

HALOX Case History #3

Microbiological Fouling in Beer Brewing

- Application:** 1595 breweries and micro-breweries in the United States; +1200 breweries in Germany
- Problem:** Controlling micro-organisms in brewing water without affecting the flavor of the product.
- Solution:** Halox electro-chemical chlorine dioxide (ClO₂) generator



A major local brewery in Germany produces high quality, traditional lagers for local distribution. It is over 500 years old and very famous in the region. The brewery treats ~156,000 gallons (~590,000 liters) of water per day. A Halox distributor provides water treatment for this site.

The chemical composition of brewing water is critical to the quality and taste of beer and the reproducibility of brewing methods. Of particular interest to the brewer is the amount of chlorine in the municipal water entering the plant. Free chlorine in brewing water can create chlorine-phenol complexes that contribute negative flavors in the finished product far out of proportion to their concentrations (medicinal flavors in the low parts per billion range). For this reason, chlorine is often removed with granulated activated charcoal (GAC) as the water enters the plant.

The Problem

Entire batches of beer with significant commercial value are discarded when flavor is outside of strict specifications. Eliminating chlorine from the process water helps prevent this. However, once the chlorine is removed, the water is susceptible to microbiological contamination in storage tanks and distribution pipe-work. It is therefore necessary to add a replacement biocide that does not interfere with the brewing process.

The Approach

Halox suggested the introduction of ClO₂ into the water as it entered the holding tanks. The goal was to control microbiological fouling without affecting the quality of the finished product.

The Specifics

A Halox chlorine dioxide generator with one cassette, capable of producing 0.26 pounds (120 grams) of ClO₂ per day was installed next to the main holding tank. The system doses directly to the tank and is controlled by a water meter that measures how much water goes to the tank. The heart of the Halox system is a patented electrochemical cassette that directly converts sodium chlorite to chlorine dioxide. When operated according to Halox guidelines, this Halox equipment generates a safe, dilute solution at a controlled, measurable rate that contains up to 550 ppm of chlorine dioxide. For specific sizing concentrations, please contact Halox Technical Service.

The Results

A ClO₂ residual of 0.2 mg/L was maintained in the holding tank for several months. The brewmeister reported that his fouling problems were gone and the quality of his brew was not affected.

The Savings

The brewery reports potential savings of over \$100,000 per year.

Other Potential Applications in the Brewery

CIP Sanitizing

ClO₂ can be very effective as the terminal sanitizing rinse in CIP systems, including filler rooms. Typically applied at 2 to 5 ppm (where its kill-rate is on the order of 60 to 90 seconds) it leaves no toxic residues to interfere with other chemical/biochemical processes. ClO₂ works quickly and breaks down into inert compounds. The unique chemistry produces no toxic organo-chlorine by-products (such as THM's) and is therefore an environmentally friendly alternative. ClO₂ is a proven virucide and fungicide and is effective in greatly reducing detrimental wild yeast strains.

Pasteurizers, Bottle/Can Warmers, Coolers

ClO₂ effectively controls both free floating (planktonic) and attached (sessile) microorganisms. Sessile bacteria flourish in biofilms that build up due to ideal environmental conditions (temperature, nutrients, etc.). Biofilm buildup occurs on heat exchange surfaces, in pipes, lines, orifices and pumps. The resulting inefficiencies cost money on wasted energy, down time and repairs. ClO₂ is the best available technology for controlling biofilms in these systems.

Additionally, the longer water can be retained in a sanitary condition, the more money is saved in water costs, water discharge, and energy to heat replacement water. ClO₂ can be periodically batch loaded into the water system or metered on a timed basis. This can extend pasteurizer waters 4 to 6 times their previous discharge cycle.

Chain and Conveyor Lube Injection

ClO₂ is injected into lubrication streams for effective slime control on conveyor lines. This allows for significantly longer run times between shut downs for cleaning, resulting in dramatic cost reductions. By attacking the biofilms attached to the conveyors and the underlying rails, various soils are loosened and the natural cleaning action of the lube is enhanced. Chains and conveyors run more smoothly, with less wear on chains and motors. Even small levels of ClO₂ will help deodorize the line.

Filler Head Assemblies

ClO₂ solutions can be sprayed on filler head assemblies in 10-second bursts during breaks and lunch. The spray coats all surfaces, attacking biofilms, inhibiting bacterial growth, and deodorizing the surrounding environment.

Water Filtration and Distribution System Disinfection

As noted, ClO₂ effectively controls both planktonic and sessile microorganisms. Because planktonic cells are much easier to destroy, a disinfection procedure often produces excellent results initially, but within 7 to 10 days the counts return. ClO₂ is able to penetrate and disrupt the biofilm whereas chlorine is completely impractical.

Mold and Odor Control of Environmental Spaces

Misting of ClO₂ solutions into air streams prevents the spread of mold and wild yeast. This controls "off-tastes" in the product.

Sanitation of Tanker Trucks and Rail Cars

ClO₂ solutions are effective for sanitizing and removing biofilms from the insides of tanker trucks and rail cars. A thorough sanitizing rinse of ClO₂ with close attention to overhead surfaces can improve the quality of product, and significantly extend its shelf life.