Atlantium
Illuminating Water Technologies

APPLICATION BRIEF

Dechlorination
Hydro-Optic™ Technology

North American Baseload Power Station Installs Hydro-Optic™ UV System to Meet Boiler Make Up Water Dechlorination Needs

With the installation of the Hydro-Optic™ (HOD) UV system, which will ensure an undetectable free available chlorine (FAC) outlet concentration below 0.02 ppm, a North American baseload generation facility will achieve effective non-chemical, dechlorination treatment of its boiler make up water to protect its ion exchange (IX) demineralization process. The facility will benefit from the HOD UV system's ability to reduce organic load, which will lead to fewer regeneration cycles of the IX resin and extend media life, while offering better absorbance. In addition, the HOD UV system's space-saving design also provides disinfection to reduce the biofouling potential by eliminating anaerobic and aerobic bacterial growth in the IX media.

A baseload generation facility in North America with a nameplate capacity of approximately 307 megawatts has installed the HOD UV technology developed by Atlantium Technologies to achieve a non-chemical, dechlorination treatment approach of the boiler make up water to protect their IX demineralization process. Installation of the HOD UV system was completed in March 2020 and will ensure an undetectable FAC outlet concentration below 0.02 ppm. The use of strong oxidants such as chlorine can damage IX resins, and as a result, dechlorination and reduction of organic compounds must be achieved prior to water entering the IX system.

The facility receives source water from the local municipality to support its process and boiler feed water needs. Historically, the facility used granular activated carbon (GAC) filters, as part of a broader multi-step treatment process, to remove residual free chlorine. The GAC filters, however, required a large footprint and were affected by higher head loss, unpredictable chlorine breakthrough, and a proliferation of bacteria.

The HOD UV system replaced two GAC filters, providing the facility a space-saving design that will reduce organic load, lead to fewer regeneration cycles of the IX resin and extend media life while offering better absorbance. The HOD UV system accommodates a flow rate of 27 m^3/hr (119 gpm) for water quality conditions with UV transmittance of 96.4 % UVT. Additionally, the HOD technology provides disinfection to reduce the biofouling potential by eliminating anaerobic and aerobic bacterial growth in the IX media.

HOD UV: Principles of Operation

The HOD UV technology is a physical process for disinfection that exposes bacteria, viruses and protozoa to germicidal wavelengths of UV light, measured in nanometers (nm), to render them incapable of reproducing or further infecting a water system. UV light can destroy chemical contaminants through a process called UV oxidation.

The HOD UV technology is equipped with medium-pressure (MP) UV lamps that provide polychromatic UV light (200-415 nm) to enable the production of a high-density broad-spectrum UV light that can inactivate a range of bacteria, viruses and organisms. The light emitted by MP lamps is within the absorption spectrum of FAC (200-360 nm), making it the ideal for dechlorination applications.

The HOD UV technology has consistently achieved FAC levels below 0.01 ppm, or non-detect levels, in full-scale commercial application with some systems operating for more than six years with extraordinary results. The HOD UV technology is unique in its ability to disinfect and dechlorinate in a single, non-chemical process.

The HOD UV technology measures four critical parameters including % UVT, flow rate, UV lamp intensity (kW) and UV apparatus (consisting of Total Internal Reflection and Dose Pacing) in real time to maintain the minimum required UV dose. The system uses a proprietary Total Internal Reflection (TIR)-based design that, when coupled with the comprehensive monitoring of critical parameters, allows the system to achieve and maintain the specified UV dose.

The system's patented TIR technology, which is similar to fiber optic science, recycles UV light energy within the HOD UV chamber. The core of the technology is its water disinfection chamber made of high-quality quartz surrounded by an air block instead of traditional stainless steel (Figure 1). This is especially important given that in traditional UV systems metal adsorbs or "detracts" the UV dose the closer it gets to metal, whereas the TIR enhances the UV dose.

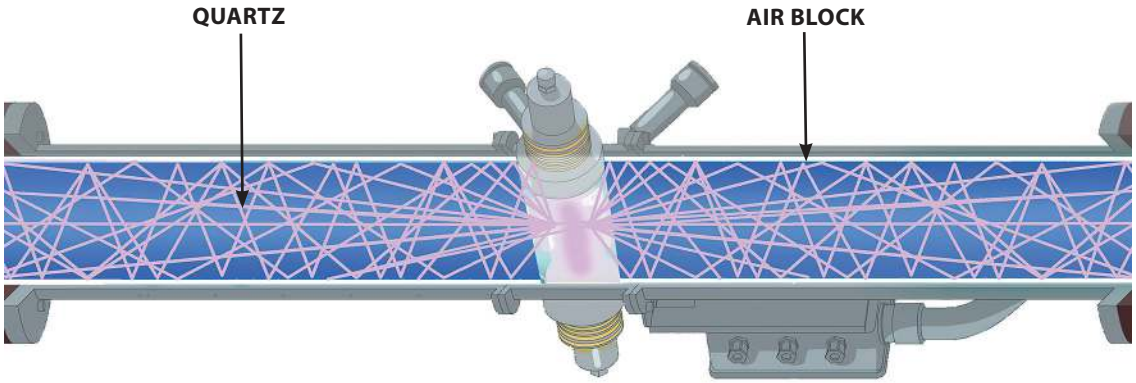

Figure 1: Atlantium Hydro-Optic™ UV Lamp and Chamber

This configuration uses fiber optic principles to trap the UV light photons and recycle their light energy. The photons repeatedly bounce through the quartz surface back into the chamber, effectively increasing their paths and their opportunities to inactivate microbes and oxidize organic compounds.

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