

Brewers' Wastewater Bulletin



THIS ISSUE

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CHEMICALS & CLEANING IN BREWING OPERATIONS

A portion of the wastewater discharged from the brewery is generated during cleaning and sanitizing cycles. This differs from the rest of the process wastewater in that it may have a lower concentration of BOD and TSS, but will likely have a more extreme pH and may also contain residual chemical substances that are potentially toxic to treatment biology.

Acid and alkali cleaners are ubiquitous throughout the industry, and depending on how much cleaning takes place at one time they may drive the discharge pH lower or higher than is either safe or required by a local Industrial User permit (if on public sewer). A given Publically Owned Treatment Works (POTW) might regulate pH as tightly as 6.0 – 9.0, and consider pH readings that are less than 5.0 or greater than 12.5 to be extreme. POTW's may regulate breweries by issuing an Industrial User Wastewater Discharge Permit.



Moreover, even properly sized in-ground septic systems should not be allowed to "sour", which can be avoided by having a neutral or even slightly alkaline discharge pH of 7.0 – 9.0.

A persistent acidic discharge will cause the pH inside a leach field to drop, interfering with treatment efficiency by suppressing the beneficial bacteria and potentially generating hydrogen sulfide and methane. A slightly alkaline discharge pH supports beneficial bacteria and treatment effectiveness. Having a system that is designed to handle both the flow and the strength of the brewery's wastewater is critical; keep potential future plans in mind when designing your system.



Examples of acids and alkali used either in concentrated form or as components of process and maintenance chemistry include:

ACIDS

- Acetic acid
- Citric acid
- Dodecylbenzene sulphonic acid/sulfate
- Hydriodic acid
- Lactic acid
- Nitric acid
- Peracetic/peroxyacetic acid (also a disinfectant)
- Phosphoric acid
- Silicic acid
- Sulfuric acid
- Tricarboxylic acid

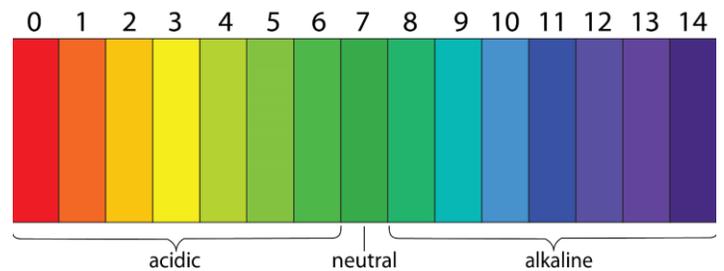
ALKALI

- Potassium hydroxide
- Sodium carbonate
- Sodium hydroxide

Cleaning and sanitizing chemistry may contain acids and alkali, as well as a range of other compounds which provide both cleaning and other chemical disinfectant characteristics that would exhibit toxic effects on treatment biology; it is equally effective at killing beneficial treatment microorganisms as it is useful (and necessary) to eliminate the harmful ones. Cleaning and sanitation applies to the tanks, pumps, filtration/centrifugation machinery, and plumbing associated with manufacturing the beer, equipment associated with bottling, canning, or kegging, and to maintaining sanitary conditions throughout the overall facility.



