

RMT Series

Ozone Ground Remediation System

Model: RMT-200

Installation & Operations Manual



The element of success.

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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 operator indoors or in an enclosure in a non-condensing environment.

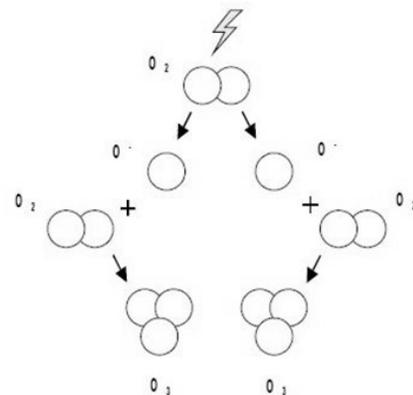
Carefully review and familiarize yourself with the following important safety information concerning the Ozone Generator:

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 or the ozone-tubing 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 tubing connections between the Ozone Generator and the injection point are secure and in good working condition. Failure to do so could result in the discharge of ozone into an undesired space.

Introduction

The RMT Ozone Generator System produces ozone from oxygen via corona discharge. The RMT system is capable of generating 260g/hr. of ozone with a feed gas of 90% oxygen.

Ozone Generation from Corona Discharge



This Ozone Water Remediation System is designed to work as a stand-alone unit with all necessary equipment and automation for ozone production and sparging built into one convenient mobile platform. The system consists of six major components:

- ◆ Air Compressor
- ◆ Air Drying Equipment
- ◆ Oxygen Concentrator
- ◆ Ozone Generator(s)
- ◆ Well Output Manifold(s)
- ◆ Ozone Injection System

Theory of Operation

The Air Compressor produces approximately 42 CFM of compressed air at 125 PSI, which is then dried to a dew point of 32°F and stored in a Compressed Air Storage Tank. The compressed air is utilized in the following ways:

- ◆ About 10 CFM is consumed by the Trident Dryspell Air Dryer to achieve the extremely low dew point and delivered to a second air storage tank. (The rated flow through the Trident Dryspell Air Dryer is about 30 CFM)
- ◆ A portion of dry air (about 10 CFM) is available for Sparge Air which is combined with the ozone flow at the Air/Ozone Manifold for sparging.
- ◆ About 22 CFM of dry air is consumed by the Oxygen Concentrator (OG-100) for oxygen production.

The Oxygen Concentrator provides 100 SCFH (47.98 SLPM) of oxygen flow at 45 PSI, at approximately 93% purity. Oxygen flows through the Ozone Generators which in parallel produce 200g/hr. (10.58 lbs./day) total ozone at full production.

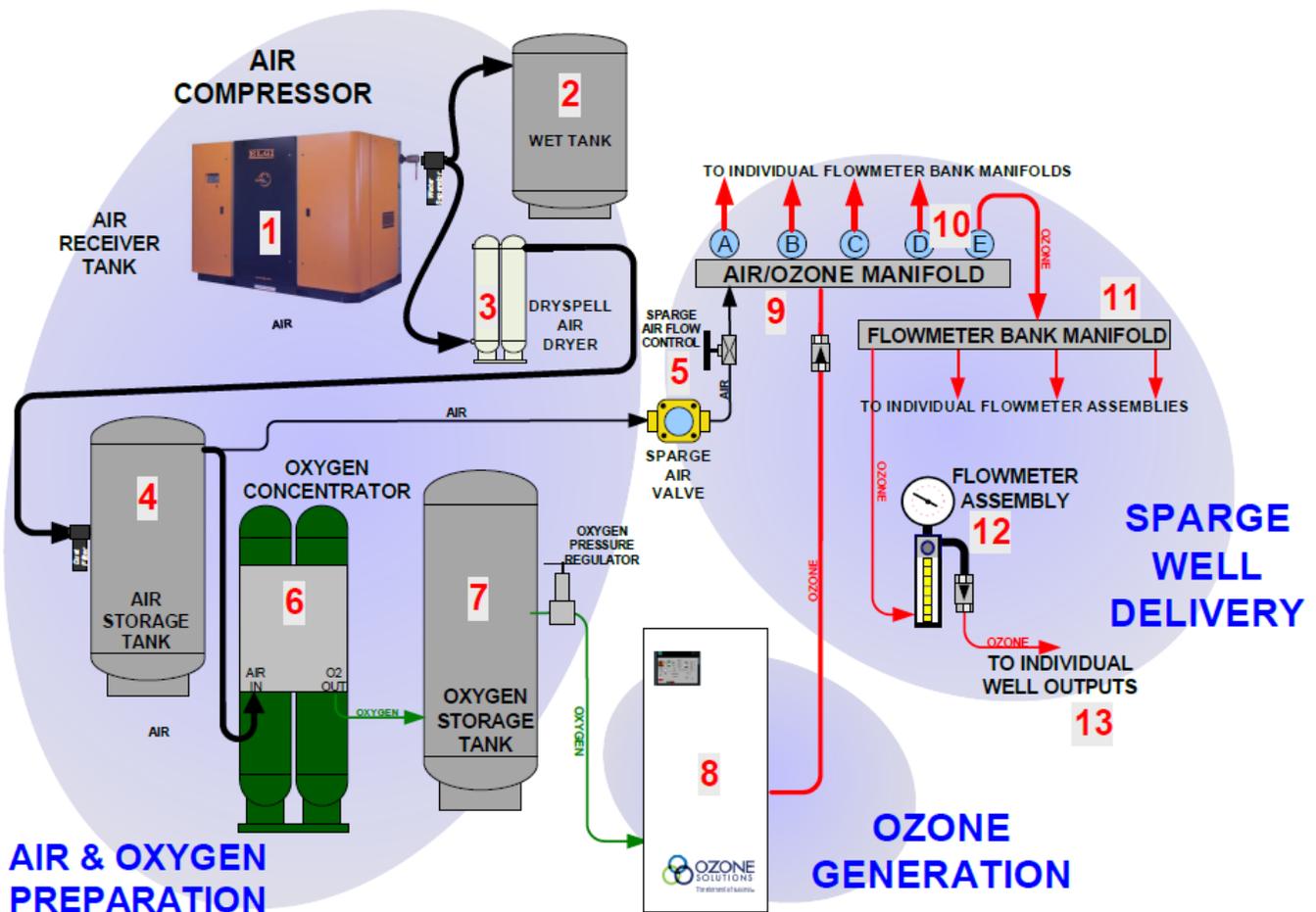
The flow of ozone from the Ozone Generators is delivered to the Air/Ozone Manifold where it combines with the Sparge Air. The mixture is then directed via timer-controlled solenoid valves to one of five Flowmeter Banks.

