Aqua ElectrOzone®

Ozone Generation Systems

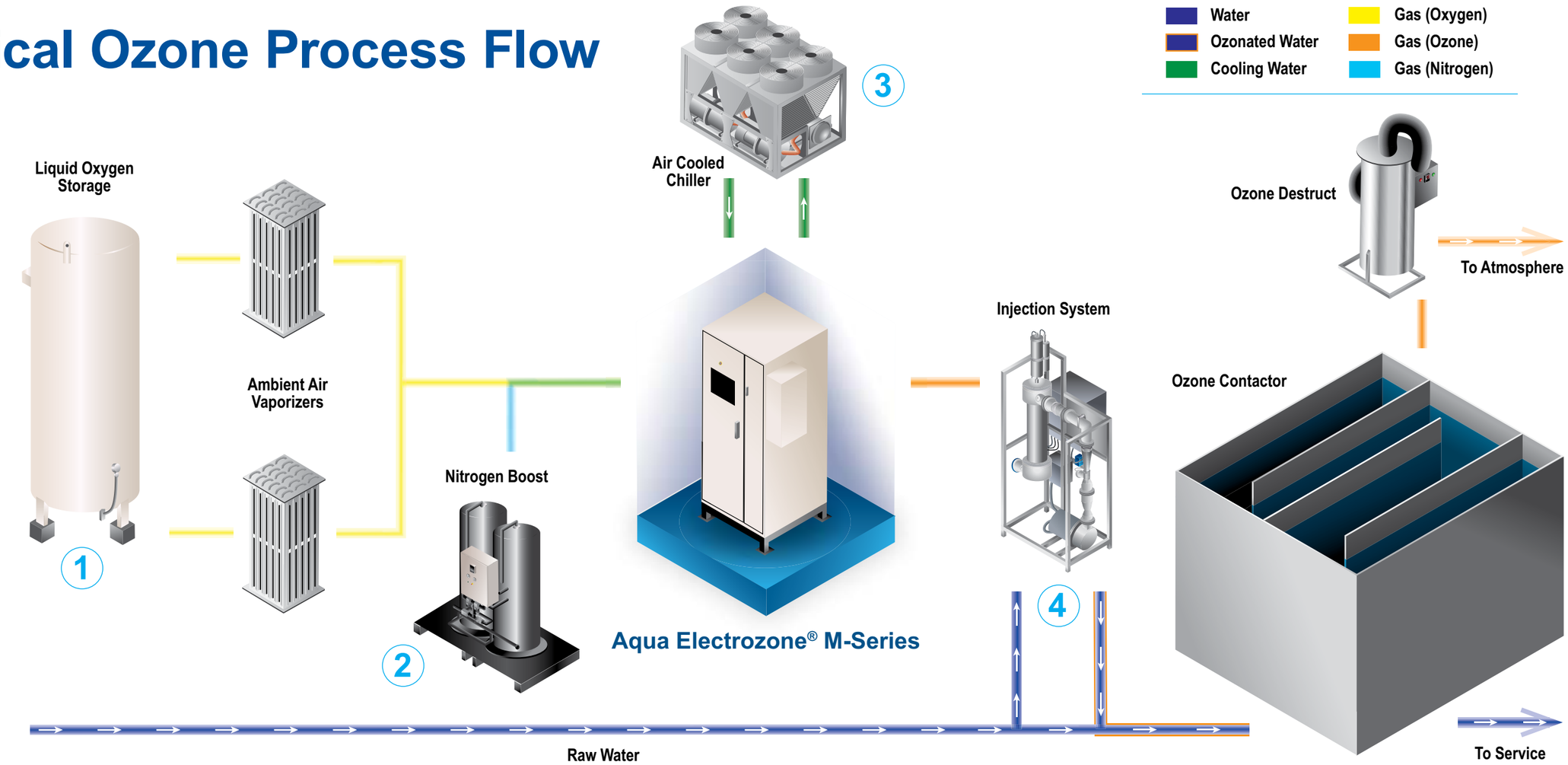


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AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Typical Ozone Process Flow



1. Cryogenic Liquid Oxygen (LOX) is commonly used as a feed gas for high concentration ozone generators like the ElectrOzone®. On-site generation technologies such as Pressure Swing Absorption (PSA) can be utilized, but may not make financial sense on larger projects.

