

TG SERIES

WATER COOLED OZONE GENERATOR

MODEL: TG-75, TG-150, TG-300, TG-450, TG-600
INSTALLATION & OPERATIONS MANUAL



451 Black Forest Road / Hull, Iowa 51239 USA
P 712.439.6880 / F 712.439.6733

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IMPORTANT SAFETY INSTRUCTIONS, READ AND FOLLOW ALL INSTRUCTIONS.

Read this manual completely before attempting installation.

SAVE THESE INSTRUCTIONS.



SECTION 1

SAFETY PRECAUTIONS

Ozone is a powerful oxidizing agent. Observe strict operating procedures while using ozone equipment. **It is imperative that only ozone compatible materials are used in conjunction with the ozone system.**

NOTE: If the operator has asthma, he or she must not enter an airspace that has a significant ozone concentration. Ozone can induce an asthma attack.

Ensure that the Ozone Generator is in a well-ventilated area. Do not allow rain or condensation to contact the Ozone Generator. The Ozone Generator is not weather proof. The unit must be operated indoors or in an enclosure in a non-condensing environment.

Carefully review and familiarize yourself with the following important safety information concerning the Ozone Generator:

1. Ozone is an extremely aggressive and powerful oxidizer. The Occupational Safety and Health Administration (OSHA) 8 hour exposure limit is 0.10 PPM. The OSHA 15 minute exposure limit for ozone is 0.3 PPM. Above 0.3 PPM, there is the risk of damage to respiratory tissues.
2. People who have no sense of smell should not operate this equipment.
3. Never attempt to verify ozone production by directly breathing or smelling the ozone outlet.
4. The Ozone Generator contains high voltages. Unauthorized entry can result in serious injury or death. For service instructions, contact Ozone Solutions.
5. Make sure all connections are secure and are not leaking. Failure to do so could result in the discharge of ozone into an undesired space.

INTRODUCTION

The water cooled ozone generator produces ozone from oxygen via corona discharge. The TG series is capable of generating 75-600g/hr of ozone with a feed gas of 90% oxygen. Ozone has many uses including pathogen inactivation and destruction of odorous gases.

THEORY OF OPERATION

The Ozone Generator produces ozone via the corona discharge method. This process uses an electrical spark to split the molecular bond of natural diatomic oxygen to form the atomic O[•] form of oxygen. These O[•] atoms then bond to other O₂ molecules to form O₃ (ozone).

The spark inside the corona cell is a controlled corona or spark. This spark is produced by forcing a high voltage source through a dielectric and a small air gap where the feed gas flows through. The spark occurs at a higher-than-line voltage and much higher-than-line frequencies, which are increased and regulated by the onboard electronics in the machine.

The basic fundamentals of flow and velocity of gas through the corona cell allow for more ozone production (g/hr) as oxygen flow increases. As the flow increases, the concentration of ozone (% by weight) decreases. Conversely, as the flow decreases, the concentration of ozone increases. At very low oxygen flow rates, the oxygen remains in the corona cell for a longer period of time.

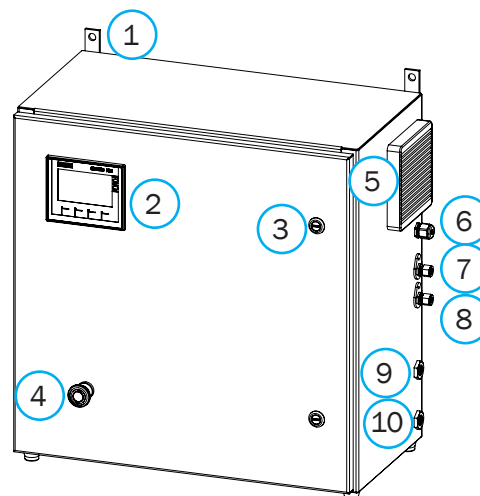
The contact time (CT value) allows a higher percentage of oxygen to be converted into ozone. The ozone production and concentration of the TG ozone machine can be determined using the performance charts in this manual.

While the flow rate of the oxygen feed gas affects the ozone output the most, the pressure of the feed gas also effects the ozone output. Higher pressures create higher concentrations of the feed gas which result in a higher ozone output or concentration. If the feed gas flow rate remains the same while under a higher pressure, it allows an increased contact time (CT value). With increased feed gas pressures, additional electrical power is needed to create a spark in the pressurized corona cell. The electronics of the TG series automatically compensate for the varying pressure to maximize the ozone output. While increased feed gas pressure helps achieve a higher output, it also forces the created ozone molecules back into oxygen at a quicker rate.

SECTION 2

COMPONENT DIAGRAM

1. **Mounting tabs** - can be used to mount the machine to a wall or rack
2. **HMI screen** - main screen to control the ozone generator
3. **Enclosure latch** - will latch and lock door of enclosure, a common flat blade screwdriver can be used to open the enclosure
4. **Emergency stop switch** - immediate push stop
5. **Cooling vents** - filtered cooling vents to maintain proper air flow through the enclosure
6. **Power cord** - 220V power cord
7. **Ozone outlet**
8. **Oxygen inlet**
9. **Cooling water out**
10. **Cooling water in**



SPECIFICATIONS

Model	TG-75	TG-150	TG-300	TG-450	TG-600
O ₃ Production (g/hr)	75	150	300	450	600
O ₂ Feed Rate (lpm)	0-15	0-30	0-60	0-90	0-120
Voltage (VAC)	208-240*	208-240*	208-240*	208-240	208-240
Power (Watts)	600	1,200	2,400	3,600	4,800
Gas Connections	3/8" Compression	3/8" Compression	1/2" FNPT	1/2" FNPT	1/2" FNPT
Cooling Connections	3/8" FNPT	3/8" FNPT	1/2" FNPT	1/2" FNPT	1/2" FNPT
Cooling Required (BTU)	2,000	4,100	8,200	12,300	16,600
Cooling Water (GPM @ 70F or cooler)	0.75	1	1.5	2	2
Size (inches; D,W,H)	11x24x24	13x24x24	17x24x30	17x30x36	17x36x42
Weight (lbs)	75	90	180	200	250

*Single phase AC power

AVAILABLE OPTIONS

Optional Accessories	Description
Flow meter	0-10 LPM, 0-20 LPM, or high accuracy 0-10 LPM flow meter
Pressure gauge	0-30 PSI or 0-60 PSI gauge to display corona cell pressure
Ozone control input	4-20 mA input or 0-10 volt input for remote operation

INSTALLATION GUIDELINES

The Ozone Generator is not weather proof; therefore, it must be operated indoors in a non-condensing, dust-free environment. The operating temperature should be 40°F to 95°F, and the storage temperature should be -20°F to 170°F.

