

# BIOZONE WATER TREATMENT

Specialists in Ozone Technology

Capability Brief

Engineered Treatment Pathways for Variable Water Conditions,  
Regulatory Compliance and Long-Term Operational Stability



## INTRODUCTION

### Engineering Water Treatment Around Real-World Variability

**Water treatment challenges rarely present themselves in uniform or predictable conditions. Borehole chemistry fluctuates, industrial demands shift, seasonal variability affects mineral loading, and compliance requirements continue to evolve. In this environment, effective treatment cannot rely on predefined equipment configurations or single-technology solutions.**

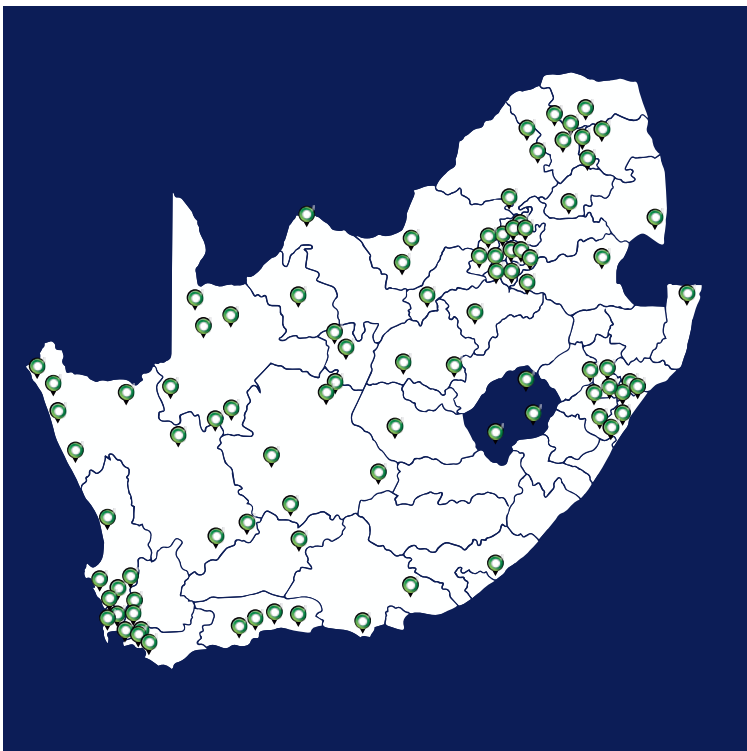
**Biozone** engineers water treatment systems based on analytical data and site-specific performance requirements. Every solution begins with a detailed assessment of inlet water chemistry, operational objectives, regulatory thresholds and long-term lifecycle considerations.

Our approach is technology-neutral and results-driven. Ozone, nanofiltration, reverse osmosis, UV and advanced media filtration are applied strategically, not as standalone offerings, but as integrated components within a controlled treatment architecture.

By selecting treatment pathways based on contaminant profile and stability requirements, Biozone delivers systems designed to:

- Manage variability in raw and process water sources
- Protect downstream infrastructure
- Reduce chemical dependency where feasible
- Maintain compliance with potable and industrial standards
- Operate reliably under continuous or remote conditions

This capability brief outlines Biozone's engineering methodology, treatment architecture and performance capabilities across borehole, industrial, beverage and decentralised water applications.



## ENGINEERING PHILOSOPHY

### Data-Led Treatment Architecture

Biozone designs water treatment systems based on analytical assessment, not predetermined product configurations. Every system begins with a detailed evaluation of :

1. **The client's water chemistry**
2. **Variability profile**
3. **Compliance requirements**
4. **Operational objectives**

Our engineering approach follows a structured methodology:

## WATER VARIABILITY & RISK MANAGEMENT

Industrial, mining and decentralised water sources rarely present stable conditions.

- **Seasonal shifts,**
- **Borehole variability,**
- **Mineral fluctuations and**
- **Biological loading introduces risk into treatment systems.**

Biozone systems are engineered to manage:

- **Bacteria control**
- **Iron, manganese and arsenic variability**
- **Hardness fluctuations**
- **Nitrate and fluoride concentration shifts**
- **Microbial instability**
- **Turbidity and suspended solids loading**
- **Seasonal conductivity changes**

By designing buffering capacity and treatment redundancy into each system, we ensure consistent output quality even when feed water fluctuates.

Water risk is managed through engineered control, not reactive adjustment.

Treatment technology selection, whether ozone, nanofiltration, reverse osmosis, UV or media filtration, is determined by the results of laboratory analysis and site-specific performance requirements.

The result is not a standardised solution, but a controlled and stable treatment architecture designed to perform under real-world variability.