2. All ozone generation requires some quantity of nitrogen in the feed gas. Traditional generators like the F-Series require a supplemental feed, while some modular systems like the M-Series typically require no additional nitrogen beyond that contained in the LOX feed.

3. Ozone generation produces a significant amount of waste heat. Maintaining an efficient process requires removing this heat with cooling water, which can either be transferred to an open loop or rejected to the atmosphere by an air cooled chiller.

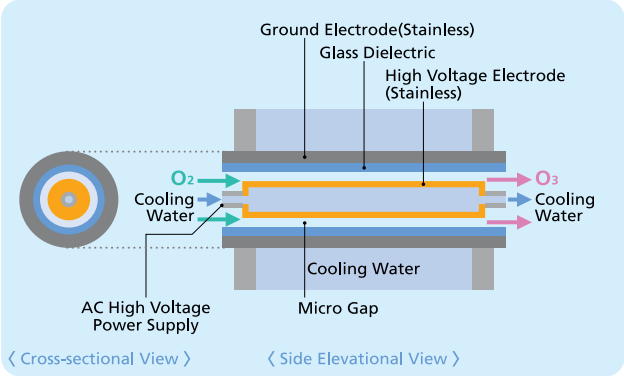
4. Once the ozone gas has been produced, it must be transferred into the water in order to provide the treatment. This can be done in a side stream approach using venturi injectors, or in a full flow approach using ceramic diffusers.

Aqua ElectrOzone®
F-Series
Ozone Generation System

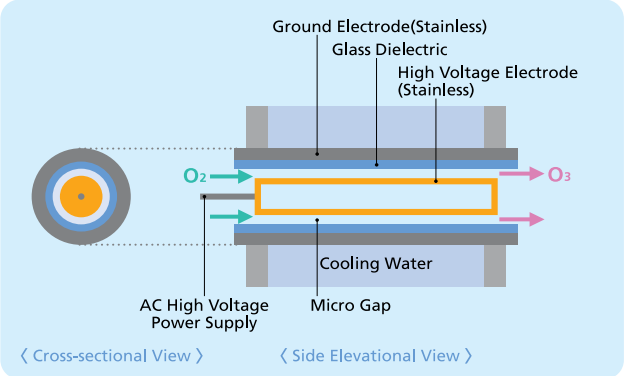


Ozone Dielectric Assemblies

The horizontal tube design, featuring a stainless steel dielectric assembly, including the borosilicate glass dielectric is among the core innovations at the heart of the Aqua ElectrOzone® F-Series generation system. This technology provides safe, consistent, high-quality drinking water to millions of people around the world, every day.



Glass-lined Dielectric Assembly (Double Cooling System)



Glass-lined Dielectric Assembly (Single Cooling System)

Operational Data

	OSD38	OSD51	OSD59	OSD67	OSD93
Maximum Capacity[1] (ppd)	910	1,530	2,330	3,200	6,280
Feed Gas Requirement[1] (scfm)	76.1	127.9	194.8	267.6	525.1
Feed Gas Purity (%)	99	99	99	99	99
Feed Gas Pressure (psig)	12-15	12-15	12-15	12-15	12-15
Feed Gas Dew Point (°F)	-75	-75	-75	-75	-75
Maximum Feed Gas THC[2] (ppm)	40	40	40	40	40
Oxygen Connection (inches)	2.5	3	4	4	6
Ozone Connection (inches)	2.5	3	4	4	6
Cooling Water Requirement (gpm)	196.9	328.1	498.8	682.5	1,338.8
Cooling Water Connection (inches)	2	4	4	4	6
Dimensions (inches)	150x100x85-1/8	164x114x103-1/4	164x126x109-1/8	177x127x121	209-1/4x149-15/16x164-3/16
Shipping Weight (pounds)	8,500	10,500	14,000	15,000	27,000

[1] Calculated at 10% ozone concentration by weight, 65° F maximum closed loop cooling water temperature

[2] Total Hydrocarbon Content

All ancillary ozone system equipment required for a complete and functioning system, including feed gas preparation and storage, ozone gas dissolution, cooling water, and ozone destruct systems are also available.