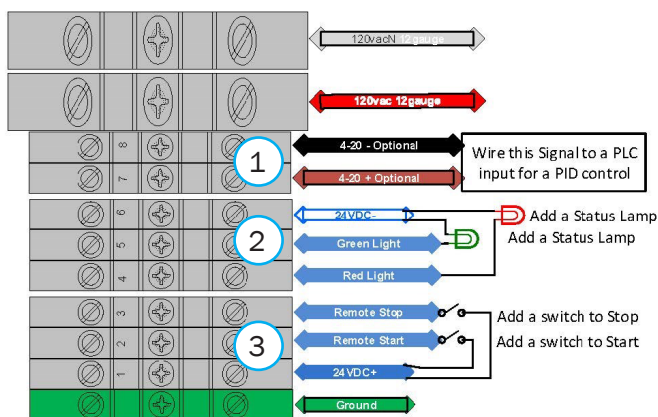
VENTILLATION

Approximately three air changes per hour is the recommended ventilation for the TG series of ozone generators. Proper ventilation will ensure the machine remains cool, and can help prevent the accumulation of ozone in the event of a leak.

Maintain 12-24 inches of clear space around the machine; especially around the filtered vents

SECTION 3

REMOTE OPERATION OR CONTROL



1. Use the 4-20 mA option to remotely control the ozone output from 0-100%
2. When the inverter is ON and producing ozone, there is a 24 VDC reference signal that can be wired to a remote location. This can be wired using terminals "24 VDC(-)" and "Green Light" and "Red Light"
3. By using either a momentary or latching relay, the ozone generator can be turned ON or OFF remotely by bridging the terminals "24 VDC(+)" and "Remote Stop" or "Remote Start"

NOTE: The use and type of the remote control must be qualified prior to system purchase, so please contact Ozone Solutions for more information before installing a remote for your unit.

FLOW METER CORRECTED FLOW CHART

When setting the flow and pressure of the Ozone Generator, it is important to understand how the pressure will affect the flow rate as displayed on the flow meter(s). If the actual discharge pressure is substantially above atmospheric pressure, the reading can be adjusted to determine the precise flow rate, according to the following formula (using PSIG):

$$(\text{adjusted flow}) = (\text{measured flow}) \times \sqrt{\frac{\text{oxygen pressure} + 14.7}{14.7}}$$

Please refer to the Corrected Flow Chart in the appendices of this manual, or contact Ozone Solutions if additional assistance is required. This corrected flow can then be used in the appropriate Performance Chart to determine how much ozone you are making. There can be up to a 10% error in this equation. Using an ozone

analyzer in line with your ozone system will provide the greatest level of accuracy and understanding of your ozone production.

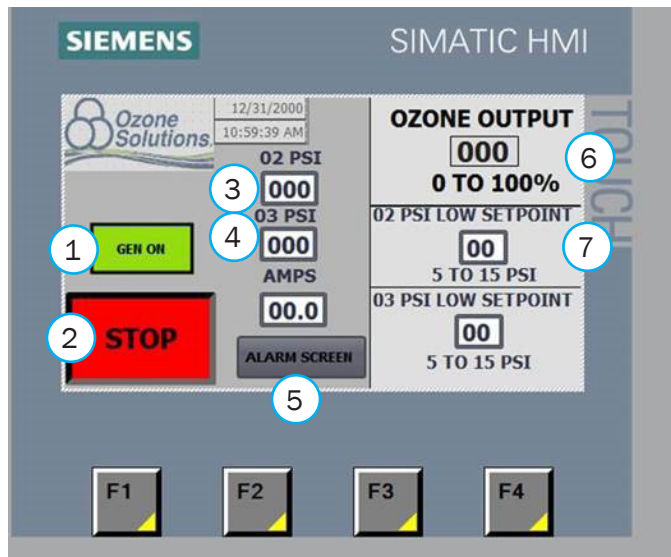
START UP

Here are tips for ensuring performance for the ozone generator:

1. Using an oxygen purity meter, measure the purity of the oxygen. When the meter measures 90% or higher. Since the purity value is not displayed on an HMI screen, and if you do not have an oxygen purity meter, flowing the oxygen through the system for a minute should be fine.
2. Set the flow and pressure to that which is expected for its operation while not exceeding the capacity of the ozone machine as shown in the performance charts in this manual.
3. Spraying soapy water on all of the gas connection points will ensure there are no leaks. Tighten or repair as needed.
4. Refer to the HMI screens to inform you when the machine is making ozone or not.
5. If the machine is or has been making ozone gas for awhile, do number 6 below. If it is not making ozone, go to #7.
6. To make sure the flow rate of the cooling water is adequate, disconnect all power sources and open the cabinet door to access the ozone generating cell (s). The cells must be cool to the touch.
7. If you encounter any problems with the operation of the machine, please check the HMI alarm screen.

SECTION 4

HMI MAIN SCREEN

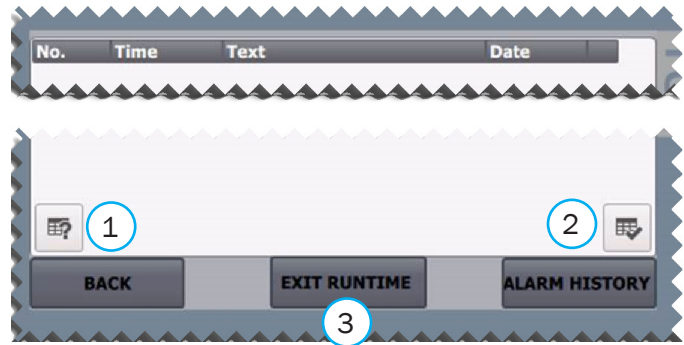


1. Inverter/Ozone Generator Status
2. Start/Stop Button - Used to start or stop the machine. When "STOP" is activated, oxygen will continue to flow
3. Measured Oxygen Pressure

4. Measured Ozone Pressure
5. Alarm Screen Button - Will take you to the HMI alarm screen. Refer to the HMI alarm screen section for more information
6. Ozone Output level - displays the value which has been entered into the HMI setpoint screen. To modify the value, tap this field, which will bring up the setpoint screen. To operate the system on oxygen only, enter a zero (0) into this field
7. O₂ PSI Low Setpoint - displays the value which has been entered into the HMI setpoint screen. To modify the value, tap this field, which will bring up the setpoint screen. If ozone pressure drops below this level, the ozone generator will shut down. **This MUST be set at a minimum of 5 PSI**
8. O₃ PSI Low Setpoint - displays the value which has been entered into the HMI setpoint screen. To modify the value, tap this field, which will bring up the setpoint screen. If ozone pressure drops below this level, the ozone generator will shut down. **This MUST be set at a minimum of 5 PSI**

HMI ALARM SCREEN

1. **Troubleshooting Tips** - will display troubleshooting tips for the highlighted alarm. You can highlight other alarms by tapping on them
2. **Alarm Delete** - inactive alarms can be deleted
3. **Exit Runtime** - will exit the run-time program and bring you to the operating system



HMI ALARM HISTORY SCREEN

The alarm history screen keeps a history of all ozone system alarms. This running log can be of good use or history when needing to service or troubleshoot the machine. This logged history cannot be deleted or cleared.

