Atlantium

Application Brief:
Advanced Oxidation Process (AOP) Hydro-Optic™ Technology

Aquifer remediation with Atlantium's Hydro-Optic™ UV AOP Technology

Effective removal of harmful organic compounds

The Advanced Oxidation Process (AOP) is a well-established method for aquifer remediation, removing contaminants such as 1,4-dioxane and trichloroethylene (TCE).

During 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.

Improved efficiency for organic reduction

The most widely used AOP method is ultraviolet (UV) radiation, which degrades radical donors, usually hydrogen peroxide (H_2O_2) to OH radicals (designated UV/H_2O_2).

Atlantium's novel AOP process, based on its Hydro-Optic™ (HOD) UV technology, uses proprietary medium pressure (MP) lamps that provide polychromatic UV light (200–410nm). HOD UV technology offers improved efficiency for organic reduction with superior monitoring capabilities to assure compliance.

HOD UV MP lamps produce a high-density broad-spectrum UV light inclusive of Wavelengths which enable effective activation of the H_2O_2 and creation of radicals [1].

Tried and tested

In Long Island, New York, HOD UV technology demonstrated complete removal to 1,4 dioxane. The project's goal was to observe 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.

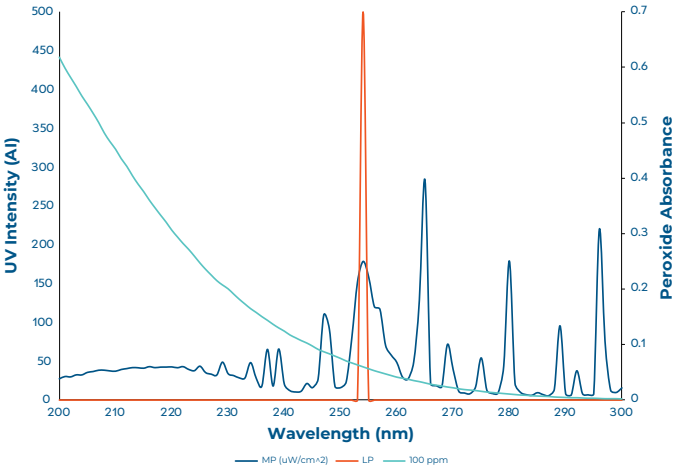

Figure 1:

Poor absorption of H_2O_2 at 254nm and much better absorption and activation of H_2O_2 at the wider spectrum of Atlantium's MP lamps

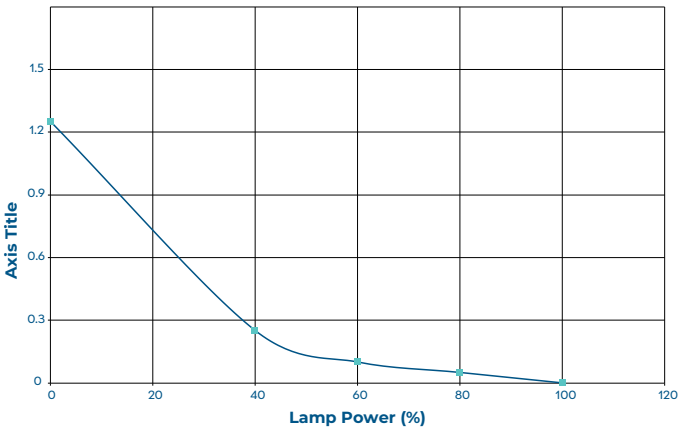

Figure 2:

When compared to LP lamps, HOD UV MP technology brings about photolysis of the oxidizing compounds, resulting in efficient oxidization of 1.4 dioxane

10x less lamps achieve same UV dose
HOD UV MP systems require less lamps to achieve the same UV dose as LP systems.

This significantly reduces the maintenance requirements of the HOD UV MP technology compared to complex LP systems that use ten times more lamps.

Ongoing monitoring for increased reliability
Atlantium's HOD UV system has a small number of lamps, enabling every lamp to be monitored individually and increasing reliability. Because chemical contaminants are not monitored continuously or even daily, choosing a system that reliably delivers and monitors the required UV dose is critical.

Constant measurement ensures consistent UV dosage
HOD UV MP technology measures % of 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 3) 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 3:

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

With Atlantium, what you see is what you get

[1] S. Goldstein, D. Aschengrau, Y. Diamant, and J. Rabani, "Photolysis of aqueous H2O2: Quantum yield and applications for polychromatic UV actinometry in photoreactors," Environ. Sci. Technol., vol. 41, no. 21, pp. 7486–7490, 2007.

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