

# The Consumer Guide to Solar Energy

## Chapter four: Solar Pool Heating

### Enjoying your swimming pool several months longer each year.

“Do you have a swimming pool in your backyard?

If so, then you really ought to be taking advantage of the most economically attractive use of solar energy available today. Solar pool heating can extend your swimming season several months each year and make that investment in your pool pay off even more with more use and enjoyment. More than 300,000 solar pool heating systems have been installed in the United States, providing efficient heating to residential and commercial swimming pools around the country.

Remember how you felt when you decided to have that pool built, or when you moved into the house that already had a swimming pool? You probably imagined many enjoyable months of the family swimming together and lounging around the pool. The evening swim parties. The kids and their friends spending afternoons outside your home. The great exercise and physical benefits of swimming.

But in reality, you probably learned that first year what most pool owners around the United States already knew: The swimming season is actually a very short one, restricted to the summer months in most of the country. A pool's temperature cycle varies with climate and geography so that a three-to four-month swimming season is fairly typical even in many of the southern states. During the rest of the year, that pool just sits out there, a reminder of how little you actually used it when you had the chance.

Sure, fossil fuel heaters are available for swimming pools, and many of them were very popular until the energy crisis of the 1970's shot fuel prices sky high, forcing many pool owners to disconnect or remove their heaters. Today, the annual cost of heating a pool with electricity, fuel oil, or propane heaters can easily range from \$1000. to more than \$3000. for a few months more of swimming time. That's why the fastest-growing use of solar energy in the U.S. today is for heating swimming pools. While the average system costs around \$4500., the significant savings over the cost of using conventional fuels to heat the pool will pay back that investment in only about 3 years. Depending on where you live in the U.S., the solar pool heater will extend your swimming season from two to four months, allowing you to use your pool for anywhere from five to eight months (or more) every year in most parts of the country.

### Why are solar pool heaters so cost-effective?

The economics of pool heating are extremely positive for a number of key reasons.

First, you really don't need to raise the water temperature very much to make a big difference in the comfort level. Just before or just after your typical swimming season, the water in your pool might be somewhere between sixty-five and seventy degrees Fahrenheit. If that water temperature can be raised as little as eight to ten degrees, it can extend the swimming season for a few months. Compare this to fifty to sixty degrees increase needed to heat water for use in your home.

Because of the much smaller differential involved in pool heating, very efficient solar collectors can be used. One of the reasons these collectors are so efficient is because of the relatively low temperatures involved. Scientists already know that the hotter solar collectors get, the more energy they lose to the outdoors, cutting down on their efficiency. But solar pool collectors don't get that hot, thus working efficiently and keeping more heat for the system.

Solar pool heating equipment is a lot simpler, too. You don't need a storage tank like your home's water heater; the pool itself serves as the storage system. And in most cases, the pools existing filtration pump can also be used to pump water through the solar collectors, cutting down on the need for extra mechanical equipment.

You also need to keep in mind that the most use of swimming pools takes place during the day time, when the sun is shining. You don't need a back-up system since the water will stay hot enough for use that night and then be reheated again the next day.

Obviously, the biggest reason why solar pool collectors are so economical is because of the high cost of alternative fuels. Because heating a pool is a luxury-not as essential as heating water for indoor household use-the cost of fuel for pool heating is strictly an extra addition to the family budget. Solar heat is absolutely free.

## How does a pool heating system work?

It's actually a very simple process with only solar collectors and some piping needed to make the system. This means no storage tank, usually no pump, and no other mechanical equipment.

Though a variety of different types of solar collectors have been designed for use with swimming pools, most are made of black plastic material with tubes running through them. The collectors in a pool heating system are not covered with glass or plastic because they are used when both solar radiation and outdoor temperatures are relatively high.

When the sun is shining, water from the pool is pumped through a pipe to the collectors and back to the pool. The sun heats the water as it flows through the collectors.

Most pool heating collectors use ultraviolet screening materials to protect the plastic materials, resulting in a lifespan of ten to fifteen years or more.

## How do I know what size system is needed?

Working with a qualified solar contractor will assure that you get the right size and type of system for your needs. However, you can estimate in advance with some general rules for sizing solar pool heating systems. Basically, the larger the area of the solar collectors, the greater the temperature rise in the pool water. The best way to estimate is to figure that the area of the solar collectors should be at least 50-75% of the pool's surface area. This ought to increase the temperature of the water up to 15 degrees. For example, if your pool is 20 feet by 30 feet (600 sq feet) it will take between 300 and 450 square feet of solar collectors, depending on your climate, to obtain the eight to 15 degree temperature rise desired.

In most parts of the country, an increase of 10 degrees means the swimming season can be extended a few more months. In southern California, his increase would allow homeowners to keep the water in their pools at around eighty-two degrees from April to October. Using natural gas to heat a pool during this time period would run around \$2000. per year at current rates. Meanwhile, a pool owner in Florida who followed this guideline would have a swimming season from March through November, with a savings of about \$1800. in natural gas heating costs.

If you want to raise the temperature even higher, just add to the size of the solar collector area. Solar pool heaters are very capable of maintaining temperatures from 80 to 92 degrees. Most prefer mid to high 80's.

