

Brewery sets new standard for water reuse

The onsite treatment solution EcoVolt will reduce the water footprint of the Lagunitas Brewery by 40 percent, which will enable the company to open a second brewery in the drought-stricken US state of California. Cambrian Innovation CEO **Matt Silver** explains how.

A revolutionary new water recycling system designed by Cambrian Innovation will reduce water use by 40 percent at the Lagunitas Brewing Company's brewery in Petaluma, California, United States, making it one of the most water efficient breweries in the world.

Scheduled to go online in early 2016, Cambrian's EcoVolt solution will enable Lagunitas to treat brewery wastewater for reuse in all aspects of the brewing process but in the beer itself, such as in boilers and cleaning cycles. Lagunitas Founder Tony Magee explained, "Our beer in Petaluma will still be made with 100 percent pure Russian River water, but we will not have to use as much freshwater for cleaning and other processes." As a result, the new water recycling system will reduce water usage ratio to 2.5:1, which Magee says is a new industry standard for a traditionally water-intensive sector.

Lagunitas Brewing Company faced steep economic and environmental costs for trucking more than 189,000 liters of wastewater per day to a plant more than 64 kilometers away to treat the water's high biological oxygen demand. Additionally, the state government of California has imposed 25-percent water reduction mandates to manage scarce water supplies during an extended drought. California also has some of the highest energy costs in the nation, which can be a limiting factor for energy-intensive processes such as the treatment of wastewater.

Given these challenges, Lagunitas had three priorities: treating wastewater cost-effectively and locally; finding a compact wastewater treatment solution that could grow with the brewery; and reusing water to ensure sustainable growth while

hedging against scarcity.

The Cambrian Innovation system will be comprised of three EcoVolt Reactors, three EcoVolt Membrane Bioreactors (MBRs), and a Water Reuse Container, all controlled and monitored by the EcoVolt Headworks. The EcoVolt Reactor employs electrically active, naturally occurring microbes to convert carbon dioxide from wastewater into methane in a process called electromethanogenesis. Unlike traditional onsite water treatment methods, such as anaerobic and aerobic digestion, the reactor's electrically enhanced microbes process a far broader range of organic concentrations in wastewater and operating conditions while recovering clean energy. Magee says the process has also demonstrated greater stability and higher quality biogas than other solutions.

The EcoVolt MBR is an aerobic polishing unit designed for the food and beverage industry to facilitate onsite water reuse. The containerized system leverages new aeration technology with proprietary automation. Plus, the EcoVolt MBR integrates with Cambrian's EcoVolt Reactor architecture, eliminating the extensive energy typically required for water reuse. The systems can be stacked for space efficiency, remotely controlled, and flexibly expanded. When combined with the EcoVolt Reactor, the system removes more than 99.9 percent of biological oxygen demand (BOD) and total suspended solids in the wastewater to produce reusable water with zero energy input. The EcoVolt MBR is a highly efficient stand-alone water treatment solution that cleans water for onsite reuse or sewer discharge for breweries, wineries, and other producers with a low volume or

concentration of wastewater.

These two solutions – EcoVolt Reactor and EcoVolt MBR – enable food and beverage companies to extract clean energy and clean water from wastewater while also earning a return on their investment.

Using the EcoVolt solution, business owners are not constrained by their local utility's capacity and can therefore focus on growth. Lagunitas Brewing Company, for example, can now expand production by 100 percent without affecting the local municipal water supply or wastewater treatment capacity. Lagunitas will also reduce their water footprint by 40 percent, eliminating all contaminants from the full wastewater flow while generating 130 kilowatts (kW) of renewable electricity. Energy generated by the system will reduce brewery carbon dioxide emissions by 1,600 metric tons per year – the equivalent of planting 639 hectares of trees every year.

Water-energy purchase agreement

Cambrian's creative financing model – the Water-Energy Purchase Agreement (WEPA) – is based on the popular solar power purchase agreement (PPA) model, in which distributed micro-utilities are provided to small businesses at no upfront cost or ownership risk. With WEPA, businesses pay monthly for clean water and energy generated by the system that's owned and operated by Cambrian.

The EcoVolt Reactor's onsite energy production qualifies customers for numerous utility

40%

The reduction of water usage that the new recycling system will achieve at the Lagunitas Brewing Company's brewery.

1,600

The reduction in the amount (metric tons) of carbon dioxide emissions per year due to the EcoVolt solution.



incentives. For example, Cambrian worked with Northern United Brewery Company (NUBC) in Michigan to secure a grant from the State of Michigan for the EcoVolt installation. Installations at Lagunitas and at Bear Republic Brewing Company, also in California, have both been granted a number of incentives as well. Under the WEPA, Cambrian Innovation monetizes all of the incentives available, passing along savings to the customer.

Traditional treatment technologies are inefficient in both efficacy and economics. Energy demand, sludge production, and large footprint requirements make



aerobic systems costly. Upfront capital, difficult operations, and systemic failures also make anaerobic alternatives expensive. Both of these system architectures force producers to design for maximum production capacity, creating a mismatch in capital spending and operational benefit. These installations are costly, as they must be designed to handle

a future, expanded production capacity. These concerns distract businesses from their core operations and customer demands. Under the WEPA, customers can match capital to need, providing a more seamless and efficient path to growth.

This new financing vehicle will enable growing industrial businesses to enjoy the benefits of converting wastewater into clean energy and water without any risk or capital expense. With their success in brewery wastewater reuse applications and in others well beyond, advanced onsite solutions such as the EcoVolt Reactor and the EcoVolt MBR

show promise in this age of water volatility.

Authors' Note

The author and Justin Buck, both Massachusetts Institute of Technology (MIT) graduates, founded Cambrian in 2006 initially to explore resource recovery in outer space with a grant from the National Aeronautical Space Administration (NASA). Since then, the company has received grants from the National Science Foundation, the Department of Defense, the Environmental Protection Agency, and several other US federal agencies, as well as private equity funding.