BIOZONE AIR TREATMENT

Capability Brief

Controlled ozone concentration, according to contaminant load, exposure time, and occupancy status.

INTRODUCTION

Controlled Atmospheric Treatment Engineering

Airborne contamination presents operational, regulatory and product integrity risks across industrial and commercial environments. Odour accumulation, microbial growth, volatile organic compounds (VOCs) and ethylene gas in cold storage environments directly impact compliance, equipment longevity, and product shelf life.

Traditional mitigation methods often rely on chemical masking agents or periodic manual disinfection. These approaches frequently address symptoms rather than root causes and may introduce secondary risks such as chemical residue, corrosion or inconsistent exposure control.

Biozone engineers controlled atmospheric ozone systems designed to:

- **Neutralise airborne and surface contaminants at a molecular level**
- **Reduce volatile organic compounds and ethylene gas accumulation**
- **Support hygiene compliance in regulated environments**
- **Operate within defined occupational exposure thresholds**
- **Deliver measurable and repeatable performance**

Each system is designed around airflow behaviour, environmental moisture conditions, contaminant load, occupancy classification, and exposure compliance requirements.

This document outlines Biozone's technical capability in atmospheric ozone treatment, including generation technologies, deployment strategies, safety frameworks and performance metrics across industrial applications.

CONTROLLED ATMOSPHERIC OZONE SYSTEMS FOR INDUSTRIAL ENVIRONMENTS

Biozone designs and deploys engineered atmospheric ozone systems for air disinfection, odour control, VOC reduction and ethylene mitigation across regulated and industrial environments.

Biozone's systems are not generic ozone generators. Each installation is engineered around:

- **Airflow patterns and air exchange rates**
- **Environmental humidity conditions**
- **Contaminant profile and load**
- **Occupancy classification**
- **Exposure compliance thresholds**

Biozone's approach combines ozone generation, moisture management, control architecture, and monitoring systems into an integrated atmospheric treatment strategy.

We design systems to deliver measurable contaminant reduction while maintaining defined occupational safety limits.

Applications include:

- **Cold chain storage and logistics**
- **Food processing and packhouses**
- **Hospitality and commercial kitchens**
- **Waste handling and wastewater facilities**
- **Mining change houses**
- **Pharmaceutical clean environments**
- **VOC remediation in enclosed spaces**

OZONE GENERATION TECHNOLOGIES

Biozone utilises two primary ozone generation technologies, selection based on environmental conditions and treatment objectives.

ULTRAVIOLET OZONE SYSTEMS

Low-Concentration Ozone for Occupied or Semi-Occupied Environments

Ultraviolet systems generate ozone by passing ambient air over a UV lamp. Ultraviolet light dissociates oxygen (O_2) molecules into oxygen atoms (O), which recombine to form ozone (O_3).

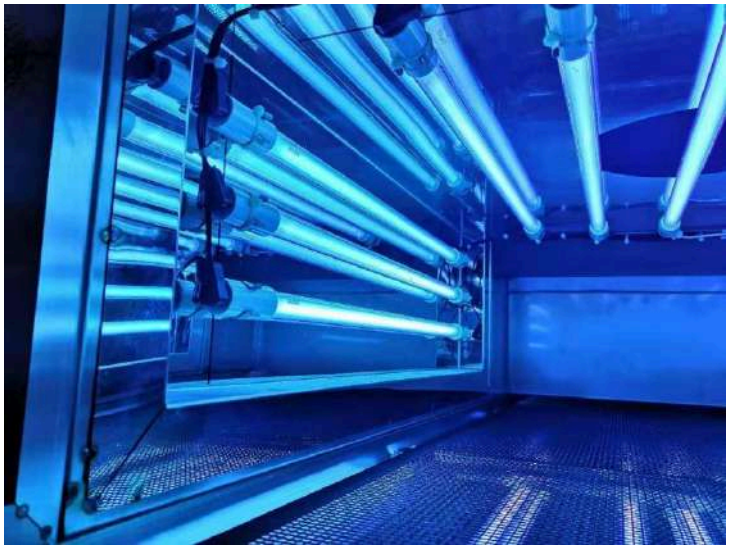
Characteristics

Lower ozone output concentration	No nitrous oxide formation	No nitrous oxide formation	Suitable for occupied or semi-occupied areas

UV systems are typically applied where ozone levels must remain within controlled exposure thresholds, including:

- **Mortuaries**
- **Hospital wards**
- **Light-duty odour control applications**
- **Maintenance-level atmospheric treatment**

Due to their lower output intensity, UV systems are generally used for continuous background disinfection rather than shock treatment.



