

Ozone Overview



Tersano's ozone-based solutions make food and water safe and fresh

Ozone is a safe and natural purification and disinfection agent for food and water. It is approved by the FDA and USDA as a food contact substance and is certified organic. Made on-site from the oxygen in air, ozone is extremely fast and effective in disinfection, sanitization and storage environments. After doing its work, ozone reverts back into pure oxygen leaving no residue.

Ozone Regulations and Safety

Ozone treatment is environmentally acceptable. It eliminates the need for handling, storage, recordkeeping and disposal of toxic chemicals that are covered by increasingly stringent government regulations. Ozone is widely used and approved:

- Ozone has been used for nearly a century in Europe
- FDA approved ozone for bottled water in 1982
- EPA allows use of ozone with no reporting or record-keeping
- FDA granted petition for use with fruits, vegetables, meat, poultry, etc. in June 2001 (food additive petition)
- USDA approved ozone as organic under the USDA Organic Rule in 2000
- Ozone is a self-policing with a distinctive clean odor
- Effective ozone levels are safely below OSHA limits



"When applied appropriately, ozone is a wonderful and natural disinfectant."

Orchard View Farms

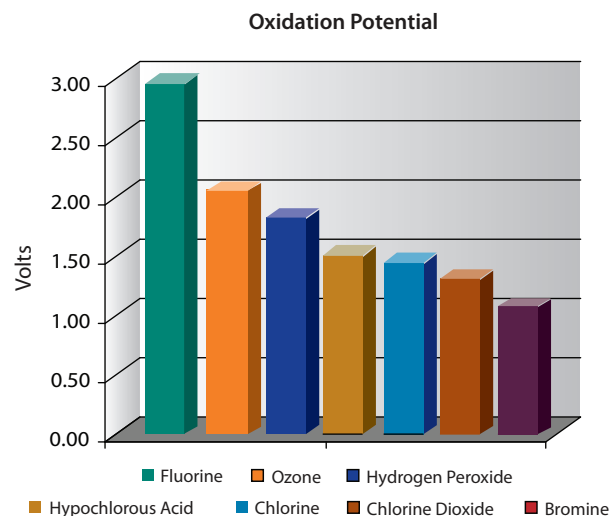
Benefits of Ozone

Ozone has been used successfully as a disinfectant and oxidant in drinking water treatment applications for more than 85 years. Over the last decade, ozone has become the preferred water sterilizer for the bottled beverage and pharmaceutical industries. After recent FDA approval, agricultural and food companies have been rapidly adopting ozone for disinfecting and storing products.

As depicted by the graph below, ozone is over 150 percent stronger than chlorine and is the second strongest oxidizing agent next to fluorine. Many applications can benefit from the use of ozone because of its superior disinfection and oxidation qualities. Due to its very short half life, any unused ozone from the application reverts to oxygen in a short period of time, making it environmentally friendly. These qualities make ozone your disinfectant of choice.

Ozone is approximately 3,000 times faster and more effective than chlorine at killing bacteria, e.g. Salmonella and E.coli, while providing customers with purity not achievable with the use of conventional chemicals. Ozone also inactivates viruses and controls mold.

Other benefits include the destruction of the ripening hormone ethylene and the reduction of odors.



Properties of Ozone

Ozone is produced by passing a stream of dry air or oxygen through a high voltage field called a corona discharge, where oxygen (O₂) in the stream is converted to ozone (O₃). Ozone is generated at the point of application.

The ozone molecule, having a molecular weight of 48, is made up of three oxygen atoms bound by equal oxygen-oxygen bonds at an obtuse angle of 116°49'. This structure provides ozone's powerful oxidizing ability.