The Flowmeter Banks are each made up of five flowmeter assemblies. Each flowmeter assembly includes a variable area flowmeter, pressure gauge, and check valve; in order to provide back-flow prevention while permitting the user to accurately monitor the individual well sparging operation. The air/ozone sparging line from each flowmeter assembly then leads to an individual well output connection on the outside of the trailer.

Monitoring devices and sensors are integrated into the control system to protect the equipment in the event of any failures or extreme environmental conditions, and to alert operators of any unexpected operation.

SECTION 2

Component Diagram



Component Description

1. Air Compressor: The Air Compressor provides 42 CFM of compressed air at 125 PSI. The compressed air is utilized for oxygen production and sparging purposes.
2. Wet Air Storage Tank: After the water separator, the wet air tank is a storage tank for the compressor. From 90-140 PSI the tank will feed make up air to the air dryer and is equipped with an automatic drain valve.
3. Dryspell Air Dryer and Filters: The Before/ After filters removes oil, contaminants, and occasional moisture that may be present in the compressed air. The Air Dryer absorbs water vapor from the air using desiccant (and subsequently purges it out). The dust filter immediately after the Air Dryer catches any dust or remaining contaminants that may be released from the desiccant.
4. Air Receiver Tank: Compressed air enters the 80-gallon tank at 90-125 PSI, dried to approximately 30° F dew point. An automatic drain at the bottom of the tank, releases any condensate water.
5. Sparge Air Valve and Flow Control: The solenoid valve is controlled automatically by the control system and opens to allow Sparge Air flow into Air/Ozone Manifold. The flow control needle valve may be used to regulate the sparge air flow.
6. Oxygen Concentrator: The concentrator removes nitrogen and other contaminants from the compressed air using Pressure Swing Absorption (PSA), providing oxygen (at least 90% purity) to maintain 45-65 PSI oxygen pressure in the Oxygen Tank. [See Manufacturer's OG-100 Manual.]
7. Oxygen Storage Tank: Accepts the surge flow of oxygen from the concentrator, feeding oxygen to the Ozone Generators in order to help maintain reliable consistent ozone production.
8. Ozone Generators: The system utilizes a single TG-300 Ozone Generator which are located towards the front of the trailer. The Ozone Generators together are capable of producing up to 200g/hr. of ozone, depending on oxygen flow.
9. Air/Ozone Manifold: Both Sparge Air and Ozone enter the manifold, each at a controlled flow. "Ozone In" is equipped with a Check Valve in order to prevent backflow of air into the ozone line, because the ozone pressure is always lower than air pressure.
10. Bank Valves (Ozone Valves): Exiting the manifold are five Red Automated Ball Valves which are controlled by a timer (built into the control system, user-programmable via the HMI control) which permits air/ozone flow to each Flowmeter Bank Manifold in any combination or sequence.
11. Flowmeter Bank Manifolds: There are five Flowmeter Bank Manifolds (Zones "1" thru "5") each connected its respective ball valve. Exiting in each of the five manifolds are four Flowmeter Assemblies, by which the sparge air/ozone is distributed to the respective well outputs.
12. Flowmeter Assembly: There are 20 Flowmeter Assemblies and each contains four main components in this order:
 - a. Flowmeter – Indicates sparge flow for each individual well output.
 - b. Needle Valve – Located at the top of and integral to the flowmeter housing, it allows flow adjustments for the individual well output.
 - c. Pressure Gauge – Indicates sparge pressure for each individual well output.
 - d. Check Valve – Prevents backflow of water or ozone back into the system from each well output.
13. Individual Well Outputs: The Flowmeter Assemblies each have a respective Well Output connection on the outside of the trailer. The connection is 3/8" NPT female.

Specifications

RMT Series	Ozone Production (g/hr.)	Oxygen Flow Rate (SCFH)	Number of Well Outputs	Current (Amps)	Voltage (Volts)
RMT-200	260	100	20	65	120/208-240V Three-phase

Installation Guidelines

Location & Placement

This Ozone Water Remediation System is designed to be located outdoors and withstand most environmental conditions. The control system has built-in safety measures to prevent equipment damage in the event of extreme conditions.

This trailer should be located in such a way as to allow access to the well output connections on the outside. The location should also allow full opening of both the front and rear doors, and to allow for adequate area around the doors for exit in the event of an emergency.

The area around the trailer should allow for adequate air movement for cooling purposes, especially where air intake and exhaust vents are located.

Electrical Power Connections

ATTENTION:

Air compressor rotation is critical. Ensure proper rotation of air compressor motor as marked on the compressor before starting the compressor or Ozone System.

Power Requirements

- **Voltage:** 120/208-240V Three-phase
- **Full Load Amperage:** ~ 65A Per Phase (maximum)
- **Overcurrent Protection:** 75 A (provided in Power Distribution Panel)
- **Maximum Power Consumption:** ~17.5 kVA at full production.

Main Supply Power Connections

Inside the Power Distribution Panel is a MAIN DISCONNECT switch located towards the bottom of the panel.

Connect incoming L1, L2, L3 to the appropriate terminals in the panel. High Leg or Wild Leg connects to L2 if necessary.

Connect Neutral Conductor to the Neutral Bar inside the panel.

Connect equipment ground terminal in panel to earth ground. If local conditions deem necessary, bond the neutral and ground within the Power Distribution Panel.

SECTION 3

Operation Guidelines

After the system is properly configured, start-up and shutdown of the system is very simple from an operator standpoint, and very little operator intervention is required. The operator presses START on the main screen, and from there the operation is completely automatic.

The automated control system will function to operate the entire Ozone Water Remediation Trailer and protect system components from such things as low air pressure, low oxygen pressure, high temperature, and ozone leaks. The sensors within the Ozone Trailer protect the system components and monitor the operating environment (provided that none of the components are manually overridden).

The schematic on page 5 shows how there are essentially three sections to the system. Two of the sections – “Air & Oxygen Preparation” and “Sparge Well Delivery”, basically operate in sequence with each other. If the Air & Oxygen Preparation is fully operational and no alarms exist then the Sparge Well Delivery can start. The third section involves “Ozone Generation”. When the first two sections are fully operational, the third can operate by beginning ozone production.

