

Solar Water Heaters



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

HIGHLIGHTS

- Solar water heaters can provide half or more of the hot water needs in the average home
- Simple or complex, solar water heater systems save money

SUMMARY

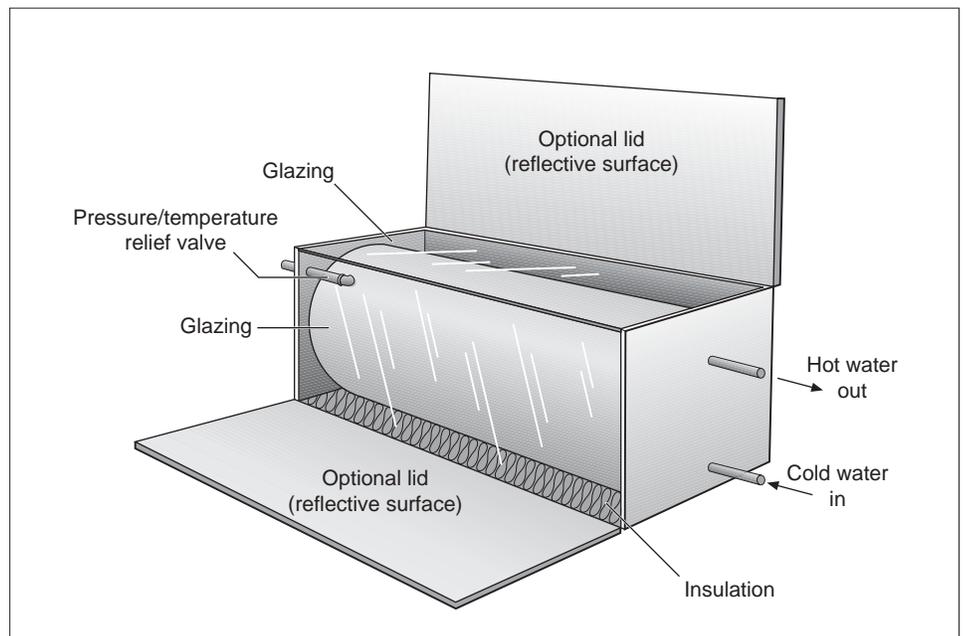
Have you ever turned on the outdoor water faucet expecting cold water to come out but got hot water instead? You have just experienced a solar water heater. Solar water heaters can be as simple as a garden hose left in the sun or as complex as multiple glass-plated solar collectors filled with a fluid. Simple or complex, solar water heaters are an inexpensive way for home and business owners to lower the cost of heating their water by replacing the cost of gas or electricity usually used to heat water with free energy from the sun.

TYPES OF SOLAR WATER HEATING SYSTEMS

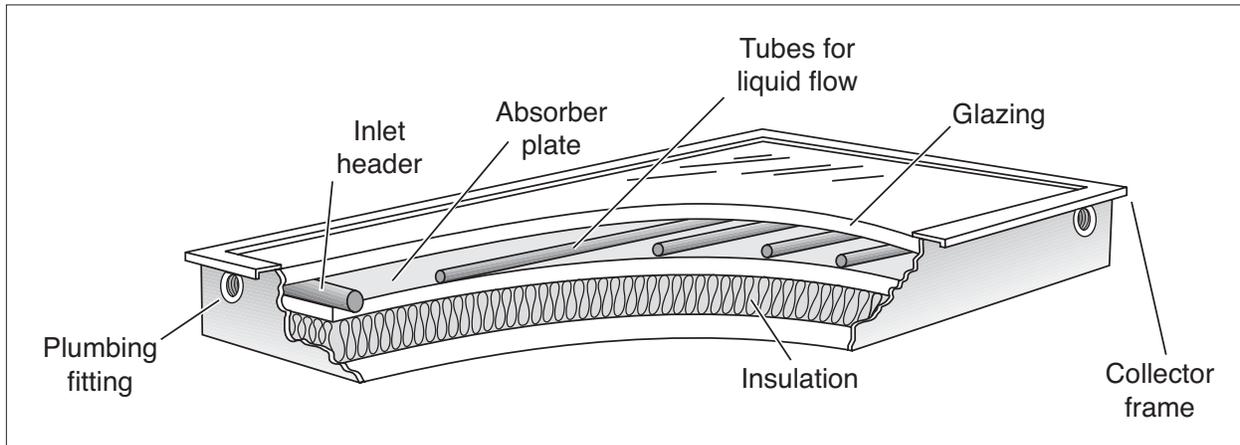
PASSIVE SYSTEMS

In simple terms, a passive solar water heating system requires no moving parts and no external energy source except the sun itself.

