

APPLICATION NOTE



STORAGE TANK AND DISTRIBUTION LOOP DISINFECTION AND SANITIZATION

CONTINUOUS OZONE TREATMENT

24/7 low concentration continuous ozone treatment with periodic high concentration sanitization delivers superior disinfection results with more process uptime, lower maintenance and operational costs, increased reliability, and improved life cycle management for ambient temperature purified-water systems.

Ozone technology delivers the most powerful commercially available oxidant and disinfectant with few undesirable issues. Sanitization and disinfection with ozone has been used for decades in pharmaceutical and other high purity water systems.

To employ ozone, its efficiency can be calculated easily, according to the concentration required to achieve the desired effect to maintain pristine systems free from of microbials and organics.

Benefits of Ozone

Superior Disinfection Results

More Process Uptime

Requires Less Maintenance

Less Expensive Than Hot Water
Sanitization

More Cost Effective Than
Chemicals

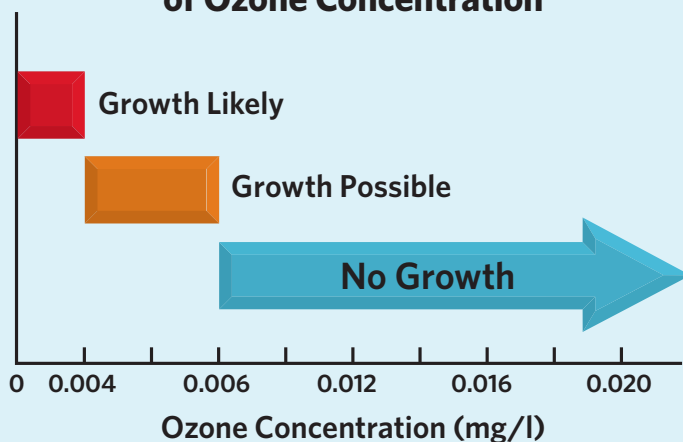
Full Monitoring in Real-time

Ozone Generated On-site
(No Storage)

Rapidly Reaches All Wetted Parts of
Water System

Quick and Seamless Integration

Microbial Growth as a Function of Ozone Concentration



Reference: Hoffmann-La Roche (Swiss Pharma 1983)

**SIMPLE. PROVEN.
OZONE TECHNOLOGY.**



Summit Ozone Systems have multiple operating modes to increase/decrease applied ozone for continuous low concentration and rapid periodic higher concentration sanitizations.

COST EFFECTIVE – SAVE TIME, USE LESS WATER & ENERGY TO SAVE MONEY

As an alternative or augmentation to hot water or chemical sanitization for purified-water systems, ozone disinfection prevents the accumulation of microbials and organics, requiring less maintenance over the life cycle of the water system.

A continuous 24/7 low concentration ozone regime with periodic high concentrations is more cost effective, up to:

- 85% less expensive than hot water sanitization five times a week¹
- 20% less expensive than once-weekly hot water sanitization¹
- Thousands of dollars less than twice yearly chemical sanitization¹

Ozone has a short half-life (the time required for the ozone concentration to dissipate to 50%). In 25°C water, 50% of the ozone decays in approximately 15 minutes (see table). Ozone reverts to oxygen after the job is done.

°C	MINUTES
15	30
20	20
25	15
30	12
35	8

DO₃ half-life as a function of water temperature (pH 7).

Ozone can also be “turned-off” with UV to rapidly remove it from the water system so production can resume faster than waiting for temperatures to cool or multiple rinsing required with heat and chemical processes.

PACKAGED OZONE DISINFECTION SYSTEMS

Designed to control the variables inherent in oxidation processes to deliver maximum efficiency and ease of system validation.

Packaged Ozone Disinfection Systems such as the Summit and Horizon family of products are designed, tested and qualified for storage tank and loop sanitization processes. All critical performance characteristics in the ozone process are measured with advanced software and feedback mechanisms for ease of operation and reliability.

The advanced and fully integrated monitoring and verification of all instrumentation and process parameters in real-time provides immediate information on the process and adherence to operating requirements specifications.

