
PureLineSolutions™
Experts in Virus Decontamination
pureline.com

The ClO_2GO_2

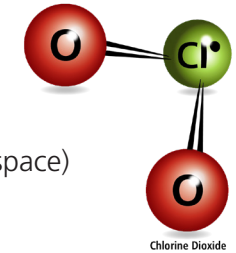
What is Chlorine Dioxide (ClO_2)

Chlorine dioxide is a strong, yet selective oxidizing agent that does not produce harmful or environmentally hazardous by-products. Chlorine dioxide is a visible yellow-green gas with a swimming pool-like odor allowing it to be detected well below its 8-hour human habitation 'safety' level of 0.1 parts-per-million.

When reacting with other substances, chlorine dioxide is selective, allowing it to be a more efficient and effective sterilizer than many other options. Chlorine dioxide is not a carcinogen nor is it a poisonous gas. Furthermore, chlorine dioxide does not leave any residues and there is no need for post-application clean up prior to resuming activities. Once the gas has dissipated to a safe level of < 0.1 ppm, typically within 60 minutes of cessation of gas generation, personnel may enter the area and activities can resume.

Chlorine dioxide works by penetrating the virus and disrupting it's metabolic functions, thus immediately and permanently eliminating the problem at its source.

About Chlorine Dioxide (ClO_2)

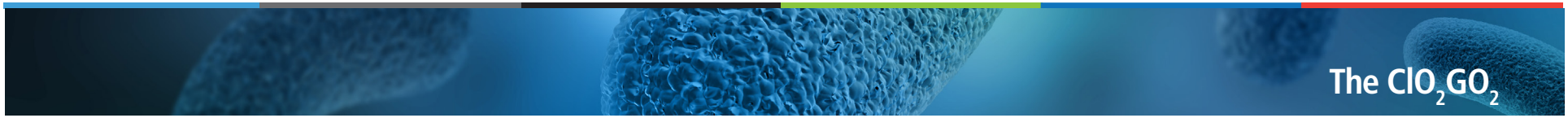


- Approved by EPA, FDA and USDA
- A sterilant capable of 6-log reduction
- No post-application cleaning required prior to resuming activities
- Applied as a real gas (Diffuses equally within space)
- Follows the "ideal gas" law
- Capable of deep penetration
- Selective oxidant
- Visible yellow-green gas

Chlorine dioxide is an EPA registered sterilent. PureLine's chlorine dioxide products and services are all EPA registered.

Why use Chlorine Dioxide (ClO_2)

- A better means of decontamination when routine methods are not producing the desired results
- Minimal material compatibility concerns
- Not poisonous, not carcinogenic
- Viruses can't build up resistance (destroys DNA)
- Activities can resume immediately
- No post-treatment cleaning necessary



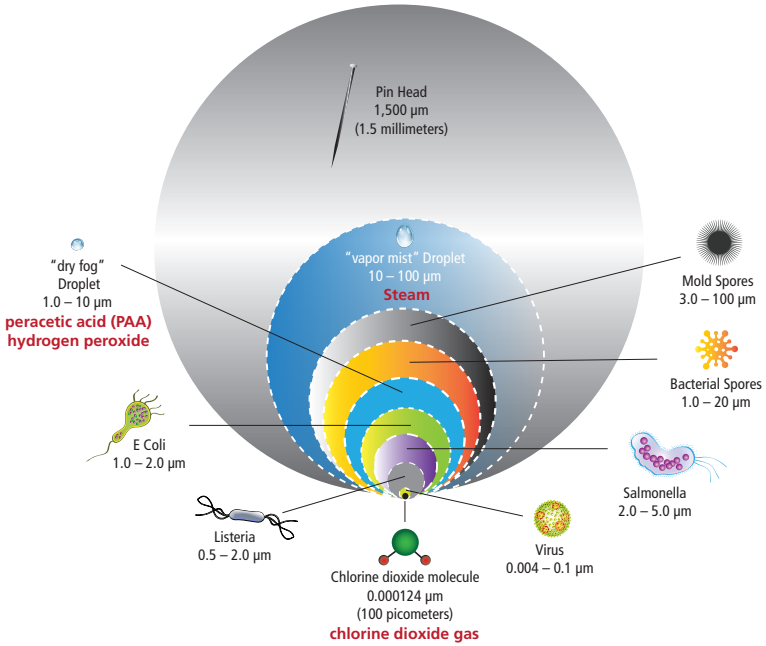
Chlorine Dioxide Advantages

- 6-log kill (99.9999% - sterilization)
- No capital investment
- Kills all bacteria, mold, viruses and other organisms
- Microorganisms can't build a resistance (destroys DNA)
- Ideal for 'dry clean only' areas
- No residue; no post-treatment cleaning
- A 'real gas' – equilibrates to the entire treatment area
- Several treatment options
- Scalable to any size application
- Non-corrosive at generated levels