Operator Startup

- *NOTE: If start-up does not occur as expected, refer to the “Configuration” or “Alarms & Troubleshooting” sections in this manual.*
- Ensure all manual air, oxygen, and cooling water isolation valves are open.
- Ensure that front and rear trailer doors remain closed during operation. Trailer is Climate controlled environment.
- Ensure the control switches on Oxygen Concentrator control panel are set to “ON” and “AUTO”.



- Ensure that the Compressor has been switched to remote control. Reference EN-07 compressor manual
- The MAIN SCREEN should be visible on the HMI Control Panel.
- After a short delay, the Air Compressor should start. Observe the AIR STORAGE TANK pressure; it should quickly increase to at least 90 PSI.
- Oxygen Concentrator should start. Observe the O2 STORAGE TANK pressure; it should increase to at least 12 PSI after a few minutes. It may take 15 minutes or longer for oxygen pressure to increase beyond 30 PSI (normal running pressure will be much higher, 45-60 PSI depending on usage).

After adequate air and oxygen pressure are established, the Sparge Air Valve will open. The appropriate zone valve will also open, controlled by the zone output timer.

“Break-through” pressure for each well will be higher than normal running pressure, as a result the flow may be lower than expected for a few minutes. The flow should increase to expected levels (as indicated by each flowmeter assembly). Ensure that flow exists for each well output on the bank of flowmeters which is currently open.

After a delay of a few minutes (exact time delay depends on start-up conditions), the Ozone Generators will start.

While the Ozone Generators are running, Ozone Concentration and Ozone Production are dependent on oxygen flow, oxygen pressure, and the setting of the Ozone Generators’ variable output. A green indicator light on each Ozone Generator indicates that the generator is producing ozone.

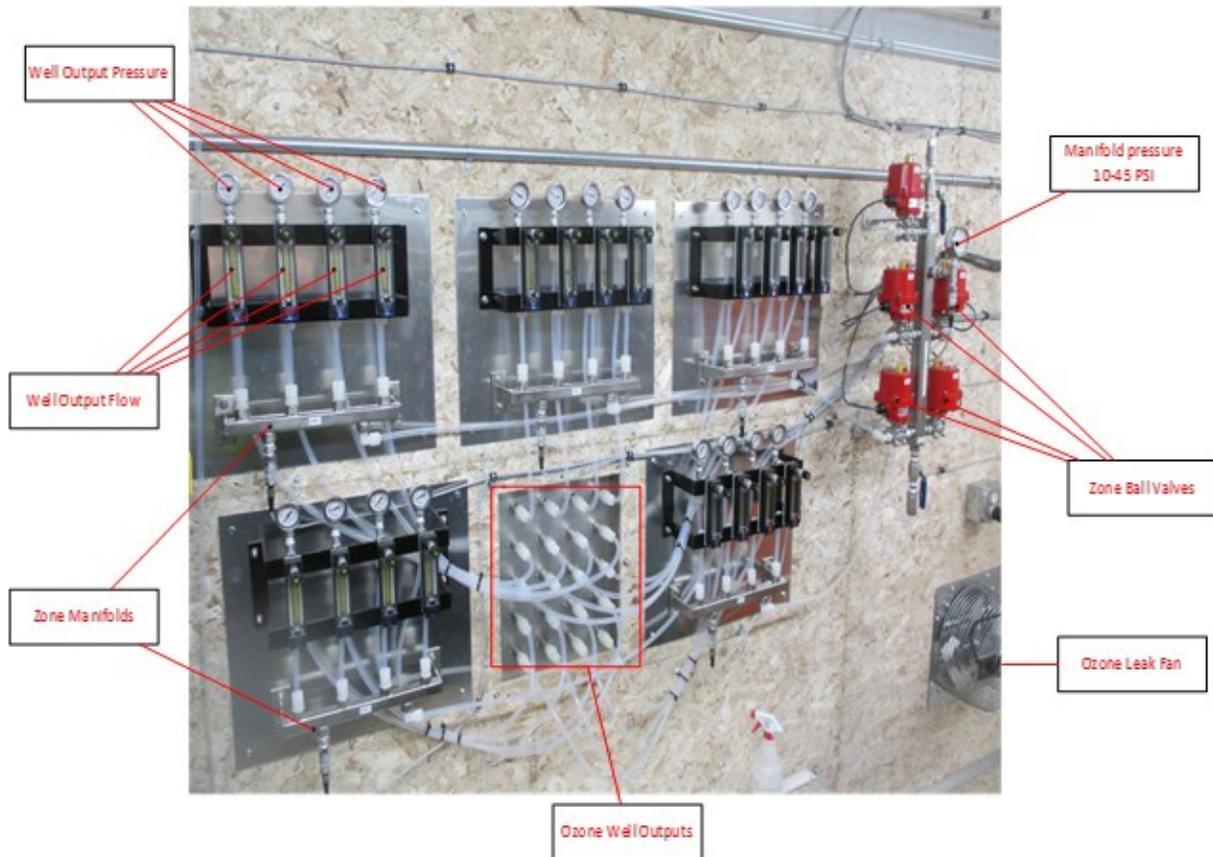
Operator Shutdown

Press the STOP button.

Allow the system to run through the automatic shutdown sequence and flush cycle.

When the panel indicates the START button again, the shutdown sequence is complete.

Ozone Output Manifolds/ Ports



Alarms and Troubleshooting

Trailer High Temperature Alarm

Alarm Condition: Temperature is above the set point. The system will shut down until the temperature drops below set point.

Possible Causes for Alarm Condition:

- Rear door of trailer is open while running, resulting in inadequate airflow to the necessary areas
- Rear trailer air intake grilles clogged.
- Outdoor temperature is excessive.
- Front door of trailer is open and the air conditioner is unable to maintain temperature.
- Air conditioner evaporator coil is frozen or there is an air conditioner failure.

- Recent ozone leak resulting in Front Trailer Fan running and allowing warm outside air in.

Trailer Rear Humidity Level High Alarm

Maximum (ambient) Rear Trailer Humidity is 95%, to prevent moisture damage to several system components. The humidity sensor, located on the rear of the trailer near the rear control box, monitors the humidity.

Alarm Condition: Relative Humidity is above the set point. The Ozone System will shut down until the humidity drops below 90%.

Possible Causes for Alarm Condition:

Humid weather – rainy, foggy, or misting conditions.
Standing water in or near the trailer.

Oxygen Tank Pressure Low Alarm

Minimum pressure is 90 PSI, as required for Oxygen Concentrator operation. The air pressure sensor, located on the Air Storage Tank below the Air Compressor, monitors this pressure.

