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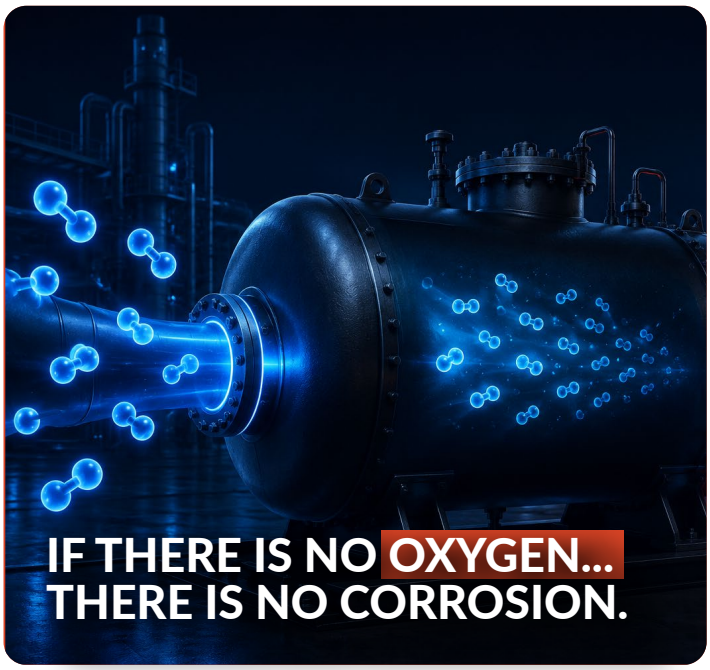
OXYLOCK®

THE WORLD'S FIRST TRUE OXYGEN ELIMINATION TECHNOLOGY

INTRODUCTION

OXYLOCK® by WATCH WATER introduces a breakthrough technology that permanently eliminates dissolved oxygen from water systems — removing the root cause of corrosion, biofouling, and bacterial growth. Unlike conventional chemical treatments and temporary protection methods, **OXYLOCK®** delivers a complete oxygen elimination solution for long-term system safety and efficiency. Designed with advanced catalytic adsorption technology, it protects heating, cooling, and industrial water systems while dramatically reducing maintenance costs and chemical dependency.

WITHOUT OXYGEN -
NO CORROSION. NO BIOFILM. NO CHEMICALS. NO FAILURES.



- Zero Dissolved Oxygen
- Zero Chemical Dosing
- Zero Corrosion Risk
- Permanent Protection
- Chemical-Free Operation

100% SYSTEM PROTECTION

- Extends system lifetime dramatically
- Eliminates chemical dosing completely
- Reduces operational cost by up to 85%
- Stabilizes entire heating & cooling systems

APPLICATIONS

- Steam Boilers
- District Heating
- Industrial Water Systems
- Cooling Systems
- Heat Exchangers
- Semiconductor Industry

IAPMO R&T WATER QUALITY PLATINUM SEAL IAPMO RESEARCH AND TESTING

PREMIUM QUALITY
MADE IN GERMANY

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THE PROBLEM

THE ROOT CAUSE OF DISTRICT HEATING FAILURE

District heating networks are among the most capital-intensive infrastructure assets in the world. Hundreds of kilometres of steel pipelines, heat exchangers, boilers, and circulation systems operate continuously - carrying water at high temperatures and pressures across entire cities. And in virtually every network, the same invisible enemy is at work, silently destroying the infrastructure from within:

Root Cause

DISSOLVED OXYGEN (O_2) - THE PRIMARY DRIVER OF CORROSION, BIOFILM, AND SYSTEM DEGRADATION

HOW OXYGEN DESTROYS DISTRICT HEATING

Oxygen dissolved in the heating circuit water triggers two simultaneous and compounding damage mechanisms:

1. Electrochemical Corrosion

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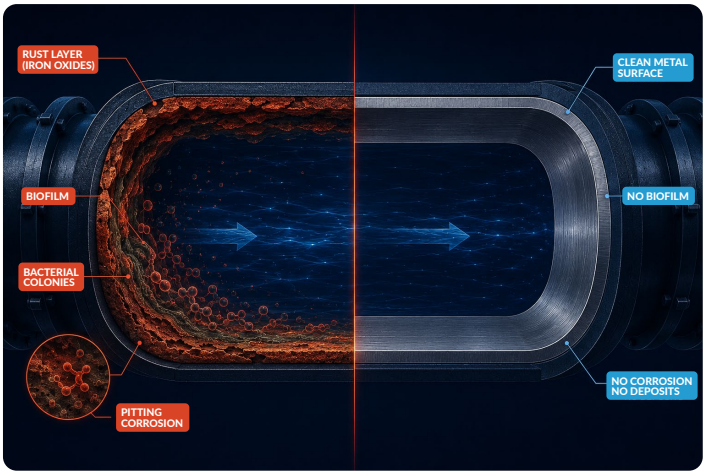