## TREATMENT ARCHITECTURE OVERVIEW

Biozone water systems are structured in layered treatment stages:

1. **AFM® (Activated Filter Media)**
2. **Activated Carbon**
3. **5 Micron Sediment Shield**
4. **Reverse Osmosis (RO)**
5. **Smart Remineralization**
6. **Ozone Disinfection**
7. **UV Sterilization**
8. **CTO Polishing**

Each layer is engineered to complement the next, ensuring process stability, protection of downstream equipment and compliance with regulatory standards. This modular architecture allows systems to be scaled, expanded or adapted as operational requirements evolve.



## BOREHOLE & RAW WATER PURIFICATION

Alternative water source

Designed for mining operations, agricultural estates, rural supply schemes and remote facilities, Biozone raw water systems stabilise variable source water to potable or process-ready standards.

Our engineering approach follows a structured methodology:

Oxidation may be achieved through ozone application where metal precipitation and microbial reduction are required.

Where mineral removal demands selective separation, membrane-based technologies are integrated accordingly. Systems are engineered to maintain compliance with SANS 241 and WHO potable standards where required.

Bacteria Control

Iron, manganese and arsenic oxidation and filtration

Nitrate and fluoride selective removal

Hardness reduction and scale mitigation

Biological stability control

Turbidity and suspended solids removal

Managing  
seasonal  
variability

Minimising  
chemical  
dependency

Protecting  
downstream  
infrastructure

## OXIDATION & CONDITIONING STRATEGIES

Oxidation is applied strategically where contaminant chemistry requires destabilisation prior to filtration.

Biozone Ozone integrates:

- **Ozone-based advanced oxidation**
- **Air or oxygen-fed ozone generation systems**
- **Controlled contact chambers**
- **ORP-monitored dosing systems**

Biozone Ozone is used when:

- **Iron and manganese precipitation is required**
- **Organic load reduction is necessary**
- **Pathogen inactivation is critical**
- **Chemical residual avoidance is preferred**

Where oxidation is not required, such as in hardness reduction applications, membrane separation may be selected instead. Technology selection remains chemistry-driven.

**4–5 log microbial reduction  
85–99% TDS reduction (RO systems)**

## FILTRATION & MEDIA SYSTEMS

Following conditioning, destabilised contaminants are removed using engineered media systems.

Biozone integrates:

- **Activated Filter Media (AFM)**
- **Multi-media pressure filtration**
- **Granular activated carbon (where required)**
- **Selective ion-exchange media**

Media selection is based on contaminant type, loading rate and desired lifecycle performance.

System design prioritises:

- **Optimised backwash cycles**
- **Reduced maintenance frequency**
- **Extended media lifespan**
- **Stable pressure differentials**



## MEMBRANE & SEPARATION TECHNOLOGIES

Where mineral concentration, hardness or dissolved solids exceed acceptable thresholds, Biozone integrates membrane systems including:

- **Nanofiltration (NF)**
- **Reverse Osmosis (RO)**
- **Hybrid membrane configurations**
- **Ultra Filtration (UF)**

Nanofiltration is frequently applied as a chemical-free alternative to salt softening for boiler feed protection and hardness management.

Typical system performance:

- **Hardness reduction up to 80%**
- **Recovery rates between 75–85%**
- **Reduced brine discharge compared to conventional softening**

Membrane selection is validated against flux performance, scaling potential and lifecycle cost modelling.



## PROCESS WATER SYSTEMS



Biozone designs process water systems for industrial and manufacturing environments including:

- **Boiler feed water pre-treatment**
- **Cooling tower makeup water stabilisation**
- **CIP (Clean-in-Place) water generation**
- **Process polishing and reuse**

Engineering priorities include:

- **Scaling mitigation**
- **Corrosion reduction**
- **Conductivity stability**
- **Equipment protection**
- **Chemical dependency reduction**

Systems are configured to protect high-value process infrastructure while maintaining consistent output parameters.

# BOTTLING & BEVERAGE WATER SYSTEMS

Integrated Treatment & Line Engineering

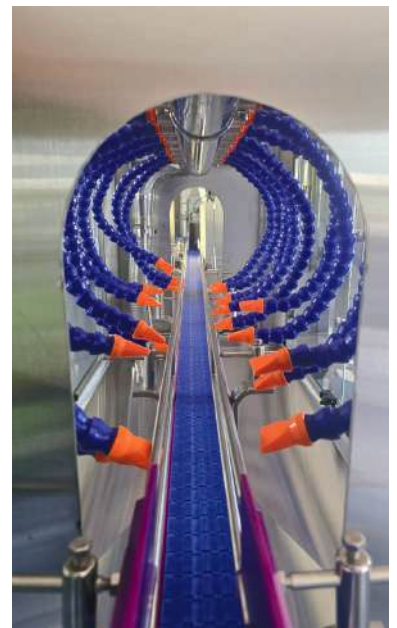
Biozone integrates water treatment directly into bottling and beverage operations.

