Advanced Ozone Treatment Systems

Pureflow OZONE DIV.

BULLETIN NO.
SCBZ001.2

JULY 2025


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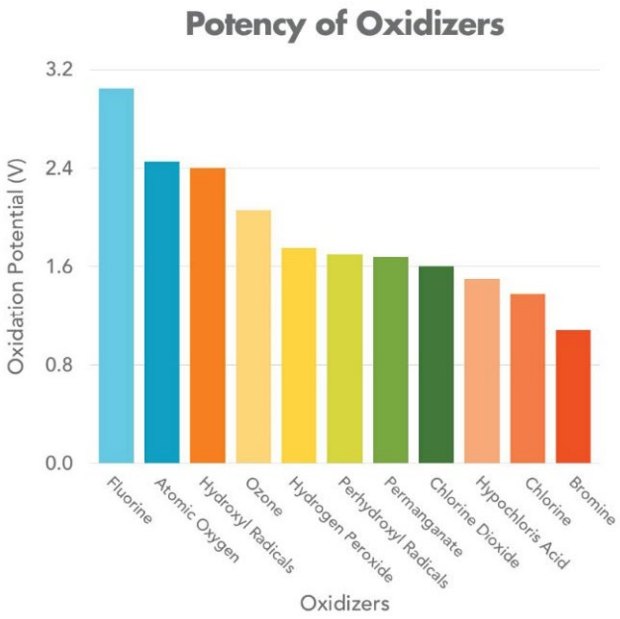
Introduction

Since installing our first ozone treatment system in 1984, Pureflow has consistently set new standards for innovation in water treatment. Through strategic partnerships with the world's top technology providers, Pureflow Ozone Division delivers advanced system solutions powered by patented technology and supported by an industry leading engineering team. Our experts bring decades of experience in process design, commissioning, and servicing ozone water treatment systems. This combination enables us to deliver sophisticated, custom-engineered ozone generation systems that ensure reliable, efficient, and effective water treatment processes for every client.

Why Ozone?

Ozone is one of the most powerful disinfectants on the planet, boasting an oxidation potential that is over 50% greater than chlorine and reacting up to 3,000 times faster than chlorine in water. Ozone is a natural and unstable gas that, after dissolution with raw water and reaction time, breaks down into oxygen, making it an environmentally sound and effective treatment solution.



APPLICATIONS

Municipal

Primary Disinfection:
Destroys pathogens, bacteria, and protozoa

Color Removal:
Restores water clarity and appeal

Taste & Odor Elimination:
Oxidation of hydrogen sulfide, algae, geosmin, and MIB

Micro-Flocculant Formation:
Enhances pretreatment for media filtration

Biological Filter Pretreatment:
Controlled low dosage ozone feed improves filter performance and longevity

Disinfection By-Product Reduction:
Minimizes harmful by-products

Other Contaminant:
Effectively targets iron, manganese, and contaminants of emerging concern (CECs)

Advanced Oxidation:
Combining ozone with UV light generates highly reactive hydroxyl radicals

Water Reuse

Tertiary Wastewater Treatment:
Delivers reliable disinfection and contaminant reduction for sustainable water recycling

Groundwater Recharge & Indirect Potable Reuse:
Log reduction and oxidation of trace organics for safety

Stormwater Reuse:
Ensures safe reclaimed water to meet federal and state regulatory standards

Industrial Applications

Aquaculture: Pathogen and disease control, enhanced fish growth, improves fish flavor by oxidizing undesirable compounds such as geosmin and MIB

Food & Beverage: Ensures product safety and extends shelf life

Textile: Provides efficient and eco-friendly bleaching of fabrics and oxidation of wastewater

Cooling Towers: Controls biological growth and improves system efficiency

Oil Field Production & Groundwater: Enables safer disposal or reuse of process water

THE ENGINEERED OZONE SYSTEM BY PUREFLOW

The Ozone Generator

Pureflow Ozone Div. is the exclusive municipal engineering partner in the USA for the ULTRAQUBE Series of ozone generators manufactured by ULTRAAQUA.

The ULTRAQUBE series high-performance ozone generators are based on patented technology that features energy-efficient high-concentration ozone technology with outstanding life cycle costs. The modular design is scalable and minimizes standby generator requirements.

Depending on application requirements, the ULTRAQUBE Series offers three standard ozone generator frame sizes with a capacity range of 4.6 PPD to 223.5 PPD at 10% wt.