CORONA DISCHARGE OZONE SYSTEMS

High-Output Ozone for Intensive Disinfection

Corona discharge systems generate ozone by passing dried oxygen-containing gas through a high-voltage electrical field. The electrical discharge dissociates oxygen molecules, enabling recombination into ozone.

Characteristics

Lower ozone output concentration	No nitrous oxide formation	No nitrous oxide formation	Suitable for occupied or semi-occupied areas

UV systems are typically applied where ozone levels must remain within controlled exposure thresholds, including:

- **Unoccupied treatment cycles**
- **Cold storage sanitation**
- **Shipping container deodorisation**
- **Intensive mould or VOC remediation**

Humidity management is critical. High moisture environments can lead to nitrous oxide formation and plate degradation.

In cold storage applications, the generator is commonly positioned outside the room, with ozone introduced via silicone or PTFE tubing to prevent moisture damage and nitric acid formation within the treated space.

FEED GAS & MOISTURE MANAGEMENT

Protecting System Integrity and Treatment Stability

Ozone generation performance and equipment longevity are directly influenced by feed gas quality and environmental humidity.

Biozone systems may operate with :

- **Air-fed configurations**
- **Oxygen-fed configurations**
- **Dried air configurations**
- **Silica gel drying systems**
- **Industrial air drier integrations**

Oxygen-fed systems provide improved concentration stability and higher ozone yield. However, due to capital cost considerations, oxygen generators are selectively implemented based on scale and application intensity.

In high-humidity environments such as cold rooms, hydroponic facilities and produce storage areas, unmanaged moisture can lead to:

- **Nitrous oxide formation**
- **Nitric acid accumulation**
- **Corona plate degradation**
- **Accelerated corrosion**

Biozone mitigates these risks through:

- **External generator placement**
- **Controlled ozone injection lines**
- **Feed gas drying systems**
- **Engineered airflow routing**

Moisture management is considered a core engineering parameter in system design, not an afterthought.

CONTROL STRATEGY & SYSTEM LOGIC

Engineered Ozone Output Management

Effective atmospheric ozone treatment is not defined by generation capacity alone. It is governed by controlled output, exposure timing and environmental feedback.

Biozone air treatment systems operate under structured control strategies determined by:

- **Occupancy classification**
- **Target contaminant reduction**
- **Space volume**
- **Air exchange rate**
- **Regulatory exposure thresholds**

Control methodologies may include:

Timer-Based Operation

Used in unoccupied or scheduled treatment environments such as:

- **Cold room sanitisation**
- **Shipping container deodorisation**
- **Post-construction VOC remediation**

The system operates at defined output levels for pre-set exposure durations, followed by natural dissipation or ventilation periods prior to re-entry.

Sensor-Based Ozone Control

In semi-occupied or regulated environments, ozone concentration is monitored in real time using electrochemical ozone sensors.

Systems may be configured to:

- **Maintain defined ppm thresholds**
- **Activate or deactivate based on sensor feedback**
- **Alarm upon concentration exceedance**
- **Integrate into building management systems**

For example, in controlled commercial environments such as smoking areas, ozone concentrations may be maintained at defined low-level thresholds (e.g., ~0.04 ppm) to mitigate odour accumulation while remaining within safety limits.

PLC & SCADA Integration

The Biozone SOZ high-output series can be integrated with PLC systems and building management infrastructure.

Where required:

- **Ozone sensors communicate with SCADA platforms**
- **Real-time ppm data is logged**
- **Output modulation is automated**
- **Compliance traceability is supported**

Smaller standalone systems operate via engineered timer logic without PLC integration.

OCCUPATIONAL EXPOSURE & COMPLIANCE FRAMEWORK

Engineered Around Safety Thresholds

Ozone exposure management is a primary design parameter in Biozone air treatment systems.