Capabilities include:

- Ozone-based bottle rinsing and sterilisation
- Product water disinfection without chemical residuals
- Ozone contact tank design and validation
- Inline monitoring and residual control
- Semi-automated to fully automated line integration
- CIP Rinse and flush lines

Applications include:

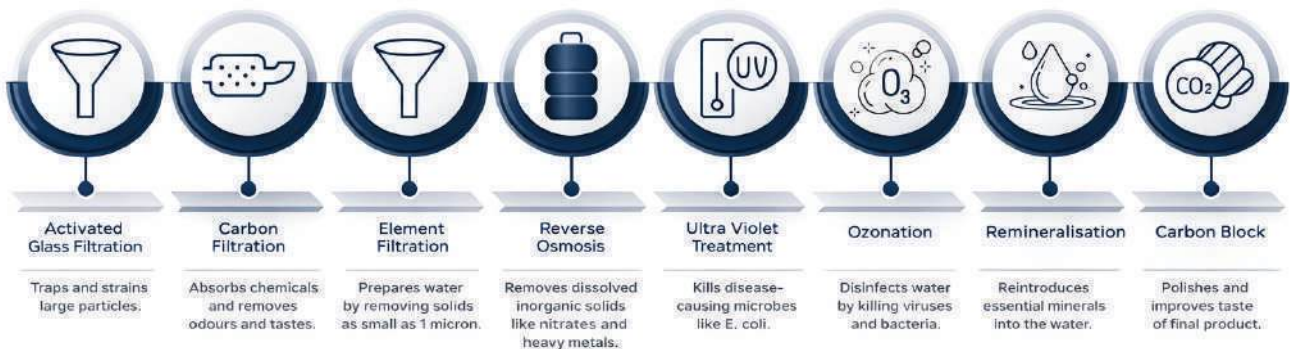
- Water bottlers
- Beverage manufacturers
- Dairy processors



## RETAIL FILLING & KIOSKS

Unlike basic retail filtration setups, Biozone's approach is engineered for consistency, protection and repeatable output. Each stage in the treatment train is designed to support the next, creating a multi-barrier purification process that remains effective even if one stage encounters variable source water conditions.

- **AFM® (Activated Filter Media):** Removes larger particles down to 1 micron while resisting bio-slime formation.
- **Activated Carbon:** Absorbs chlorine, pesticides and organic compounds that affect odour and taste.
- **Sediment Filtration:** Provides a physical barrier that protects downstream treatment stages.
- **Reverse Osmosis (RO):** Removes dissolved salts, heavy metals, and a broad range of contaminants.
- **Smart Remineralisation:** Restores only the essential minerals required to achieve balanced, premium-tasting water.
- **Ozone Disinfection:** Provides fast, high-level disinfection as a core Biozone specialty.
- **UV Sterilisation:** Adds a secondary microbial barrier through UV exposure.
- **CTO Polishing:** Final taste polishing for a clean, crisp finished water product.



## BUILT, ENGINEERED & SUPPORTED BY BIOZONE



Because Biozone manufactures and engineers its own systems, retail filling and kiosk clients benefit from more than just installed equipment. They gain access to a treatment partner with deep expertise in ozone, UV, reverse osmosis, remineralisation, monitoring and long-term system support. The result is a retail water solution designed for reliability, maintainability and premium product consistency.

- **High-purity water with very low dissolved solids**
- **Protection against nitrates and agricultural runoff contamination**
- **Balanced pH through controlled remineralisation**
- **Sterile final water through ozone + UV "double kill" protection**
- **Locally engineered and manufactured systems**
- **Digital ORP monitoring for disinfection precision**
- **Proactive SLA and maintenance support**
- **Component availability through local stockholding**

## CONTAINERISED & DECENTRALISED SYSTEMS

Biozone designs containerised water treatment systems for:

- Mines
- Retail refill stations
- Shopping centres
- Remote mining camps
- Rural communities
- Construction sites
- Schools

Features include:

- Nanofiltration
- Reverse osmosis + ozone integration
- Plug-and-play deployment
- Pre-commissioned systems
- Real-time TDS and flow monitoring
- Rapid mobilisation capability

Requires no municipal connections.