Features & Benefits:
Highest ozone concentration available ***(9-20% by weight)***
Built-in redundancy
Modular expansion
Robust design for integration into complex environments ***(NEMA 4X enclosure)***
Energy Efficient
Lower maintenance costs
Safe, quiet, and reliable
Compact footprint
Highest operating gas pressure available ***(up to 43.5 psig / 3.0 bar)***

Liquid Oxygen Storage & Vaporizer Selection Manifold

The Vaporizer Selection Manifold is an automated system for cryogenic liquid oxygen installations that maximizes vaporizer efficiency and reliability. By automatically alternating between two or more ambient air vaporizers, the manifold prevents excessive ice accumulation on any single vaporizer. This process ensures consistent vaporization rates, maintains optimal heat transfer, and reduces the risk of performance degradation or supply interruption due to ice buildup.

Features & Benefits:

Automatic Switching: Alternates between multiple ambient vaporizers based on a preset timer or system demand, minimizing ice buildup on any single vaporizer

Peak Efficiency: Maintains vaporizers at optimal performance by allowing one unit to defrost while the other is in use, preventing loss of heat transfer surface area due to ice insulation

System Monitoring: Continuously monitors process temperature to eliminate downstream process failures

Customizable Cycle: User Adjustable settings accommodate site conditions and seasonal changes

The Compressed Air Preparation System (optional)

Compressed air preparation systems are essential for onsite effective oxygen generation as they ensure that the air supplied to the oxygen concentrator is dry, clean, and delivered at the correct pressure.

Features & Benefits:
Multi-stage filtration and drying technology eliminates low quality ozone production
Robust air compression delivers consistent, regulated pressure for optimal on-site oxygen generation
Reduces maintenance requirements and extends equipment lifespan by minimizing contaminant buildup
Supports stable, high-concentration oxygen generation, resulting in effective and reliable ozone generation
Continuous monitoring and alarming features to confirm performance

The Oxygen Generation System (optional)

Pureflow's on-site oxygen generation systems are engineered to deliver high-concentration oxygen for optimal ozone output. Our custom designed solutions include, pressure swing adsorption (PSA), or vacuum pressure swing adsorption (VPSA) technologies to ensure reliability, efficiency, and adaptability for your specific application requirements.

Features & Benefits:
Delivers high-concentration oxygen essential for ozone production *(95% O_2)*
Customizable PSA, and VSA systems to match your operational requirements
Adjustable oxygen flow rates for precise control of ozone production and concentration
Continuous, stable oxygen supply ensures uninterrupted ozone generation
Reduced dependence on external oxygen suppliers, ensuring on-site reliability *(PSA / VSA)*
Automated controls for user-friendly operation and monitoring

Supplemental Air System / Nitrogen Doping System

Ozone generators typically experience a significant drop in efficiency when operating on pure oxygen alone. This is because a small amount of nitrogen is essential for optimal ozone production. Nitrogen creates a beneficial environment that enhances the generator's catalytic performance.

Note: *Ozone generator manufacturers often derate the capacity of their generators* if nitrogen is not fed.

Features & Benefits:

Optimized Nitrogen Doping: Blends the ideal amount of nitrogen into pure oxygen to maximize ozone generation efficiency

Dynamic Real-Time Control: Active control loop adjusts nitrogen levels based on operating conditions for consistent, high-performance output

Improved Catalytic Performance: Enhances ozone production by creating beneficial effects and active sites within the reactors

Energy and Cost Savings: Maximizes ozone output while reducing energy consumption, lowering overall operational costs

The Cooling System

High-concentration ozone generators require effective cooling to prevent ozone decomposition at elevated temperatures. Pureflow provides packaged cooling water systems featuring both air/water-cooled chillers and closed-loop plate-and-frame heat exchanger skids that keep ozone reactors cool and operating efficiently.

Features & Benefits:

Closed-loop circulation: Prevents scaling and corrosion within the ozone generator

High Concentration Capability: Supports ozone concentrations up to 20% by weight

Programmable Controls: Allows management of target temperature, delta temperature, and supply flow

Safety Features: Protection against abnormal temperature, current, pressure, and flow rate conditions

Touch-Cool Operation: Keeps ozone reactors cool to the touch, extending equipment lifespan

The Mass Transfer System

Pureflow's custom-designed Ozone Mass Transfer Systems deliver exceptional efficiency by channeling high-concentration ozone directly to the dissolution location, ensuring minimal pressure losses and consistently achieving the target dissolved ozone concentration in water. By leveraging advanced ozone generation technology, our systems produce higher ozone concentrations with less oxygen in the mixture, resulting in superior mass transfer efficiency, optimized water treatment performance, and reduced ozone consumption.

Features & Benefits:
N+1 redundancy for maximum reliability
Highly configurable to meet diverse operational needs
Onboard trending for real-time performance monitoring
Advanced PID control loop for precise system management

The Ozone Serpentine Contactor

Pureflow's Serpentine Contactors are engineered for maximum operational flexibility and efficiency. Our innovative design delivers reliable performance across both high and low production demands, ensuring seamless adaptation to your plant's changing needs.

