

# Chlorine Dioxide

## FOR THMs & HAAs CONTROL

**Trihalomethanes (THMs) and haloacetic acids (HAAs) are disinfection byproducts (DBPs) associated with the common practice of disinfecting potable water. Chlorine dioxide offers utilities a quick and simple solution to THMs and HAAs regulatory compliance without costly plant upgrades.**



The Stage One Disinfectant and Disinfection Byproduct (DBP) Rule reduces the level of DBP compounds allowed to be formed from the use of disinfectants. The objective of the DBP Rule is to minimize the adverse health effects associated with elevated levels of DBPs in treated water. In January of 2006, the Stage Two Disinfectant and Disinfection Byproduct Rule which builds on the initial Stage One Rule was signed into law. The Stage Two Rule essentially maintains the current Maximum Contamination Levels (MCLs) and DBPs from Stage One Rule but provides a more rigorous Individual Distribution System Evaluation (IDSE) to identify the high risk areas in the distribution system while also changing the running annual compliance calculation.

The two classes of DBPs that impact most potable water facilities are total trihalomethanes (TTHMs) and HAAs. These two classes are usually formed by chlorination and bromination of naturally occurring humic substances in drinking water. TTHMs & HAAs comprise 50% of the total organic halide (TOX) when water is chlorinated.

New regulations like the Stage One and the Stage Two Disinfectant and Disinfection Byproduct (DBP) Rules, which limit THMs and HAAs levels, have severely curtailed the use of traditional chlorine treatment resulting in the need to reevaluate THMs & HAAs treatment strategies.

The Stage One Rule is fully implemented today and sets the total allowable TTHMs at 0.08 mg/L and HAAs at 0.06 mg/L. Implementation of the Stage Two Rule will start in 2012 depending upon the size of the utility

- **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**

### Easy Solution

Using chlorine dioxide does not result in the formation of chlorinated or brominated disinfection byproducts like THMs or HAAs. Chlorine dioxide is not a chlorinating agent and can be used as a primary disinfectant or as a raw water oxidant for THMs & HAAs precursor reduction in potable water treatment systems.

### Versatile Disinfectant

Chlorine dioxide's use is not limited to THMs & HAAs control in potable water systems. This versatile disinfectant also 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 and 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.

Chlorine dioxide is a powerful oxidant with CT values second only to ozone in biocidal efficacy, but without the high capital expenditures and ozonation byproducts. In addition, chlorine dioxide does not have the solids loading problem and long detention times associated with potassium permanganate. 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 control THMs & HAAs without exceeding the MCL.



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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:

- Taste and Odor Control
- Improved Disinfection Credits (C x T)
- Iron and Manganese Control
- Color Removal and Algae Control
- Cryptosporidium Inactivation
- Zebra Mussel Control
- Nitrification Control

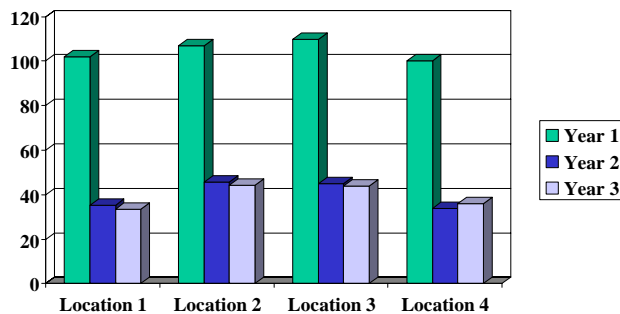
### Approvals

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.

**THM Reduction with ClO<sub>2</sub>**  
Annual Average by sample location – Units are ppb  
Chlorine Dioxide Started in Year 2 – THM MCL is 80 ppb



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