



“The Chlorine Dioxide People”

Application Note #36 – Preventive Food Decontamination

Introduction

Any food production facility is a perfect environment for harmful organisms to thrive. With plenty of water, food, and hard to reach areas, organisms can hide in countless locations. With consumable food and drink being processed right alongside these areas, cross contamination is inevitable. By taking preventative measures, risk of issues can be minimized or eliminated. This means that recalls will be easily avoided, which results in less wasted expenditures and maintaining consumer trust. Companies could have unremitting detrimental side effects from damage against its reputation that could last years. Measures such as preventative decontaminations and other procedures will help to eliminate any harmful organisms that would cause such issues.

When it comes to cleaning and sanitizing a full production area filled with equipment, machinery, spiral freezers, conveyors, cracks and crevices, 30-foot ceilings, HVAC ducting, and numerous other obstacles, a quality method of decontamination is crucial to find in order to properly clean. Spraying or wiping chemicals onto everything can be a difficult, and unrealistic task. It is unlikely to reach every surface, and even if contact is made, most methods and agents simply are not effective enough. Liquid chemicals like sprays or fogs need to have a certain concentration and contact time in order to guarantee a kill. Most important, and difficult, is the fact that they need to contact every single organism in order to kill every single organism. Some liquids can also be harsh on equipment. Mists and vapors are composed of large molecules which can stick to surfaces and become blocked from getting into any small areas like scratches. In fact, even vapors such as hydrogen peroxide vapor cannot penetrate any space smaller than 4mm wide. Mists and fogs provide even less penetration. Also, with many agents, any leftover chemicals may need to be rinsed off.

Wipe-downs are very time consuming and come with the added stress of trying to physically reach every surface in the area without missing a spot and without re-contaminating any surface during the process. This can be an extremely lengthy process requiring special equipment and plenty of extra time and energy from everyone involved. While wiping surfaces down sounds simple, getting every single spot is an impossible task. Cracks, pipe and screw



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threads will not be completely decontaminated. However, by using gaseous chlorine dioxide, these stresses are all eliminated due to the nature of chlorine dioxide to completely fill a space.

Room Decontamination with Chlorine Dioxide Gas

Chlorine dioxide is a true gas at room temperature, not a vapor, so it will completely fill its container, no matter how small or large of volume, without creating condensation or pooling of damaging chemicals. This means it will get into every area, every crack on every surface, every machine, every duct and any other place that might harbor micro-organisms. At 0.124nm, the gas can get inside machinery or equipment that would be difficult or impossible with liquids or vapors, simply because it is such a small molecule. It can be thought of like oxygen, it is ever-present in an environment and can seep into the tightest of places. Chlorine Dioxide gas can also easily penetrate all the microscopic scratches that would normally be too small for a liquid or

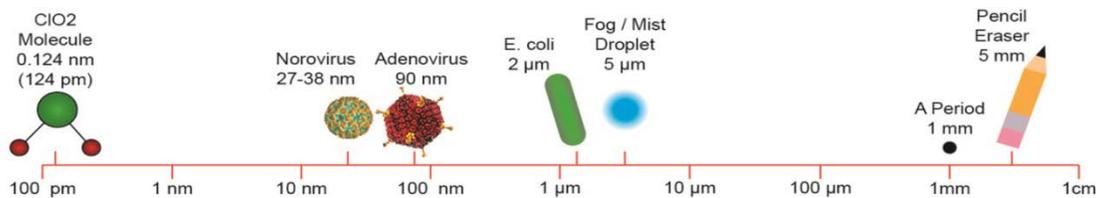


Figure 1: Size Comparison of Chlorine Dioxide to Common Micro-Organisms

vapor that would just condense on the surface. Being a true gas also means that chlorine dioxide will reach from the lowest points in a room to the highest points and everything in-between without any extra set-up. Pipes, ducts, conveyors, electronic equipment and anything else which is not airtight will be subject to the killing power of chlorine dioxide.

A great application for utilizing chlorine dioxide is to create a gassing room. This can be used for decontaminating tools such as brooms, shovels, HEPA vacuums, etc. It can also be used for production equipment such as conveyor belts, hoses, and even portable process equipment.

With gaseous CD, the biggest concern is ensuring that the proper concentration and exposure time is reached. Luckily with the proper measurement technology and process control, this is a simple task.