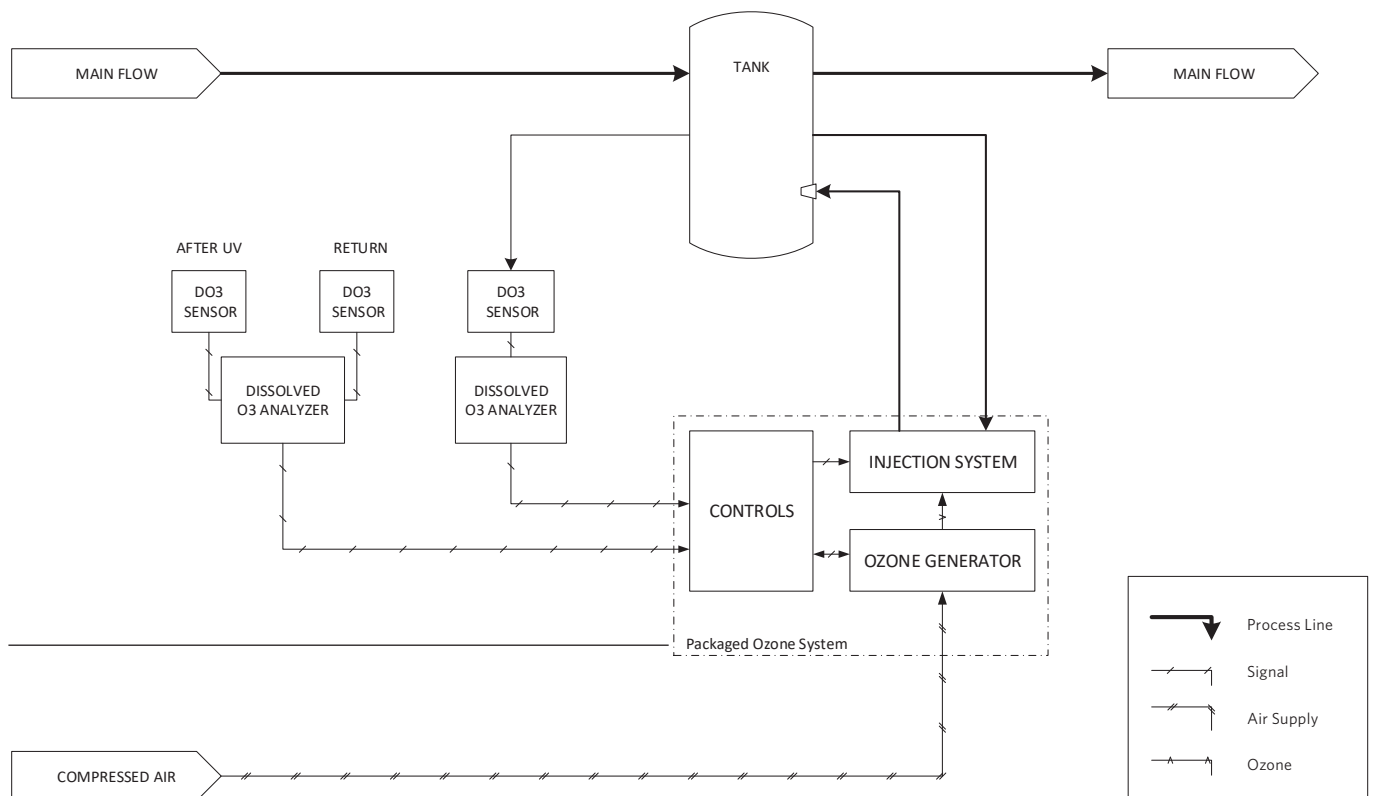
With Packaged Ozone Disinfection Systems, installation and operational qualification (FAT, IQ, IOQ, PQ) are easier and lower cost. Commissioning and qualification is performed straightforwardly because Packaged Ozone Disinfection Systems are standard products with known performance characteristics that readily integrate with continuous plant monitoring used for validation.

QUALIFIED PERFORMANCE, PRECISION CONTROL AND FOREVER RELIABILITY

Packaged Ozone Disinfection Systems generate ozone on-site (no storage) and include the ozone generator, feed gas (usually oxygen concentrator and/or air dryer), injection mass transfer, mixing and gas management devices, ozone monitors and control (ambient and dissolved ozone monitors), and an ultraviolet (UV) for dissolved ozone destruction.

Compressed air is used to generate the feed gas. The ozone generator uses corona discharge to generate ozone from oxygen in the feed gas. Ozone gas is transferred into the water stream using pressure with injection mass transfer. The ozone gas dissolves into the water to rapidly reach all wetted parts of the water system to rapidly disinfect and destroy microbes.

PACKAGED OZONE DISINFECTION PROCESS FLOW DIAGRAM



A good solution is continuous ozonation of the storage tank and rapid periodic ozone disinfecting of the distribution loop in addition to UV water sanitizations.

PACKAGED OZONE SYSTEMS

SUMMIT K1 OZONE DISINFECTION SYSTEM

Designed for a quick and seamless integration into your pure water system. The K1 provides an efficient production and delivery of 18-70g/h ozone with the latest safety features and is system commission and qualification ready.

- Compact Stainless Steel Construction
- Sanitary Design
- Efficient 18-70g/h Production & Delivery
- Ambient Ozone Detector Standard
- Easy-to-use Software & Large Touch Screen
- Auto-precision DO3 Control
- System Commission & Qualification Ready



SUMMIT Q2 OZONE DISINFECTION SYSTEM

For larger applications, the Q2 is powerful and configurable to produce and deliver 18-2kg/h ozone. The flexible design allows for multiple operating modes, a suite of integrated instrumentation and multiple monitoring locations and is also system commission and qualification ready.

- Scalable Stainless Steel Construction
- Wide Range 18-2kg/h Production & Delivery
- Ambient Ozone Detector Standard
- Easy-to-use Software & Large Touch Screen
- Auto-precision DO3 Control and Trending
- Expandable Ozone Instrumentation and Monitoring
- Mode Operation for Low to High Ozone Demand
- System Commission & Qualification Ready



References

1. *Comparison of Ozone and Hot Water Sanitization in Pharmaceutical Water Systems*. Cohen and Nissan, ISPE Water Conference, June 2010, Arlington, VA.
2. *The Efficacy of Ozone and Chemical Sanitization for Microbial Control*. Ultrapure Water Pharmaceutical Conference, June 2013, Lombard, Ill.
3. *Performance and Validation of Ozone Generation for Pharmaceutical Water Systems*. Cohen and Johnson, Pharmaceutical Engineering, July-August 2017.
4. *ISPE Ozone Sanitization of Pharmaceutical Water Systems Good Practice Guide*. July 2012.



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