System Features and Advantages

Advanced Power Supply Technology

- Pulse Width Modulation – lowest native harmonics available without external filters.
- High frequency – operates between 6.5 and 10 kHz via pulse density modulation, reducing coronal hot spots and eliminating dielectric failure.

Practical, Serviceable Generator Design

- One high-voltage electrode per ground tube and plentiful viewports permit visualization of each coronal field, providing easy identification and location of non-powered tubes.
- Closed loop cooling water pump and heat exchanger are located on the generator skid, eliminating the need for separate cooling water equipment while also providing footprint savings.
- Generator skid design is optimized for servicing all skid-mounted instrumentation, valves, and mechanical equipment, eliminating tight spaces or impossible angles.



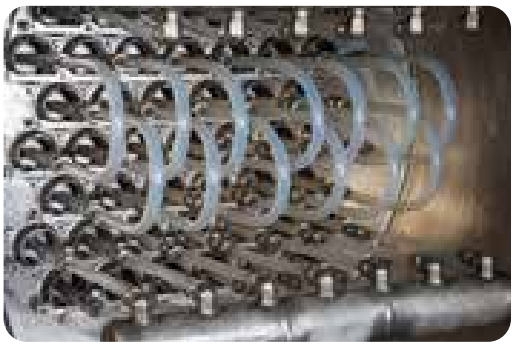
Power Supply Units

Unique, Unbreakable Dielectrics

- Dielectric assembly is fabricated completely of stainless steel and borosilicate glass, rather than more fragile materials.
- Dielectric assembly is completely removable and replaceable, including the ground electrode. No more capping off damaged tubes!
- Features MicroGap™ Core Technology, an 0.3mm discharge gap, contributing to even coronal generation and steady operation.
- Fused design protects dielectrics from power surges, eliminating breakage.
- Unique double-cooled design permits both generator shell cooling and high-voltage electrode cooling, preventing hot spots and contributing to dielectric durability.
- More ozone production per tube than any other available generator, with excellent production efficiency.
- Longest dielectric life with zero failures and backed by a 10 year, non-prorated warranty.

Committed to Service

- 20+ experienced service technicians based nationwide, with quick response times and outstanding technical skills.
- 24/7/365 customer service line with ozone system experts available at all times.
- Ozone demand/decay analysis, dosage determination, and other lab services available upon request.
- Ozone piloting services available – inquire for more information.
- Extended warranty periods and custom maintenance/service agreements available upon request.



Advanced Double-Cooled Dielectric Design



PWM Power =
Lowest Harmonics



Practical Design, Maximum Serviceability

Aqua ElectrOzone® M-Series

Modular Ozone Generation System

How It Works

Principle of Modular Ozone Generation

The Aqua ElectrOzone® M-Series features QuadBlock® dielectric cell technology. Each QuadBlock cell is an independent ozone generator with its own dedicated microprocessor-based control board, high frequency switching power supply and ceramic dielectrics. Each completely sealed QuadBlock cell can handle the most rugged environments, is practically silent and effectively requires no cleaning or maintenance.



M-Series 5x (Front View)



M-Series 5x (Rear View)

Operational Data









	2x	5x	10x	20x	30x	36x
Maximum Capacity[1] (ppd)	34	85	170	340	510	612
Required Transformer (kVa)	30	30	45	75	112.5	150
Feed Gas Requirement[1] (scfm)	2.5	6.3	12.5	25.1	37.6	45.6
Feed Gas Purity (%)	90 (minimum)	90 (minimum)	90 (minimum)	90 (minimum)	90 (minimum)	90 (minimum)
Feed Gas Pressure (psig)	20	20	20	20	20	20
Feed Gas Dew Point (°F)	-65	-65	-65	-65	-65	-65
Maximum Feed Gas THC[2] (ppm)	15	15	15	15	15	15
Oxygen Connection (inches)	0.75	0.75	0.75	1.25	1.25	1.5
Ozone Connection (inches)	0.5	0.75	0.75	1.25	1.25	1.5
Cooling Water Requirement (gpm)[1]	4.7	8.5	18.8	34.4	50	59
Cooling Water Connection (inches)	0.5	0.75	1	1.25	1.25	1.5
Dimensions (inches)	49.02x71.85 x18.32	41.27x78.89 x33.30	75x87x34.21	111x94.10 x34.21	111x102.10 x34.21	110.33x31.91 x103.71
Shipping Weight (pounds)	850	1,010	2,020	2,638	3,730	4,100

[1] Calculated at 10% ozone concentration by weight, 50° F maximum closed loop cooling water temperature, and 99% pure oxygen feed.