No.	Time	Text	Date
140001	11:08:06 AM	Connection disconnected: HMI_Connected_1, Station 192.168.0.1, Rack 0, Slot 1.	1/18/2016
110001	11:07:56 AM	Change to operating mode 'online' 1/18/2016	\$
270006	11:07:56 AM	Project modified: Alarms cannot be 1/18/2016	\$



HMI SETPOINT SCREEN

The setpoint screen comes up when you touch fields [6], [7], or [8] on the HMI main screen. Enter the desired value into the top field then tap the enter/return key.

SECTION 5

MAINTENANCE AND SERVICE PARTS

As long as the feed gas is kept dry, dust free, and pure, the Ozone Generator will not need maintenance. Ensure strict maintenance procedures of the oxygen generator as specified in the oxygen generator manual.

There are no serviceable parts inside the TG Series. If any part fails to operate or other problems arise call Ozone Solutions for service and repair.

WARRANTY

Ozone Solutions warrants all new equipment assembled, manufactured, and sold to be free from defects in material and workmanship under normal use and service for a period of one (1) year after date of sale to the original purchaser.

Some products may have a specific warranty period other than what is outlined in this document. For such products, the manufacturer warranty will supersede this warranty. Ozone Solutions will honor the manufacturer's warranty, but if and when advised by the manufacturer, may have the customer deal

directly with the manufacturer. This warranty covers all parts that are not outlined in a product maintenance schedule. This warranty will be void if any piece of the equipment is used in a manner other than what is explicitly outlined in the product manuals.

If any part of the equipment manufactured by Ozone Solutions proves to be defective during the warranty period, please contact Ozone Solutions at 712.439.6880, or service@ozonesolutions.com.

Prior authorization is required before working on or shipping a product back to us. Failure to get prior authorization may result in denial of your claim. Once authorized, you may return the defective equipment to Ozone Solutions with the transportation charges prepaid. If Ozone Solutions finds the equipment to be defective, it will be repaired or replaced at our discretion, free of charge, to the original purchaser (F.O.B. factory).

This warranty shall not place any liability on Ozone Solutions for any transportation charges, labor, or cost for, or during the replacement of any parts. The replaced part(s) or product will then continue the original warranty duration. The replaced parts will not start a new one (1) year coverage period. The purchaser by acceptance of the equipment will assume all liability for the consequences of its use or misuse by the purchaser, employees, or others. This warranty shall not apply to any piece of equipment, or part thereof sold by this company which has been subject to any accident caused in transit, alterations by unauthorized service, negligence, abuse, or damage by flood, fire, or act of God. This warranty shall constitute the entire warranty and/or agreement between Ozone Solutions and the original purchaser, and in lieu of all other warranties, expressed or implied, either oral or written, including the warranty of merchantability and fitness for a particular use and of all other obligations or liabilities on our part. Ozone Solutions neither assumes nor authorizes any other person or entity to assume for us any liability associated with the sale of its products or equipment.

The term "original purchaser," as used in this warranty, means whom the product was originally sold to by Ozone Solutions or by an authorized dealer. Ozone Solutions reserves the right to make changes in its products without notice. Because of this, Ozone Solutions is not obligated to replace warranty defective part (s) and/or product with the same original part or product.

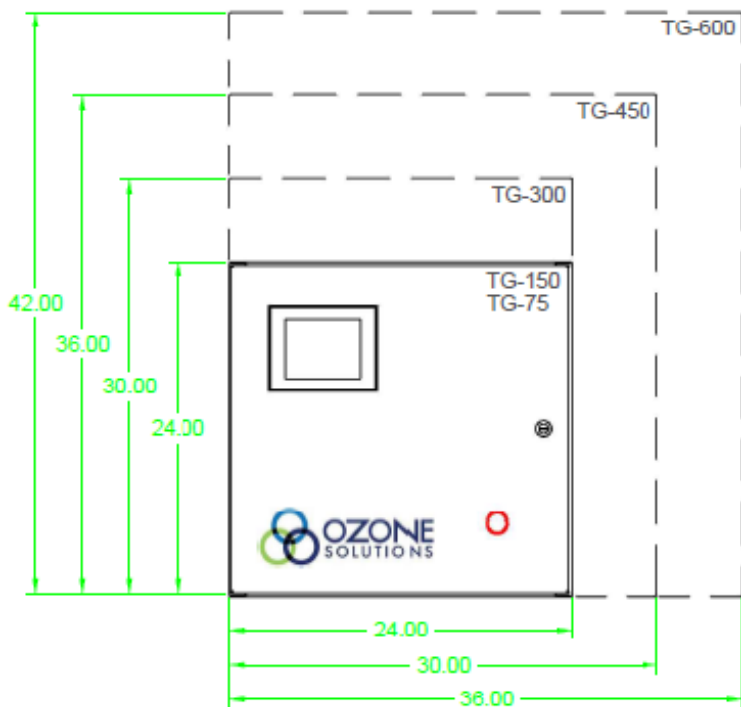
CONTACT INFORMATION

Ozone Solutions, Inc.
451 Black Forest Road
Hull, IA 51239 USA

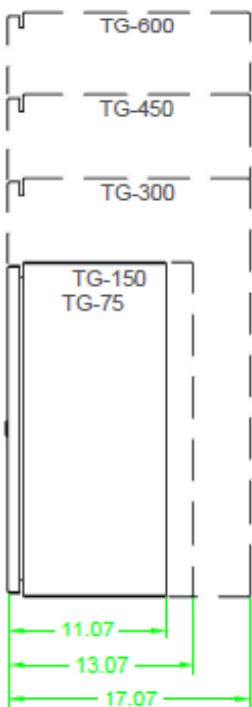
Phone:	712.439.6880
Fax:	712.439.6733
Email:	sales@ozonesolutions.com
Website:	www.ozonesolutions.com

SIZE CHART

TG-75	24" x 24" x 11.07"
TG-150	24" x 24" x 13.07"
TG-300	24" x 30" x 17.07"
TG-450	30" x 36" x 17.07"
TG-600	36" x 42" x 17.07"



FRONT VIEW



RIGHT-SIDE VIEW

SCALE: 1" = 1'-0"		DRAWING NO: TG-75,150,300,450,600	
ORIG DRAWN: 04/14/16		TITLE: TG-75,150,300,450,600	
CHECKED: DAK		SIZE: A	SHEET: 1 OF 1
APPROVED: DAK		REV: A	