- **Set point:** 90 PSI
- **Hysteresis:** 10 PSI
- **Alarm Delay:** 99 seconds
- **Alarm Reset Delay:** 0.01 seconds

Alarm Condition: Oxygen Storage Tank Pressure is below the set point. The Oxygen Concentrator will shut down until pressure reaches Dry Air Tank set point.

Possible Causes for Alarm Condition:

- Manual ball valve is closed.
- Air filter requires maintenance.
- Air leak.
- Oxygen Concentrator consuming excessive air due to oxygen flow set point is too high – decrease set point.
- Oxygen Concentrator consuming excessive air due to low oxygen pressure – allow oxygen pressure to increase by temporarily lowering oxygen flow.
- Oxygen Concentrator consuming excessive air due to Oxygen Concentrator failure.

Ozone Leak Alarm

Ozone Sensor located in the front trailer compartment indicates ozone level in the front of the trailer and alerts the Control System of excessive ozone levels.

- **Set point:** 0.30 PPM Ozone
- **Hysteresis:** 0.15 PPM Ozone
- **Alarm Delay:** 0 seconds
- **Alarm Reset Delay:** 5 seconds.

Alarm Condition: Excessive ozone levels exist in the front trailer compartment. The Ozone Generators will shut down and the Front and Rear Trailer Exhaust Fans will run until the ozone level is lowered to less than 0.15 PPM.

Possible Causes for Alarm Condition:

Excessive ozone levels **outside** the trailer may have drifted into the front trailer compartment.

Ozone Leak inside the front of the trailer. To diagnose, start with process of elimination. Between each test, allow the ozone level in the front of the trailer to drop below the alarm level, then:

To eliminate possible internal Ozone Generator leak: Turn off *one* Ozone Generator using the switch located on the Ozone Generator, and allow the system to run and determine if the ozone leak still exists. Do this with all generators.

Determine if the leak is limited to one particular Bank: Record current timer settings and then set each timer to 999 minutes in order to eliminate possible automatic switching. Manually cycle through one bank at a time, allowing each bank to run for at least 10 minutes *with ozone production*. (Set timers back to previous settings when finish with trailer).

If a leak occurs with *any* Flowmeter Bank running, the leak is in between Ozone Generators and solenoid valves (on Air/Ozone Mixing Manifold).

Determine if the leak is limited to one particular Flowmeter Assembly:

While counting number of turns to close (so that settings can be returned to normal after testing), close all flowmeter needle valves, except one.

Allow the system to run (ensure that the appropriate bank is open), opening one needle valve at a time every 5-10 minutes until the leaking flowmeter is found.

If a leak occurs with numerous flowmeters, the leak precedes flowmeter needle valves.

If the leak is related to one Flowmeter Assembly, then the leak is between needle valve and bulkhead connection at the trailer wall.

If a particular Flowmeter Assembly is not found to be leaking, use soapy water to check all connections from the solenoid valve to the Flowmeter Bank Manifold and from the Flowmeter Bank Manifold to each Flowmeter Assembly.

If process of elimination does not locate the leak, a **hand-held Ozone Sensor** may be useful in pinpointing the area of the leak. When using an Ozone Sensor to find a leak, bear in mind that the response time of the sensor and small amounts of air movement around the leak may affect readings. Also, ozone can be “absorbed” by clothing and other objects, which will affect readings as well.

Section 4

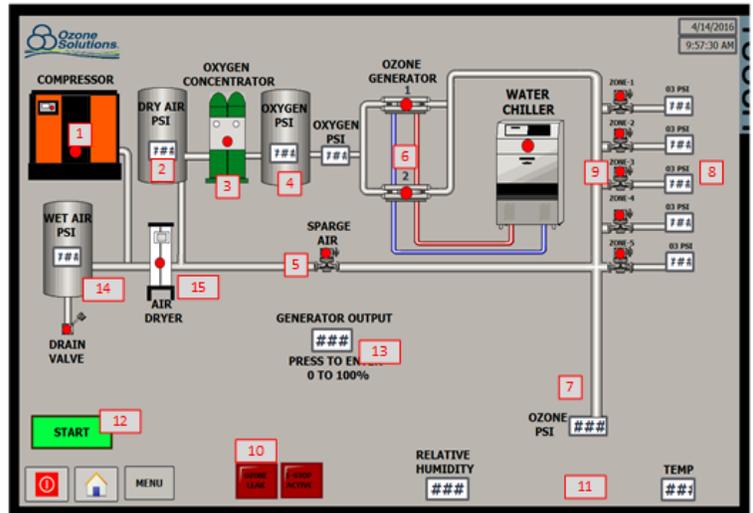
HMI Control Display - Overview

The HMI panel allows access to all automatic functions of this Ozone Water Remediation System. All of the system components operate automatically, while the HMI panel displays the current status of each part of the system. Various set points (to adjust running parameters and alarm parameters) can be adjusted by the operator during shutdown or during operation. The HMI panel also allows manual operation of some of the components, to allow for a step-by-step manual start-up when necessary for troubleshooting or occasional initial startup assistance.

- **ROOT SCREEN (Screen #1)** provides a readout of all system operating conditions. Since most of the system functions are automatic, it is often difficult to understand what is happening as the system runs through normal start-up, shutdown, and alarm procedures. This screen allows the operator to monitor all conditions in one convenient display. Adjustment of the Oxygen Flow is available on this screen.
- **TIMER SCREEN (Screen #2)** - The timer is designed to cycle through different banks of well outputs consecutively, each according to its predetermined set point configured by the operator. As the timer is operating, the accumulated “open” time (time that the bank is ON) for each bank (with and without ozone) is recorded in “minutes” and displayed in on this screen.
- **SET POINT SCREEN (Screen #3)** – provides user to set up customs settings for the system to run/alarm at. This screen has a Data Record function that if power is lost to the control system, on repower the settings return to the last value put into the Recorder.

- **OVERRIDE SCREEN (Screen #4)** provides a “MANUAL OVERRIDE” control of each system components, to allow for maintenance and troubleshooting actions not supported by the automatic operation. The screen is password protected to prevent use by unauthorized operators.

