Safety Data Sheet for Ozone

(formerly MSDS)

1. Product Identification

Product Name: Ozone

Other Common Names: O_3, triatomic oxygen, trioxygen

Product Use: This SDS is limited to the ozone produced in gaseous form onsite by small commercial ozone generators in low concentrations (less than 10 gm/hr.). The use is typically for odor abatement and is for air-borne applications only (not for water treatment).

Ozone Generator Manufacturer: CBI Inc., 3102 E Fifth St, Tyler, TX 75701 USA. Trade name for units: Sonozaire Odor Neutralizer.

Main Phone No: 903 597 0311 **Website**: www.sonozaire.com **Email**: sonozaire@cbi.com

2. Hazard Identification

GHS Classifications

Physical Hazards	Health Hazards	Environmental Hazards
Output levels do not qualify as an oxidizing gas under GHS Chapter 2.4	Respiratory Irritation/Toxicity (Category 1)	Equipment is not useable for water treatment.
	Eye Irritation (Category 2B)	

Notes: Anyone with chronic pulmonary problems, including asthma and COPD, should avoid exposure to ozone.
Respiratory toxicity will develop before eye irritation goes beyond listed categories.
Ozone levels produced by ozone generators covered here do not have levels harmful to skin.

3. Composition

Chemical Name: Ozone **CAS Registry No**: 10028-15-6

Common Names: Ozone, triatomic oxygen, trioxygen **NIOSH RTECS #**: RS8225000

Chemical Formula: O_3

4. First-Aid Measures

Route of Entry	Symptoms	First Aid
Eyes	Irritation, dryness	Rinse with water (remove contacts)
Inhalation	Headache, dry throat, cough, shortness of breath, heaviness of chest, drowsiness, fatigue, inflammation of upper respiratory tract	Remove to a fresh air area, if necessary a trained person should administer oxygen.

For severe cases or when symptoms don't improve, seek medical help.

5. Fire Fighting Measures

Ozone is not flammable, but is considered an oxidant at higher levels. However the levels of ozone generated below 50 ppm do not increase the rate of burning. Use standard extinguishing agents for indicated burning materials. The ozone generating equipment covered by this SDS does not generate more than the 1/2 lb/day (0.23kg/day) indicated in the 2012 NFPA Chapter 54, Article 54.1.1.

6. Accidental Release Measures

Turn off the ozone generator, or remove power and evacuate the area. Ventilate the area with fresh air by opening windows and doors. Do not occupy the area until the ozone level has subsided to safe levels, which should occur within minutes to hours.

7. Handling and Storage

Ozone is to be used in enclosed unoccupied areas and transported from generation point to application point with ozone resistant hose or pipe.

8. Exposure Controls/Personal Protection

OSHA Permissible Exposure Limit/NIOSH Relative Exposure Limit: 0.1 ppm (0.2 mg/m^3) 8-hr/day, 40hr/week time weighted average.

OSHA/NIOSH Short Time Exposure Limit: 0.3 ppm (0.6mg/m^3) 15 minutes.

OSHA/NIOSH Immediately Dangerous to Life or Health: 5 ppm (10 mg/m^3.)

FDA Continuous Exposure: 0.05 ppm (0.1 mg/m^3.)

WARNING PROPERTIES: Odor threshold is detectible in the 0.01-0.04 ppm range, and is treated as a material with adequate warning properties. Ozone is an oxidant and must be used carefully. Fortunately, the odor of ozone generally prevents long periods of prolonged exposure.

RESPIRATORY PROTECTION:

NIOSH	Respirator Recommendations
0-1 ppm	Any chemical cartridge respirator with cartridges providing protection against compound of concern. Any supplied-air respirator.
0-2.5 ppm	Any supplied-air respirator operating in a continuous-flow mode. Any powered air-purifying respirator with cartridges providing protection against compound of concern.
0-5 ppm	Any chemical cartridge respirator with a full facepiece and cartridges providing protection against compound of concern. Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against compound of concern. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece.
Emergency or Entry into Unknown IDLH Conditions	Any self-contained breathing apparatus with a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with a full facepiece and is operated in a pressure demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.
Escape	Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against compound of concern. Any appropriate escape-type self-contained breathing apparatus.

ENGINEERING CONTROLS: For small levels of ozone use forced ventilation to remove ozone from areas. Use ozone level controls to monitor and control levels of ozone in areas that are occupied or unoccupied as necessary to maintain ozone levels for personnel protection or selected operational levels.

DESTRUCTION OF EXCESSIVE OZONE: To reduce levels of ozone in treatment area introduce fresh and/or warm air with dynamic airflow. Heat, humidity, and air movement will speed up the reaction of ozone thereby lowering the levels and increasing oxygen level.