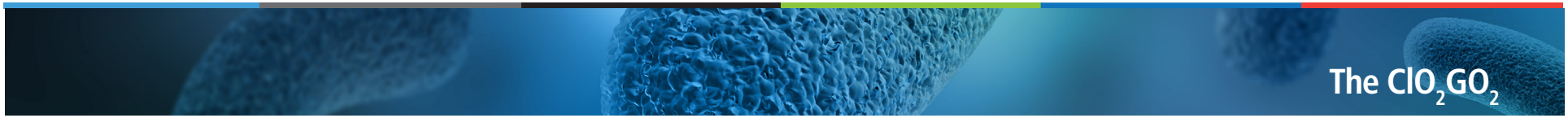
Common Organisms

- Viruses
- Fungi
- Bacteria
- Spores
- Many other organisms

ClO_2 Size Comparison Chart



At 124 picometers (0.000124 micrometers), a chlorine dioxide gas molecule is much smaller than any microorganism. Chlorine dioxide is a real gas and by definition expands and conforms to the shape of the area in which it is held and acquires a uniform density inside that area, even in the presence of gravity and also regardless of the amount of material in the area. This property of chlorine dioxide gas allows it to easily penetrate and disinfect locations where other fumigant applications such as dry fog are not able to effectively reach.



Decontamination Properties of Chlorine Dioxide

Since the 1920s, chlorine dioxide has been known for its disinfecting properties. It was recognized as a chemo-sterilizing agent in 1984; and in 1988, it was registered with the US Environmental Protection Agency (US EPA) for use as a sterilant. The USDA has deemed chlorine dioxide as certified for organic use in crop production, as an algicide, disinfectant and sanitizer. In addition, no corrosion is observed when using materials such as stainless steel, Lexan, and various other plastics such as Delrin, Teflon, and ultra-high molecular weight polyethylene (UHMWPE). With appropriate delivery equipment and care, chlorine dioxide is a safe and effective means of decontamination. A significant safety feature of chlorine dioxide is that it has a distinct odor much like a swimming pool, making even minor leaks self-alerting, well below the human habitation safety limit.

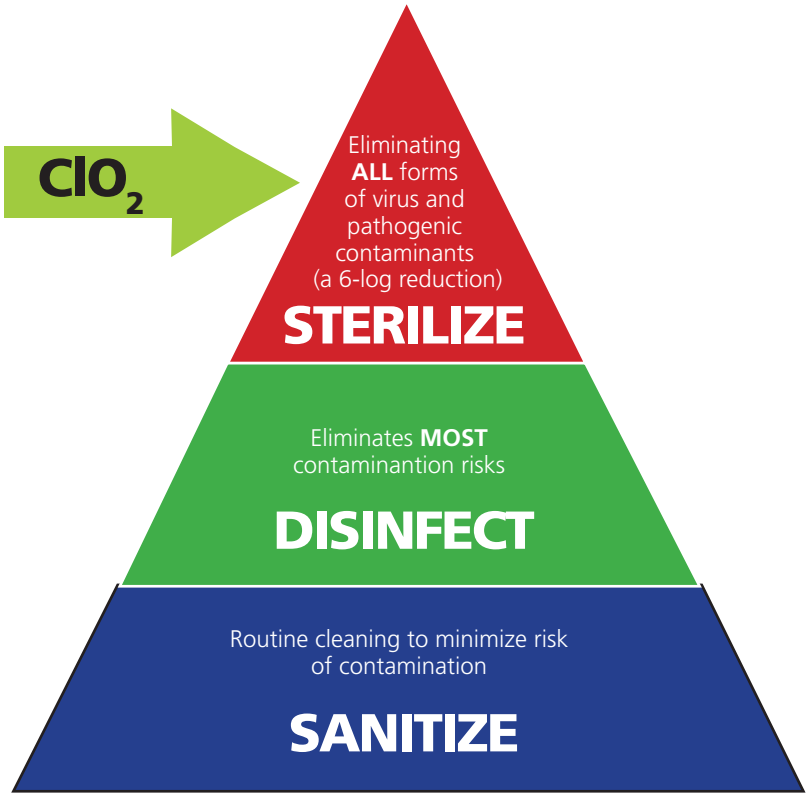
Both gaseous and aqueous phase chlorine dioxide has been proven to be an effective sterilizing agent that has broad and high biocidal effectiveness. Both forms of chlorine dioxide have been reported to effectively inactivate pathogens, including all viruses, bacteria, bacterial spores, fungi, molds and yeasts.