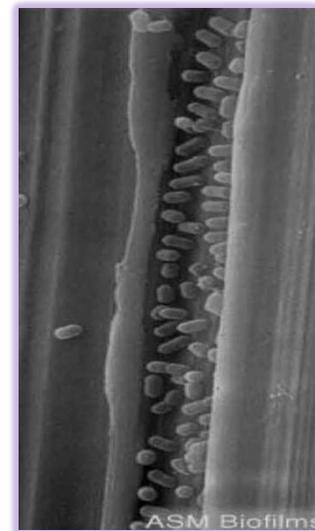


Figure 2: A Microscopic Scratch in Stainless Steel Harbors E.Coli



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Minidox-M

Decontaminating rooms, enclosures, and tented pieces of equipment is easy with the Minidox-M CD Gas Generator. It can connect to just about any space and provide a tightly controlled decontamination process to achieve a 6-log sterilization level kill. A continuous sample of the concentration of chlorine dioxide gas in air is taken to monitor the process and only allow it to complete when the proper dosage has been met. The Minidox-M can easily decontaminate areas up to 25,000 ft³, with a maximum capacity of 70,000 ft³. Easily portable, the Minidox-M can be moved throughout a facility due to its small footprint and easily maneuverable wheels. With a treatment cost of about \$0.06 USD per cubic foot, the Minidox-M offers an inexpensive method of providing the most effective and most reliable decontamination process available.



Megadox-P

The Megadox-P CD Gas Generator expands on the Minidox-M by providing a larger capacity. With four times the capacity, the Megadox-P can easily decontaminate areas up to 100,000 ft³, with a maximum capacity of 280,000 ft³. It can connect to just about any space and provide a tightly controlled decontamination process to achieve a 6-log sterilization level kill. Continuous sampling of the concentration of chlorine dioxide gas in air can be taken at 1-5 locations in order to monitor the process. Once again, the process will only be allowed to complete once the proper dosage has been met. Easily portable on a palletized base, the Megadox-P can be moved throughout easily from facility to facility to provide decontamination at multiple facilities wherever they may be located. Offering the same treatment cost of about \$0.06 USD per cubic foot as the Minidox-M, the Megadox-P offers an inexpensive method of providing the most effective and most reliable decontamination process available.



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Decontamination Services

ClorDiSys offers routine preventive decontamination services where a team will come onsite and provide a turnkey service to safely decontaminate any size space. With over 1000 decontaminations performed for a variety of industries, facility types, building ages, and applications, our team has the experience to successfully accomplish any project.

Common applications include:

- Spiral Freezers
- Aseptic Filling Areas
- Dry Processing Equipment and Rooms
- Trucks and Containers
- Tanks and Vessels
- Piping Systems
- RTE Processing Rooms



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Surface Disinfection with UV-C

Daily maintenance of a clean, sanitized workspace is the most effective method to reduce the risk of contamination. Quaternary sanitizers are used in wipe-downs, but many of these sanitizers are not providing enough of a kill to prevent microbes from surviving. Most liquids require a longer contact time than a wipe-down can guarantee, meaning dangerous microbes can survive. If any of the sanitizer starts to evaporate before this time is satisfied, it can leave patches of surface contamination. Ultraviolet light, specifically the UV-C spectrum, has been found to be a particularly useful tool in combatting these unexpected surface organisms. UV technology should be considered a supplement to normal cleaning and disinfection.

UV-C is a chemical-free technology which ensures a complete surface disinfection in mere minutes. It works by emitting light at the 254nm wavelength, which inactivates the DNA of cells, rendering them effectively dead. UV does not cause any kind of harm to surfaces or inorganic materials, meaning equipment is safe all the way through the cycle.



Figure 3: UV Lights, Bright Enough to Kill

Whether the intent is to decontaminate an entire kitchen, or disinfect surfaces, or to prevent the need for a large cleanup operation, UV has the ability to help meet your needs. It is chemical free, easy, low cost, and can be accomplished in mere minutes. As long as the light shines on the organisms, it will be able to kill them.



FLASHBAR™

For a quick and easy solution to all disinfection needs, the Flashbar™ can be installed on any flat surface. Ceilings, walls, and even floors can be utilized as a permanent location for these 48" UV fixtures. Mount them above work tables, slicers, conveyor belts, and any other areas that have even a remote possibility of contamination.

