

Advanced Oxidation Process (AOP) Hydro-Optic™ Technology

Atlantium's Hydro-Optic™ UV AOP Technology

Atlantium offers a novel advanced oxidation process (AOP) based on its Hydro-Optic™ (HOD) UV technology that uses proprietary medium pressure (MP) lamps and provides polychromatic UV light (200–410nm). The HOD UV technology offers improved efficiency for organic reduction with superior monitoring capabilities over other AOP technologies to assure compliance.

UV de-contamination can work via two mechanisms: direct-photolysis and advanced oxidation process (AOP). The first is effective against compounds that absorb UV (high molar absorptivity) such as ozone, chlorine and N-nitrosodimethylamine (NDMA). The radical generation is effective against compounds that react well with radicals such as 1,4-dioxane and trichloroethylene (TCE). The degradation of most compounds occurs by both AOP mechanisms simultaneously.

HOD UV systems require less lamps to achieve the same UV dose as low pressure (LP) UV systems. This significantly reduces the maintenance requirements of the HOD UV MP technology compared to complex LP systems that use ten times more the number of lamps.

Most importantly, when a UV system has a small number of lamps they can be monitored individually and increase reliability. Chemical contaminants are not monitored continuously or even daily so choosing a system that reliably delivers and monitors the required UV dose is critical.

Atlantium uses an advanced and proprietary control system, featuring real-time water quality and lamp performance monitoring to ensure treatment efficacy. The HOD UV technology measures %UVT, flow rate, and UV lamp intensity (kW) in real time to maintain the minimum required UV dose. UVT is an indicator of water quality and designates the percentage of UV light that passes through the water.

Atlantium's HOD UV systems (Figure 1) monitor each MP lamp individually to make sure that—“what you see is what you get”. As UVT and lamp output are measured separately, the HOD UV system automatically adjusts lamp power when conditions fluctuate so that the minimum required dose set by the user is guaranteed to be delivered.



Figure 1:
Hydro-Optic™ (HOD) UV system offers improved efficiency for organic reduction with superior monitoring capabilities over other AOP technologies to ensure compliance.

1,4-Dioxane Removal

In the AOP process an oxidizer compound is broken down to generate hydroxyl (OH) radicals that react with organic and inorganic compounds in the water. Some compounds, such as 1,4-dioxane and TCE, react with the OH radical more readily than others.

The most used AOP method involves the use of UV radiation, which degrades radical donors, usually hydrogen peroxide (H₂O₂) to OH radicals (designated UV/ H₂O₂).

In a pilot test in Long Island, New York, the HOD UV technology demonstrated complete removal to 1,4 dioxane. The goal of the project was to see the degradation of 1,4-dioxane from an initial concentration of 1.3 ppb to below the analytical detection limit of 0.02 ppb or 0.07 ppb and the New York maximum contaminant level (MCL) of 1 ppb. Data from this pilot is shown in Figure 2.

NDMA Removal

In UV-photolysis, chemical contaminants such as NDMA are exposed to direct ultraviolet (UV) light and are broken down into harmless constituents. NDMA is photolyzed by UV light at a wavelength of approximately 228 nanometers (nm) (Mitch and others 2003b).

In a pilot test in North America, the HOD UV technology demonstrated a high removal efficiency for NDMA. The HOD UV technology treated influent NDMA concentrations of 10,000 ppt to 2ppt. Data from this pilot is shown in Figure 3.

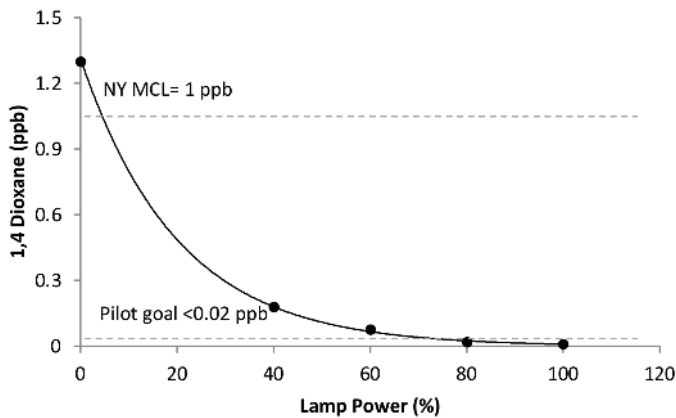


Figure 2:

Degradation of 1,4-dioxane from an initial concentration of 1.3 ppb to below the analytical detection limit of 0.02 ppb or 0.07 ppb and the New York maximum contaminant level (MCL) of 1 ppb. 100% data point is below detection limit and is represented as 0.01 for illustration.

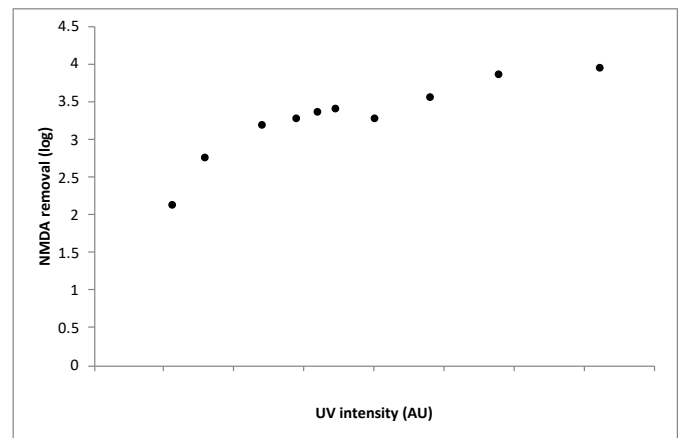


Figure 3:

Results of HOD UV AOP degradation of NDMA from an initial concentration of 10,000 ppt to below a discharge detection limit of 2 ppt at a pilot site in North America.

[1]. Mitch, W.A., Sharp, J.O, Trussell, R.R., Valentine, R.L., Alvarez-Cohen, L., and D.L. Sedlack. 2003b. "N-Nitrosodimethylamine (NDMA) as a Drinking Water Contaminant: A Review." Environmental Engineering Science. Volume 20 (5). Pages 389 to 404. superfund.berkeley.edu/pdf/231.pdf



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