

# Chlorine Dioxide

## CT DISINFECTION CREDITS

**The broad spectrum disinfection properties of chlorine dioxide result in a lower C T value than traditional chlorine treatment to help a plant comply with EPA regulations. Chlorine dioxide offers utilities a simple solution to primary disinfection requirements.**



The Surface Water Treatment Rule (SWTR), published in 1989, requires potable water utilities serving greater than 10,000 people to calculate “CT” values for the four EPA approved disinfectants, ozone, chlorine dioxide, chlorine and chloramines to ensure a minimum inactivation of a particular pathogen in surface waters is achieved. CT is the product of disinfectant residual concentration “C” in mg/L and contact time “T” in minutes to achieve a 3 log reduction of Giardia and a 4 log reduction of viruses.

New regulations such as the Stage One and the Stage Two Disinfectant and Disinfection Byproduct (DBP) Rules, limiting trihalomethanes (THMs) and haloacetic acids (HAAs) levels, have severely curtailed the use of traditional chlorine treatment resulting in the need to reevaluate water treatment strategies.

### Easy Solution

Traditional chlorine treatment limitations include lack of adequate retention time, elevated pH system water and achieving CT compliance, which results in elevated halogenated disinfection byproduct problems. Chlorine dioxide has a lower CT value than chlorine resulting in less detention time, is not pH sensitive at typical water production and is not a halogen so it won't chlorinate organics to form THMs or HAAs. Chlorine dioxide is a viable alternative to traditional chlorine treatment for systems that are struggling to balance the CT compliance under the SWTR versus the disinfection byproduct of the Stage One DBP Rule.

### Versatile Disinfectant

Chlorine dioxide is a versatile disinfectant that can be used as a primary disinfectant in potable water, as it reduces or controls bacteria, viruses, cysts and algae while being effective over wide temperature & pH ranges. Using chlorine dioxide will help optimize overall treatment efficiencies, including improved coagulation, reduced turbidities, improved particulate removals, increased CT values and lower THMs and HAAs levels.

Chlorine dioxide, when used as a primary disinfectant in potable water treatment, is a powerful oxidant with CT values second only to ozone in biocidal efficacy, but without the high capital expenditures and the ozonation byproducts. In addition, chlorine dioxide does not have the solids loading problem and the lengthy detention times associated with potassium permanganate. Using chlorine dioxide does not result in the formation of chlorinated or brominated disinfection byproducts like THMs or HAAs. A reduction byproduct of chlorine dioxide is chlorite ion, which is regulated under the Stage One and the Stage Two Disinfectant and Disinfection Byproduct (DBP) Rules at 1.0 mg/L maximum contaminant level (MCL). At typical dosage rates, chlorine dioxide can be used successfully to achieve CT compliance without exceeding the MCL.

- **Broad spectrum antimicrobial activity**
- **Effective over a wide pH range**
- **2.6 times the oxidizing capacity of chlorine**
- **Does not chlorinate or form halogenated DBPs**
- **Selective chemistry; no reaction with ammonia**
- **Easily implemented and fed to system**
- **Not temperature sensitive**
- **Residuals easily analyzed**
- **Bacteria, protozoa & virus inactivation**
- **Cost effective alternative**



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### Low Capital / Easily Implemented

Chlorine dioxide cannot be shipped in a drum and must be generated on-site. An International Dioxide, Inc. (IDI), OXYCHLOR® on-site generator produces chlorine dioxide solution safely under vacuum and delivers the solution to the point of application. Chlorine dioxide is fed similarly to existing chlorine disinfection treatment systems often using the existing feed piping. The OXYCHLOR® generators use ADOX® sodium chlorite as the precursor solution to chlorine dioxide, which is available from IDI. There are numerous types of affordable generators available from IDI that can normally be installed in 1 - 2 days to meet your treatment needs.

### Additional Uses

Chlorine dioxide's broad spectrum capabilities enable it to be used in a variety of potable water applications:

- Iron & Manganese Oxidation
- Taste & Odor Control
- Trihalomethane (THMs) & Haloacetic Acids (HAAs) Control
- Color Removal & Algae Control
- Cryptosporidium Inactivation
- Nitrification Control
- Zebra Mussel Control

### Approvals

The use of chlorine dioxide is approved by U.S. EPA's Office of Ground Water and Drinking Water. The ADOX® sodium chlorite precursor solutions carry U.S. EPA registrations and are ANSI/NSF Standard 60 Drinking Water Additive certified.

### Information Available

International Dioxide, Inc., a DuPont Company, is a world-leading provider of chlorine dioxide products and related technology for disinfecting, sanitizing and odor control applications. IDI has specialized in chlorine dioxide technologies for over 60 years and is a leading supplier of chlorine dioxide technologies for a wide variety of markets. For additional information about International Dioxide's OXYCHLOR® chlorine dioxide generator systems and ADOX® sodium chlorite precursor solutions, please contact IDI's sales office.

CT Values in Water @ 10°C with pH 6 – 9 (mg-min/L)			
Disinfectant	Viruses 4-log (99.99%)	Giardia 3-log (99.9%)	pH on Efficacy
Ozone	1.0	1.43	Little influence
ClO <sub>2</sub>	25.1	23	Efficacy slightly increases with pH
Chlorine	6	104	Efficacy decreases considerably with the increase of pH
Chloramines	1491	1850	Little influence

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Guidance Manual for Filtration & Disinfection Compliance Requirements, Appendix E (USEPA, 1991, edition)

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