall spray expands almost immediately when it hits a surface, the cavity-fill product is injected as a liquid and takes several minutes to expand fully. Icynene Inc. president Graeme Kirkland explains that the slow expansion is necessary to avoid deformation of the interior wallboard.

As an insulation material, Icynene is expensive — roughly $1 per square foot for a 6-inch wall. But in addi-

tion to its insulating properties, Icynene also seals against air leakage and vapor transmission, and when properly applied, eliminates the need for additional air barriers and vapor retarders. A recent study at the National Association of Home Builders (NAHB) found that when the avoided costs for air and vapor sealing are factored in, the cost for Icynene compares favorably with a conventional wall with similar energy performance.

Icynene does not contain CFCs or HCFCs. The blowing agent is carbon dioxide, which is produced by a chemical reaction during mixing and which dissipates after foaming. The only undesirable side effect of this material is that it typically produces a lot of waste on site. When applied to open stud bays, the foam overfills the cavity and must be trimmed. The trimmings can be compressed to a smaller volume, but there is still considerable waste for disposal.

Radiant-Barrier Roof Sheathing

Koolply is a roof sheathing with built-in radiant barrier. It consists of perforated foil laminated onto OSB or plywood sheets and is used in place of ordinary roof sheathing in warm climates.

In warm, sunny climates, Koolply reduces radiant heat transfer from the sun-heated roof down into the attic. On a hot, sunny day in Texas, an attic with Koolply sheathing will run 20° to 30°F cooler than an attic with ordinary sheathing. Total cooling energy savings will range from 5% to 15%, depending on the specific climate and the amount of insulation on the attic floor.

Builders like this product because its installation doesn't interfere with the construction process. It is simply used in place of ordinary roof sheathing, with no extra labor or materials or special tools. Some builders have expressed concerns that since Koolply retains heat, theoretically it could make the roof hotter and shorten the life of the roof shingles. But at least two shingle manufacturers — GAF and Elk — have approved use of their shingles over Koolply without jeopardizing the warranties.

Koolply is the only radiant-barrier product on the market that doesn't require special installation. The shiny surface comes laminated to the underside of the roof sheathing.

As with any radiant-barrier product, Koolply's usefulness is limited to warm, sunny climates. It's currently available only in the Southwest, at a cost of about $4.50 per sheet higher than regular OSB or plywood. ■

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