Gaseous chlorine dioxide has proven to be an effective sterilant. Jeng and Woodworth (1990) reported the sporicidal activity of chlorine dioxide gas. Gaseous chlorine dioxide has successfully been used to decontaminate B. anthracis (anthrax) contaminated areas of the Hart Senate Office Building and the Brentwood postal sorting facility in Washington, DC. Hans et al. also reported high efficacy of chlorine dioxide gas in reducing Bacillus spores on paper, plastic, epoxy-coated stainless steel and wood surfaces. Additionally, much research has demonstrated that chlorine dioxide gas is highly effective in eliminating foodborne pathogens such as E. coli, Listeria and Salmonella.

Chlorine dioxide is a sterilant

In microbiology the probability that an object that has been subjected to a sterilization process may nevertheless remain nonsterile is called the sterility assurance level (SAL). The SAL is used to measure the probability of microorganism survival and measured in orders of magnitude reduction, also called a "log" reduction.

Chlorine dioxide, when applied correctly, provides for sterilization (6-log reduction). Chlorine dioxide is therefore defined as a chemical sterilant and is a selective oxidant that effectively destroys several components of microbial cells. It destroys the DNA in cells and, therefore microorganisms such as bacteria, virus and mold are unable to build up a resistance. Because chlorine dioxide is selective, the oxidizing action is retained longer than other fumigation agents such as peracetic acid or hydrogen peroxide, therefore allowing for maximum kill.



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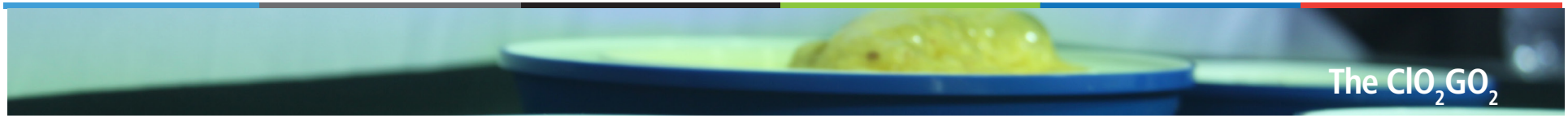
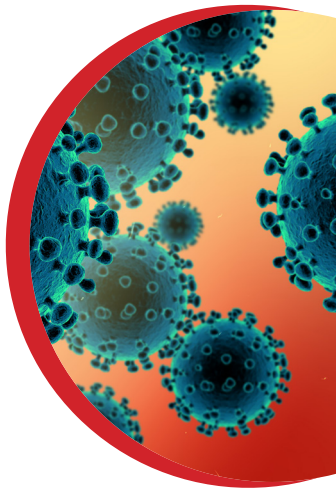


PureLine's chlorine dioxide gas treatments provide peace of mind that your facility is sterilized.

Viruses can be living anywhere! Using ClO_2 gas ensures that 100% of surfaces are decontaminated. This treatment removes the element of human error from the cleaning process, eliminating the risk of possible missed surfaces and recontamination.

DON'T RISK IT!

- PureLine's chlorine dioxide gas treatments provides a 6-log kill (99.9999%) on all viruses
- Scalable to any size facility
- Entire treatments are typically done in a few hours
- Safe, non-corrosive, and no residue left behind



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MobileClean™

Areas larger than 125,000 cubic ft

- 125,000 - 5,000,000+ cubic ft plants
- 6 to 8-hour application
- Electrolytic generation of ClO_2 on-site
- Decontamination and prevention
- Widespread virus outbreak
- Immediate restart of normal activities

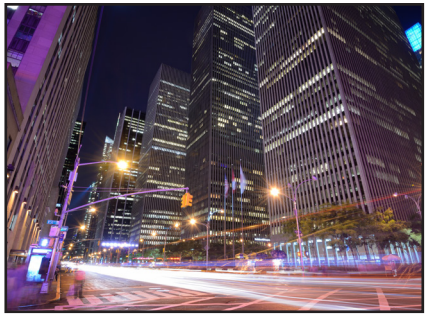
Targeted Applications

- Entire Buildings
- Schools
- Cruise Ships
- Large Public Common Areas
- Office Buildings
- Large Conference Rooms

Entire Buildings

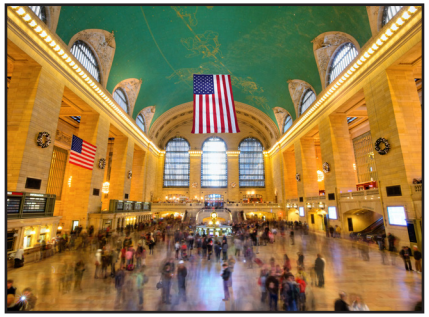
Cruise Ships

Conference Rooms



Office Buildings

Schools



Large Public Common Areas

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PureFlo™

Areas up to 50,000 cubic ft

- 2 – 3 hour application
- Precise dosing; minimal downtime
- Great for targeted applications where a quick turnaround is critical

Targeted Applications

- Airplanes
- Buses
- Trains & Commuter Rail
- Small buildings and rooms
- Hospital operating rooms

Airplanes

Buses

Trains

Commuter Rail

Small Buildings

Hospital

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The ClO_2GO_2

PureVista™

Areas up to ~125,000 cubic ft.