Iron Oxidation Reaction

$$4Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3$$

Dissolved oxygen reacts with steel surfaces → continuous iron hydroxide (rust) formation → pitting corrosion → pipe wall thinning → leakage

2. Biological Activation

- Oxygen enables aerobic bacteria to grow in the warm water environment
- Biofilm forms on pipe walls - protecting bacteria from chemical treatment
- Legionella thrives in warm, oxygen-rich water within distribution loops
- Microbial-induced corrosion (MIC) accelerates material loss beneath biofilm

WHY CURRENT METHODS FAIL

District heating operators have relied on chemical oxygen scavengers for decades. Sodium sulphite, hydrazine, DEHA, carbohydrazide - the products change, but the principle remains the same: dose a reactive chemical into the water to bind with oxygen and neutralise it. The approach is operationally complex, costly, environmentally problematic, and - most critically - **it never fully removes the oxygen.**

CHEMICAL SCAVENGERS - REALITY

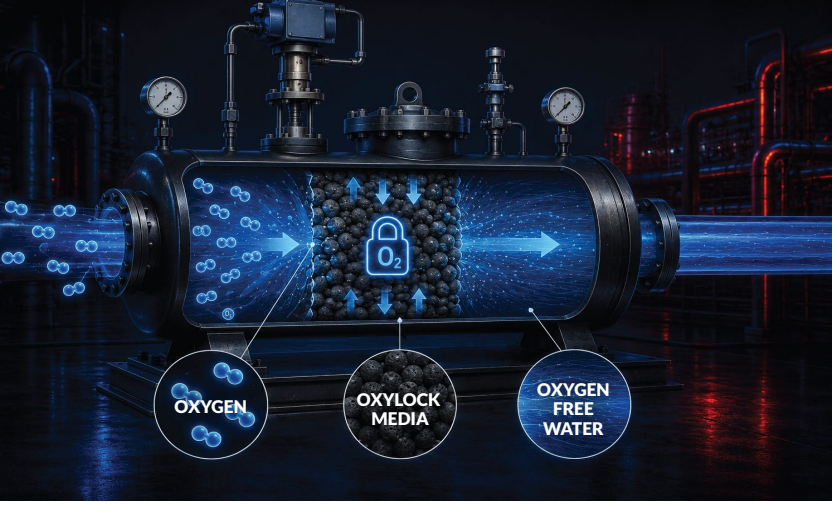
- ⊗ Partial oxygen removal only - micro-levels remain
- ⊗ Continuous dosing required - never-ending operational cost
- ⊗ Dosing imbalance causes system instability
- ⊗ Toxic chemicals - handling, storage, disposal risks
- ⊗ Corrosion continues at trace oxygen levels
- ⊗ Biofilm survives in protected micro-zones

AS LONG AS OXYGEN EXISTS - CORROSION WILL NEVER STOP.

CHEMICAL SCAVENGERS REPLACED BY

- Hydrazine - carcinogenic, banned in many jurisdictions
- Sulfite-based scavengers - corrosive, adds dissolved solids
- Carbohydrazide — high cost, complex dosing
- DEHA — toxic, environmentally persistent

OXYLOCK® eliminates the need for all of the above.



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THE CRITICAL TRUTH

Chemical treatment addresses the symptoms of oxygen in the system. It does not address the oxygen itself. As long as even trace levels of dissolved oxygen remain - whether through make-up water ingress, air entry at expansion vessels, or pump seals - corrosion and biofilm formation continue at the electrochemical level, invisibly and relentlessly.

OXYLOCK® - THE BREAKTHROUGH

ADVANCED FRAMEWORK MATRIX - HOW OXYLOCK® WORKS

OXYLOCK® is built on an **Advanced Framework Matrix** - a proprietary combination of MOF (Metal Organic Frameworks), COF (Covalent Organic Frameworks), AOF (Anode Organic Frameworks), and Cathodic Functional Structures. Together, these materials generate an internal electrochemical environment that continuously and autonomously eliminates dissolved oxygen from passing water.

