MiPro™ Advanced Oxidation Process

OPTIMIZED TO SOLVE YOUR TOUGHEST TREATMENT CHALLENGE

WEDECO

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The Treatment Challenge

As water resources become increasingly stressed due to drought, flooding, population growth and pollution, the close linkage between wastewater, rivers, lakes and groundwater becomes even more important. Our use and reuse of water has become a critical water quality and supply issue, one frequently challenged by the presence of recalcitrant trace organic compounds. Trace organic compounds enter our water resources through many paths:

- Taste and odor compounds, such as geosmin and 2-MIB, occur naturally due to algal blooms in lakes and reservoirs.
- Endocrine disrupting compounds (EDC) pharmaceuticals and personal care products (PPCPs), pass through conventional wastewater treatment and into the environment and raw water supplies.
- Agriculture runoff may contribute herbicides and pesticides to our water supplies.
- Industries may discharge wastewater containing micropollutants such as N-nitrosodimethylamine (NDMA), 1,4-Dioxane and other chemicals.

Conventional treatment systems, whether wastewater or drinking water, often allow these trace organics to pass through, posing a threat to human health and the environment. These recalcitrant trace organics don't readily break down in biological processes and can pass through treatment technologies such as filtration, membranes, reverse osmosis and granular activated carbon.

Advanced Oxidation Processes (AOPs) are often needed to remove these recalcitrant trace organics that cannot be removed by other means.

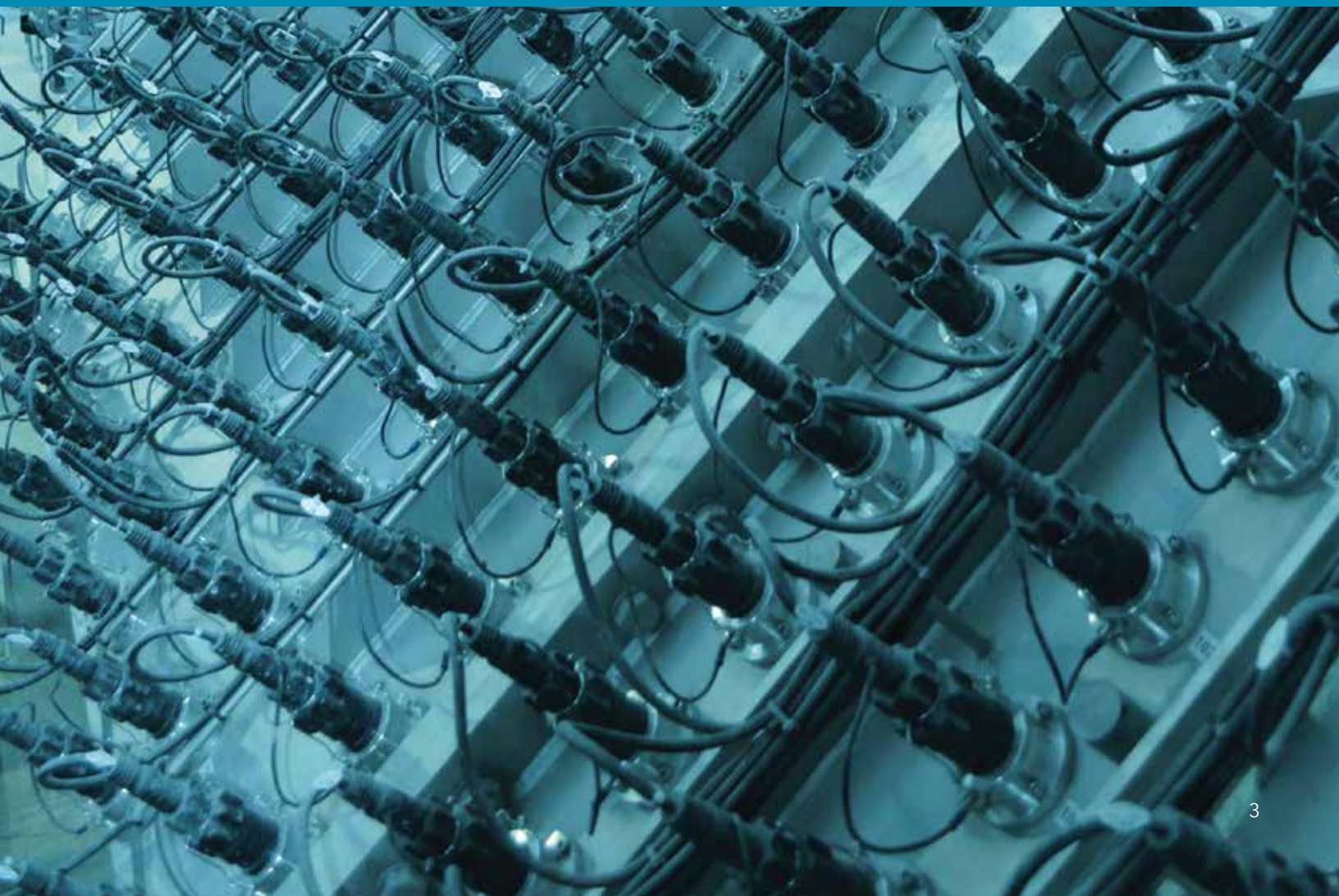
Remove challenging contaminants with Wedeco MiPro™ AOP

