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The Man Who Would Save Beer

**Bob Lachky of
"Here's to Beer"**

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Brewing Up New Energy

Green energy is making headlines again, for good reason. Always an image-booster, renewable energy options are looking better economically at energy intensive breweries.

Brewers on three continents are evaluating one emerging energy generating technology, the fuel cell, which offers high efficiency, extremely low emissions and useful heat and also can serve as a backup power system. And they like what they see.

Sierra Nevada Brewing Company began installing fuel cells at his Chico, CA, brewery in 2005. Owner Ken Grossman says he will save "a couple hundred thousand dollars" a year and earned his company international notice. Grossman is shopping for more fuel cell products based on this early experience.

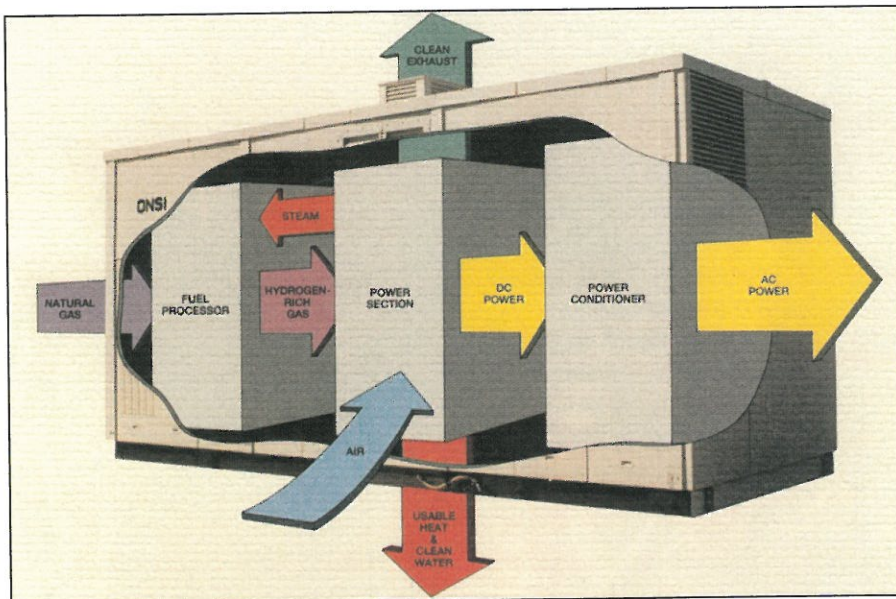
Environmentalists and politicians generally love them, too. A significant federal tax incentive is available for fuel cell installations, and many states have incentives as well.

Breweries have adopted innovative ideas to reduce their energy consumption: installing motion sensors and skylights to save electricity; utilizing the outdoor environment, such as lakes and cold air, for cooling during production; and reclaiming steam for heating offices and tasting rooms; all of which help cut production costs and deliver environmental benefits.

Some brewers also have made a substantial commitment to green energy production, and feature that commitment in their marketing, but green energy still carries the stigma of not being cheap or efficient enough to compete with grid power.

"Fuel cells are proving to be a way for breweries to go green and also save money in the long run because they offer an unmatched combination of benefits," says Robert Rose, Executive Director of the US Fuel Cell Council, the trade association for the fuel cell industry.

Fuel cells use an electrochemical process, instead of combustion, to convert hydrogen and oxygen into electricity, heat, and water. Fuel cells are inherently more efficient than systems that burn fuel, and fuel cell systems produce little or no pollution—ounces rather than tons. Fuel cells are so clean, in fact, that Los Angeles has formally exempted them from air pollution



TOP: A schematic of UTC fuel cell. This similar to the type installed by Sierra Nevada Brewing Co. of Chico, California. **CENTER:** Sierra Nevada's four FuelCell Energy 250kW DFC 300 fuel cells. **BOTTOM PHOTO:** Installation of fuel cell plant underway at Sierra Nevada.

permitting, and they are likely to be exempt in any other locale.

That's not all. They are quiet. They are scalable, which allows installations to be tailored to the consumer's needs. They generate high-quality, reliable power to protect sensitive instruments. They can operate off-grid as stand-alone units, or be configured to continue operating when grid power fails. In states that allow it, they can also generate power for sale back to the grid.

Hundreds of cogeneration units are providing power and useful heat at commercial and industrial facilities world wide. Most operate on natural gas or propane, but an increasing number use waste gases from landfills, waste water treatment plants or industrial processes.

It is in this sense that a fuel cell has a special place at a brewery; the brewery can supply a significant portion of its electricity needs from its waste. Untreated brewery effluent can undergo anaerobic digestion, which breaks down organic compounds to generate methane, a hydrogen rich fuel.