Corrected Flow Chart

PSI

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
0															
5		5.79	6.46	7.11	7.68	8.22	8.72	9.19	9.65	10.08	10.49	10.89	11.27		
10		11.58	12.95	14.21	15.36	16.43	17.44	18.39	19.29	20.15	20.98	21.77	22.54		
15		17.36	19.44	21.32	23.06	24.65	26.16	27.58	28.94	30.23	31.47	32.66	33.81		
20		23.15	25.93	28.63	30.79	32.87	34.88	36.77	38.58	40.30	41.96	43.55	45.08		
25		28.94	32.41	35.54	38.44	41.08	43.59	45.97	48.23	50.38	52.45	54.44	56.36		
30		34.73	38.89	42.64	46.08	49.30	52.31	55.16	57.87	60.46	62.94	65.32	67.63		
35		40.52	45.37	49.75	53.77	57.52	61.03	64.36	67.52	70.53	73.43	76.21	78.90		
40		46.31	51.85	56.86	61.46	65.73	69.75	73.55	77.16	80.61	83.92	87.10	90.17		
45		52.09	58.33	63.96	69.14	73.95	78.47	82.74	86.81	90.69	94.41	97.99	101.44		
50		57.88	64.81	71.07	76.82	82.17	87.19	91.94	96.45	100.76	104.90	108.87	112.71		
55		63.67	71.29	78.18	84.50	90.39	95.91	101.13	106.10	110.84	115.39	119.76	123.98		
60		69.46	77.78	85.28	92.18	98.60	104.63	110.32	115.74	120.91	125.88	130.65	135.23		
65		75.25	84.26	92.39	99.87	106.82	113.35	119.52	125.30	130.69	135.57	141.54	146.53		
70		81.03	90.74	99.50	107.55	115.04	122.07	128.71	135.03	141.07	146.85	152.42	157.80		
75		86.82	97.22	105.51	113.23	120.25	126.78	132.91	138.68	144.14	149.35	154.31	159.07		
80		92.61	103.70	113.71	122.91	131.47	139.50	147.10	154.32	161.22	167.84	174.20	180.34		
85		98.40	110.18	120.82	130.59	139.69	148.22	156.29	163.97	171.30	178.33	185.09	191.61		
90		104.19	116.65	127.93	138.28	147.90	156.94	165.49	173.61	181.37	188.81	195.97	202.83		
95		109.98	123.14	135.03	145.96	156.12	165.66	174.68	183.26	191.45	199.30	206.86	214.15		
100		115.76	129.63	142.14	153.64	164.34	174.36	183.87	192.90	201.52	209.79	217.75	225.42		
105		121.55	136.11	148.25	159.32	170.55	181.10	191.07	200.55	210.60	220.28	228.64	236.70		
110		127.34	142.59	155.36	169.00	180.77	191.82	202.26	212.19	221.68	230.77	239.52	247.97		
115		133.13	149.07	163.46	176.60	188.99	200.54	211.45	221.84	231.75	241.26	250.41	259.24		
120		138.92	155.55	170.57	184.37	197.20	209.26	220.55	231.48	241.83	251.75	261.30	270.51		

FLOW

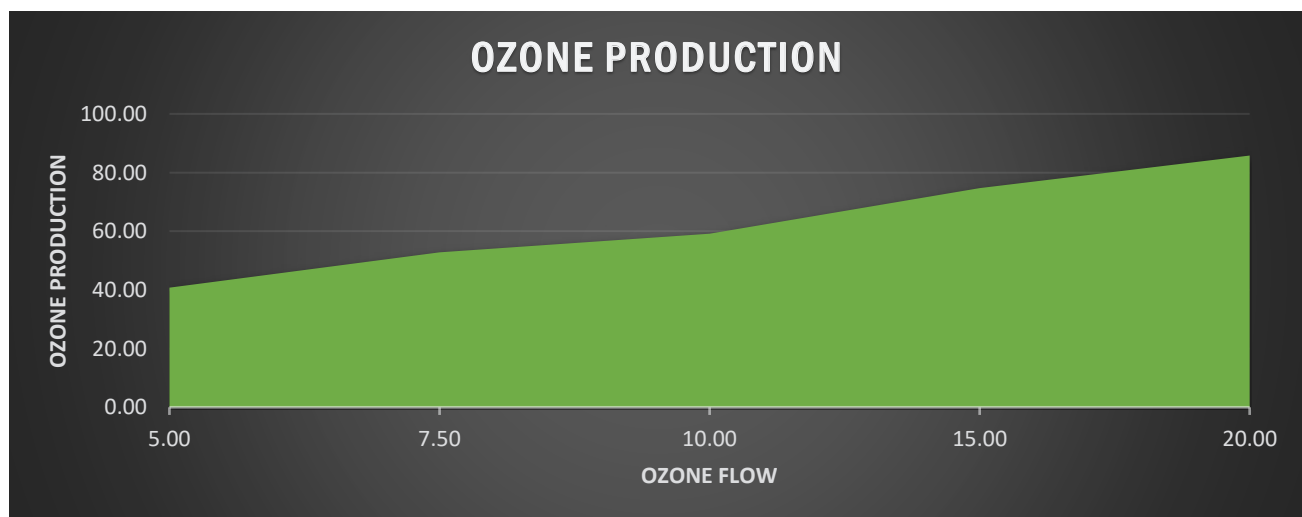
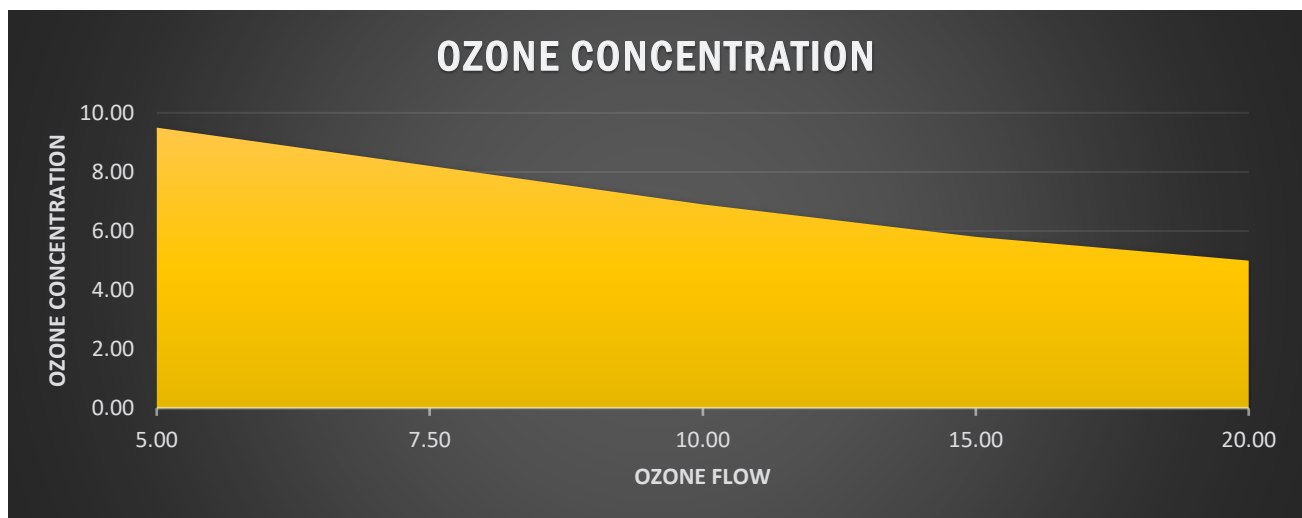
APPENDIX C - PERFORMANCE CHARTS