Advanced Oxidation Processes, or AOPs, use the oxidation power of hydroxyl radicals, the strongest oxidant available for water treatment to remove these recalcitrant compounds.

The need for AOP includes:

- Providing safe drinking water from impacted source waters,
- Removing taste and odor from drinking water,
- Producing wastewater effluent that does not negatively impact the receiving waters, and
- Reclaiming wastewater for beneficial or potable reuse

MiPro™ AOP utilizes the most efficient oxidation method available to remove these trace organic compounds to safeguard human health and the environment.



MiPro™ AOP is designed and optimized to be the most cost effective treatment for YOUR needs

The processes used in AOP – ozone, peroxide, ultraviolet radiation, chlorine – are powerful treatment technologies both by themselves and in conjunction with each other. The key to selecting the best AOP solution is to find the right combination of these processes to most efficiently generate hydroxyl radicals that reduce the target contaminants. The best AOP for YOUR water treatment needs will depend upon many factors including:

- Type and concentration of trace organic compounds in your water
- Treatment target concentrations for each contaminant of concern, including regulatory requirements and end use (drinking water, reuse, discharge to environment)
- Your water matrix, including parameters such as pH, TOC, COD, alkalinity and more
- Upstream and downstream unit operations in the overall treatment train – the multiple barrier approach is often the most cost-effective solution
- Energy and chemical costs

Ozone + Peroxide	**MiPro™ eco$_3$ and Pro$_3$mix®** Very efficient production of hydroxyl radicals, excellent for many AOP applications.
UV + peroxide or UV + hypochlorite	**MiPro™ photo** Highly effective for photo sensitive compounds like NDMA and for low concentrations of contaminants in clean waters, such as RO permeate and drinking water. While the use of hydrogen peroxide is typical, the use of hypochlorite is advantageous in applications with low pH (such as RO permeate in water reuse).
Ozone + Peroxide + UV	**MiPro™ eco$_3$ plus** Ideal for process stream with multiple contaminants and pathogens, leverage the strength of each technology for most efficient result.
Wedeco MiPro™ AOP solution is tailor fit to your water chemistry and flow rates	

Wedeco's experts will help you select and optimize the best AOP solution with state-of-the-art bench-scale and pilot-scale treatability services

Put our expertise to work for you. Our AOP experts have been designing innovative oxidation systems using ozone and ultraviolet light for over 20 years. They have the knowledge and experience to help you cost effectively evaluate your project to determine the optimal technology and design.

Quick and inexpensive screening with bench-scale UV, ozone and AOP options to assess the feasibility of AOP and establish the best design criteria for your project. We can often go directly from bench-scale testing to a full-scale design. Our treatability testing labs in Herford, Germany and Charlotte, North Carolina include a broad applications database to leverage our extensive experience from around the world, to find you the best solution.

