

Integrated heating

Combining technologies for maximum efficiency

By Simon Blake

As heating costs continue to increase, HVAC contractors and builders must become ever more creative to find savings for their residential customers.

Home builder Carmine Cesta, president of Cesta Developments Inc. of Toronto, has little doubt about what his customers are looking for: "Utilities are going through the roof ... it's time to go green. You absolutely have to."

When he built his own 5,500 sq. ft. family home in Caledon, Ontario last fall, he took a hard look at different HVAC systems with his contractor, Frank Ciardulli of NGS Air Systems, also of Toronto. One of his goals was to make his home virtually a test facility for solutions that he could offer his customers.

Integrated system

Ciardulli specified a Genesis HTM-100 integrated heating system from Tirino Corp., Concord, Ont. (www.tirino.ca) It

operates on propane and provides forced air heating and cooling, DHW and radiant floor heating for the basement. A built-in heat recovery ventilator (HRV) provides mechanical ventilation in this tight modern home, which exceeds R-2000 standards.

Tirino is one five manufacturing groups that participated in the Natural Resources Canada (NRCan) Advanced Integrated Mechanical Systems (AIMS) project (reported in the March/April 2001 issue of HVAC/Refrigeration magazine). Those products are being marketed under the eKocomfort brand.

Solar assistance

Six roof-mounted Chromagen solar thermal panels that, combined, average about 30,000 Btu/h, supplement the Genesis unit. This substantially reduces the heating load because the feed water is typically pre-heated to between 40 and 60°C (104-140°F), depending on the amount of solar energy available



A happy collaboration. Pictured are, from left, builder and homeowner Carmine Cesta, Mark Bates (Tirino) and Vladimir Nikiforov (Your Solar Home). Missing is the fourth member of the team, mechanical contractor Frank Ciardulli.

and the radiant floor system load.

Dr. Vladimir Nikiforov of Your Solar Home (www.yoursolarhome.com) of Vaughan, Ont., designed the solar system and supplied the equipment. He heads up research and development for the company.

There are two indirect storage tanks – a 70-gallon unit for DHW storage only and a 60-gallon tank that incorporates two heat exchangers.

A Thermomax 400 solar controller maintains the 60-gallon tank at 40°C (104°F) for the radiant floor system. When there is a call for heat, it starts the circulator pump for the solar panels.

A glycol mixture circulates through the solar panels and transfers the heat into the tank through the bottom heat exchanger. The radiant floor system is also a closed loop system, circulating through a heat exchanger in the top of the tank. Any excess energy/temperature is bled off into the second tank, which is maintained at 60°C (140°F) for DHW. If there isn't enough heat, the solar controller will call for heat from the Genesis unit.

Stand-alone appliance

The twin indirect tanks allow ample water for a whirlpool tub and other options in this large custom-built home, but they are not required with the Genesis unit, remarked Mark Bates, sales manager for Tirino.

In many ways, the unit operates like a large on-demand water heater. It is designed to supply hot water for DHW, space heating and the radiant floor – up to 180 gallons of 120°F water in the first hour – without a storage tank in the system. Its Riello burner is rated at 170,000 Btu/h input with a maximum output of 145,000 Btu/h.

The stainless steel heat exchanger and all fittings are approved for potable water. An anti-scald valve is built in.

A high efficiency 1/2 horsepower ECM motor drives the two-speed fan and HRV. The heating coil can supply

up to 1,400 CFM of forced air at a 45-degree temperature rise. An optional air conditioning coil adds four tons of cooling.

The HRV achieves 70 per cent heat recovery and provides the necessary mechanical ventilation in this tight modern home.

Hookups are straightforward: 3/4-inch DHW connections, intake and exhaust (PVC) for the HRV, gas and electrical, reported Bates. Ductwork is virtually the same as for a forced air system. A conventional 24-volt heating/cooling thermostat provides control.

Again, in an effort to maximize efficiency, the system in Cesta's home also incorporates three panel-type Solarheat 1500 air collectors from Your Solar Home, mounted on the south wall. They supply up to 15,000 Btu/h in warm air.

This is also controlled by the Thermomax 400, which is wired into the Genesis circuit board. When there is a call for heat and the solar collector outlet air temperature exceeds a set point, a sensor signals the Thermomax which triggers the Genesis circuit board and kicks the fan motor into high speed to draw more solar heat into the HRV.



The rural well system operates through state-of-the-art water treatment equipment.

Marketing solar

It would be fair to say that solar energy has an image problem. Big promises and great expectations have seldom been realized – not at a realistic price anyway.

"There has been a real information gap," remarked Robert Waters, manager of product education and training for Viessmann Manufacturing Company Inc., Waterloo, Ont. (www.Viessmann.com) "People have unrealistic expectations ... solar is not really practical for heating an entire house."

But that doesn't mean solar doesn't have potential. Today, solar equipment suppliers are taking a pragmatic approach

in using their equipment to supplement traditional DHW and HVAC systems.

"We're trying to do something the solar industry has never been able to do," remarked Todd Kirkpatrick, president of Your Solar Home, Vaughan, Ont. "That is ... to use the existing heating and plumbing contractors network to integrate our technology into existing boilers, furnaces, HRVs, etc." Like Viessmann, the company offers packaged systems that add supplementary solar heating to a DHW system. Viessmann offers systems with either flat-plate or more efficient (and expensive) vacuum

tube collectors, noted Waters.

In addition its efficient flat plate Chromagen liquid solar collectors, Your Solar Home manufactures solar air collectors that feed heated air into the return air duct of forced air systems. "We are planning on taking our air-based system and integrating that with an HRV or clean air furnace ... Instead of sucking fresh air you are sucking fresh warm air and saving up to 50 percent of the ventilation load by using solar heated air," said Kirkpatrick. A modified damper bypasses the solar collectors above a certain temperature. A larger system is available for commercial applications. The company is working with various HRV

manufacturers and DHW storage tank manufacturers to offer 'solar-ready' equipment.

Your Solar Home has developed a mounting system that incorporates solar collectors into the roof or wall structure with additional thermal insulation.

Waters will make a technical presentation on solar and hydronics April 26 at the Great Lakes Hydronics Conference in Toronto. (See The New Hydronics newsletter in this issue or go to www.heatingedge.com.)

With a payback that decreases with every spike in energy prices, the smart application of solar energy can't help but become more popular with homeowners.

Water quality

Water quality is always an issue with rural well systems. Cesta installed a state-of-the-art water treatment system that includes a sediment/iron filter, reverse osmosis, a water softener and ultra-violet for drinking water only.

There are many factors to consider when planning a heating system for a home. At \$12,000 plus, the system in Cesta's home is an expensive system and considerably more elaborate than typically required in a home. But he intends to log fuel use and other data over a six-month period to see whether this makes sense for his customers.

High energy costs have pushed installed cost down the list of priorities, while moving long-term operating savings to the top of the list. At the same time, comfort has become a priority.

Today's well-informed homeowners want the option of spending more to get a better system. Energy efficiency is not the tough sell that it used to be.



Hookups on the integrated heating unit, incomplete at the time of P&HVAC's visit, are straightforward.

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