OZONE GENERATOR PERFORMANCE TEST



TG SERIES OZONE GENERATORS

		Ozone Concentration (% by weight)	Ozone Production (g/hr)
Ozone Flow (lpm)	PSI	TG-75	TG-75
5.00	10	9.50	40.76
7.50	10	8.20	52.77
10.00	10	6.90	59.20
15.00	10	5.80	74.65
20.00	10	5.00	85.80



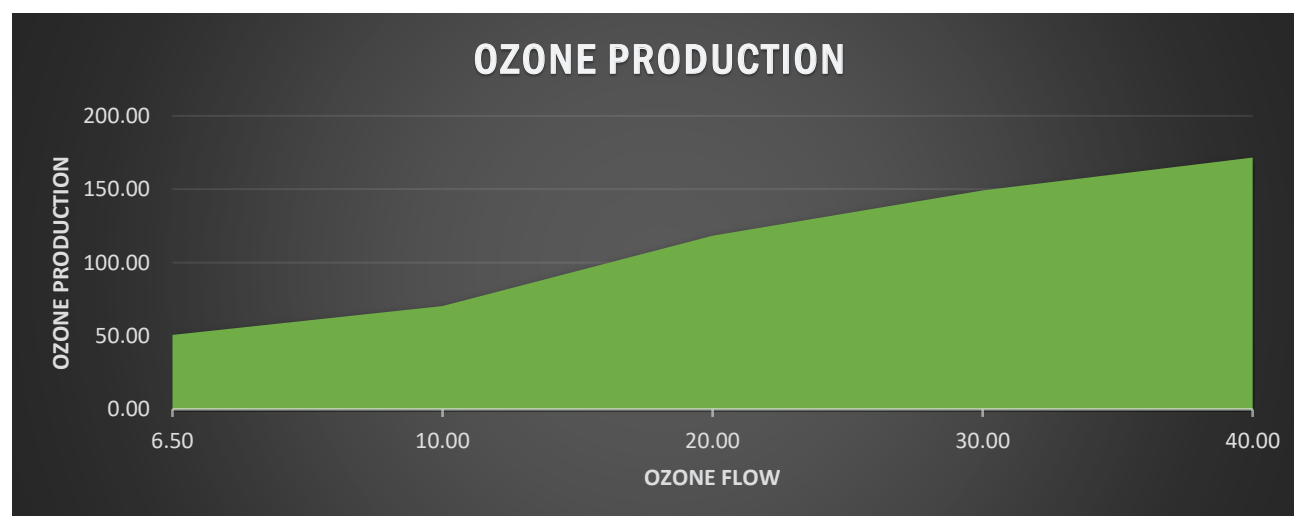
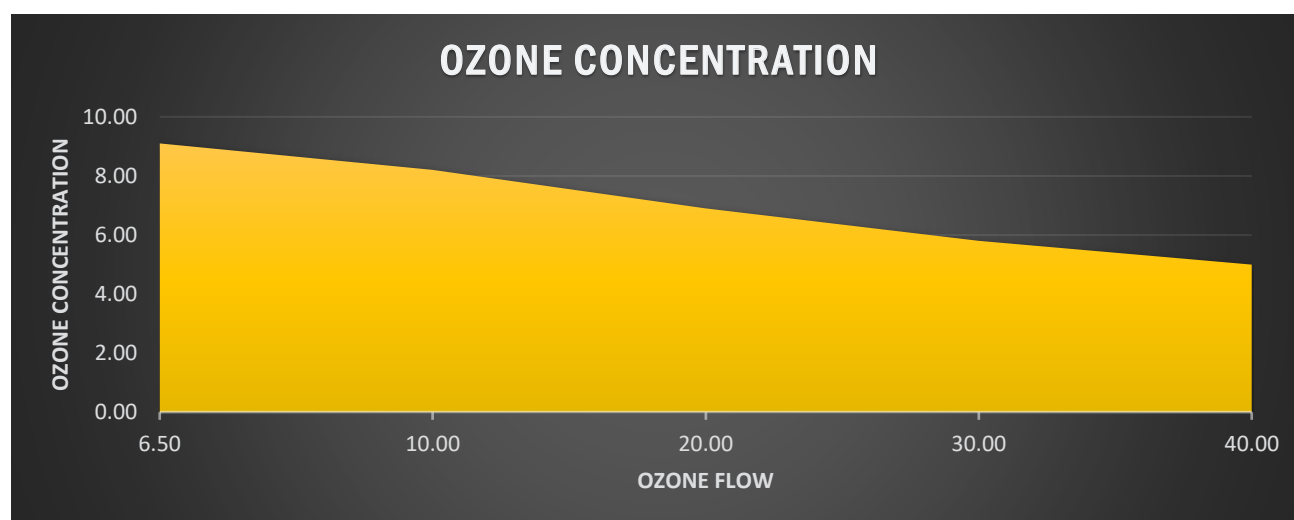
Test was performed at 72°F, running for over an hour. Cooling water at 10 gph flow rate and 70°F.
Additional Equipment: Ozone Analyzer API 454 and API 460H

OZONE GENERATOR PERFORMANCE TEST



TG SERIES OZONE GENERATORS

		Ozone Concentration (% by weight)	Ozone Production (g/hr)
Ozone Flow (lpm)	PSI	TG-150	TG-150
6.50	20	9.10	50.75
10.00	20	8.20	70.36
20.00	20	6.90	118.40
30.00	20	5.80	149.29
40.00	20	5.00	171.60



