

Solar Solutions

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Pump stations for solar hot water systems

The future is modular

I recently spent a couple of days at the Anaheim Convention Center touring the Solar Power Industry (SPI) trade show. Although the show was dominated by Photovoltaics and all things related to solar electric installations, there was a strong turnout from the solar heating industry, as well — from a variety of different countries. More than 50 exhibitors carried products for solar thermal applications, about half of these included a solar water heater in their display. At the heart of virtually every solar water heater at this trade show there was some kind of prefabricated, modular pump station. Around two dozen pump modules made an appearance at the SPI 2009 trade show, and the



Figure 17-1

majority of these were intended for solar hot water heating. The photos in **Figure 17-1** show just a sample of pump modules that appeared at this show. (Photos were taken with the verbal permission of the vendors.)

Modular pump stations are not really a new idea. They have been available for a long time from hydronic heating component-system providers. In the solar heating industry, they also were used in a variety of solar water heater designs in the past. For example, the Grumman and Novan modules from the 1980s used external heat exchangers, dual pumps and included an expansion tank and other controls. A well designed pump station has the potential to enhance performance on every level of the six principles of good hydronic design. I welcome the use of modular design for solar water heaters as is can only make the installations faster and better. At this trade show, I was struck not only by the plethora of models being offered, but also by their similar geometry. The vast majority, include a single glycol pump, check valve and charging ports (with valves for purging and draining) in a configuration that allows for easy two-pipe connection to the solar collectors, and a two-pipe connection to an in-tank heat exchanger.

Taking a broader view of the solar heating industry for a moment, the wide acceptance and duplication of these very similar modular pump stations probably means two things: (1)The solar water heating industry has accepted (and seems to be promoting) closed-loop glycol systems as a default standard in the U.S. market; and (2) There is a robust competition among suppliers to “streamline” these systems to make them easier to install. If so, then we have seen the future of solar water heating and the future is modular. I have been assembling single-pump glycol water heaters with in-tank heat exchangers in the field for decades with very good results. A module that requires only two-pipe connections on each side is clearly a much easier alternative than the cumbersome field assembly of a dozen smaller components. If this is the new standard, then I can only add my applause.

Pump station components and features

The most basic solar pump station typically contains the following parts:

- Glycol pump
- Pump unions or flanges
- Isolation ball valves
- Check valve
- Charging port assembly (for filling, draining and air purging)

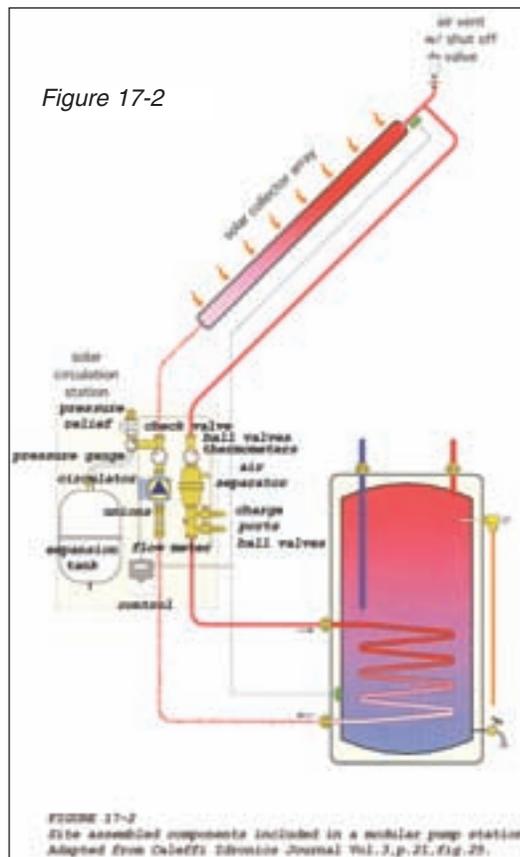
- Rigid “clamshell” insulating cover

The more advanced solar pump stations include even more features:

- Temperature gauges
- Flow meter
- Pressure gauge
- Pressure relief valve
- Expansion tank port with Isolation valve, unions or pipe connector
- Expansion tank with mounting brackets
- Air separator
- Electronic pump controls

Figure 17-2 shows, for example, how a Caleffi solar circulation station combines all of these parts into one package. Some suppliers go even further by including flexible insulated piping with easy union connections, additional expansion tank fittings, advanced pump controllers, “off grid” PV pumps and even solar DHW kits complete with the tank, pipes, unions and every last gasket. Sometimes pump stations are also designed to include an external heat exchanger and sometimes a second pump with all the necessary plumbing and controls to go along with that pump.

