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## SOLAR HEATING CUTS MANUFACTURING COSTS AT MILWAUKEE BREWERY

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### THE ENEREF INSTITUTE EXAMINES HOW A SOLAR HEATING SYSTEM MEETS HOT WATER DEMANDS FOR A BREWERY

Today, Milwaukee is one of the surprising US cities leading the way in solar installations. Situated in the colder, northern part of the country, the City of Milwaukee was inspired to help residents save on their energy bills while building their local economy. Recognized as a

Solar America City as early as 2008, Milwaukee has created a unique network of programs to make solar energy assessable to area residents and businesses. "Milwaukee is quickly becoming known for its leadership on sustainability initiatives," says Amy Heart, Solar Program

## WE'RE ALSO PROVIDING RESOURCES FOR OUR RESIDENTS TO BE MORE SUSTAINABLE AS WELL.

### Milwaukee Brewing Company was a great candidate for such a prominent project, and the brewery's popular tours would guarantee an audience for solar heating.

Manager for the city's successful Milwaukee Shines solar program. "We are making real investments in our City-owned facilities and infrastructure, but we're also providing resources for our residents to be more sustainable as well."

#### "MILWAUKEE SHINES" BRINGS SOLAR TO CITY

Despite the state's snowy winters, Wisconsin is a great setting to benefit from solar energy. In fact, with the dryer, colder air of winter, more sunlight is able to reach solar panels. Additionally, all that Midwestern snow acts as a reflector for sunlight onto the panels.

In 2008, the city created Milwaukee Shines, a dynamic program to promote the use of solar in the region. Milwaukee Shines educates local residents and businesses about solar energy, streamlines permitting and financing, and has already brought many well-paying jobs to the area through its promotion of the solar industry.

Additionally, Milwaukee Shines

advances the city's economy. Not only does the program pull talent from local installers, but from neighboring manufacturers as well. Caleffi Hydronic Solutions is a Milwaukee-based leading supplier of high-quality component parts for the hydronics industry, including solar heating, biomass and geothermal industry. As a large manufacturer, Caleffi was an ideal partner for Milwaukee Shines on multiple green projects in the city's effort to build a more sustainable, earth-friendly community. Caleffi Solar is also one of the founding members of the Milwaukee Metro Solar Hot Water Business Council, which is a public-private partnership that supports a locally-based network of solar heating manufacturers and installers.

#### EXTENSIVE NETWORK OF MILWAUKEE PROGRAMS

Of course, solar energy is only part of the solution to building an energy-independent city. The Milwaukee Energy Efficiency program (ME2), a federally funded

program, works to make energy efficiency accessible to businesses and homeowners. The program provides free evaluations, financing plans, and cash-back incentives to home and business owners. After initial consultations, participants are partnered with an Energy Advocate to guide them through the improvements and make sure they receive all possible financial incentives. Since its creation in 2010, ME2 has helped improve over 720 homes and over 130 businesses.

With such an extensive network of programs surrounding it, Milwaukee Brewing Company knew exactly where to turn when it decided to install a solar heating system to reduce the high cost of energy of the beer brewing process. Milwaukee Brewing Company had already taken steps to reduce its energy footprint by processing the entire brewing-to-bottling operation on-site, even sourcing local hops and packaging suppliers. However, one big area for improvement remained: its hot water load for its beer.

#### THE BREWING PROCESS

While each brewer's process is slightly different, beer brewing requires very hot water for multiple processing steps. In one of the initial phases of brewing beer, for example, barley and hot water are mixed in a large steel tank called a mash tun. The heat allows enzymes to convert starches in the malt into

## INSTALLATION ONLY TOOK 6 WEEKS

*The components included 28 4'x10' Caleffi 4-port StarMax collectors with 40,000 kBTU/day capacity*



sugar. Later, the brewing liquid, or wort, is boiled with hops and other additions to create the beer's flavor and finish the initial brewing process. It naturally requires a great deal of thermal energy to heat such a great deal of water.

Even though the brewery had already modified one of its two boilers to burn waste vegetable oil from local restaurants and installed heat recovery systems from refrigeration systems, most of the 1500 gallons of process water the brewery uses every day was still being heated with natural gas. The brewery decided to free itself from the expense and environmental

impact of natural gas by turning to solar water heating.