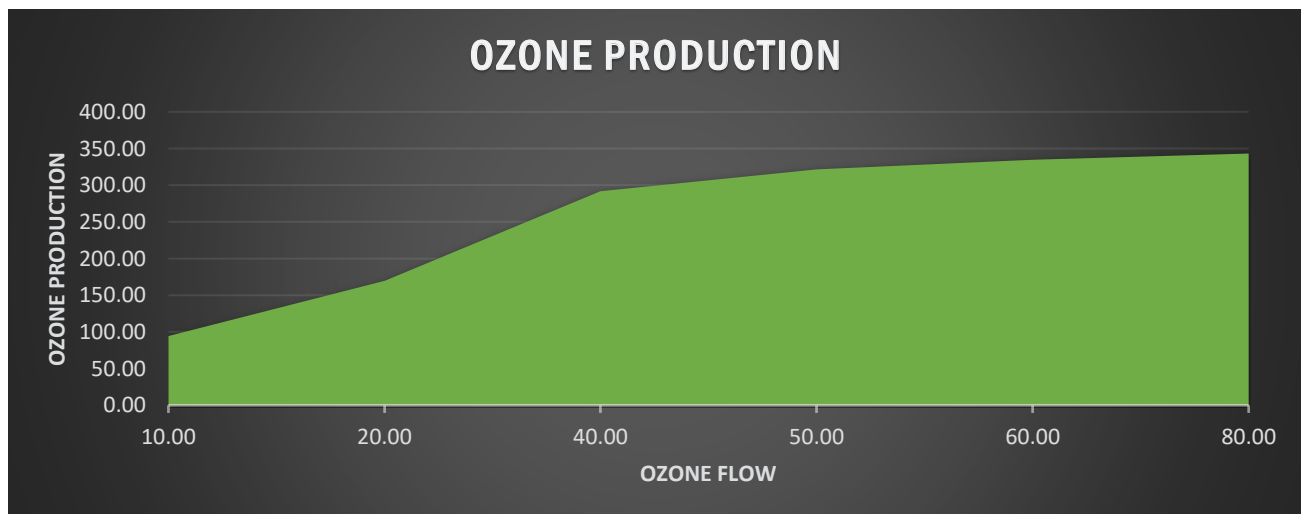
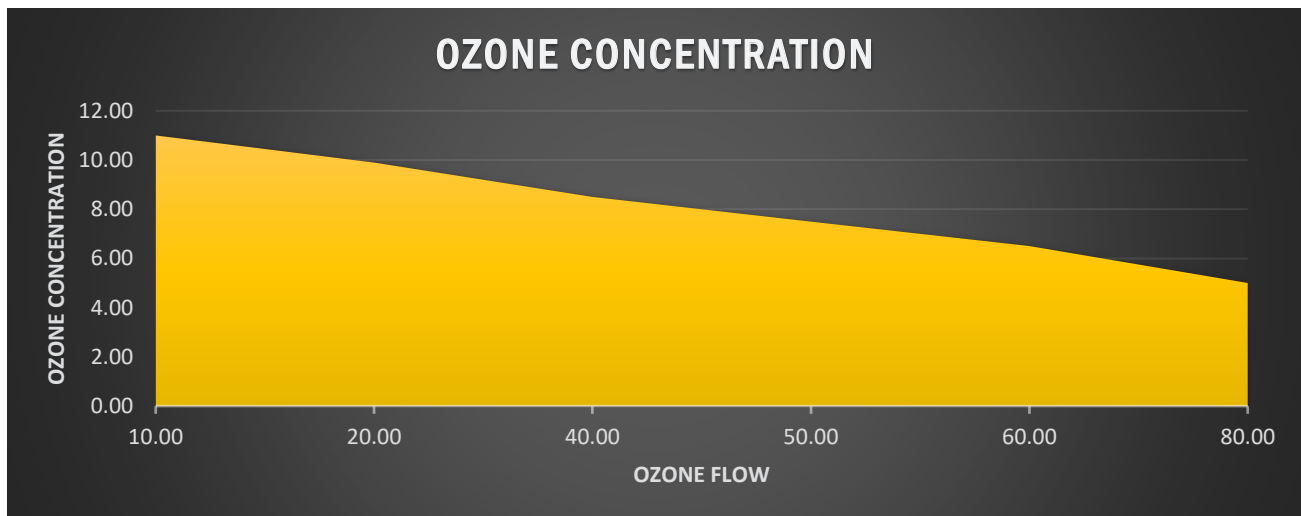
Test was performed at 72°F, running for over an hour. Cooling water at 20 gph flow rate and 70°F.
Additional Equipment: Ozone Analyzer API 454 and API 460H

OZONE GENERATOR PERFORMANCE TEST



TG SERIES OZONE GENERATORS

		Ozone Concentration (% by weight)	Ozone Production (g/hr)
Ozone Flow (lpm)	PSI	TG-300	TG-300
10.00	20	11.00	94.38
20.00	20	9.90	169.88
40.00	20	8.50	291.72
50.00	20	7.50	321.75
60.00	20	6.50	334.62
80.00	20	5.00	343.20



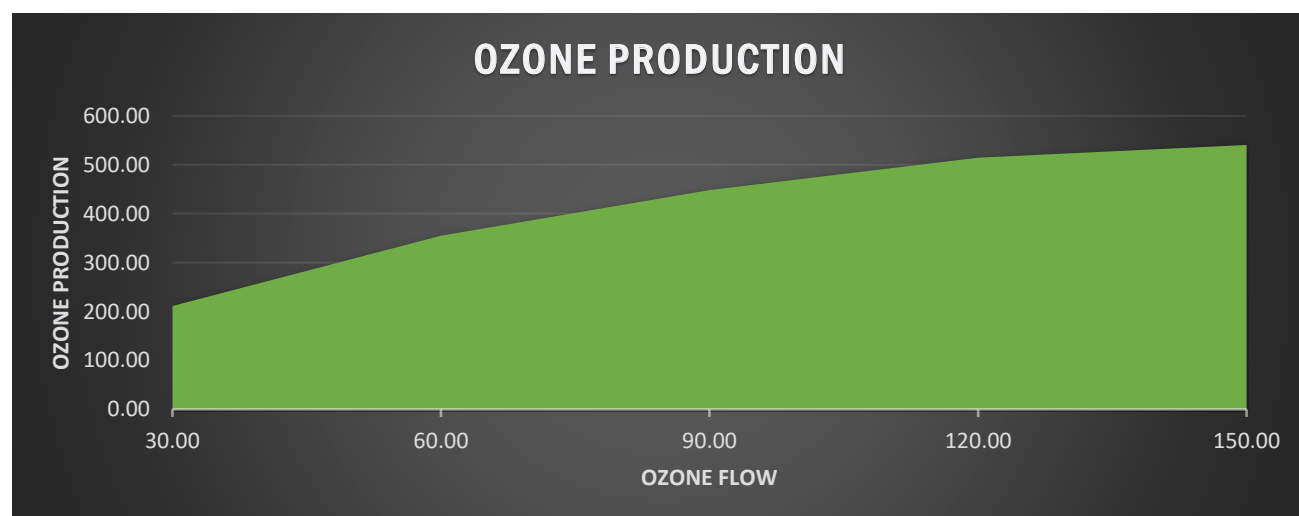
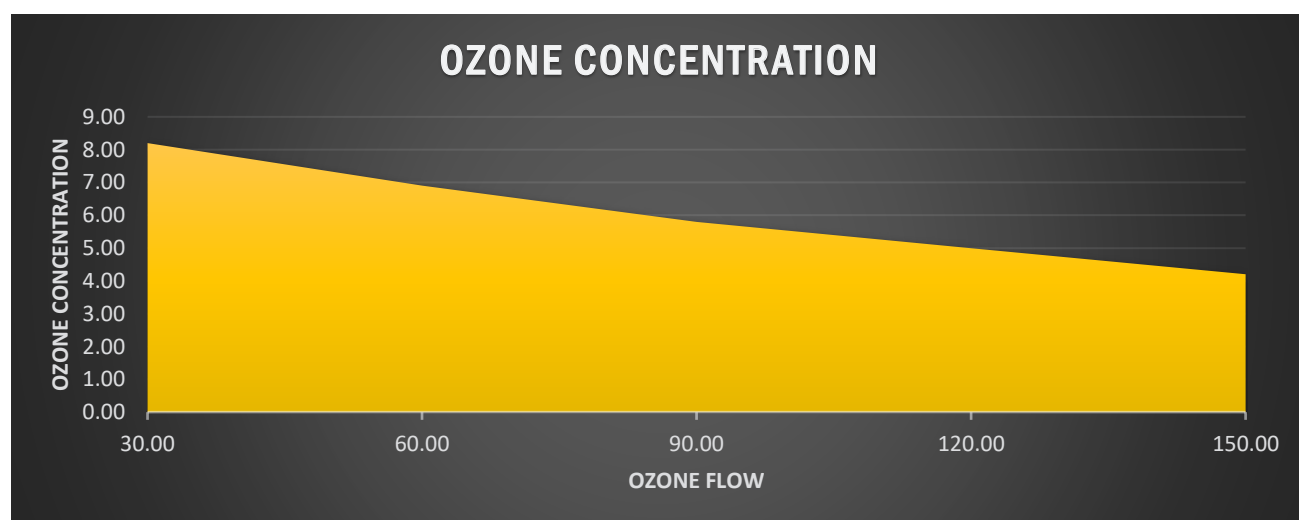
Test was performed at 72°F, running for over an hour. Cooling water at 30 gph flow rate and 70°F.
 Additional Equipment: Ozone Analyzer API 454 and API 460H