HMI Control Display - Root Screen



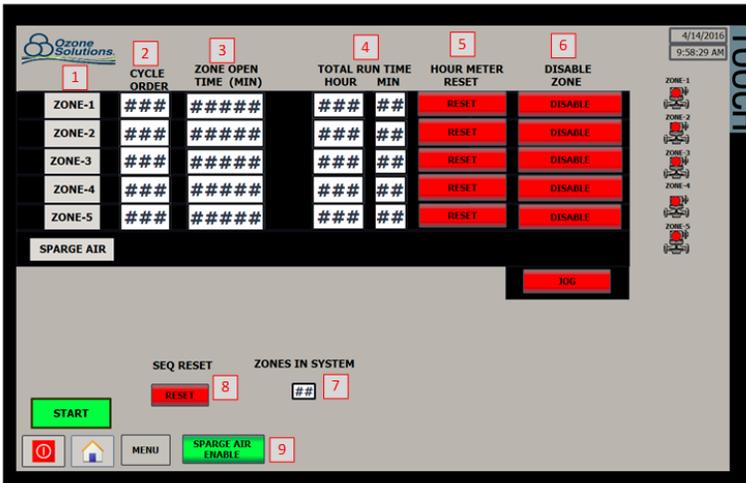
1. **AIR COMPRESSOR Status** – Indicates current status of Air Compressor.
2. **DRY AIR TANK Status** – Indicates air pressure in the Dry Air Storage Tank.
3. **OXYGEN CONCENTRATOR Status**– Indicates status of Oxygen Concentrator
4. **OXYGEN STORAGE TANK Pressure**– Indicates current Oxygen Storage Tank pressure.
5. **SPARGE AIR VALVE Status**– Indicates status of Sparge Air Valve (OPEN or CLOSED)
6. **OZONE GENERATORS Status** – Indicates status of Ozone Generator.
7. **AIR/OZONE MIXING MANIFOLD Pressure** – Indicates pressure in the Ozone manifold.
8. **FLOWMETER BANK Status** – Indicates which Flowmeter Bank Manifold is open (if multiple banks are open due to OVERRIDE status, multiple indicators will be indicated layered on top of one another).
9. **FLOWMETER ZONE Status** – Indicates status of valves exiting manifold – which valve is open (Zone 1, Zone 2, etc.), whether a manual override is enacted, or if all valves are closed.

10. **COMMON ALARM Status** – Status Lights will illuminate when there is an Ozone Leak, E-stop Active, and System Pause Active.
11. **AMBIENT ROOM Status**- Read out of the Temp and Humidity in the trailer.
12. **SYSTEM Status** – Indicates mode of system. Start will activate the system to start building pressure (Green Button). Stop (Red Button) will activate the System Flush and turn the Ozone Output off and run oxygen through the outputs for set time.
13. **Ozone Generator Output Control**– Controls the output of the ozone generator inverter boards. This



setting will work from 25-100% ozone output.

14. **WET AIR TANK Pressure** – Indicates the pressure being stored in the Wet Tank.
15. **AIR DRYER Status** – Indicates when the Air Dryer is being powered.

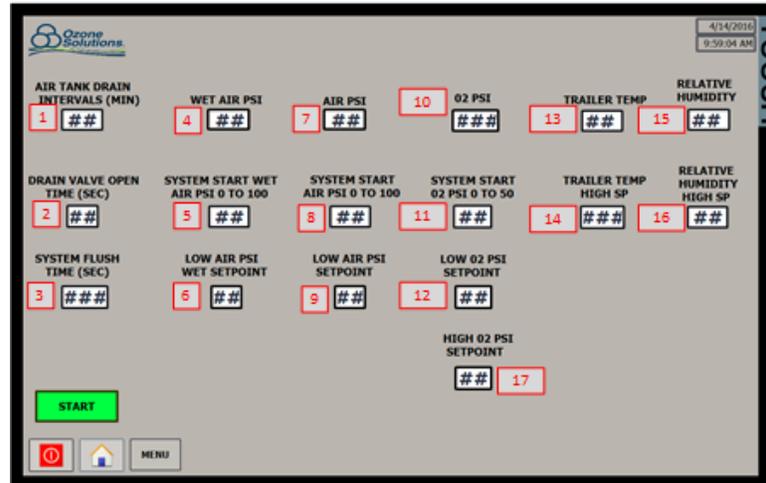


HMI Control Display - Timer Screen

1. **ZONE NUMBER**
2. **CYCLE ORDER** – Changing the numbers in the Cycle Order determines the order of which Zone will be next to open for its period of time.
3. **ZONE OPEN TIME** – Zone timers can be placed here to regulate the time the Zone is open before switching to the next zone in the cycle.

4. **TOTAL RUN TIME** – Lets the user know how long the zone has been open to help with data logging the system.
5. **HOURLY METER RESET**- Resets timer on the adjacent zone.
6. **DISABLE ZONE**- Allows a user to disable the zone if needed.
7. **ZONES IN SYSTEM**- A readout of how many zones are currently enabled in the system.
8. **SEQ RESET**- Resets the recorder back to factory settings.
9. **SPARGE AIR DISABLE**- Disable the sparge air solenoid.

HMI Control Display - Set Point



1. **AIR TANK DRAIN INTERVALS (MIN)** - Value will set the time in minutes between the wet and dry air tanks drains.
2. **DRAIN VALVE OPEN TIME** – Value will set the time in seconds of the drains of the wet and dry tanks will be open.
3. **SYSTEM FLUSH TIME (SEC)** – After pressing the stop button on the ROOT SCREEN, the system will turn off ozone production and purge oxygen through the Zone that was last open to clear the lines of Ozone for value set in seconds.
5. **WET AIR PSI**– Pressure inside the Wet Air Tank
6. **SYSTEM START WET AIR PSI 0 TO 100** - After the pressure of the Wet Air Tank exceeds the value set the Air Dryer will begin.
7. **LOW AIR PSI WET SETPOINT**- Alarms the user of a low PSI in the Wet Air Tank after 30 seconds if the pressure drops below this value.

7. **AIR PSI-** Pressure inside the Dry Air Storage Tank.
8. **SYSTEM START AIR PSI 0 TO 100-** After the pressure of the Dry Air Tank exceeds the value set the Oxygen Concentrator will begin.
9. **LOW AIR PSI SETPOINT-** Alarms the user of a low PSI in the Dry Air Tank after 30 seconds if the pressure drops below this value.
10. **OXYGEN PSI-** Pressure inside the Oxygen Air Tank.
11. **SYSTEM START 02 PSI 0 TO 50-** After the pressure of the Oxygen Air Tank exceeds the value set the Ozone Production will begin.
12. **LOW OXYGEN PSI SETPOINT-** Alarms the user of a low PSI in the Oxygen Air Tank after 30 seconds if the pressure drops below this value.
13. **TRAILER TEMP-** Ambient air temperature inside the trailer.
14. **TRAILER TEMP HIGH SETPOINT-** Alarms the user of a high trailer temp after 30 seconds if the temp rises above this value.
15. **RELATIVE HUMIDITY-** Ambient humidity inside the trailer.
16. **RELATIVE HUMIDITY HIGH SETPOINT-** Alarms the user of high humidity in the trailer after 30 seconds if the humidity rises above this value.
17. **HIGH OXYGEN PSI SETPOINT-** ??????