After a physical cleaning, the Flashbar™ can then be switched on as personnel leave the room, disinfecting everything under the lights and assuring a clean, germ-free workspace upon return. For an alternative solution, install the lights in a designated disinfection room and wheel in any equipment that needs to be disinfected. Dedicated brooms and shovels are also a great application. Close the door and disinfect everything inside. UV-C does not pass through regular glass, so with a window anyone can safely observe from outside the area.

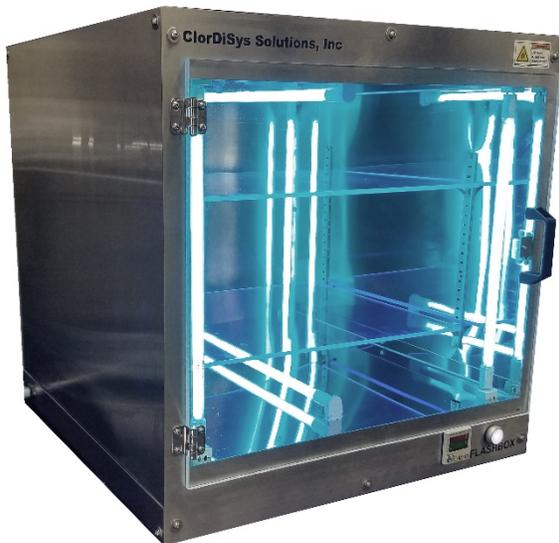
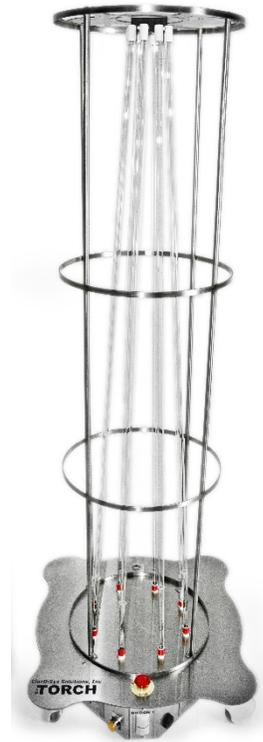


TORCH™

The Torch™ is a six-foot tall tower which uses 8 UV-C bulbs to achieve a full 360-degree arc of germicidal light. It can be used to disinfect anything within ten feet of the bulbs. Because of the full range of light, the Torch™ will disinfect walls, ceilings, floors, and any equipment the light touches. It comes fully equipped with motion sensors and remote start/stop, eliminating any safety concerns as an operator does not need to be near the Torch™ to operate it. Place it near equipment to disinfect in five minutes, then roll it away and work can continue.

FLASHBOX™

The Flashbox™ is the perfect solution for smaller scale disinfection. With an interior space of 14" H x 21.5" D x 21.5" W with two quartz glass shelves, the Flashbox™ fits any tools, utensils, shoes, cell phones, tablets, or other equipment that might need a quick disinfection after washing. Operation is as simple as setting a timer and pressing the start button. The self-contained nature of the machine means no added safety protocols. Also, the close proximity to the bulbs means that disinfection is faster, requiring only one minute to eliminate harmful microbes. Pass-through options are available for bringing items into a clean area such as production, or a laboratory.



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Surface Disinfection with liquid Chlorine Dioxide



Cleaning of the workplace is a critical first step in eliminating organisms. This enables all other methods to work better. The common high-level disinfectants commonly used includes quaternary compounds, Peracetic acid / hydrogen peroxide mixtures, bleach, and chlorine dioxide solutions. While liquid CD has many shortcomings compared to gaseous CD, it typically is the most effective liquid method. ClorDiSys offers CSI-3000™, a concentrated solution that can be used to wipe, mop, or spray areas or to treat floor drains. CSI-3000™ is also able to be used as a fruit, vegetable, or poultry wash. CSI-3000™ can also be utilized to disinfect drinking water for livestock or other farm animals.