Physical Constants of Ozone

MOLECULAR WEIGHT, G/G-MOL	48.000
BOILING POINT, °C	-111.900
MELTING POINT, °C	-193.000
GAS DENSITY, 0°C GRAMS/LITER	2.144
CRITICAL TEMPERATURE, °C	-12.100
CRITICAL TEMPERATURE, °C	54.600
CRITICAL VOLUME, CC/MOL	147.100

Ozone Fire Code

2003 UNIFORM FIRE CODE APPENDIX II-I OZONE GAS-GENERATING EQUIPMENT

SECTION 1 - SCOPE

Equipment having a maximum ozone-generating capacity of 1121b (0.23 kg) or more over a 24-hour period shall be in accordance with this annex.

Exception: Ozone-generating equipment used in one and two family dwellings and lodging and rooming house occupancies.

SECTION 2 - DEFINITIONS

For the purpose of Appendix II-I, certain terms are defined as follows:

OZONE GENERATOR is equipment which causes the production of ozone.

SECTION 3 - STANDARDS

The following standard is intended for use as a guide in the design, fabrication testing and use of equipment regulated by Appendix II-I:

Standard 250, Enclosures for Electrical Equipment
National Electric Manufacturers Association
2101 L Street, N.W. Suite 300
Washington, DC 20037

SECTION 4 - LOCATION

4.1 General. Ozone generators shall be located in approved cabinets or ozone-generator rooms in accordance with Section 4

EXCEPTION: A generator within an approved pressure vessel need not be in a cabinet or ozone-generator room when located outside of buildings.

4.2 Cabinets. Ozone cabinets shall be constructed of approved materials compatible with ozone in accordance with nationally recognized standards. Cabinets shall display an approved sign stating, OZONE GAS GENERATOR - HIGHLY TOXIC - OXIDIZER, See Section 3.

Cabinets shall be braced for seismic activity in accordance with the Building Code.

Cabinets shall be mechanically ventilated with a minimum of six air changes per hour. Exhausted air shall be directed to a treatment system designed to reduce the discharge concentration of the gas to one half of the IDLH value at the point of discharge to the atmosphere.

The average velocity of ventilation at makeup air openings with cabinet doors closed shall not be less than 200 ft per minute (1.02 m/s).

4.3 Ozone-generator Rooms. Ozone-generator rooms shall be mechanically ventilated with a minimum of six air changes per hour. Exhausted air shall be directed to a treatment system designed to reduce the discharge concentration of gas to one half of the IDLH value at the point of discharge to the atmosphere or ozone-generator rooms shall be equipped with a continuous gas detection system which will shut off the generator and sound a local alarm when concentrations above the permissible exposure limit occur.

Ozone-generator rooms shall not be normally occupied, and such rooms shall be kept free of combustible and hazardous material storage. Room access doors shall display an approved sign stating: OZONE GAS GENERATOR - HIGHLY TOXIC - OXIDIZER.

SECTION 5 - PIPING VALVES AND FITTINGS

5.1 General. Piping, valves, fittings and related components used to convey ozone shall be in accordance with Section 5.

5.2 Secondary Containment. Secondary containment, such as double-walled piping or exhausted enclosures, shall be provided for piping, valves, fittings and related components. Secondary containment shall be capable of directing a sudden release to an approved treatment system.

Exception: Welded stainless steel piping and tubing.

5.3 Materials. Materials shall be compatible with ozone and shall be rated for the design operating pressures.

5.4 Identification. Piping shall be identified "Ozone Gas - Highly Toxic - Oxidizer."

SECTION 6 - AUTOMATIC SHUTDOWN

Ozone generators shall be designed to automatically shut down under the following conditions:

- (1) When the dissolved ozone concentration in the water being treated is above saturation when measured at the point where the water is exposed to the atmosphere,
- (2) When the process using generated ozone is shut down,
- (3) Failure of the ventilation system for the cabinet or ozone generator room, or
- (4) Failure of the gas detection system.

SECTION 7 - MANUAL SHUTDOWN

Manual shutdown controls shall be provided at the generator and, if in a room, within 10 ft (3 m) of the main exit or exit-access door.