The pH scale



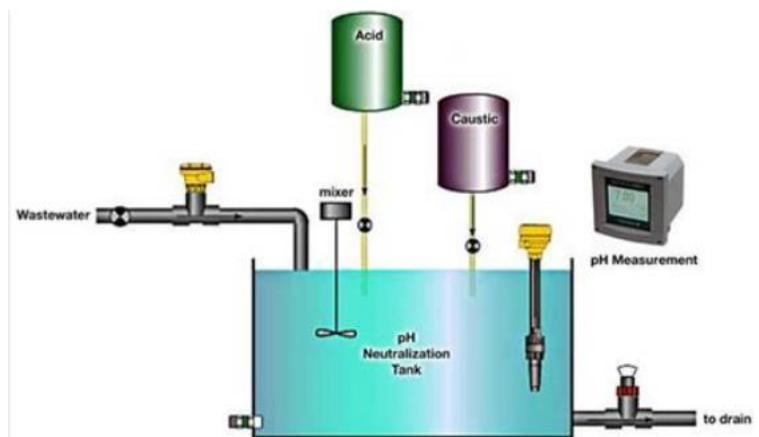
Additionally, a common feature of cleaning and sanitation is that it occurs in cycles. It may occur continuously, spread throughout the production process, where it is possible that a combination of dilution and chemical reactions might help mitigate the magnitude of pH swings or biological toxicity. Which is often the case in larger breweries that are in continuous operation throughout a workweek. Cleaning and sanitation may take place throughout the entire facility at the end of the production day. That translates to the potential for both excessively low or high pH, and significant effluent toxicity. Small and medium sized breweries in particular may be subject to significant discharge impacts due to this (necessary) end of workday cleaning and sanitation practice. pH extremes in the discharge may also lead to the corrosive damage of plumbing and pumps, leaching of metals like copper and lead into the discharge, and the generation of corrosive/flammable/toxic/noxious gases (like hydrogen sulfide or chloramine).

Examples of other chemistry that may be used throughout the brewing, cleaning, and sanitizing processes:

Adhesives, alcohols (ethanol, isopropanol, butoxy and other ethoxylated alcohols), ethylene and propylene glycol, ethylene glycol propyl ether, EDTA, alkyltrimethylenediamine, diethanolamine, cyclohexylamine, morpholine, naphthenic oil, oxyrane, sodium dichloroisocyanurate, sodium hypochlorite (bleach), quarternary ammonium compounds, hydrogen peroxide, ozonated water, iodine, soaps, sulfur, inks.



When discharge pH or toxicity are a matter for concern, a common mitigation strategy is to install equalization/neutralization capacity. Equalization provides the opportunity for “leveling out” the wastewater pH and chemical characteristics by extending the “dwell time” prior to discharge. In its simplest form this can consist of appropriately-sized tanks, tote bins, or drums into which process wastewater can flow for a practical period of time prior to discharge. If necessary, agitation can be provided to better mix the accumulated wastewater components. Experience may show that there could still be pH swings that pose problems, like non-compliance with a local Industrial User Permit or “souring” of an in-ground septic system. The addition of a pH measurement and neutralization system to the agitated equalization tank can address this. Either a continuous or batch treatment approach may be used, depending on the operational preference of and resources available to the Brewery.



As in any business endeavor, conservation of materials will help keep costs in check while minimizing the difficulty in controlling the discharge. Engage with other breweries which are known for quality, consistency, and efficiency to develop your program and then dial it in through experience. Avoid excessive generation of wastewater in the first place (make maximum use of dry cleanup BMPs) and use just enough process chemistry to consistently get the cleaning/sanitizing job done right without going so far as to create quality problems or leave unwanted residues in your product.

Cheers!

USEFUL INFORMATION

Maine Water Environment Association (MeWEA)

www.mewea.org

The mission of the Maine Water Environment Association is to support and enhance Maine's water environment community.

To achieve this we will:

- Promote training opportunities for the water environment community;
- Support balanced environmental policy and practice;
- Promote education and collaboration with the public to protect and enhance Maine's water resources;
- Foster a strong and resilient water environment community

MeWEA Pretreatment Committee – Brewery Resources

<https://www.mewea.org/pretreatment-committee/>

Brewers Association Wastewater Management Guidance Manual

<https://www.brewersassociation.org/educational-publications/wastewater-management-guidance-manual/>

Maine Department of Environmental Protection – Stormwater Management Best Practices For Breweries

<https://www.maine.gov/dep/water/wd/multisector/breweryBMP2017.pdf>

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PROTECTING MAINE'S WATER
RESOURCES