OZONE GENERATOR PERFORMANCE TEST



TG SERIES OZONE GENERATORS

		Ozone Concentration (% by weight)	Ozone Production (g/hr)
Ozone Flow (lpm)	PSI	TG-450	TG-450
30.00	20	8.20	211.07
60.00	20	6.90	355.21
90.00	20	5.80	447.88
120.00	20	5.00	514.80
150.00	20	4.20	540.54



Test was performed at 72°F, running for over an hour.

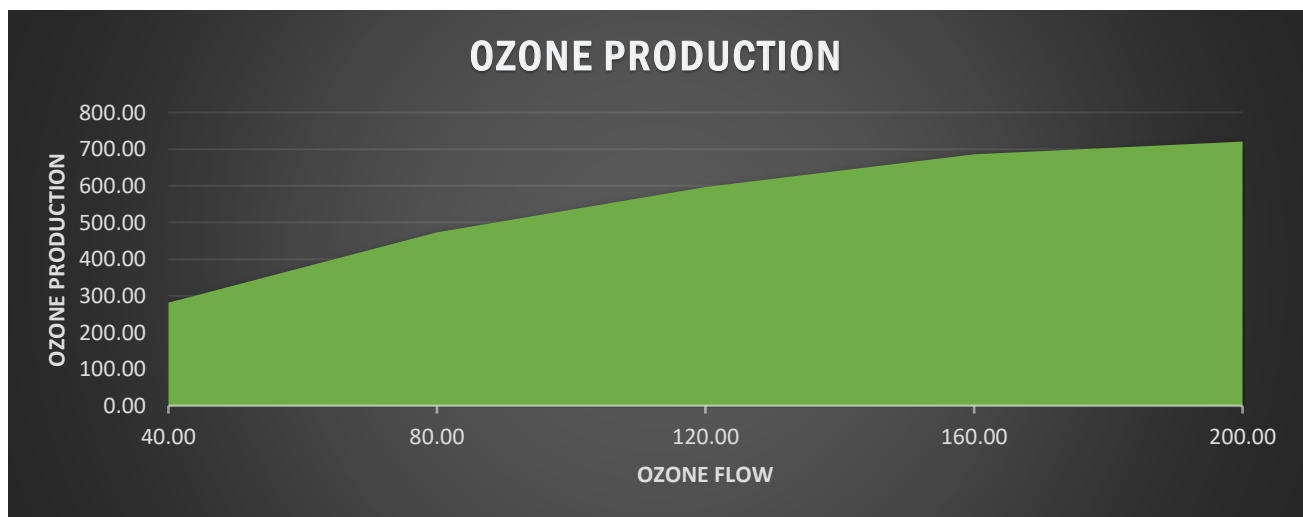
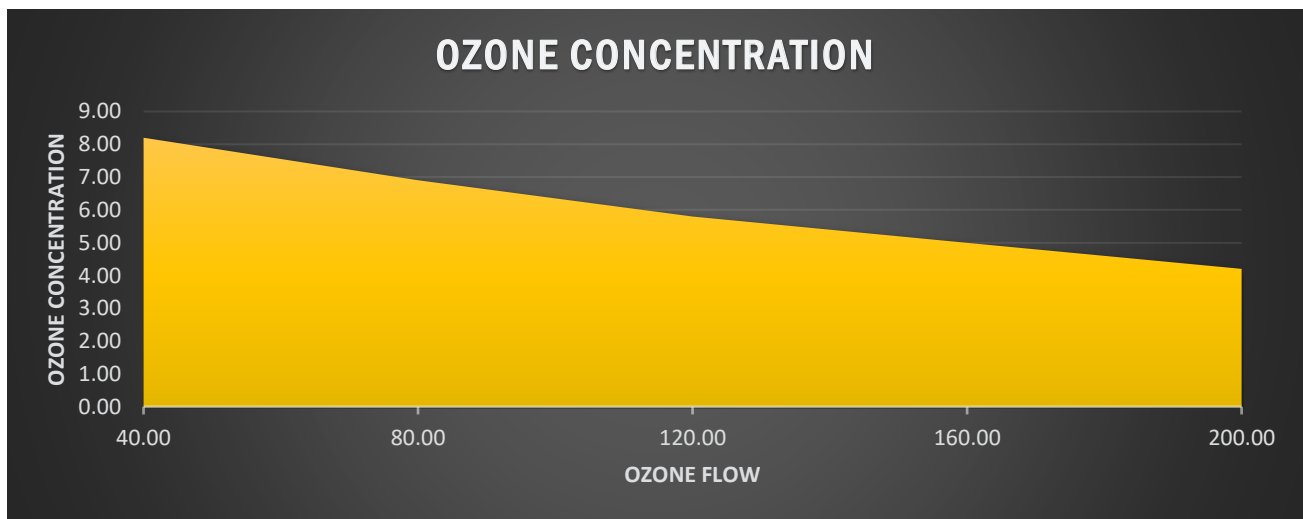
Additional Equipment: Ozone Analyzer API 460H