Features & Benefits:

- Multiple sample and injection ports for precise monitoring and control supporting everything from dissolved residual ozone verification to advanced oxidation process management
- Extended contact time of up to 20 minutes, all while minimizing your facility's footprint
- Modular 316L stainless steel pipelines preassembled on stackable skids, allowing for fast, straightforward on-site installation

The Ozone Destruct System

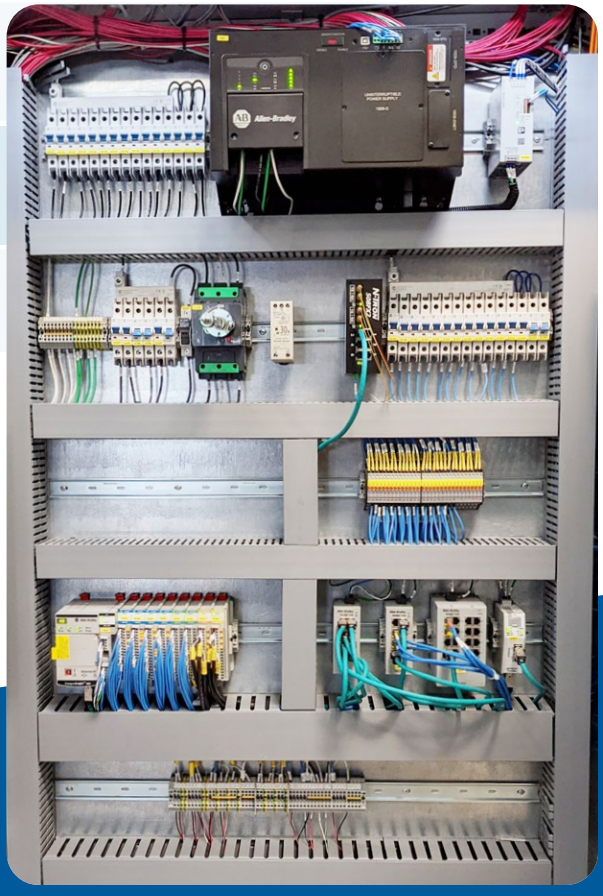
Ozone is a highly effective oxidant used in water treatment to eliminate contaminants. Residual ozone can be hazardous to humans and aquatic life if it is not properly managed. Pureflow's custom Ozone Destruct Systems are engineered to safely and efficiently eliminate ozone off-gas, ensuring compliance with environmental regulations and protecting both public health, plant equipment, and the environment before treated water is discharged or distributed.

Features & Benefits:
Constructed with ozone corrosion-resistant materials for long-lasting durability
Energy-efficient operation for reduced running costs
Continuous inlet and outlet ozone (gas) monitoring used to optimize system performance
Supplemental air inlet valve for managing low ozone production scenarios
Online trending for real-time data and process insight
PID control loops for independent pressure and temperature regulation
Easily removable and replaceable catalyst chamber for simplified maintenance

The Master Control Panel

Pureflow provides comprehensive control solutions integrated within our engineered system packages. Our UL508A-certified control panel shop, paired with our expert electrical engineering and controls team, guarantees that every panel is custom-built to deliver exceptional reliability and performance.

Features & Benefits:
Custom electrical engineering and controls tailored to your specific application
Advanced, intuitive control schemes for responsive water treatment management
SCADA ready for real-time monitoring and remote system access
Easy integration with existing plant processes and equipment
Comprehensive system diagnostics and alarms for proactive maintenance
User-friendly interface for simplified operation and troubleshooting
Data and trend focused user-interface



The Mobile Pilot Ozone Laboratory:

Field pilot studies for ozone treatment are essential to accurately determine ozone dosages, contact times, and operational parameters to effectively treat unique water sources. These studies provide critical, site-specific data that enable the design of full-scale systems. Pureflow's mobile pilot laboratory is fully equipped to demonstrate the effectiveness and value of ozone treatment.

Features & Benefits:
15 Ft. air conditioned and heated mobile trailer with portable ozone generator
Produces up to 9 PPD of ozone @ 10% by weight
Side-stream venturi injection mass transfer skid
Serpentine ozone contactor
System commissioning and operator training by Pureflow

Enhancing Ozone Solutions with CFD Modeling

Pureflow Ozone Division leverages advanced Computational Fluid Dynamics (CFD) to optimize ozone system performance, ensuring precision and cost efficiency.