System configuration is determined according to:

- **Occupancy type (occupied, semi-occupied, unoccupied)**
- **Exposure duration**
- **Regulatory and occupational safety thresholds**
- **Environmental air exchange conditions**

In semi-occupied environments, ozone concentration targets are programmed conservatively to remain within defined occupational exposure limits.

Handheld ozone monitors such as the Dräger Pac 8000 are commonly used for validation and verification during commissioning and maintenance.

In larger installations, wall-mounted ozone sensors are positioned strategically to:

- **Detect leakage**
- **Trigger alarms**
- **Shut down generation if required**

Where large ozone plants are installed within work areas, monitoring systems are configured to either:

- **Automatically cease ozone production**
- **Activate alarm protocols**

Compliance is treated as an engineering control variable.

Ozone concentration levels are engineered in accordance with recognised occupational exposure standards applicable to the installation environment.

OZONE DESTRUCTION & OFF-GAS MANAGEMENT

Controlled Residual Mitigation

In certain applications, residual ozone must be actively neutralised before air discharge into occupied environments.

Biozone utilises:

- **Thermal ozone destruction systems**
- **Catalytic ozone destruct units**

These systems convert residual ozone (O_3) back to oxygen (O_2) prior to release.

Ozone destruct units are typically deployed where:

- **High-output ozone generators are located indoors**
- **Ozone off-gas is present in water treatment facilities**
- **Occupational exposure risk must be actively mitigated**

Destruction systems form part of an integrated safety architecture and are engineered according to system scale and discharge pathway.

MEASURED PERFORMANCE OUTCOMES

Quantifiable Atmospheric Treatment Impact

Biozone air treatment systems are engineered to deliver measurable contaminant reduction across controlled environments. Performance is influenced by concentration level, exposure duration, airflow dynamics, and environmental conditions.

Typical performance ranges observed across industrial applications:

Volatile Organic Compounds (VOCs)
• 30 – 70% reduction - Dependent on compound type, exposure duration, and air exchange rate.

Ethylene Gas (C_2H_4)
• 50 – 90% reduction - Critical for fresh produce storage environments to slow premature ripening.

Airborne Pathogens
• 1–3 log reduction - Effective against bacteria, fungus growth, mould spores, and certain airborne microbial loads under controlled exposure conditions.

Performance is application-specific and engineered according to contaminant profile and environmental variables.

APPLICATION PERFORMANCE ENVIRONMENTS

Engineered Across Operational Contexts

System performance varies according to environmental conditions, space volume and deployment configuration.

Coverage Capability
10 m² – 1,000+ m² environments
Scaled according to generator output and airflow integration.

Cold Storage Environments
No inherent volume limitation. System architecture is scaled proportionally to room size and treatment objective.

Odour & Smoke Remediation
Portable units such as Biozone OdoGo and PathoGo provide targeted high-output treatment for:

- **Post-fire smoke remediation**
- **Mould remediation**
- **Waste handling areas**
- **Change rooms and enclosed facilities**

Deployment model selection influences performance outcomes and exposure protocols.

SYSTEM DEPLOYMENT CONFIGURATIONS

Fixed, Ducted, and Portable Architectures

Biozone air treatment systems are deployed across multiple structural configurations.

Fixed Installation
Installed inside or outside the treatable space with controlled injection routing.

Duct-Mounted Integration
Installed within HVAC duct systems to treat recirculated air streams.

Standalone Portable Units
High-output mobile systems for intermittent or targeted remediation.

External Generator Placement
In high-humidity environments, ozone generators are positioned outside the treated area to protect internal components and manage moisture exposure.

Deployment architecture is determined by:

- **Humidity profile**
- **Occupancy status**
- **Air circulation pathways**
- **Treatment intensity requirements**

COMPETITIVE DIFFERENTIATION

Engineered Atmospheric Control, not Generic Ozone Supply

Biozone's competitive strength in air treatment lies in structured atmospheric engineering.

Key differentiators include:

- **Oxygen-fed system capability (where application is justified)**
- **Integrated air and water disinfection expertise**
- **Modular retrofit architecture**
- **Preventative maintenance support**
- **Affordable consumable strategy**
- **Chemical reduction methodology**
- **Energy-conscious design**

Our strongest market distinction lies in designing controlled atmospheric ozone systems engineered around airflow dynamics, safety compliance, and measurable performance, not simply supplying ozone generators.

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