OZONE GENERATOR PERFORMANCE TEST



TG SERIES OZONE GENERATORS

		Ozone Concentration (% by weight)	Ozone Production (g/hr)
Ozone Flow (lpm)	PSI	TG-600	TG-600
40.00	20	8.20	281.42
80.00	20	6.90	473.62
120.00	20	5.80	597.17
160.00	20	5.00	686.40
200.00	20	4.20	720.72



Test was performed at 72°F, running for over an hour. C
 Additional Equipment: Ozone Analyzer API 460H

APPENDIX D - SAFETY DATA SHEET



SAFETY DATA SHEET FOR OZONE FORMERLY MSDS

1. PRODUCT IDENTIFICATION

PRODUCT NAME: Ozone

COMMON NAME / SYNONYMS: Triatomic Oxygen, Trioxygen, O₃

OZONE GENERATOR MANUFACTURER / SUPPLIER: Ozone Solutions
451 Black Forest Road / Hull, Iowa 51239
712.439.6880 / www.ozonesolutions.com / tinfo@ozonesolutions.com

PRODUCT USE: This SDS is limited to ozone produced in gaseous form on site by an ozone generator, in varying concentrations, in either air or aqueous solutions, for the purposes of odor abatement, oxidation of organic compounds or antimicrobial intervention, in a variety of applications.

2. HAZARD IDENTIFICATION

GHS CLASSIFICATIONS

PHYSICAL	HEALTH	ENVIRONMENTAL
Oxidizing Gas	Skin Irritation - Category 3 Eye Irritation - Category 2B Respiratory System Toxicity - Category 1 (Single & Repeated)	Severe

WHMIS CLASSIFICATIONS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM, CANADA): C, D1A, D2A, D2B, F
Source: CCOHS CHEMINFO Record Number 774

3. COMPOSITION

CHEMICAL NAME	Ozone
COMMON NAMES	Triatomic Oxygen, Trioxygen
CHEMICAL FORMULA	O ₃
CAS REGISTRY NUMBER	10028-15-6

4. FIRST AID MEASURES

ROUTE OF ENTRY		SYMPTOMS	FIRST AID
Skin Contact	Yes	Irritation	Rinse with Water
Skin Absorption	No	NA	NA
Eye Contact	Yes	Irritation	Rinse with Water, Remove Contacts
Ingestion	No	NA	NA
Inhalation	Yes	Headache, Cough, Heavy Chest, Shortness of Breath	Remove to Fresh Air, Provide Oxygen Therapy as Needed

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

5. FIRE FIGHTING MEASURES

Ozone itself is not flammable. As a strong oxidant it may accelerate, even initiate, combustion or cause explosions. Use whatever extinguishing agents are indicated for the burning materials.

6. ACCIDENTAL RELEASE MEASURES

Turn off the ozone generator and ventilate the area. Evacuate until ozone levels subside to a safe level (<0.1 ppm).

7. HANDLING AND STORAGE

Ozone must be contained within ozone-resistant tubing and pipes from the generation point to the application point.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

OSHA PERMISSIBLE EXPOSURE LIMIT	8 hour TWA 0.1 ppm
ANSI / ASTM	8 hour TWA 0.1 ppm, STEL 0.3 ppm
ACGIH	8 hour TWA 0.1 ppm, STEL 0.3 ppm
NIOSH	ELCV 0.1 ppm Light; 0.8 ppm Moderate; 0.5 ppm Heavy; Light, Moderate, Heavy Work TWA <=2 Hours, 0.2 ppm Immediately Dangerous to Life or Health 5.0 ppm

RESPIRATORY PROTECTION: Use full face self-contained breathing apparatus for entering areas with a high concentration of ozone.

ENGINEERING CONTROL: Use ozone destruct unit for off gassing of ozone.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Gas	pH	NA
MOLECULAR WEIGHT	48.0	Decomposition Temperature	NA
APPEARANCE	Clear at Low Concentration, Blue at Higher Concentration	Evaporation Rate	NA
ODOR	Distinct Pungent Odor	Flash Point	NA
ODOR THRESHOLD	0.02 to 0.05 ppm; Exposure Desensitizes	Auto-Ignition Temperature	NA
MELTING POINT	-193° C / -315° F	Relative Density	NA
BOILING POINT	-112° C / -169° F	Partition Coefficient	NA
VAPOR PRESSURE	> 1 atm	Flammability	NA
VAPOR DENSITY	1.6 (Air = 1)	Explosive Limits	NA
SOLUBILITY IN WATER	570 mg / L at 20° C 100% O ₃ ; 0.64 at 0° C	Viscosity	NA

10. STABILITY AND REACTIVITY

Ozone is highly unstable and highly reactive. Avoid contact with oxidizable substances. Ozone will readily react and spontaneously decompose under normal ambient temperatures.

11. TOXICOLOGY INFORMATION

ROUTES OF EXPOSURE	Inhalation, Eyes, Skin Exposure
EFFECTS OF ACUTE EXPOSURE	Discomfort; including headache, coughing, dry throat, shortness of breath, pulmonary edema; higher levels of exposure intensify symptoms. Possible irritation of skin and / or eyes.
EFFECTS OF CHRONIC EXPOSURE	Similar to Acute Exposure effects, with possible development of chronic breathing disorders, including asthma.
LC ₅₀	Mice 12.6 ppm for 3 hrs / Hamsters 35.5 ppm for 3 hrs
IRRITANCY OF OZONE	Yes
SENSITIZATION TO OZONE	No
CARCINOGENICITY (NTP, IARC, OSHA)	No
REPRODUCTIVE TOXICITY, TERATOGENICITY, MUTAGENICITY	Not Proven
TOXICOLOGICALLY SYNERGISTIC PRODUCTS	Increased susceptibility to allergens, pathogens and irritants

12. ECOLOGICAL INFORMATION

The immediate surrounding area may be adversely affected by an ozone release, particularly plant life. Discharge of ozone in water solution may be harmful to aquatic life. Due to natural decomposition, bioaccumulation will not occur and the area affected will be limited.

13. DISPOSAL CONSIDERATIONS

Off-gassing of ozone should be through an ozone destruct unit which breaks ozone down to oxygen before release into the atmosphere.

14. TRANSPORT INFORMATION

NOT APPLICABLE, as ozone is unstable and either reacts or decomposes and must be generated at the location and time of use.

15. REGULATORY INFORMATION (Source: EPA List of Lists)

SARA TITLE III SECTION 302 EHS TPQ	100 lbs
SARA TITLE III SECTION 304 EHS RQ	100 lbs
SARA TITLE III SECTION 313	> 10,000 lbs used / year

16. OTHER INFORMATION

Half-life of ozone in water at 20° C = 20 minutes; in dry still air at 24° C = 25 hour; decreases significantly with increase in humidity, presence of contaminants, air movement and / or increase in temperature.

Preparer: Tim McConnel and Stacey Eben, Ozone Solutions 5/1/2012 (layout revision (2/13/2018))

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