

NITRIFICATION AND DBP CONTROL WITH CHLORINE DIOXIDE

Drinking water utilities that use chloramines as a disinfectant for their distribution systems are commonly plagued by nitrification, which can significantly affect water quality.

Nitrification is the microbial process in which ammonia is oxidized to nitrite and potentially to nitrate. Conversion of ammonia to nitrite in drinking water distribution systems is often caused by ammonia oxidizing bacteria (AOB) and nitrogen oxidizing bacteria (NOB). Nitrification in drinking water distribution systems can have serious adverse effects on water quality such as loss of total chlorine residual, release of free ammonia and formation of nitrite and/or nitrate from ammonia, lowering of pH, and increases in microbiological activity from low disinfectant residual levels.

Common techniques such as system flushing, boosting chloramine levels and break-point chlorination have been applied, but can lead to high levels of disinfection by-products (DBPs) and cause taste and odor complaints from the public.

The Solution - Chlorine Dioxide

Applying chlorine dioxide (ClO_2) or sodium chlorite (NaClO_2) in low doses is proven to be highly effective in helping to control nitrification while staying in compliance with EPA DBP Phase II Rules. Chlorine dioxide does not react with ammonia like chlorine and will oxidize the AOB and NOB in the system, helping to prevent nitrification. By using ClO_2 the utility can optimize the use of chloramines as a disinfectant for the distribution system.

Chlorine dioxide can be applied to raw water or settled water (prior to coagulation or filtration) to help prevent nitrification in the distribution system. The ClO_2 reduction by-product, chlorite ion, benefits the system by inhibiting the formation of AOB, NOB and biofilms.

ClO_2 is highly effective in controlling waterborne pathogens while minimizing halogenated disinfection by-products. ClO_2 is also a broad-spectrum microbiocide and is effective against viruses, bacteria, and fungi; and even more effective than chlorine for the inactivation of the encysted parasites *Giardia* and *Cryptosporidium*.



Millennium III™ Chlorine Dioxide Generator

Powerful Disinfectant and Oxidizing Agent

Chlorine Dioxide is a powerful disinfectant and oxidant agent for drinking water treatment. It has several distinct chemical advantages, which complement the traditional use of chlorine in potable water treatment.

Since chlorine dioxide does not hydrolyze in water, its germicidal activity is relatively constant over a broad pH 2-10 range. It can also be used to control taste, odor, color, iron, and manganese removal.

Millennium III™ Chlorine Dioxide Generator

The Millennium™ III Chlorine Dioxide Generator features next generation technology for safety, durability, ease of use and maintenance. Concentrated chemical precursors are vacuum fed to safely control reactions, maximizing chlorine dioxide yield and minimizing by-product formation. Millennium III generators are designed, built and certified in compliance to NSF 61, Section 8 standards.

The use of chlorine dioxide and its DBP, the chlorite ion, at less than MCL limits entering distribution, may serve as an aide in the prevention and control of nitrification issues that often arise in distribution. EPA FIFRA registered label directions and state permitted guidelines must be followed when treating municipal drinking water systems.

Method of Feed

Chlorine dioxide gas is produced by activating Evoqua's Aktaklor Solution (NaClO₂) with an oxidizing agent or an acid source. Aktaklor is converted to chlorine dioxide in the generator and applied as a dilute solution.

Feed Requirements

For most municipal and other potable water systems, a ClO₂ dosage of up to 2 mg/L is sufficient to provide adequate disinfection.

About Evoqua

Evoqua has over 60 years of experience in chlorine dioxide products and applications. Our products are backed by the industry's most responsive service organization. Services include: installation, startup, training, and ongoing preventative maintenance to keep your system operating.

For More Information

www.evoqua.com/millennium

Evoqua Combines Technology & Expertise to Deliver Safe, Consistent High Purity Chlorine Dioxide

- **Safe:** Incorporates real time monitoring
- **Robust:** Single or multi-point ClO₂ injection
- **Reliable:** Self-tuning for consistent delivery
- **Efficient:** Yield efficiency of 95 percent



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