Dissolved O_2
Corrosion Potential
Biological Activity
Zero

OXYLOCK - DISTRICT HEATING APPLICATION

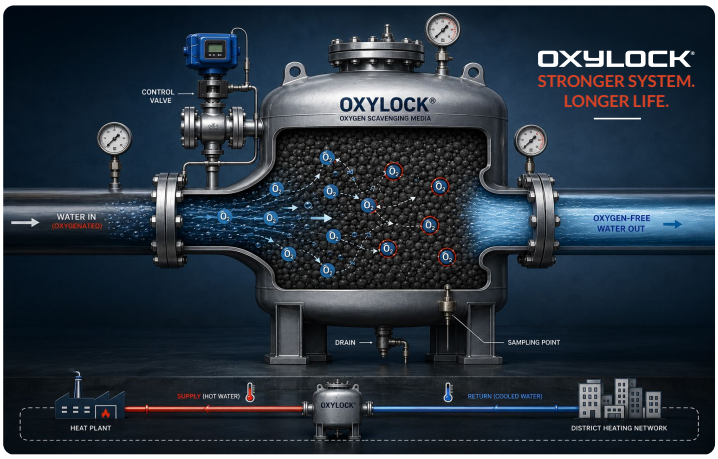
The media's unique material composition creates:

- **Micro-anode and cathode zones -** formed within the media bed itself
- **Continuous internal electron flow -** generating a powerful redox field
- **High-energy redox field** breaks dissolved O_2 molecules and converts them into stable, bound forms
- **Vacuum adsorption effect** actively pulls oxygen out of solution, traps it in the framework structure, and prevents re-release

THE OXYGEN LOCKING MECHANISM

Unlike conventional systems that reduce oxygen temporarily:

- **OXYLOCK® does not just remove oxygen -** it locks oxygen permanently
- **Zero re-dissolution -** oxygen cannot return to the water
- **Continuous performance -** no performance curve over time
- **Self-powered system -** internal current generated by the media itself, no external energy required
- **Ultra-high surface area -** massive adsorption capacity with multi-layered active sites



ANOXIC PASSIVATION - THE BONUS EFFECT

As dissolved oxygen reaches near-zero levels throughout the district heating circuit, **OXYLOCK®** triggers Anoxic Passivation — a secondary protection mechanism unique to this technology. The high internal electrical current generated by the media alters the surface energy of exposed metals, forming a stable passive electrochemical layer on all pipe surfaces, heat exchangers, and boiler components within the circuit.

- Protective layer forms on all metal surfaces in the circuit
- Metal reactivity is drastically reduced - corrosion cannot initiate
- Existing minor rust deposits are stabilised and halted
- Protection persists even during operational fluctuations

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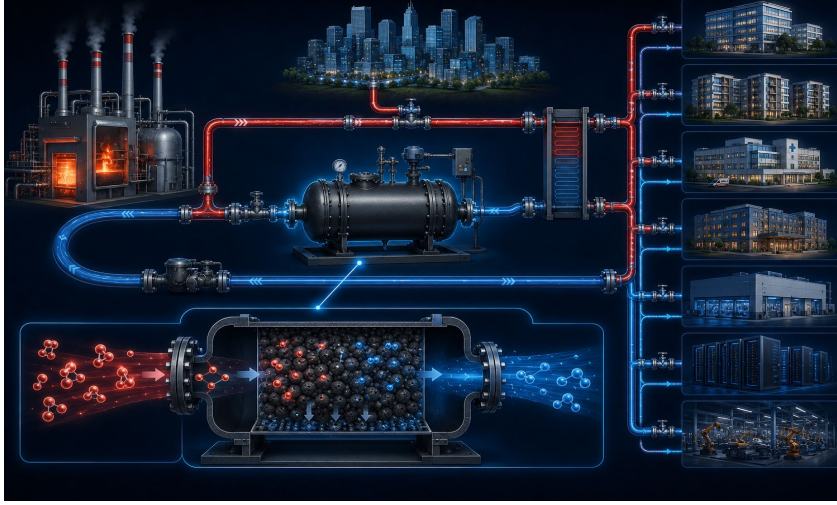


SYSTEM DESIGN

ENGINEERED FOR DISTRICT HEATING NETWORKS

OXYLOCK® is installed as a pressure vessel system, designed for direct inline integration into district heating circulation loops - primary circuits, secondary circuits, boiler feed lines, and make-up water systems. The system is engineered for continuous flow operation and requires no chemical storage, no dosing infrastructure, and no dedicated operational staff.