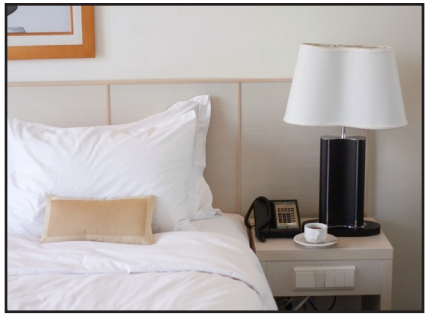
- Small electrical cabinets, and rooms
- 2 to 6-hour application
- Water activated
- Sized to specific room dimensions
- Economical, routine cleaning
- Full Service or DIY

Targeted Applications

- Fitness Facilities
- Locker Rooms
- Hotel Rooms
- Cars
- Conference Rooms
- Cafeterias

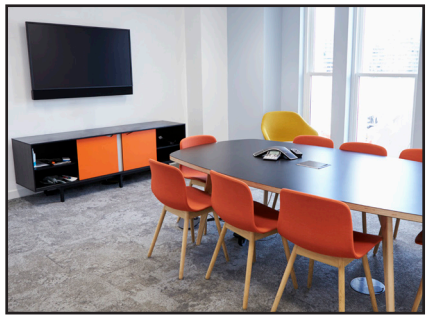
Fitness Facilities

Locker Rooms



Hotel Rooms

Public Washrooms



Conference Rooms

Restaurant

Complete Line of Chlorine Dioxide Products and Services

MobileClean™

Pureline's MobileClean™ is an effective and comprehensive large-scale chlorine dioxide gas decontamination service, producing a 99.9% pure chlorine dioxide gas. The MobileClean service resets the clock on the micro-biological load and provides the customer with a clean break. Gas concentrations are digitally monitored and logged throughout an eight-hour gas generation process, assuring target concentrations are achieved, and a successful fumigation treatment has been completed.

PureFlo™

The PureFlo™ chlorine dioxide treatment system works by using PureLine's Pure 3000™ aqueous chlorine dioxide solution to deliver a fast, accurate dosing for targeted applications. Proprietary gas stripping technology allows for a chlorine dioxide treatment to be applied quickly while maximizing disinfection results and minimizing downtime. The chlorine dioxide rich air from the Pure3000 containers is mixed back into the bulk of the circulation air to produce a clean, dry chlorine dioxide gas stream capable of sterilizing large areas within a few hours, or less, depending on the volume of space being treated.

pHlorSan™

pHlorSan™ is the first and only large-scale liquid chlorine dioxide floor, wall and drain treatment service on the market, providing entire facility or large production area treatment. Using PureLine's Pure3000 chlorine dioxide solution, the pHlorSan™ treatment has the capability to kill bacteria, bio-film and other biological contaminants causing decontamination challenges.
he chlorine dioxide solution contact duration of the target areas is approximately 30 minutes.
pHlorSan™ is often used in conjunction with a full-service MobileClean™ , PureFlo™ or PureVista™ treatment.

PureVista™

PureVista™ is a portable, water-activated, disinfection system that has the power to decontaminate surfaces, equipment, and facility air with unmatched effectiveness. PureVista chlorine dioxide generation system creates pure chlorine dioxide gas on-site making it perfect for routine or emergency cleaning for smaller areas. PureVista is inexpensive, safe, and can be scaled to the specifications of any facility to deliver effective disinfection. PureVista is available in sizes ranging from 2-gram capsules for use in small cabinets, up to 100-gram canisters that can be used in a specified quantity for rooms or entire facilities.

About PureLine Solutions

We are experts in the manufacture, generation and application of chlorine dioxide. PureLine specializes in designing and implementing chlorine dioxide solutions utilizing our broad line of proven ClO_2 generators and pre-cursor chemicals. In locations across the nation and around the world, PureLine's patented and proven high-purity chlorine dioxide generation equipment is enhancing the safety, reliability, efficiency, and cost-effectiveness of the water treatment process.

At the core of our strength is the seamless collaboration between a dedicated group of professionals-environmental chemists, chemical engineers, design and manufacturing engineers and operations experts-all committed to one goal: improving the quality of vital water supplies used by our valued clients. PureLine supports and consults in various markets, including oil & gas production, food safety and virus decontamination.

- **All products made in the USA**
- Privately held company
- Decontamination products and services
- Chlorine dioxide fumigation to eliminate viruses and other pathogens
- Remediation and preventive treatment
- Proven efficacy
- Operate in U.S., Latin America, Middle East –150 employees