Also keep in mind that collectors should face south and be mounted at an angle equal to the local latitude (or latitude plus 15 degrees to maximize winter heating) if possible. Your contractor might have to vary from these guidelines if the location of the house or other factors make these locations impossible, with only minimal loss of effectiveness.

## Can I install a solar pool heater myself?

This is a frequently asked question because much of the basic equipment, including the pump a great deal of the pipe work is already in place. However, unless you are experienced with both plumbing and electrical work, it is advisable to have a solar contractor do the work. Experience had shown that a job taking six hours by an experienced crew will take two do-it-yourselfers a couple of days to complete. Furthermore, the quality of the installation, the duration of the guarantee, and the ease of operation will always be greater with a professional installation.

Many homeowners have tried a do-it-yourself version of a pool heater with less than adequate results. Because a solar collector is basically just a hose or tube filled with water that is heated by the sun, we've heard of examples where a homeowner has bought a couple of dozen garden hoses, nailed them to the roof, and pumped the pool water through them. Even though the look of such a system is usually enough to discourage someone from trying this, there's a more practical reason why this isn't very cost-effective. Researchers have estimated that it would take at least 2 miles of half inch garden hose to raise the temperature enough to make the pool water swimmable. Now you may have a pretty big roof on your house, but 2 miles of hose?

## Can solar energy be used to heat a spa or hot tub?

Spas and hot tubs both pose special problems for energy-conscious owners because of the high temperatures that are needed and the night time energy use patterns. Both of these factors reduce the general effec-

tiveness of solar energy systems, but options exist to make them effective.

Solar collectors can be used to bring the water temperature to 105 degrees Fahrenheit during the day. While the spa or tub is used, the water temperature will drop 1 or 2 degrees every fifteen minutes, which is adequate for most people. However, if the 105 degree temperature must be maintained, you can use a gas, oil, or electric back-up heater. Some homeowners use heat pumps to absorb heat from the air and dissipate it at an elevated temperature to the spa water.

What seems to work best for general use is a solar water heater to bring the temperature to the desired level, and an insulated cover to cut down on evaporation losses when the tub or spa is not in use. Most people only use their hot tubs for an hour or so each day, leaving plenty of time for the unit to be covered. This combination of solar energy and a cover ought to provide for your heating needs at a much lower cost than using fossil fuels.

The best way to enhance the solar system's performance is to use a pool cover to keep the heat from escaping. It has been said that trying to keep pool water warm without a cover is like trying to heat a house without a roof. Most experts recommend a light colored or transparent cover which will allow sunlight into the pool, adding to the solar performance, while actually absorbing heat and helping raise the temperature. Generally, keeping your pool covered for twelve hours a day can result in a 5 degree increase in your pool. Covering it for twenty hours a day can raise the temperature of your solar heated pool ten degrees higher than it would have been otherwise.

A cover will also help keep the pool clean, cutting down on the cost of chemicals and filter maintenance. Current research points to the fact that the pool water itself is a much greater absorber of solar radiation than any cover can be. For this reason it is recommended to leave the pool open during peak solar hours of the day (10am-3pm) and cover it to prevent the loss during other hours. A properly sized solar collector can actually recover most if not all of the loss that occurred during the previous evening, and most people will find that a cover is unnecessary for a large portion of their season. Typically, the beginning and end of your swimming season, or whenever the temperature will fall below 65 degrees may be the only times you will need the added performance that a "heat retention" cover provides. For the most part, you can expect to take a nice break from the use of a blanket through the peak summer months of June, July and most of August.

## Other tips

Recent research has found another way for pool owners to save some money while helping utility companies cut down on their peak power usage.

Depending on how long your pool pump runs everyday, you could be spending anywhere from forty to one hundred dollars each month on electricity for the pump. If you've had your pool for awhile, chances are good that the pump is oversized, not very efficient, and is usually set to run for far too long each day. A way to save energy, then, is to set the pump to run as little as necessary- enough to mix the chemicals throughout the pool and keep it free of debris by drawing water out through the skimmer, floor vacuum and filter, but not so long that it wastes energy. A study by researchers at Florida Atlantic University in Boca Raton, Florida found that most people were happy with the cleanliness of their pool when the pump ran as little as two to four hours a day- far less than most pool pumps are set to operate.

The way to maximize energy savings is to set the pumps time clock to run only during peak solar hours of the day so that you are maximizing heat gain while minimizing pump running time and electricity usage. The hours of 8-6, 9-5, 10-4, 11-3 are recommended windows of 10, 8, 6 and 4 hour pump cycles during the peak solar day.

We strongly recommend that you watch your pool closely for the first week or two after you make any changes in the settings. Since so many factors affect the exact amount of time needed for your pool, including shading, amount of nearby debris, climate, etc., you will probably need to experiment with one of the above cycles to find the best time setting for your pump. The bottom line, though, is that reduced pump running time can cut about 60 percent of the electricity you're using now, while a professional solar heating system can cut 100 percent of your heating fuel costs.

The guidelines listed in this chapter can greatly increase your enjoyment of your swimming pool while cutting down dramatically on energy use. Installing an automatic solar pool heater, using a pool cover, and cutting down on pump running times will maximize your use of the pool and greatly extend your swimming season. That means a lot less time during the year when you look at your pool and wish the water was warm enough for swimming.

Solar pool heating can give you the pool you've always dreamed about at a cost you've only dreamed about!