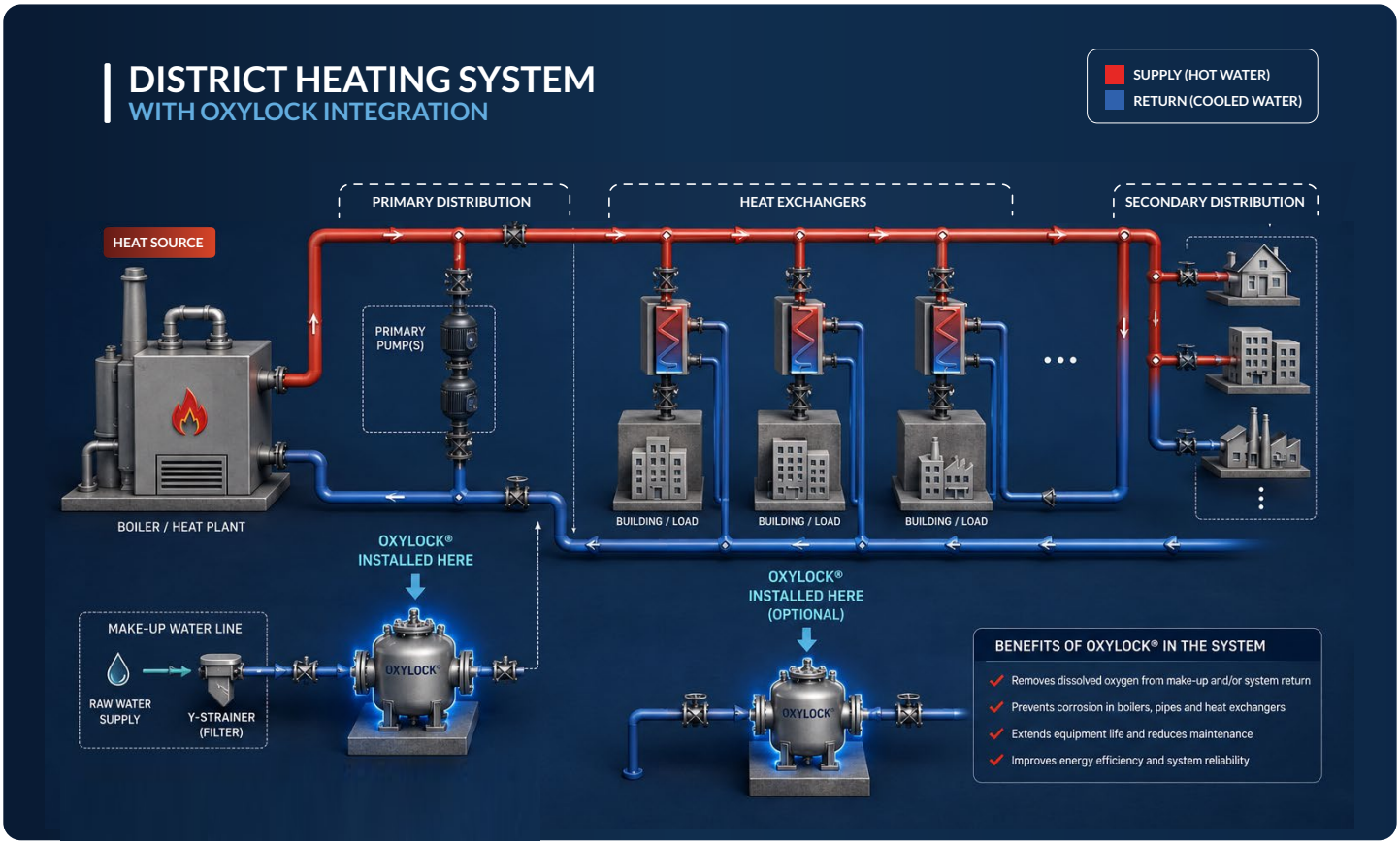
SYSTEM CONFIGURATION

- **Pressure vessel system** industrial grade, inline installation
- **Equipped with control valve** e.g. Clack® for automated backwash sequencing
- **Designed for continuous flow operation** 24/7 protection without interruption
- **Upflow (packed bed) or downflow** configurable to system requirements

OPERATIONAL ADVANTAGES

THE FIRST TECHNOLOGY THAT REMOVES
OXYGEN - COMPLETELY

- 100% Oxygen Removal
- No chemical dosing
- No complex controls
- No Byproducts
- Long Media Life
- Safe & Sustainable



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TECHNICAL COMPARISON

OXYLOCK® VS. CONVENTIONAL CHEMICAL TREATMENT

The table below compares **OXYLOCK®** against standard chemical scavenger programmes currently used in district heating networks worldwide.

