

The sunny West has seen an explosion of solar panels appearing on roofs but, as a space heating source, solar still needs help. Photo courtesy of Taco.



SOLAR-TO-RADIANT—some would consider it to be the Holy Grail of hydronic systems. But before I stir visions of mechanical perfection with the sun as your only source of heat, I'll suggest you wait before canceling that boiler order.

Sure, you can harness the sun's energy to warm floors. But in most cases it's neither cost effective or energy efficient to do it that way.

During the winter months, when space heating is most needed, solar energy (orientation of the sun) is at its weakest. In some instances, the sun's angle may be so low solar arrays may produce only a small fraction of the heat they're rated for.

Solar thermal systems installed for space heating are typically designed to provide some (maybe all) of the heat during the shoulder seasons, spring and fall.

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For solar thermal systems to contribute substantially to space heating, a lot of collector surface area is needed—approximately one-half- to one square foot of collector area per 10 square feet of floor area to be heated.

Also, take into account the greater likelihood of interference from snow, trees and other obstructions during the winter months, and clouds.

The best home orientations are when the roof ridge runs east to west, providing a south-facing exposure. Installers should place panels on a west or east-facing roof; add about 25 percent more area to compensate for exposure that isn't optimal.

That also means a larger thermal storage capacity will be needed to allow the system to cope when the space heating is not being used during the summer months. That

BABY STEPS

Sunshine-sourced radiant heat isn't quite ready to go it alone *By Dave Sweet*

(mixed), then pumped through the radiantly-heated floor.

Back-up heat

On cloudy days, when the sun isn't bright enough to heat the home fully, a back-up heating system will be needed. This secondary source of heat could come in many forms: wood stove, furnace, boiler or heat pump. For radiant, a boiler is best, though a conventional water heater may meet the need sufficiently.

Forced air systems can also be tied to solar thermal heat through the use of a liquid-to-air heat exchanger.

Details, details

Glycol-filled, closed loop solar systems are a finicky lot. If the system is sized for optimal performance during a specific season, it may be over- or under-sized during another. If sized for use during the winter months, two things may apply: the panels will produce a lot more heat in the summer, and the heat storage will be too small.

Over-sized buffer tanks may help. Or, having heat-sinks that dissipate unwanted heat may be another useful option.

It may also be good to consider the use of an oversized expansion tank to allow for the entire volume of system fluid to expand. This will avoid the trauma of steaming-out and over-pressurization, an event sure to lose some of the charge via the relief valve. This would come into play if grid power is lost when heat is being produced. Without back-up power for pump operation, glycol solutions will expand and steam-out. (Regardless: system glycol should be checked annually to for change in ph that could affect the all the components in the system).

It's also important to point out that if—instead—a drain-back system is installed with a high limit set point in the controller, then overheating is a non issue. The high limit sensor for the tank overrides the pump operation, producing no heat; the collectors remain dry and un-damaged.

With drain-back systems, no heat dump strategy is required. Drain-backs are always preferred when using “combi” systems. The key strategy is to over-size the collector array, dumping excess heat into the radiant heating system. During the summer months this isn't practical so the system simply shuts off.

is, unless you've got a pool to heat or will “throw the heat away” into an in-ground or air-type heat sink. If not, the solar panels may overheat, reducing the life of the heat transfer fluids and the system, overall.

Retrofit, or new?

Are customers asking for solar assist as a retrofit? That's toughest of all, sure to challenge any reasonable budget.

Using a solar thermal system to contribute to space heating for new construction is a lot more attractive, especially if the home is well insulated, and the heat's being channeled toward in-floor radiant. If that's the case, solar thermal heat could provide up to half of the home's space heating needs.

The best system to accomplish this transfers heat into a storage tank. The water in the tank is then reduced in temperature



SOLAR RADIANT



Even with advances in solar technology, some accessories will probably be on tap if a hydronic system is in the plans. Photo courtesy of Taco.

And, of course, DHW

Don't ignore the advantage of tapping solar thermal arrays to supply heat for domestic water year-round, meeting 60 to 85 percent of the energy that's needed. It's important to note that heating domestic water is typically the number two consumer of energy in a home (preceded only by space heating).

Size matters

There really is no one key to sizing solar thermal. In each case, it's a balancing act to match the customer's budget and expectation. An installer or system designer will also need to consider the area available for collector arrays and storage tanks.

But keep in mind: solar is a good fit for radiant heating in some circumstances, not all. Most often, the BTU output simply isn't sufficient for the job, so solar may be used just to heat just a part of the home, or to add some measure of heat to a radiant system that gets most of its heat from another source.

Passive solar space heating

In homes that use passive solar energy for space heating, the whole house acts as a solar collector. This is done by designing the home in such a way as to take best advantage of raw sunlight reaching into the home.

If many of the home's windows face south, the structure will receive maximum exposure to the sun's radiant energy. Here, too, thermal storage can help because the sun's warmth is stored in a home's thermal mass (bricks, walls, tile floors) – material that absorbs the heat and then slowly releases it, long after sunset. The only caveat: south-facing glass should have overhangs in place to repel direct sunlight during the summer months.

But wait, there's more

At Taco, we want you to know more about the potential, and the realities if solar heat applications. To learn more, go to www.taco-hvac.com. Be sure to enter your email address. Then, activate the "residential professional" link. Next, go to FloPro University and from there to the courses page. Courses include:

- Learn about Solar Water Heating Theory and Application. Topics covered include how solar water heating systems work, the different types of solar water heating systems, their components and configurations, how to determine the solar potential of your locale, how to choose a practical system for your customers, and why you can't dabble in solar water heating and expect to succeed.
- Solar Water Heating: Taco Solutions for Pumping and Control. Learn practical solutions to real-world challenges that you're likely to encounter in designing a residential solar water heating system. Also: How to size systems to match requirements, systems operation, the advantages of variable speed pumping and system optimization. **RJ**

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