9. Physical and Chemical Properties

Physical State	Gas, clear to bluish color	Boiling Point	-111.9°C/-169.4°F	Solubility	0.001% (0*C)
Molecular Weight	48.0 g/mole	Evaporation Rate	N/A	Auto-Ignition Temp	N/A
Odor	Distinctive Pungent Odor	Flammability (gas)	N/A	Decomposition Temp	N/A
Odor Threshold	0.01-0.04 ppm; sensitivity decreases with exposure	Explosive Limits	N/A	Viscosity	N/A
pH	N/A	Vapor Pressure	>1 atm	Specific Gravity	2.144 g/L
Melting Point	-192.5°C/-314.5°F	Vapor Density	1.6 (air=1)	Ionization Potential	12.52eV
Flash Point	N/A	Relative Gas Density	1.66		

10. Stability and Reactivity

Ozone is very unstable and reacts very quickly with air-borne and surface contaminants, odors, and many chemicals. It will decompose very rapidly in normal ambient temperatures. Warmer temperatures and higher humidity levels, along with dynamic airflow radically increase rate of decomposition. Therefore colder, drier temperatures with static airflow reduce rate of decomposition. Materials that react adversely to ozone are natural rubber (latex), nitrile rubber (hoses for fuels), latex foam rubber, bare steel, nylons, and some thin plastics. Items that require removal or covering include plants, animals, fish tanks, oil paintings (dyes and pigments), some leathers (if treated for long periods), and tires.

11. Toxicological Information

Likely routes of exposure for low levels of ozone production: Inhalation, eyes.

Effects of Acute (short term) Exposure: Irritation and dryness of eyes, nose, and throat and may cause shortness of breath and/or coughing. Other effects include headaches, fatigue, drowsiness and inflammation of the upper respiratory tract.

Effects of Chronic (long term) Exposure: Similar to short exposure, with possibility of breathing disorders, including asthma, or other pulmonary conditions

Irritancy of Ozone	Yes	Teratogenicity	Not Proven
Sensitization to Ozone	No	Mutagenicity	Not Proven
Carcinogenicity (NTP, IARC, OSHA)	No	Toxicologically Synergistic Products	Increased susceptibility to allergens, pathogens, irritants
Reproductive Toxicity	Not Proven		

12. Ecological Information

Ozone can have adverse effects on plant life at high concentrations, or at lower concentrations for long time periods. This is particularly true where ozone is being used indoors where plants are present. Remove plants from ozone exposure. Avoid ozone contact with water or wet materials to prevent the formation of hydrogen peroxide.

13. Disposal Considerations

Stop the production of ozone. Residual ozone should be allowed time to decay back to oxygen. Air movement and higher temperatures and humidity increase the decay rate.

14. Transport Information

NOT APPLICABLE – Ozone is not transportable and is required to be generated at the site location and at time it is being used. It is unstable and will decompose or react with other substances in the environment.

15. Regulatory Information

2012 NFPA 1 Chapter 54 – Uniform Fire Code

OSHA/NIOSH – Exposure Limits, Respiratory Protection

FDA - General Recognized as Safe (1982), Title 21 Section 801.415 - Continuous Exposure Limits (2013)

16. Other Information

The practical half-life of ozone in air is variable based upon the temperature, relative humidity, air movement and presence of contaminants. When odors or air contaminants are present, ozone oxidizes immediately when in contact with odor molecules. Thus ozone level in a treatment area will begin low and as the odors are neutralized, the ozone level will rise. Air movement is necessary to provide the interaction of ozone with the odors. EPA report EPA-600/R-95-154 (Oct 1995) indicated that low levels of ozone decayed completely in 12 minutes. A 2010 study of decay time by Purdue University Agricultural and Biological Engineering with high levels of ozone (700-1700 ppm) indicates that for each degree centigrade of temperature increase the half-life decreases by 45.6 minutes, while an increase of humidity from 0% up to 87% provided a 70% decrease in half-life of ozone (24deg C). The study also indicated that air movement provided the greatest decreased in the decay time of ozone. Airflow at 109 cfm and at 217 cfm reduced half-life of ozone to 49 and 39 minutes at 24 degree C and 0% RH. Thus in odor treatment areas where it is warm and humid, and with high airflow levels all of the decreases will come into effect. In odor removal applications for rooms or buildings where the ozone levels might reach the 3-10 ppm range and where air movers, HVAC systems, or fans are used, with airflows of 1000 cfm or larger the half-life, with approximately 50% RH, would be in the 10-20 minute range or lower. With odors elements in the room, the decay of ozone will be even faster. For an example, for 15 minute half-life a treatment area with an ozone level of 5 ppm, within 90 minutes the ozone level should be reduced to approximately 0.094 ppm which is below the OSHA PEL limit of 0.1 ppm. A similar example with 30 minute half-life and same ozone level of 5 ppm would require 180 minutes to reduce to approximately 0.094 ppm. In all cases airflow should continue during ozone decaying time, and after this fresh air should be introduced into the treatment area to increase the oxygen level and reduce any lingering ozone.

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Date of Preparation: 7/1/2014