Parameter	Chemical Scavengers	OXYLOCK®
Oxygen Removal	Partial - trace levels remain	100% - near-zero achieved
Corrosion Control	Limited - continues at micro-level	Total - no corrosion potential
Biofilm Formation	Possible - biofilm survives	Eliminated - no oxygen, no biofilm
Legionella Risk	Remains - requires biocide	Eliminated - no aerobic bacteria
Chemical Use	Continuous - daily dosing	Zero — no chemicals required
System Stability	Fluctuating - dosing dependent	Absolute - physical process
Operational Cost	Ongoing - chemical + labour	Up to 85% lower
Environmental Risk	Toxic chemical discharge	Zero - no chemical discharge
Maintenance	High - regular monitoring	Minimal - backwash only

WHY **OXYLOCK®** WINS
BECAUSE IT DOES NOT FIGHT THE PROBLEM...
IT REMOVES THE CAUSE

DISTRICT HEATING IMPACT

WHAT OXYLOCK® DELIVERS FOR DISTRICT HEATING NETWORKS

The operational and financial consequences of eliminating dissolved oxygen from a district heating network extend well beyond the removal of chemical costs. Because oxygen is the root cause of both the primary corrosion mechanism and the secondary biological degradation process, removing it simultaneously addresses every downstream problem in a single installation.

85%
Reduction in water treatment operational costs

100%
Dissolved oxygen removed - near-zero levels

ZERO
Chemical discharge into the water or environment

PROTECTION OF CRITICAL INFRASTRUCTURE

Pipelines
corrosion halted at the electrochemical root cause; pitting and wall thinning cease

Heat exchangers
fouling eliminated, thermal efficiency maintained at design capacity

Boilers and pressure vessels
protected from oxygen attack at high-temperature zones

Pump seals and valve bodies
reduced corrosive wear, extended service intervals

Return pipework
historically the most vulnerable section; now fully protected

CHEMICAL SYSTEMS TREAT THE SYMPTOMS.
OXYLOCK® REMOVES THE CAUSE.

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ENERGY EFFICIENCY IMPROVEMENT

Biofilm and scale deposits on heat transfer surfaces are direct consequences of dissolved oxygen in the system. Each millimetre of biofilm reduces heat transfer efficiency by up to 10–15%. **OXYLOCK®** eliminates the biological substrate for biofilm growth — restoring and maintaining design-level thermal performance throughout the network's operational life.

- Heat transfer surfaces maintained at original design efficiency
- Fuel consumption reduced - less energy required to reach delivery temperatures
- Pump energy reduced - lower pressure drop through clean pipework
- Fewer emergency shutdowns and unplanned maintenance events

REGULATORY & ENVIRONMENTAL COMPLIANCE

- Eliminates handling, storage, and disposal of hazardous chemical scavengers
- No toxic discharge into the water system or drainage infrastructure
- Supports compliance with increasingly stringent EU chemical handling directives
- Legionella risk eliminated - no aerobic bacterial activity possible without oxygen
- No COSHH (chemical hazard) risk for operational staff

OXYLOCK® is not an improvement to district heating water treatment. It is a complete replacement - the first technology that addresses the root cause rather than managing the consequences.

OPERATING PARAMETERS

Flow direction	Up-flow (packed bed) and Down-flow
System freeboard (down-flow)	25 – 30 %
Filtration rate	10 – 20 Bv/h
Backwash velocity	10 – 20 m/h
Minimum depth	80 cm
EBCT	≥ 90 seconds

TECHNICAL PARAMETERS

Technology Type	Oxygen Elimination Technology
Appearance	Granular, Dark Grey/Black
Granule size	0.6 - 2.4 mm
Mesh size	8 x 30
Bulk density	Approx 520-530 g/L

Standard Packaging

Packaging	Weight of product	Quantity/ pallet	Gross Wt./ pallet
Bag (30 L)	15.7 kg	40	653 kg

** Other packaging can be considered on request*

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