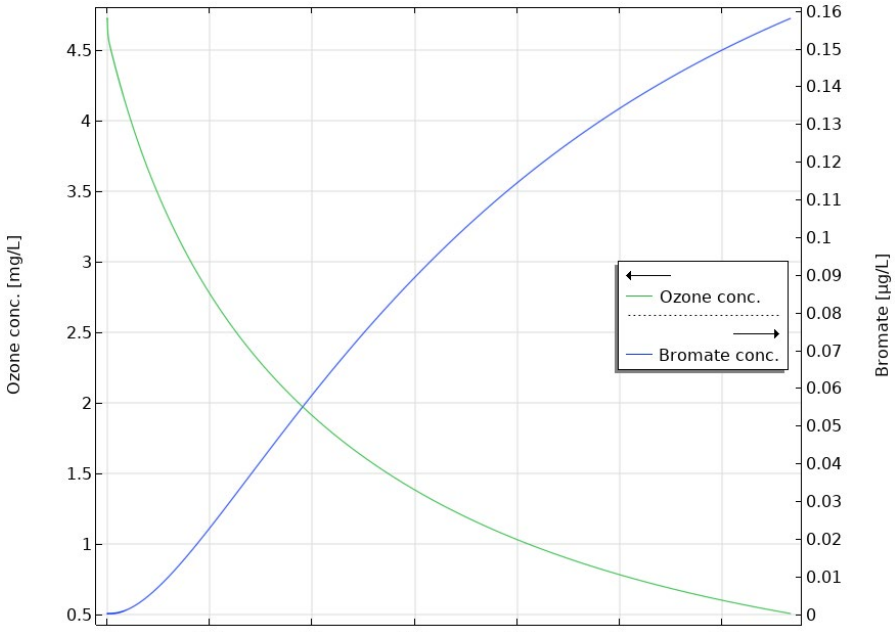
Features & Benefits:

Ozone Transfer Efficiency: Analyze bubble size, contact time, and mixing dynamics to maximize dissolution rates and minimize off-gassing, ensuring cost-effective system performance

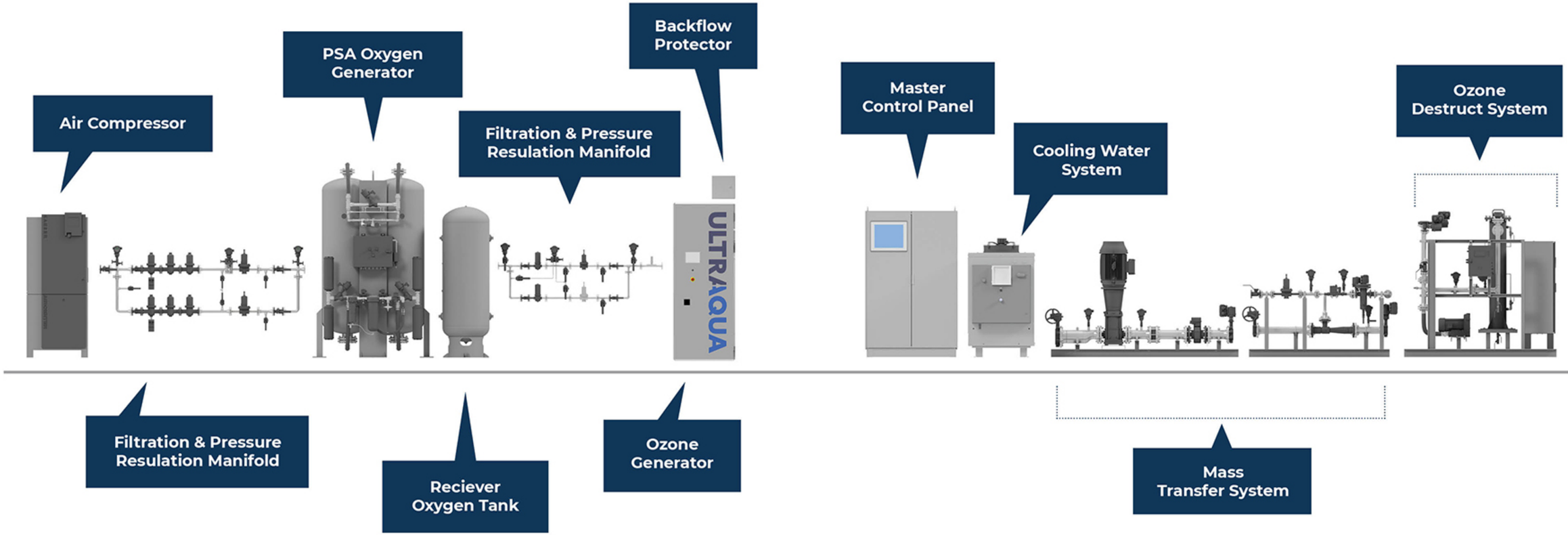
Optimized Contactors: Predict flow patterns, ozone distribution, and potential quiescent zones to maximize disinfection efficiency and minimize energy use

Injection Precision: Simulate gas-liquid interactions to determine ideal ozone injection points, enhancing dissolution rates in multi-phase systems

Real-World Validation: Model complex scenarios to identify and mitigate design flaws before implementation



The Engineered System



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