The basic passive water heater consists of a water tank that has been painted black and placed in a well-insulated box that has glass or plastic on one side. This set up allows the sun's rays to heat the tank. This type of system is often called a



BREAD BOX OR BATCH HEATER *The basic, passive water heater allows cold water to flow in from the bottom and hot water to flow out of the top.*



ACTIVE, INDIRECT SOLAR COLLECTOR *It is a very simple machine.*

“bread box” or batch heater. It allows cold water to flow in from the bottom and hot water to flow out of the top. The system operates using only the water pressure from the water provider. Water from the system is then transferred to a standard water heater. The water is then stored where your thermostat can determine if the water is already hot enough for use. If the water is not hot enough, additional heat is added to increase the water temperature.

ACTIVE SYSTEMS: DIRECT AND INDIRECT

Active solar water heaters are more efficient than passive solar water heaters. But they also require more equipment like collectors, sensors, pumps and controllers.

Active systems come in two types: direct and indirect. Direct systems heat water in the collectors. Indirect systems do not heat the household water, but instead they use another fluid such as freon, distilled water or propylene glycol. After the fluid is heated in the collectors, it travels through a heat exchanger, where the heat it contains is transferred to the household water.

While direct systems are more efficient than indirect ones, they require more maintenance and could develop a problem called scaling. Scaling is a build up of mineral deposits that can clog the smaller pipes so that water cannot flow through them much like what happens to veins and arteries when they get clogged, slowing down the flow of blood. Also, all water from inside the pipes may need to be drained in an active system. This is to prevent damage to the pipes or system from freezing or overheating. This need for a drain requires additional parts.

SOLAR COLLECTORS

A flat solar collector is a very simple machine. It consists of an insulated rectangular box. It contains a metal plate (usually copper) that has been painted black, with a pipe at each end (called headers) that are connected to small tubes (called risers) also made from pipe. Water flows from the header into the risers. Water is first heated in the risers and then returns to the storage tank. The entire box is covered with a special glass that is hail resistant. The entire box is then installed, usually on the roof of a building, and tilted so it can capture as much sunlight as possible.

STORAGE TANKS

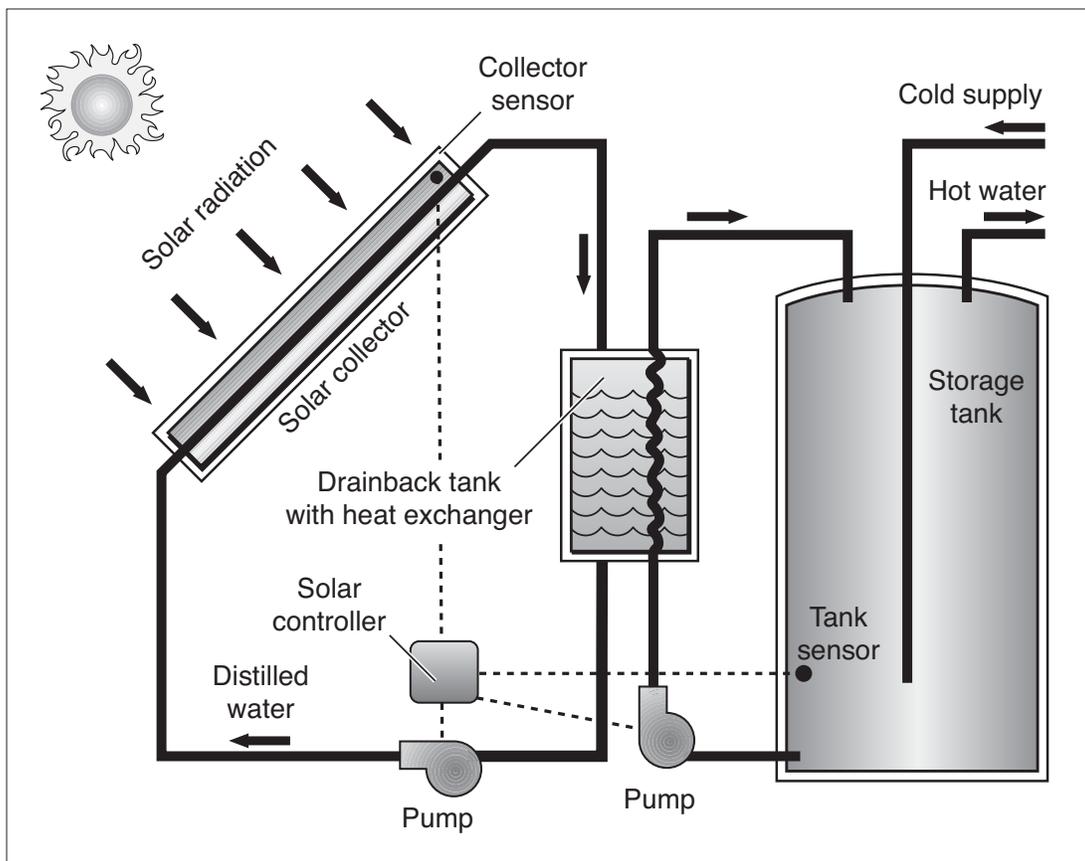
Whether you use a direct or indirect solar water heater, a large storage tank will be needed. The most commonly used size is 80 gallons. Solar water storage tanks look similar to standard water heater tanks. But they are very well insulated to save the heat gained by the collectors. Water is usually transferred from the solar water storage tank to a standard water heater tank.