Air Disinfection with UV-C

Within any facility, the air can be a source of contamination. Airborne organisms are harmful, and there are various methods attempting to rid their threat, however many come with pitfalls to their efficacy. Ion emitting air filters emit negative ions that attach to particles and cause them to fall to the ground. Because of this, particles can be stirred up with foot traffic or by a gust of wind from movement like doors opening. Ozone emitting air filters emit ozone to kill harmful organisms, but in large quantities, ozone can be harmful to humans and animals. Plus, in order to kill things like spores, high concentrations are needed, meaning unsafe levels are generated. HEPA filters are commonly used but vary in effectiveness. One issue is that filters must regularly be changed, adding another task to accomplish and also be another routine expense. Also, harmful organisms and spores such as mold are large enough to be caught in a HEPA filter, but these organisms stay alive on the filters' surface. This trait allows other particles to accumulate and fill the space to act as nutrients and allow mold spores to grow on and through the filter membrane to be released back into the air. These issues are addressed with the Torch Aire line of products. Air is continuously filtered through the unit and passes by UV-C emitting bulbs. This design allows for people to be present while in use due to the UV-C bulbs being shielded, and is filter free which allows for simplicity. The UV-C will kill 99.9% of harmful organisms providing continuous disinfection of the air to protect the environment.



TORCH AIRE™

Torch Aire-Recessed™ is an ultraviolet light room air disinfection unit. Torch Aire-Recessed™ is designed to help eliminate airborne microbes, particularly in crowded or poorly ventilated areas, and in situations where the risk of cross contamination is high.

Torch Aire-Recessed™ is easily mounted in a ceiling and fits especially well within a drop ceiling format. Torch Aire-Recessed™ pulls air inward and allows for enclosed UV-C bulbs to disinfect the air that passes over the bulbs. Torch Aire-Recessed™ is constructed of stainless steel with a reflective aluminum exposure chamber.



Torch Aire-Mega™ is a portable room air disinfection system. Since the UV-C bulbs are enclosed, the Torch Aire-Mega™ can be utilized in an occupied area. When in operation, air is drawn into the fixture through the four louvered filter panels which are located around the base of the fixture. The air passes then into the exposure chamber where it flows over twelve UV-C bulbs and is disinfected. The air then leaves the fixture through the louvered exhaust panel that is located on the top of the fixture. This design prevents UV-C exposure by restricting light from passing into the occupied room, making it safe for people to be in the room at all times.

Torch Aire-Mega™ is constructed of stainless steel and has a high polished interior for optimal reflectivity. The maximum treatment capacity is 120,000 cubic feet per hour, allowing for large spaces to have a sufficient amount of air exchanges to have continually disinfected air.

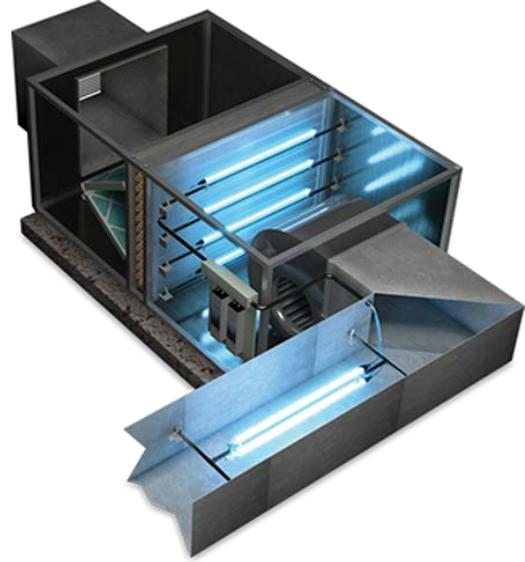


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AIRGLOW™

AirGlow™ is an in-duct ultraviolet light disinfection system that can be installed in any HVAC system. The AirGlow™ can help reduce and/or eliminate the growth of bacteria, mold and spores and also prevent the spread of airborne cold and flu viruses, as well as other airborne transmitted diseases. The AirGlow™ can be utilized for two distinct purposes. To reduce or eliminate airborne organisms, the AirGlow™ would be positioned parallel to the airflow to maximize contact time on the organisms. To improve energy efficiency, the AirGlow™ would be positioned parallel to the cooling coils. Used in this configuration, biofilm production on the coils is prevented or reduced thereby reducing the decrease in both heat transfer and airflow and thus increasing energy efficiency.



Flash Flood™

The Flash Flood™ is designed to eliminate harmful organisms from within water sources. Water passes by UV-C bulbs which will kill any organisms without the use of chemicals. Units can be sized for varying capacities depending on requirements.



Summary

Food production facilities are environments that are under constant threat of contamination. Whether it be a full room decontamination, or focused on separate equipment or components, especially spiral freezers with countless tiny mechanisms, routine prevention methods will minimize the risks of a dangerous outbreak of pathogens like listeria, e. coli, salmonella and more. Preventative decontaminations are economical, in the fact that they can avert the costs of recalled product, as well as maintaining a stellar reputation to consumers.



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