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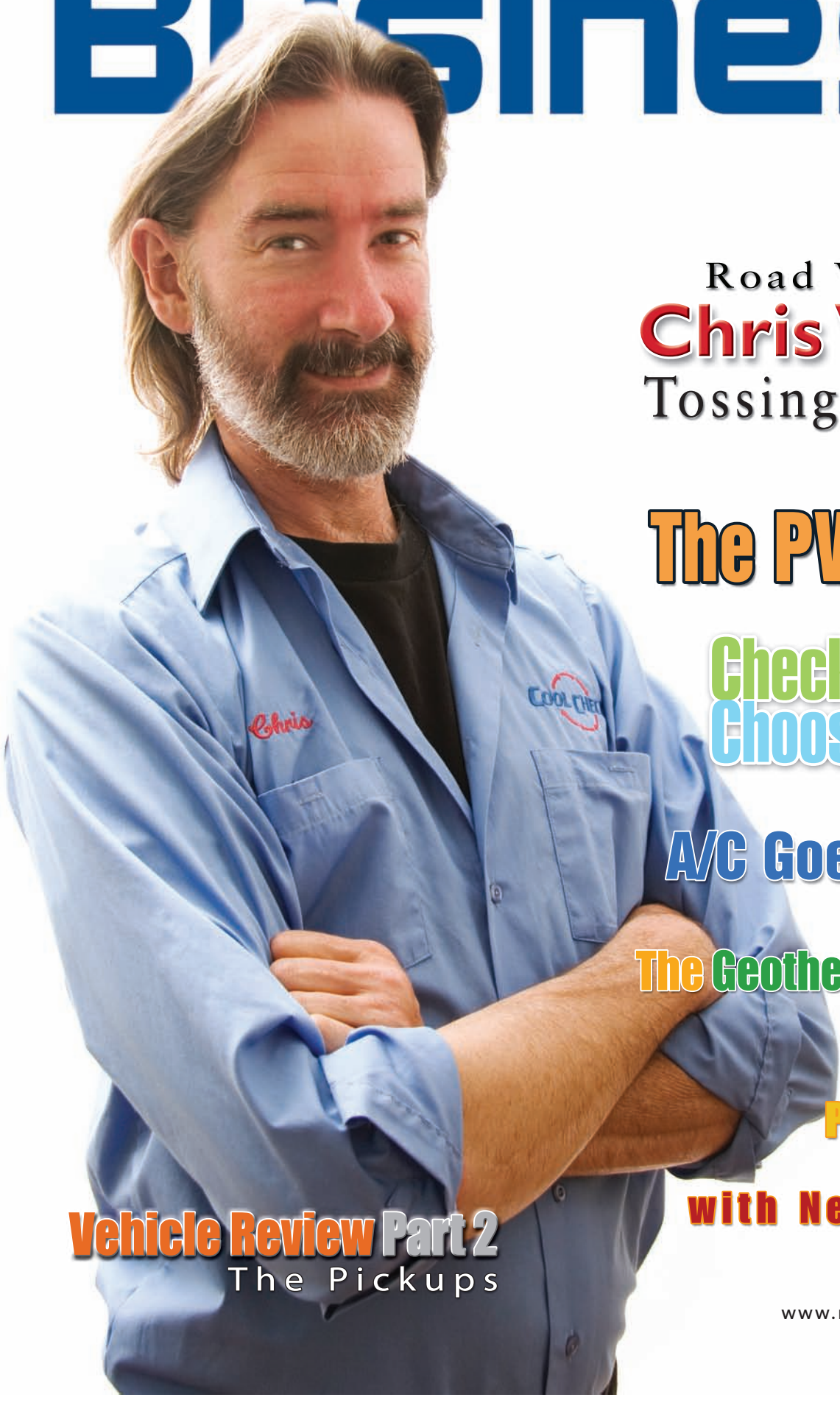

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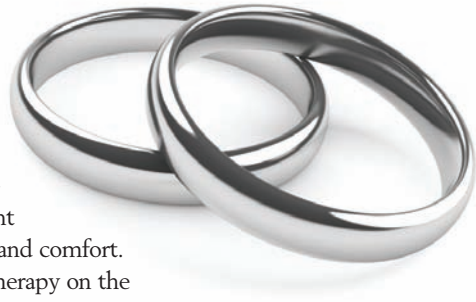
PM #41536047

by Dave Yates and John Vastyan

Radiant's New, Ground-Source Geo Nuptials



Marriage counselors and new age hydronics contractors will readily affirm that a lasting bond requires attentive, well-grounded care, abundant warmth, compatibility and comfort. Enter a new breed of therapy on the hydronics scene. Its focus is the marriage of water-to-water geothermal with radiant heat. The offspring: sufficient Euro-panel heat and warmth for domestic water, too.