## AUTOMATION & MONITORING

All Biozone systems integrate monitoring and control frameworks including:

- ORP monitoring
- Tank levels
- Discharge water quality
- Flow rate tracking
- Conductivity measurement
- TDS monitoring
- Pressure differential monitoring
- Remote monitoring capability

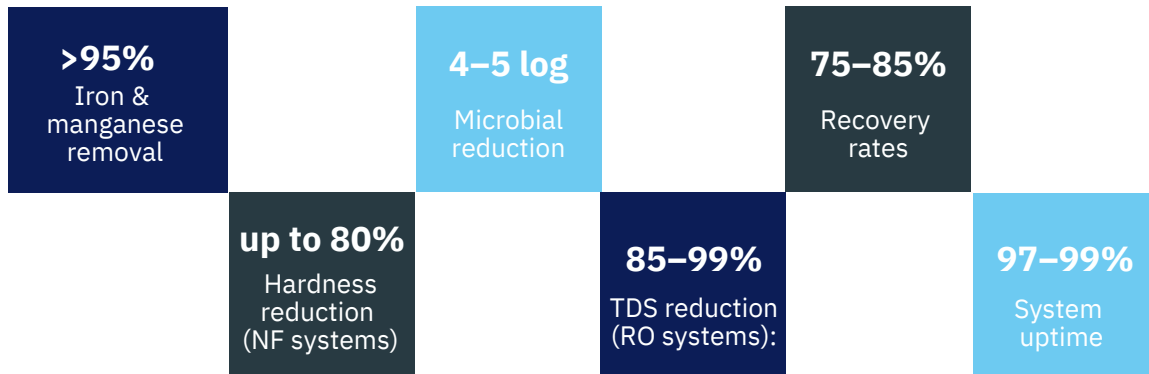
Automation reduces operator dependency and ensures treatment stability under variable input conditions.

Systems are engineered for 24/7 operation with minimal manual intervention.



# PERFORMANCE BENCHMARKS

Water Treatment Performance Indicators (Typical Capability Range):



Performance metrics are validated through third-party testing and ongoing operational monitoring.

## CASE STUDY HIGHLIGHT – MINING APPLICATION

**Industry:** Mining (Platinum Group Metals)  
**Application:** Boiler feed water softening + potable water supply  
**Technology:** Nanofiltration (NF) membrane system with AFM pre-treatment  
**Commissioned:** 2024 (continuous operation since)  
**Capacity:** 12 kL/hour (144-192 kL/day)  
**Treatment Process:** AFM pre-filtration → Nanofiltration → Chlorine disinfection

Containerised 12 kL/h nanofiltration system replacing salt softening for 600 mg/L hardness borehole water. Delivers 80% hardness reduction for boiler protection + SANS 241 potable water. Eliminates 70-90 tons annual salt discharge and R1.6M+ yearly operating costs. AFM pre-treatment, online monitoring, 10-year media lifespan.

### EASTPLATS CROCODILE MINE

**Nanofiltration Hardness Reduction System**  
**80% Hardness Reduction | 80% Recovery | <18 Month Payback**

**Industry:** Platinum Group Metals Mining  
**Location:** South Africa  
**Commissioned:** 2024  
**System Type:** Containerised Nanofiltration (NF)  
**Design Capacity:** 12 kL/h (144-192 kL/day)  
**Recovery Rate:** 80%  
**Compliance:** SANS 241 | WHO

#### Treatment Process Flow



#### Design Principles

- Mass balance modelling
- Hydraulic residence time optimisation
- Membrane flux validation
- Automated online monitoring

Containerised plug-and-play configuration

### FINANCIAL AND ENVIRONMENTAL IMPACT

CONVENTIONAL SOFTENING VS BIOZONE NANOFILTRATION SYSTEM			
Metric	Conventional	Nanofiltration	Impact
Salt Usage	70-90 t/year	0	Eliminated
Brine Discharge	80/20 m <sup>3</sup> /year	0	Zero liability
Annual OPEX	R1.62-2.16M	±R180,000	Major reduction
Equipment Life	5-7 Years	10+ Years	Extended asset life
<b>Projected Financial Outcome</b> Annual Savings: R1.44M – R1.98M Payback Period: <18 Months Chemical Usage: 0 kg/year Water Recovery: 80%		<b>Validation and Compliance</b> • SANS 241 Certified • WHO Aligned • Third-Party Testing • Online Monitoring & Control	

### OPERATIONAL BENEFITS

Continuous Operation	Monitoring & Control	Deployment	Scalability
24/7 Automated	Real-time data	Rapid mobilisation	Modular design
Minimal Maintenance	Remote monitoring	Pre-commissioned	Expandable capacity

#### TECHNICAL PERFORMANCE

Inlet Hardness: 600 mg/L	Recovery Rate: 80%	System designed using mass balance modelling, hydraulic residence time optimisation and membrane flux validation under variable hardness conditions.
Outlet Hardness: <120 mg/L	Media Lifespan: 10+ Years	
Hardness Reduction: 80%	Configuration: Containerised	



**BIOZONE MANUFACTURING PTY LTD**

Unit 2, Northlands Production Park, Epsom  
Avenue,  
Hoogland,  
Randburg  
2162  
sales@biozone.co.za  
+27 67 972 2169