2. **GENERATOR FAULT OVERRIDE- ONLY TO BE USED in cases where the generator inverter board are being tuned and tested by trained personal. NOTIFY OZONE SOLUTIONS SERVICE DEPARTMENT WHEN PRESSED!**
3. **GENERATOR DISABLE BUTTONS-** When there is a fault reoccurring with a inverter board and needs to be disabled, the button will bypass all alarms and production from the generator disabled.
4. **ZONE MANUAL ANABLE-** User can open one of the Zone ball valves by pressing and holding the zone he/she would like to open. Only one zone can be manually opened at one time.

Section 5

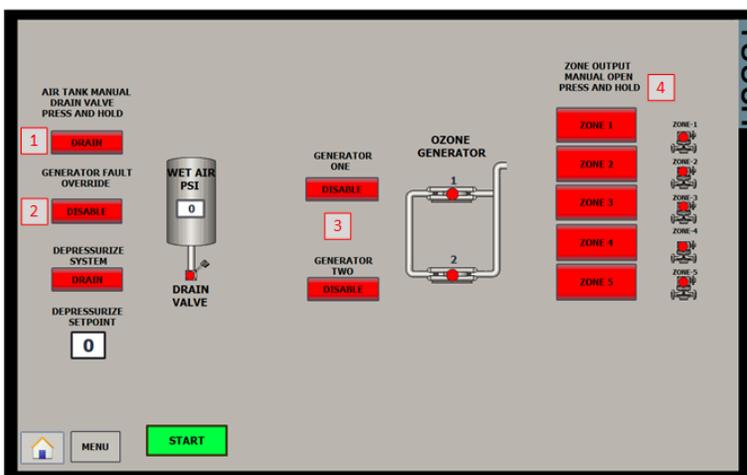
Personal Safety

Flushing ozone from the system

Safety warnings regarding ozone gas are found at the beginning of this manual. The Ozone Water Remediation System produces a large amount of ozone, which can be inadvertently “stored” within the Ozone Generators, manifolds, and ozone lines.

NOTE: In most circumstances, a very small amount of ozone will be contained within the system after shutdown and therefore exposure will be minimal.

HMI Control Display - Manual



1. **WET AND DRY AIR TANK MANUAL DRAIN BUTTON-** Manual button that will engage the drain to clear any extra build up of water sitting in the tanks

Eventually the ozone (even while in the system) will safely revert back to oxygen, but in the right conditions the ozone can remain in the system for 24 hours or even longer. In the event that maintenance must be performed on the components in contact with ozone, the following is recommended for reducing the possibility of exposure to the ozone:

Whenever possible it is recommended that the machine run with maximum permissible air and oxygen flow for at least 10 minutes with the Ozone Generator OFF in order to flush out most residual ozone.

If the machine cannot be operated prior to maintenance or repair, a waiting period of 12 to 24 hours (if ozone has been produced recently) is recommended to allow the ozone to decay by reverting back into oxygen.

Isolating energy sources

The Ozone Water Remediation Trailer has electrical and mechanical hazards, and maintenance or repair should not take place unless all energy sources have been turned off, disconnected, and/or drained. Energy sources include, but are not limited to:

- Electrical power
- Air Storage Tank
- Oxygen Storage Tank
- Oxygen Concentrator sieve beds
- Ozone Generator internal capacitors

Equipment Damage Concerns during normal operation.

With normal use of the system as instructed by Ozone Solutions and as outlined in this manual, the Trailer-200 Ozone Remediation System is monitored and protected to prevent damage to equipment. Even with these protective measures, it is possible to cause equipment damage in the event of operator error or lack of maintenance:-

Component	Cause/Failure	Effect
Oxygen Concentrator	Operating the system with malfunctioning or dirty compressed air filters.	-Shortened sieve bed life, lower oxygen concentration, lower oxygen flow (See OGSi Oxygen Concentrator OM)
	Operating the system with oxygen flow beyond the compacity of the Oxygen Concentrator (maximum capacity of the OG-250 is 250SCFH/118LPM)	-Shortened sieve bed life, lower oxygen concentration, lower oxygen flow (See OGSi Oxygen Concentrator OM)
Ozone Generators	Allowing water to back-up throught the system and enter the Ozone Generators, by allowing check valves to become stuck open or removing check valves.	-Ozone Generator failure. -Solenoid valve and/or Flowmeter clogging.
	Allowing the Ozone Generators to run while the Oxygen Concentrator is damaged or not maintaining >85% purity.	-Ozone Generator failure.
Air Compressor	Low oil or lack of filter maintenance.	-Compressor failure.
	Lack of ventilation filter maintenance, allowing the compressor to run in extreme heat conditions (normally protected by sensor).	-Compressor or other Trailer-200 component failure due to heat. -Moisture in compressed air causing O2, O3 generator, flowmeter and solenoid valve damage.

Warranty

Ozone Solutions warrants all 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 manufacture.

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 1-888-892-0303, or tech@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