Several breweries, including Anheuser-Busch, have already begun treating their brew sewage and extracting enough methane to supplement 10-20% of their heating cost. Burning the methane solely for heating, however, is an extremely inefficient use of the fuel.

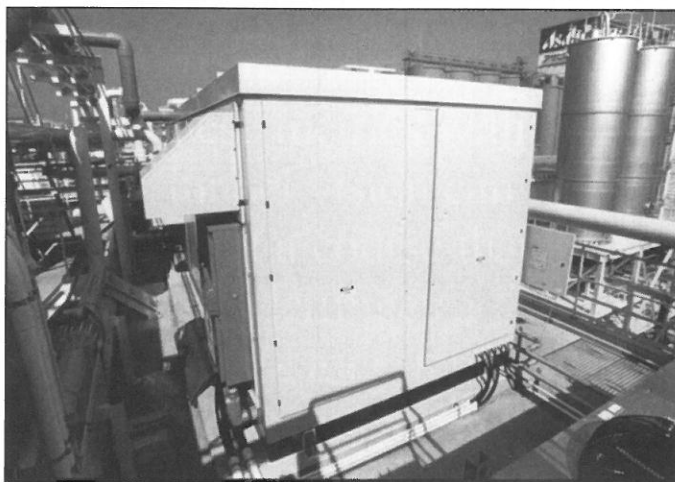
In a cogeneration system, where both the heat and electricity are used, the fuel cell maximizes the energy available in methane. The energy gained from the electrochemical process along with the heat exhaust can achieve 85% efficiency; without the pollution, and noise associated with combustion systems.

Sierra Nevada Brewing Co. became the first brewery in the United States to install a fuel cell when it began taking delivery of four of FuelCell Energy's 250 kW molten carbonate fuel cells. The units produce up to 1MW of electrical power and enough heat to make steam at 125 pounds per square inch, offsetting their boilers' energy consumption by about 10%.

Although the brewery's waste does not provide enough fuel to run all four fuel cells, it currently provides, on average, 500 kW of power. Natural gas is used to make up the remainder of the energy needs. Sierra Nevada is not entirely

grid-free either. The company still has to purchase electricity from the grid, but it is able to offset its peak-period consumption by 1 MW and sell unused electricity back to the grid when its own demand is low.

Sierra Nevada's Grossman, says his "couple hundred thousand dollar" energy cost savings, combined with government incentives, will allow him to pay off the capital cost of the fuel cells in five years.



These images depict fuel cell installations at Sapporo (top) and Asahi Breweries in Japan. The Asahi and Sapporo plants utilize UTC Fuel Cells 200kW phosphoric acid fuel cells.

Grossman has been impressed with performance of the fuel cells. "Aside from the mechanical parts of the system, the fans and such, the fuel cells have worked pretty flawlessly," he said. Grossman is now looking into a fuel cell operated forklift for the warehouse.

Sierra Nevada isn't the only brewery utilizing fuel cells. The three major breweries in Japan—Sapporo, Kirin, and Asahi—installed 200 kW fuel cells in 1998. Those units were supplied by United Technologies Corporation's UTC Power. Fuchschen Brewery in Düsseldorf, Germany has had success in reducing its energy cost with a Vaillant fuel cell.

Beyond Energy Savings

Governments in Europe and Japan have made substantial commitment to reduce emissions of carbon dioxide and other greenhouse gas emissions, in some cases providing monetary incentives. The U.S. relies, for the moment, on voluntary reductions. Fuel cells offer a brewer an exceptional opportunity to achieve greenhouse gas reductions.

Anaerobic digester gas is generally considered a renewable fuel, since it is an organic waste product. Harnessing energy from organic waste dramatically reduces net CO₂ emissions, since next year's crop will absorb most of this year's emissions.

Fuel cells also run silently and don't disrupt the atmosphere in the brewery's public places, such as restaurants or beer gardens, unlike combustion generators. And there is no need to purchase a backup generator to protect production during blackouts. The fuel cells at Sierra Nevada have drawn increased attention from outside the beer industry—university classes and professors, public officials and people from as far away as Brazil have heard about the brewery's project and requested tours of the novel technology.

Incentives

Tax credits and other incentives are an important part of the current financial equation of fuel cells, as the new technology is just beginning to penetrate early markets. Substantial incentives are on the books to help cover the first cost of fuel cells.

The federal government's 2005 Energy Policy Act, for instance, offers tax credits to businesses that install fuel cells that are at least 500 watts and have a generation efficiency of 30% or greater. The tax credit covers 30% of the capital cost up to of \$1000 per 1 kW of capacity. Sixteen states currently provide grants or loans and 13 states have tax incentives or rebates for stationary fuel cells.

Fuel cells could be the solution you didn't even know you were looking for. ■

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