[2] Total Hydrocarbon Content

All ancillary ozone system equipment required for a complete and functioning system, including feed gas preparation and storage, ozone gas dissolution, cooling water, and ozone destruct systems are also available.

System Features and Advantages

Advanced Power Supply Technology

- Extremely high frequency operation of 23 kHz permits decreased power supply footprint and whisper silent operation.
- Dynamic power supply maintains ideal resonance and stable ozone production across a wide range of operating conditions.

Practical, Serviceable Generator Design

- Combined generator/PSU enclosure takes up to 85% less footprint than leading alternatives.
- Ozone generator cabinet is UL-508A listed, and contains no exposed high voltage.
- Simple appliance-like installation involves only seven connections – cooling water supply/return, control I/O, power supply, compressed air, oxygen in, ozone out.
- Generator enclosure design is optimized for servicing of all onboard instrumentation, valves, and mechanical equipment, eliminating tight spaces or impossible angles.
- Full system control available at local generator control panel, reducing system costs and simplifying architecture. Discrete Master Ozone System Control Panels are also available.
- Plentiful onboard instrumentation, including mass flow, ozone concentration, cooling water temperature/flow, and ozone production monitoring and trending.

Featuring QuadBlock® Modular Dielectric Cell Technology

The QuadBlock is fabricated from advanced materials, extremely reliable, and rated to 100 psi (with testing to 500 psi). Its rugged construction is virtually immune to vibration and shock.

- In additional to the generator enclosure, each individual QuadBlock is also UL listed.
- Integrated controls allow for individual optimization and monitoring of each QuadBlock cell.
- Supplemental nitrogen is not required for efficient ozone generation, even with liquid oxygen feed gas, reducing nitric acid fouling potential.
- Modular design allows internal redundancy. Spare QuadBlock dielectrics can be preinstalled, coming online immediately in the event of failures, and eliminating generator redundancy requirements.
- Up to 30:1 direct turndown with standard design – can achieve 100:1 turndown in most applications.

Committed To Service

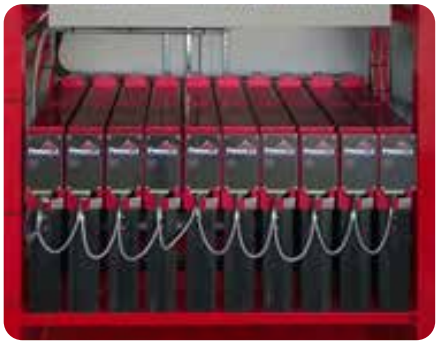
- 20+ experienced service technicians based nationwide, with quick response times and outstanding technical skills.
- Customer service line with ozone system experts available 24/7/365.
- Ozone demand/decay analysis, dosage determination, and other lab services available upon request.
- Ozone piloting services available – inquire for more information.
- Extended warranty periods and custom maintenance/service agreements available upon request.



Single Skid Solution



In-Generator Full System Control



Discrete Ozone Generation Cells

Since 1969, Aqua-Aerobic Systems, Inc. has led the industry by providing advanced solutions in water and wastewater treatment. As an applied engineering company serving both municipal and industrial customers, we work collaboratively with consulting engineers, owners, plant managers, and operators to design and manufacture the best treatment solution with the lowest lifecycle cost.

Providing TOTAL Water Management Solutions

Aeration & Mixing
Biological Processes
Filtration
Oxidation & Disinfection
Membranes
Controls & Monitoring Systems
Aftermarket Products and Services

Aqua ElectrOzone®

Ozone Generation Systems

Visit our website at www.aqua-aerobic.com to learn more about the Aqua ElectrOzone® Ozone Generation Systems and our complete line of products and services.

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The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs. Patents Apply.

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