



REDUCING BOD IN BREWERY WASTEWATER

CLIENT:	Woodstock Inn, Station & Brewery
LOCATION:	North Woodstock, New Hampshire, USA
TREATMENT TYPE:	Brewery wastewater
WASTEWATER FLOW:	2325 gal/day (average)
SYSTEM SIZE:	6 x BioGill Towers

SITUATION

Expanding brewery: Nestled in the White Mountains of New Hampshire, Woodstock Inn, Station & Brewery is a bustling venue for locals and the many visitors drawn to the mountains year-round. Brewing since 1995, Woodstock beers are served at the onsite restaurant, bars, hotel, and event space, as well as distributed throughout New England. To meet increased demand, in 2013 the brewery added a new 30-barrel brewing system to their original 7-barrel system.

As the brewery ramped up production, the small local municipal wastewater treatment plant struggled to handle the increased loadings. To avoid overloading the plant, a new permit required the brewery to reduce wastewater BOD and TSS concentrations to below 300 mg/L.

Sidestreaming: The brewery's first step was to reduce the amount of organic material entering the wastewater. Known as "sidestreaming", the brewery adjusted practices to collect the most concentrated liquid and solid waste streams generated by the brewing process - such as spent grain, yeast, hops, and waste beer - and keep them out of the drain. This organic material is now captured and repurposed to feed local cattle and composting processes, rather than increasing wastewater BOD and TSS.

High-strength wastewater surcharges: Sidestreaming significantly reduced overall BOD and TSS levels, but concentrations of soluble BOD remained elevated well above compliance levels. Extra sewer fees for the high BOD loads were costing the brewery more than \$10,000 per month, equivalent to around \$12 per barrel of beer produced.

SOLUTION

In 2017, BioGill partnered with Woodstock and its local engineer to demonstrate the technology. Following the successful trial, a full-scale wastewater pre-treatment process was designed incorporating six BioGill Towers.

BioGill is an innovative biological treatment technology that employs patented, nano-ceramic media known as "Gills" to effectively cultivate a treating biomass. The bioreactors are modular and compact in design, so as volumes increase, further units can be easily added. Units can also be retrofitted to existing plants to boost performance and capacity. When incorporated into a wastewater pre-treatment process, the technology can reduce soluble BOD in brewery wastewater by more than 90%.



Woodstock Inn, Station & Brewery, brewing beer since 1995.



DESIGN

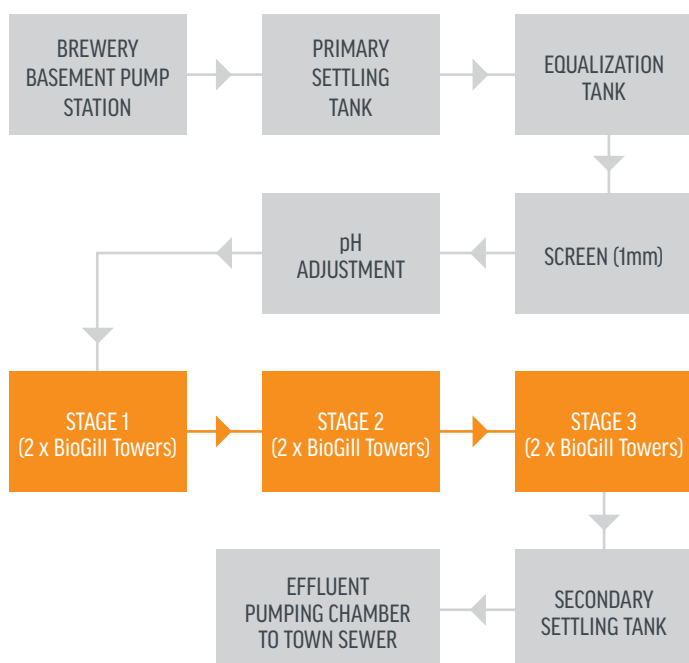
A key objective of the full-scale system was to incorporate as much existing infrastructure as possible, including three in-ground septic tanks located beneath the brewery parking lot. These concrete tanks now provide volume for settling of solids and equalization, normalizing the flow and concentration of the raw wastewater before biological treatment.

Wastewater is pumped continuously from these underground tanks, through a 1 mm filter, and pH adjusted before flowing to the biological treatment process. Six BioGill Towers are arranged in 3 stages (2 Towers per stage), with each bioreactor mounted above a small recirculation tank. Wastewater moves through the system by gravity from one stage to the next for additional treatment.

Inside each bioreactor, microorganisms growing throughout the Gills consume dissolved nutrients, converting soluble BOD into biomass. The heat of the biological activity generates natural convection currents that pull air into each bioreactor through vents, providing oxygen to the microbes without requiring powered aeration. The unique nature of the Gill structure promotes a resilient biomass that can handle fluctuations in wastewater flow and characteristics that accompany the weekly and seasonal patterns of brewery production activities.

As the biomass grows, it sloughs naturally from the Gills and settles in the recirculation tanks, where it is easily removed. Treated effluent flows by gravity to another of the brewery's pre-existing in-ground tanks for pH monitoring before discharge to the Town sewer.

Process Flow Schematic

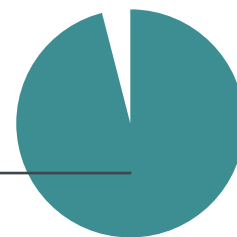


RESULTS

The new treatment process was commissioned in February 2019. Regular effluent sampling during the first months of operation showed average BOD reductions of 91%, significantly reducing the brewery's wastewater discharge costs, and improving operations at the local municipal plant.

Installing the onsite wastewater treatment system is the latest in a series of projects implemented at Woodstock Inn, Station & Brewery to improve sustainability outcomes and reduce the environmental footprint. Other initiatives include solar water heating, as well as solar energy and heat exchange and recovery systems. This brewery is fast becoming an example of industry-leading practices in energy efficiency, renewable energy, solid waste management, and now wastewater treatment.

91%



91% average BOD removal



Six BioGill Tower units are used in the biological stage of the treatment process.

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Case studies and technical reports are available at biogill.com