When looking for a supplier of solar



pump stations, you might start by looking into these exhibitors who appeared at the SPI 2009 trade show. This is a short list in alphabetical order of some of the exhibitors with solar water heating pump modules and some other related products, also. For a complete list of all the solar thermal exhibitors, see the SPI web site at <http://www.solarpowerinternational.com/>. You may recognize some of these names already available from local heating equipment suppliers:

Selected SPI 2009 exhibitors with modular solar hot water products:

Aeroline Tube Systems, Bosch Thermotechnology Corp, Buderus, Caleffi North America Inc., EnerWorks Solar Water Heating, Entech Solar, Free Hot Water, Giacomini (Gia Sun), Heliodyne, Oventrop, PAW GmbH & CO. KG, Rheem Manufacturing, Roth, Rovanco Piping Systems, Schuco International KG, SOLARHOT, Steca Elektronik GmbH, Stiebel Eltron, Inc., SunEarth, Inc., Sunpeak USA, VELUX Solar Water Heating, Viessmann Mfg. Co. (U.S.) Inc.

The advantages

Every hydronic heating installer is already familiar with the alternative to modular components, and that is site assembly. In fact, many of us who have this experience have a good track record of fast assembly with no leaks and reliable heating performance. But there is always the potential for error when dozens (or even hundreds) of components are required, each with the potential to leak or be installed in the wrong position. The potential for error also increases when there are many installers involved with varying levels of experience.

Plumbing installation can sometimes feel like a battle; against time, weather and all kinds of inconvenient circumstances posed by the "real world." In the heat of battle a simple oversight or a snap decision to save time can turn into a major headache down the road. I have lost track of the number of times we have been troubleshooting in the field and found reversed piping to the collector, reversed pump or check valve position, air vents forgotten or in the wrong position, glycol leak from field assembled joints and a host of other smaller mistakes. Even the most seasoned installers can (and do) make these mistakes on occasion. Any of these mistakes can steal the profit from a solar heating job, and eliminating these pitfalls might just be the biggest benefit offered by modular

design. This may be especially valuable to new solar installers as a way to avoid these pitfalls from the beginning.

The most obvious advantage to going modular is, of course, the elimination of the time and labor to assemble all those components, mentioned above, by hand. This can potentially free up the installer's time for doing less assembly and more complete installations each week.

The only disadvantage seems to be the higher component price of the prefabricated modules which can seem pricey at first glance. This extra cost can be easily compared to the known labor savings from avoiding site assembly but also the often intangible savings of call backs and damage control from unforeseen errors made during site assembly. At my solar heating company, I have been using more and more modules in recent years and feel that this approach is worthwhile. The clean and compact appearance of the finished insulated module tends to draw compliments from the owners and anyone else who sees it, which is an added intangible benefit for the installer.

Final Notes

The costs and benefits of deploying modular pump stations will vary depending on regional and local conditions as well as the level of experience of the installers and the number of installations per month being targeted. Brand names and manufacturers are mentioned only to provide examples for illustration and do not constitute any recommendation or endorsement. ■

Bristol Stickney, partner and technical director at Cedar Mountain Solar Systems in Santa Fe, N.M., has been designing, manufacturing, engineering, repairing and installing solar hydronic heating systems for more than 30 years. He holds a Bachelor of Science in Mechanical Engineering and is a licensed Mechanical Contractor in New Mexico. He is the chief technical officer for SolarLogic LLC and is involved in training programs for solar heating professionals (visit www.cedarmountainsolar.com for more training information.)

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Take the Mystery out of Solar Heating Controls

BRISTOL STICKNEY & CEDAR MOUNTAIN SOLAR SYSTEMS

welcome you to their January 2010
SOLAR THERMAL TRAINING INTENSIVE
in Santa Fe, New Mexico

JANUARY 28—29, 2010
supplemental programs on Jan. 27 & 30

Solar Heating Expert, Bristol Stickney, author of
Solar Solutions articles in PHC News and Plumbing Engineer,
demonstrates his elegantly simple, comprehensive solar
heating control strategies for integrated systems.

Two day intensive hands-on training • Working lab environment



*Best advanced thermal course that I have taken.
Covers topics usually not touched on.*
— Joey Arnold, AltE University, Columbus Ohio

Very Educational & Exciting.
— Justin Graham, AAA Solar Supply, NM

See our website for program information:
cedarmountainsolar.com

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