### SOLAR HEATING: HOW IT WORKS

Unlike the more common solar photovoltaic (PV) systems, which are designed to generate electricity, solar heating uses the sun's energy directly to heat water, much the way a car gets hot while sitting under the sun. Often providing up to majority of a building's hot water needs, solar water heating, or solar thermal, systems are a perfect fit for such a hot-water-intensive industry. Solar hot water for food production applications, such as beer brewing, are

designated by the solar industry as solar heat for industrial processes (SHIP), or simply process heating. One of the most effective uses of process heating is in the food and beverage industry.

Once a solar heating system is installed it begins to save on the cost of energy right away. And once the energy savings pays for the installation, the thermal energy created by the system is free. Research by Enerref Institute ([enerref.org](http://enerref.org)) has found a well-designed solar heating systems can operate successfully for 30 years – well beyond the time needed to pay for the system.

## IN 2008, MILWAUKEE WAS NAMED ONE OF 25 SOLAR AMERICA CITIES BY THE U.S DEPARTMENT OF ENERGY.

Milwaukee Shines supports industry development by creating a robust local workforce, increasing the number of certified solar installers, and encouraging solar manufacturing businesses to locate in the city. Milwaukee Shines is the City of Milwaukee's solar energy program.

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"For processes with a large hot water load, solar heating is one of the best investments a manufacturer can make," explains Seth Warren Rose, founding director of Eneref Institute.

Wisconsin and the City of Milwaukee were eager to help Milwaukee Brewing Company's dreams come true. Wisconsin has already been able to convert 7.4% of its electricity generation to renewable sources. Milwaukee Brewing Company's green credentials made them a great candidate for such a prominent project, and the brewery's popular tours would guarantee an audience for the solar heating technology.

### COLLABORATIVE SUCCESS

To help fund the installation, Milwaukee Brewing Company received \$50,000 in grants from Me2 and Milwaukee Shines. Additionally, Milwaukee Brewing Company received two competitive grants from Wisconsin's Focus On Energy program to finance the project, as well as a grant from the Wisconsin State Energy Office as part of their program to encourage breweries to become more sustainable.

The project wasn't just locally-

supported—it was locally sourced. The project's design, manufacturing, and installation came almost entirely from Wisconsin companies. H&H Solar Energy Services, based in Madison, designed and installed the system. Because of the brewery's requirement for a top-quality solar heating system the decision to use Caleffi solar heating components "was easy", says Adam Gusse, the Project Manager for H&H.

### THE RIGHT SPECIFICATIONS

The components included 28 4'x10' Caleffi 4-port StarMax collectors with 40,000 kBTU/day capacity, installed on the roof with Caleffi Quadtrac rails, a 175-gallon solar drain-back tank, and two specially-made 550 gallon solar storage tanks that rest on the brewery floor. From there, water is pumped into a multipurpose 3000 gallon hot water tank as needed. Storage water is pumped into a multi-purpose 3000 gallon hot water tank, as needed. The system is controlled with a Caleffi iSolar BX multi-functional temperature differential controller, which includes energy measurement functionality by connecting to a 1-1/2" Caleffi V40 multi-jet rotary pulse flow meter and flow and return

platinum RTD 1000 Ohm temperature sensors.

While the project's development and funding took about a year to complete, the installation only took six weeks. With its production of 1200-1500 gallons of hot water per day, the system immediately started making a difference in the brewery's natural gas consumption. "Throughout the year, the brewery will see a natural gas savings of over 50%," predicts Gusse. Additionally, because water is heated in the solar tanks before entering the liquor tanks, the liquor tank has to work less and will therefore last longer.

### RAISING AWARENESS FOR WORK WELL DONE

The project offered great PR benefits the brewery as well, garnering visits from "the two largest TV stations in the city," says Gusse, as well as the Milwaukee-Wisconsin Journal Sentinel, Wisconsin Public Radio (WPR), and multiple online solar- and Milwaukee-focused outlets.

In March, Milwaukee BizTimes explored Milwaukee's growing solar industry and the savings and jobs it's creating in the region. Besides recognizing it as a Solar

America City, the U.S. Department of Energy highlighted the city of Milwaukee's efforts online, saying, "One community leading the way is the City of Milwaukee." As more people learn about Milwaukee Brewing Company's green efforts through visits to the brewery and other breweries create their own solar projects, Milwaukee Brewing Company and Caleffi's profile will only increase.

Says Heart, "What makes me most proud about this Milwaukee Brewing Company project is that no one involved in this project wants to keep it to themselves. Milwaukee Brewing Company wants to help other brewers follow its lead and Caleffi wants to help other solar companies learn how to sell similar projects around the state and nation. The idea is to help others make the same investment because we will all benefit in the long run."

*Research and reporting compiled and provided by Eneref Institute.*

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