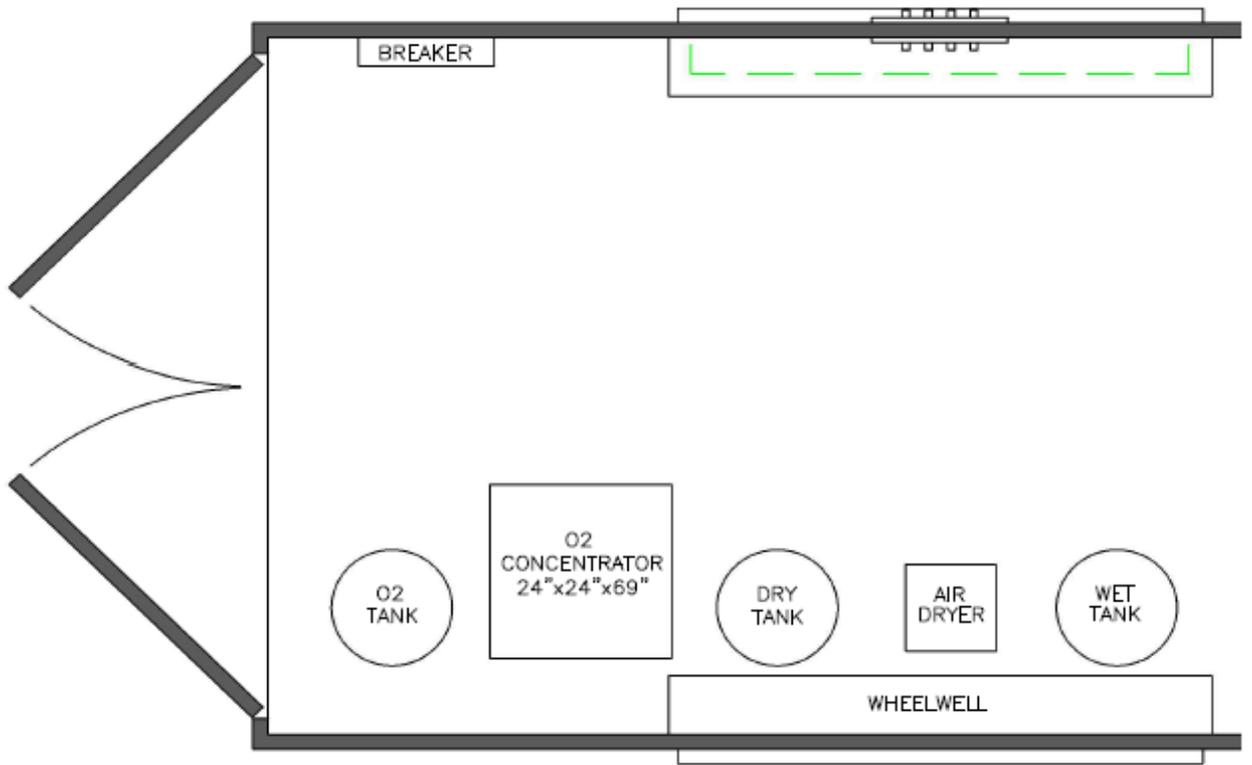
Phone: (712) 439-6880

Fax: (712) 439-6733

Email: sales@ozonesolutions.com

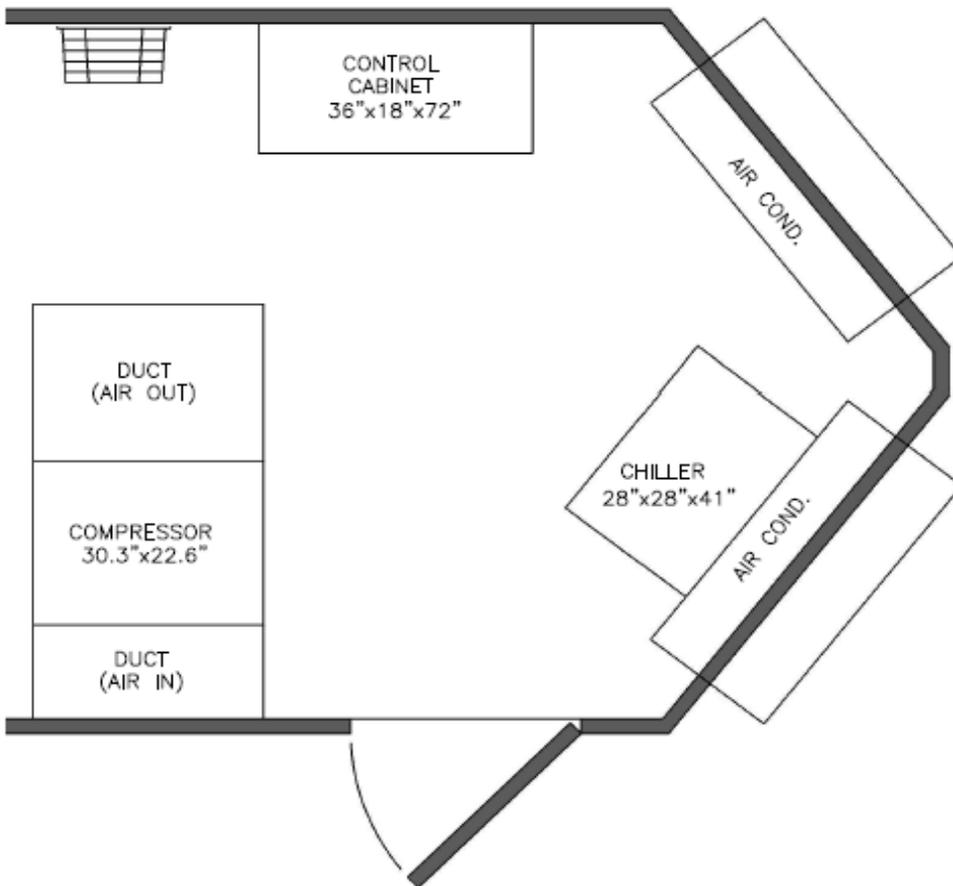
Website: www.ozonesolutions.com

Appendix A - CAD Drawing



TOP VIEW

Appendix A - CAD Drawing
(continued)



SCALE: 1/2" = 1'-0"
ORIG DRAWN: 04/22/16
CHECKED: DAK
APPROVED: DAK



DRAWING NO: URS-200		
TITLE: URS-200		
SIZE: A	SHEET: 2 OF 2	REV: A

Appendix B - Maintenance

Some of the individual components will require periodic maintenance and/or calibration, please reference the individual component manuals for information. Components requiring maintenance includes, but may not be limited to:

- Air Compressor
- Trident Dryspell Air Dryer
- Compressed Air Filters
- Oxygen Concentrator
- Solenoid Valves
- Flowmeters
- Check Valves
- Ozone Leak Sensor

Appendix B - Maintenance

(Continued)

Maintenance Schedule

Maintenance to other components on the Trailer-200 Ozone Remediation System are described in the following Maintenance Schedule:

Trailer Components:

Every Startup	Entire system	Ensure proper gas pressures and flows, ensure temperatures are not excessive after several consecutive hours of warm-up.	
Monthly	Intake Air Grilles & Exhaust Fans	Check and/or clean all intake air grilles in rear of shed, run fans and check operation.	
	Drain Valves	Check that valve closes & opens properly.	SVB-8
	Sparge Air Valve	Check that valve closes & opens properly.	SVB-8
	Ozone Valves	Check that valve closes & opens properly.	SVSS-6D rebuild
	Ozone Manifolds/ Flowmeters	Cycle through all manifolds and check for flow at all flowmeters in use, watch for ozone leaks.	
Every 6 months, or as necessary.	Compressed Air Filters	Check and/or replace all filter elements.	CF-12:Replacement Filter PR-8:Replacement Filter
	Oxygen Filter	Check and/or replace all filter elements.	CF-8:Replacement Filter
	Electrical Control & Ozone Generator Enclosures	Clean ventilation air inlets, clean any dust from internal components. Clean HMI Panel	
Annually	Ozone Leak Sensor	Replace sensor element.	SEN-1.0
Every 3 years, or as needed.	Ozone manifold check valves	Test and/or Replace.	CVSS-6 or CVSS-8
Every 5 years, or as needed.	Ozone Out Fitting Check Valves.	Test and/or Replace.	CVHP-6

Appendix B - Maintenance
(Continued)

Refrigerant Air Dryer:

Time Interval	Component	Action	Parts Required
Weekly	Condensate Drains	Verify Operation.	
Every 3 months	Refrigerant system	Clean condenser cooling fins.	
		Check dryer current draw under full load (must be producing air)	
Annually or 3,000 hours	Condensate drains	Disassemble and clean, inspect, or replace.	

Oxygen Concentrator (OG-100)

Time Interval	Component	Action	Parts Required
Daily	Filter drain(s)	Ensure automatic drain functions properly.	
Monthly	Filter(s)	Inspect filters and bowls, replace filters as necessary.	OG-100:Air Filter
			OG-100:Exhaust Muffler
Every 6 months	Filter(s)	Inspect filters and bowls, replace filters as necessary.	OG-100:Air Filter
Annually or 8,000 hours	Filter(s)	Check performance of all valves and actuators.	
	Valves	Rebuild Cycle Solenoid Valves (x6)	OG-100:Valve Rebuild
Emergency Spare Parts	Replacement Solenoid Valve		OG-100: Valve
	Check Valve		OG-100: Check Valve
	Sieve Material		XP-Sieve

Appendix B - Maintenance

(Continued)

Compressor: EN-07 ELGI

Time Interval	Component	Action	Parts Required
Daily	Air-end	Check coolant level	Coolant
	Entire unit	Visual check of machine for any leaks, dust build up or unusual noise or vibration.	
	Package pre-filter	Visual check condition of package pre-filter, blow clean if needed.	Pre Filter
	Tank	Check that automatic drain is operating.	Tank
First 150 hours	Coolant	Change coolant filter	Coolant
Monthly or every 100 hours	Package pre-filter	Remove and clean package pre-filter, replace if needed. Check the cooler(s) for build up of foreign matter. Clean if necessary by blowing out with air or by pressure washing.	Air-Oil Separator Element & AOS Gasket
Every 3 months	Safety pressure relief valve	Operate the safety valve manually to verify that the valve mechanism is functioning correctly and that a small amount of air is released.	
Annually or 3,000 hours	Entire unit	Check the operation of the high temperature protection switch (109 C)	Drive Coupling Element
		Change coolant filter	Coolant
		Check scavenge screen for blockage, clean if needed.	
		Change Separator element	Air-Oil Separator Element & AOS Gasket
		Change air filter element	Air Filter Element
		Change or clean package pre-filter	Oil Filter Element
		Check Drive Belt	Oil-Air lube UT Synthetic
		Inspect tank for corrosion or leaks	

Appendix B - Maintenance
(Continued)

Compressor (Continued):

Time Interval	Component	Action	Parts Required
Two years or 9,000 hours	Entire unit	Check drive belt	
		Replace Ultra-Plus Coolant	Coolant
		All items on "3,000 hour" service	
		Replace/Rebuild Solenoid valves as needed:	Solenoid Valve
		Replace/Rebuild Inlet Valve Kit as needed:	Intake Valve Kit
		Replace/Rebuild Minimum Pressure Valve Kit as needed:	Minimum Pressure Valve Kit
		Replace/Rebuild Thermostatic Valve Cartridge Kit as needed:	Blow Down Valve Kit
Four years or 18,000 hours	Entire unit	Perform all 3,000 hour and 9,000 hour maintenance	
		Replace all hoses (one each of parts list)	Hose MPV to Cooler Kit
			Hose MOS to Ball-Valve Kit
			Hose Manifold to Cooler
			Hose Cooler to Manifold Kit
			Hose Oil Injection Kit
		Strip, clean, and re-grease motor bearings of ODP motors (if applicable)	
Inspect or replace motor contactor points			

Appendix C - OSHA

1. PRODUCT IDENTIFICATION	
Product Name: OZONE	
Common Names/Synonyms: Triatomic Oxygen, trioxygen .	
Ozone Generator Manufacturer/Supplier Ozone Solutions, Inc. www.ozonesolutions.com 451 Black Forest Rd. tech@ozonesolutions.com Hull, IA 51239 712-439-6880	
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 solution, 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)	Acute Aquatic Toxicity – Category I
NOTE: Severe respiratory toxicity will develop before skin or eye irritation go beyond listed categories. <i>Anyone with chronic pulmonary problems, especially asthma, should avoid exposure to ozone.</i>		
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
<i>For severe cases, or if symptoms don't improve, seek medical help.</i>			

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; 0.08 ppm moderate; 0.05 ppm , heavy Light, moderate, heavy work TWA <= 2 hours: 0.2 ppm Immediately Dangerous to Life or Health (IDLH) 5 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 @20°C & 100% O ₂ ; 0.64 @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. TOXICOLOGICAL INFORMATION	
Likely 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 hours; hamsters, 35.5 ppm for 3 hours	
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, 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
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.
Source: EPA List of Lists

16. OTHER INFORMATION
Half-life of ozone in water at 20°C = 20 min; in dry still air at 24°C = 25 hr ; decreases significantly with increase in humidity, presence of contaminants, air movement, and/or increase in temperature.
Preparer: Dave Kuiper, Ozone Solutions
Date of Preparation: 5/1/2015

Disclaimer: Ozone Solutions provides this information in good faith, but makes no claim as to its comprehensiveness or accuracy. It is intended solely as a guide for the safe handling of the product by properly trained personnel, and makes no representations or warranties, express or implied, of the merchantability or fitness of the product for any purpose, and Ozone Solutions will not be responsible for any damages resulting from the use of, or reliance upon, this information.



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