Earlier systems had a chilly relationship. Geo systems producing 115° to 120°F had a tough time carrying the load and were quickly off to divorce court if the homeowners expected domestic hot water or radiant panel heat.

The peace-keeper is the emergence of new, higher-temp, water-to-water geothermal systems (like ClimateMaster's THW, or Carrier's GT-PX). These systems make use of scroll compressor technologies that make heat outputs in the range of 145 to 160°F, at efficiencies up to 30 EER, quite possible.

Yet, there's a third facet to the system that must be brought into the relationship with great care – the geo-exchange field. It can be an ugly relationship if there are bugs in the works underground.

The **Geo** Field

The earth's crust acts like a thermal storage battery. A geo field harvests this thermal energy which is then transported into the heat pump. Three basic geo exchange methods can be used, closed loop vertical or horizontal; pond or lake closed loop; or an open system, where water is extracted and either returned to the same well where it is rejected at the top; rejected to an injection well; or pump-'n-dump where it can be rejected to a stream or pond.

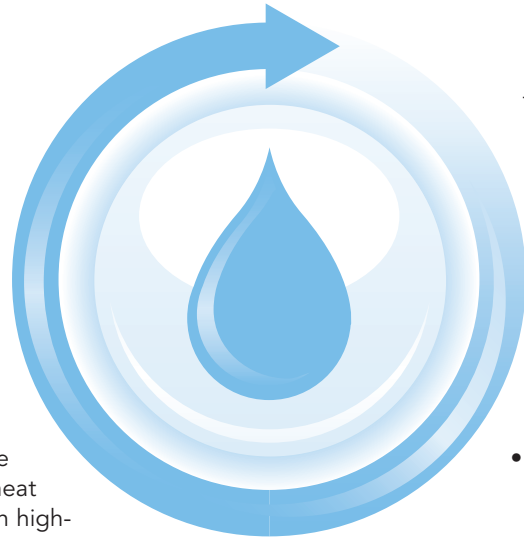
A majority of systems are closed-loop vertical bore holes with high-density polyethylene piping that's fuse-welded together. There are specific tools and techniques for this, but a key ingredient – once you've used heat to prepare the coupling and pipe end – is plenty of good ol' fashioned muscle-power to push the joint together and hold it until it sets. Done properly, the fitting and pipe join as one, with the joint being stronger than the piping itself.

The **cycle**

With a call for comfort inside the home, these things should happen:

• **Hydronic circulators** begin to move water through heat emitters such as floors, walls, ceiling, towel bars or Euro-panels, a heat exchanger in a buffer tank for combined hydronic and potable water heating (the fluids are separated physically, of course), or radiant statuary.

• The **heat pump compressor** activates the refrigerant cycle. The refrigerant-to-water heat exchanger on the hydronic side begins with high-temp compressed gas, converted to high-temp, high-pressure fluid exchanging heat with the hydronic water. . . and then onward to a second heat exchanger where it flashes off to a low-pressure, low-temp gas as it absorbs heat energy from the passing water/antifreeze mix that's now bound for the geo field.



• Rinse, wash, repeat.

When you need it the most, you get it the least.

As you'd find with any good marriage, there are limits to what you can get away with. A hydronic radiant designer should know there are limits to sustained upper water delivery temps. The same thing can be said if the geo designer fails to understand the relationship between sustained BTUH extraction and the size of the geo field.

Most water-to-water geo systems are limited to a maximum output of 120°F, although technology is available to produce temps in the 145 to 160°F range. These are BTUHs that can mean the difference between a hot relationship and one that is simply ho-hum.

Can you build a system for 120°F output during design conditions when the home's heating-load-demand is at its maximum?

It all depends.

It's relatively easy to reject heat into the earth during a home's cooling cycle. It's not so easy to pull heat from the ground. On average, a well that will get rid of 24,000 BTUHs will only yield 80 per cent, or 19,200-BTUs, for heating purposes.

Why is that?

The below-zero centigrade water/glycol or water/alcohol solution that exits the home is gradually freezing the geo field along the tubing run, so the earthsicle replicates what you'd expect to see, performance-wise, from a standard air-to-air heat pump when outdoor air temperatures fall below freezing, meaning there's little or no energy extraction for indoor comfort.

A word of warning: An undersized geo field can lose all capacity, meaning no heat for the occupants, or expensive heating bills if electricity is tapped for supplemental heat.

Feel **the love**

Most installation techniques require only the lowest water temperatures (85° to 120°F), easily achieved by both old and new geothermal heat makers. Some staple-up and over-floor applications may require substantially higher temperatures though, and it's in this area where the love between radiant and systems based on the water-to-water heat pump has really grown.