Solar water heaters can heat water to a temperature that is much higher than needed in the home. Therefore, special valves, called tempering or mixing valves, are recommended to control the water temperature. The special valve can be set to the desired temperature, such as 120 degrees Fahrenheit. If the solar heated water is too hot, it mixes cold water with the hot water before it reaches the faucet.

GETTING MORE FROM YOUR SYSTEM

Solar water heating systems can range in price from \$800 for a simple passive water heater to \$3,500 for a professionally made system. Conventional water heaters typically cost less than \$1,000 when installed. You can get the most out of your solar water heater by installing low flow showerheads and aerators on all faucets. This is an affordable way to conserve water and reduce hot water use as well.

Do you realize that the time of day when you use water could greatly affect how well a solar system works? For instance, after you are done with your normal morning water needs like showering, you could wait until around noon to do laundry. This gives the solar water heater time to heat up more water that can be used in the afternoon.



ACTIVE, DIRECT SYSTEM A direct system must be allowed to drain to prevent damage.

ORGANIZATIONS

American Solar Energy Society
2400 Central Ave., G-1
Boulder, CO 80301
(303) 443-3130
www.ases.org

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922
(407) 638-1000
www.fsec.ucf.edu

Passive Solar Industries Council
1511 K Street, Suite 600
Washington, DC 20005
(202) 628-7400
www.sbicouncil.org

Texas Solar Energy Society
P.O. Box 1447
Austin, TX 78767-1447
(800) 465-5049
e-mail: info@txses.org
www.txses.org

Texas Renewable Energy Industries Association
P.O. Box 16469
Austin, TX 78761
(512) 345-5446
www.treia.org

RESOURCES

TEXAS RENEWABLE ENERGY EDUCATION CAMPAIGN

FREE TEXAS RENEWABLE ENERGY INFORMATION

For more information on how you can put Texas' abundant renewable energy resources to use in your home or business, visit our website at www.InfinitePower.org or call us at 1-800-531-5441 ext 31796. Ask about our free Teacher Resource Guides and CD available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

Renewables, products, sustainable living.

El Paso Solar Energy Association. Lots of good information.
<http://www.epsea.org/wtr.html>

Florida Solar Energy Center. Information on solar pool heating and other information. www.fsec.ucf.edu You can order a manual called "Solar Water and Pool Heating Design and Installation Manual," for \$25. Run by the Florida Solar Energy Center, the site contains a panoply of other documents on renewable energy <http://www.fsec.ucf.edu/solar/install/solarmanual.htm>

Improve Energy Efficiency with Solar Water Heating
www.energystar.gov/ia/new_homes/features/ESSolarWaterHeating.pdf

A Sourcebook for Green and Sustainable Living covering energy, water, building materials, solid waste and other topics. A mammoth resource.
www.greenbuilder.com/sourcebook

U. S. Department of Energy offers a wealth of information on solar water heating, including tips on sizing your system, potential cost savings and other helpful info. http://www.eere.energy.gov/RE/solar_hotwater.html

Software tools to estimate the economic benefits can be found at:
http://www.eere.energy.gov/buildings/tools_directory/

BOOKS:

The Passive Solar Energy Book. Edward Mazria, Rodale Press, 1979.

Solar Water Heating Systems, Active and Passive. US Department of Energy. (available by calling (800 523-2929)



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

InfinitePower.org

Financial Acknowledgement This publication was developed as part of the Renewable Energy Demonstration Program and was funded 100% with oil overcharge funds from the Exxon settlement as provided by the Texas State Energy Conservation Office and the U.S. Department of Energy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

State Energy Conservation Office
111 East 17th Street, Room 1114
Austin, Texas 78774
Ph. 800.531.5441 ext 31796
www.InfinitePower.org

Texas Comptroller of Public Accounts
Publication #96-814 (08/06)