Our pilot-scale systems allow you to test every type of AOP and simulate a full-scale system

See for yourself the effectiveness of AOP and know precisely what to expect from your system. Wedeco's fleet of fully automated, containerized MiPro™ AOP pilot plants, allows you to evaluate a variety of treatment options, with a flexible range of UV, ozone and AOP tests. Our engineers will work closely with you to determine the optimum configuration for a custom engineered solution. Pilot testing pays dividends by:

- **Minimizing risk through demonstration of the technology.** You know it will work.
- **Lowering operation and maintenance costs** through optimization of dosing and controls.
- **Fine tuning the full-scale design criteria, saving on capital costs.** The final system is not oversized due to uncertainty and overly conservative safety factors, but properly sized to ensure compliance.
- **Facilitating operator training.** Your staff can learn the operations during testing, seeing the results of changing operational parameters.
- **Demonstrating compliance to regulatory agencies and obtain validation acceptance.**
- **Generating a full-scale performance guarantee from Xylem.**

Our plug and play configurations allow for quick set up on your site and can be integrated with other technologies to simulate treatment trains.

The result? We partner with you to reduce project costs, expedite technology selection and ensure successful implementation.

Terminal Island Water Reclamation Plant

Faced with one of the most severe droughts on record, Los Angeles Sanitation contracted with Xylem to pilot test Wedeco MiPro™ AOP to facilitate full-scale AOP technology selection for the Advanced Water Purification Facility expansion. This facility will provide safe water that complies with groundwater recharge regulations for indirect potable reuse.

The testing, carried out at the Terminal Island Water Reclamation Plant, compared multiple AOP methods and demonstrated that, for this project, MiPro™ AOP using UV and chlorine is the most effective final barrier against pathogens such as virus, Giardia, and cryptosporidium and regulated contaminants including NDMA and 1,4-Dioxane.

MiPro™ AOP's application of UV and chlorine is a significant breakthrough, making water reuse more sustainable and cost effective. The upgrade of the Terminal Island plant will include MiPro™ photo to treat 12 million gallons per day (MGD) of highly purified water for beneficial reuse, reducing dependency on imported potable water supplies.

Single source for integrated solutions – process equipment and controls

A process is only as good as its weakest link. To ensure that treatment requirements are achieved, Xylem provides integrated turnkey solutions, including all the treatment equipment and controls.

MiPro™ AOP systems can be provided pre-assembled for plug and play simplicity, expediting the construction schedule and minimizing installation costs. Xylem process experts will work closely with your engineers, contractors and operators during the entire process, through start up and training and for the life of the system. Single source, integrated solutions from Xylem offer an unparalleled performance guarantee, backed further by Xylem's TotalCare Service support.

Your Wedeco MiPro™ AOP solution is guaranteed to meet your treatment objectives.

Backed by Wedeco, the leader in ozone and UV design.

MiPro™ AOP uses the same technologies pioneered by Wedeco for energy efficient UV and ozone treatment. With unsurpassed reliability and integrated control protocols for energy efficient operation, you are assured of continuous compliance at the lowest possible life cycle costs.

Whatever your treatment challenges, whatever your contaminants, the Wedeco experts can assist you in defining the most cost effective MiPro™ AOP system for your unique requirements.

Together. Let's Solve Today's Treatment Challenges Now. Let's Solve Water.

Proven results in worldwide installations

Three Wedeco PDO 1000 ozone generators are producing up to 51 kg of ozone per hour from liquid oxygen.

End user: K-Water
Location: Sung-Nam South Korea
Flow rate: 34,390 m^3/h (218 MGD US)
Treatment need: Taste and odor (T&O), geosmin and 2-MIB
Solution: MiPro™ eco_3
Ozone dose: 2 g/m^3
H_2O_2 dose: 0.5 ppm
2-MIB removal: 0.5 Log

Pro_3 mix utilizes ozone and peroxide to break down pesticides while limiting bromate production.

End user: Anglian Water Services
Location: United Kingdom
Flow rate: 40 m^3/h (0.25 MGD)
Treatment need: Metaldehyde removal in high bromide water
Bromide in source water: 80 µg/L
Solution: Pro_3 mix
Ozone capacity: 400 g/h
H_2O_2 dose: 5 – 25 g/m^3
Metaldehyde removal: 0.5 LOG
Bromate in finished water: < 3 µg/L

Wedeco MiPro™ photo is delivered skid mounted including all controls and analytical devices like UVT monitor and H_2O_2 measurement.

End user: SK Engineering and Construction
Location: South Korea
Flow rate: 40 m^3/h (0.25 MGD)
Treatment needed: 2-MIB removal for T&O
Solution: MiPro™ photo, with hydrogen peroxide
UV dose: 4-8000 J/m^2
2-MIB removal: > 0.5 LOG

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to **www.xyleminc.com**

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