The recipe for comfort is tied chiefly to three factors – the loss of BTUs, the method of installation, and the hydronic temperature needed to offset the heat loss. The colder the ambient setting (tied to Mother Nature, and the building's insulative cocoon), the higher the fluid temperatures that will be required.

Can't **Crank it** Up

With many hydronic systems, especially when low-temp radiant's involved, there's plenty of room to play. Misinterpret a floor covering? Simply raise the water delivery temps, or increase circulation to that zone. Many boiler-driven systems can easily deliver 20 to 30 per cent more heat, even at design condition loads.

With a ground source heat pump, the game has changed dramatically. There's very little room for error. If the system is designed for tight performance at design conditions, you may have some cranky customers on your hands. If, however, you can convince them of the need to go 10 or 20 per cent further with the geo-exchange field, you've just given them a great insurance policy!

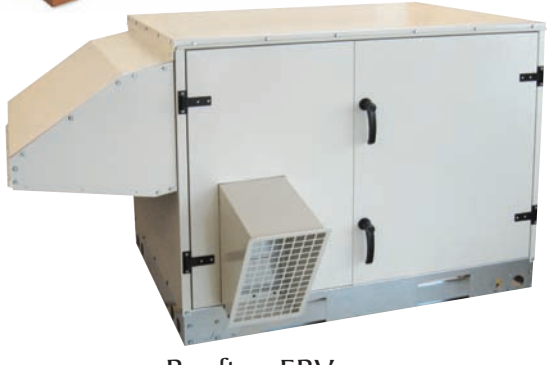
Dave Yates is president of a mechanical contracting firm, a board member of the Radiant Panel Association and has written about hydronics, plumbing, and radiant heat for the past decade. John Vastyan has been researching and writing about the hydronics, HVAC, radiant heat, solar and geothermal industries since 1987.

Stuff you need

On-site storage

The three-point latch with Watchman IV lock system on select models of JobMaster and StorageMaster chests and piano boxes from Knaack is designed to provide extra protection against break-ins from pry bars, bolt cutters and hack saws. Also offered as an additional feature is the company's weather-resistant Power Pass electrical pass-through for power cord access.

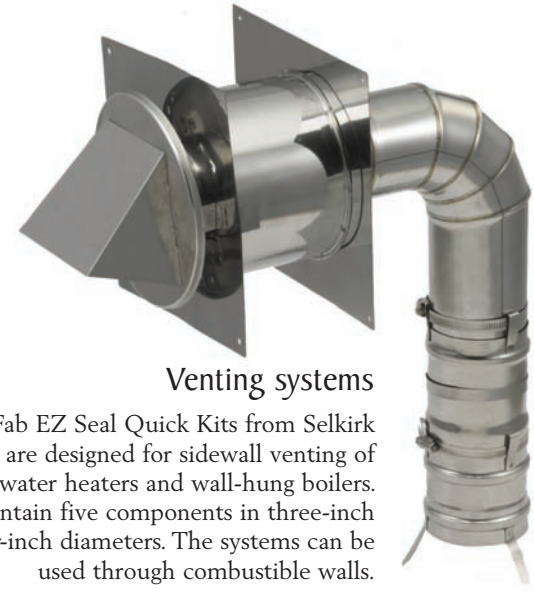
knaack.com



Rooftop ERV

Fantech's high-efficiency rooftop commercial energy recovery ventilator is available in two configurations, the RTW 850 and the RTW 1230. Both are powered by direct-drive, maintenance-free backward inclined motorized impeller motors. The cabinet features insulated double-wall construction for strength and condensation control.

fantech.net



Venting systems

HeatFab EZ Seal Quick Kits from Selkirk Canada are designed for sidewall venting of tankless water heaters and wall-hung boilers. The kits contain five components in three-inch or four-inch diameters. The systems can be used through combustible walls.

selkirkcorp.com

Chimney liner

Don Park's all-fuel stainless steel chimney liner requires no screws to secure the liner. It is ULC approved, and the tee snout is designed to be recessed into the tee for ease of installation in tight chimneys for diameters larger than five inches.

donpark.com

Water-to-water heat pump

ClimateMaster's line of Tranquility high-temperature water-to-water heat pumps are rated for water loop heat pump, ground loop heat pump and ground water heat pump applications. They are available in 26,600 to 44,800 BTUH sizes in 50 Hz voltages and 32,600 BTUH size for 60 Hz voltages. The high-temperature scroll compressor is designed to generate water temperatures up to 145°F.

climatemaster.com

Clevis hanger

The Caddy Slot lock-slotted clevis hanger from Erico features a removable slotted crossbeam that replaces a standard nut and bolt. It is available for 1/2" through eight-inch pipe sizes.

erico.com