

## Wisconsin sock maker steps up to solar hot water

CASE STUDY BY ED BLUME AND MICHAEL VICKERMAN



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“We wanted to do something genuine, not phony,” said Bob Chesebro, president of family-owned Wigwam Mills, Sheboygan, about his company’s decision to install a solar energy system.

Initially, Chesebro wasn’t sure which kind of solar energy system to go with. But the more he delved into the question, the more he came to believe that solar hot water would provide the best fit for the 103-year-old company. Placed in service in February 2008, Wigwam’s 27 solar collectors supply 47 percent of the hot water used by the company to shrink, bleach, antimicrobial treat, wash and soften 40,000 pairs of socks each day.

“We are the first sock manufacturer in Wisconsin to have integrated solar water heating into our production process,” adds Paul Milbrath, Wigwam’s director of purchasing, product development and maintenance.

The idea for the installation was first raised in a phone conversation between Milbrath and Rob Schroeder, who manages the Wigwam account for Alliant Energy. Schroeder told Milbrath to get in touch with Kurt Koepp of Hot Water Products, a Milwaukee-based distributor of solar water heating equipment. After listening to Milbrath describe Wigwam’s hot water requirements, Koepp suggested that Wigwam hire Craig Tarr of Hudson-based Energy Concepts to analyze the feasibility of preheating Wigwam’s water with solar energy.

Tarr, a licensed Professional Engineer (PE) with considerable experience designing heating and cooling systems, visited the plant and studied the building’s mechanicals and energy use patterns. Though Wigwam’s 200,000-square-foot building could easily accommodate a large solar array, Tarr’s biggest challenge was to design a system that would mesh with Wigwam’s five-day-a-week production schedule. Under those conditions, a typical pressurized closed-loop configuration, which collects energy whenever the sun shines, would be at risk of overheating on the days Wigwam was closed.

Tarr’s solution was to engineer a solar hot water system that allows the glycol solution to drain back



PHOTO COURTESY CRAIG TARR

into a storage tank when the system is idle. This type of configuration is known as a drainback system.

“You can’t turn the sun off on the weekend. In a pressurized closed-loop system, you do not have much temperature control,” says Tarr. “With a drainback system, Wigwam has temperature control. The company can make do with a smaller storage tank, and it also doesn’t have to worry about stagnating fluid. However, drainback systems are more difficult to design. The pumps have to be sized differently because they have to overcome the lack of pressure in the piping runs.”

Built at a cost of \$115,000, Wigwam’s system is expected to displace 2,132 therms of natural gas annually. Factoring in a Focus on Energy grant of \$17,059, a 30 percent federal tax credit and accelerated depreciation, Tarr calculates that Wigwam’s investment will be fully recovered in eight to nine years. Of course, if natural gas prices continue their rapid rise, the payback will be considerably shorter.

The avoided natural gas combustion will result in 12.5 fewer tons of carbon dioxide (CO<sub>2</sub>) discharged into the atmosphere annually.



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Wigwam's installation showcases Tarr's skill in identifying and designing renewable energy systems that are compatible with existing facility operations and loads. "I can step out of the renewable energy box when the situation calls for it," says Tarr, who studied solar and wind engineering while obtaining a degree in mechanical engineering from the University of Colorado.

In approaching a potential renewable energy installation, Energy Concepts takes the lead in contacting customers, designing systems, ordering equipment and post-construction commissioning. The company usually contracts with Steiner Plumbing and Electric, based in River Falls, to physically install the renewable energy system. Energy Concepts also brought in Aldag/Honald Mechanical and Butzen Brothers Roofing, two Sheboygan contractors familiar with the Wigwam facility, to mount the array, fasten it to the beams below, plumb the system, and complete necessary roofing modifications.

The next project on Energy Concepts' plate is a solar hot water project to serve Osceola Middle School. This installation will be configured to serve, in sequence, a spa, a wading pool, the main pool and the rest of the domestic water used in school. This may be the first configuration of its kind in Wisconsin, but if Wigwam Mills is any indication, Energy Concepts is up to the challenge.

#### Full Service Installer & Lead Contractor

Craig Tarr, PE, LEED AP  
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Hudson, WI 54016  
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energyconcepts.us

#### Types of system installations:

Solar hot water, solar electric, and wind electric

#### Service Territory:

Statewide

#### System installer:

Steiner Plumbing and Electric  
Paul Steiner  
River Falls, Wisconsin  
715.425.5544  
steinerinc.net

#### Distributor:

Hot Water Products  
Milwaukee, Wisconsin  
888.430.5971  
hotwaterproducts.com

#### Panel manufacturer:

SolarSkies  
Starbuck, Minnesota  
877.765.2757  
solarskies.com

#### At-A-Glance – Solar Hot Water System

**Collector space:** 1,080 sq. ft (27 4'x10' panels)

**Annual fuel savings:** 2,132 therms

**Avoided CO2 emissions:** 12.5 tons/year

**Solar contribution to hot water load:** 47 percent

**Preheated water volume:** 1,300 gallons

**Incoming water temperature:** 45°

**Installation cost:** \$115,000

**Focus on Energy Incentive:** \$17,059

**System payback:** Nine years