

Hydro-Optic™ Technology MACRO/MICRO BIOFOULING CONTROL

FirstLight Power Resources Installs Hydro-Optic™ UV System for Mussel Control at Stevenson Hydroelectric Station

The Stevenson Hydroelectric Station located in Connecticut has a nameplate capacity of approximately 28.9 megawatts. The facility is managed by FirstLight Power Resources (FirstLight), a subsidiary of H2O Power. Following the invasion of zebra mussels in the Housatonic and Shepaug Rivers and Lake Lillinonah Reservoir, FirstLight inquired about control options to protect their facilities while having little to no environmental or ecological impact. The Hydro-Optic™ (HOD) UV treatment system was selected for non-chemical control of invasive mussels in cooling water circuits in the Housatonic River Project hydroelectric system at the Stevenson.



Stevenson has four turbines, with six heat exchangers requiring protection from macro/micro biofouling from invasive mussels. In June 2016, two Hydro-Optic UV systems (Model RZ163-12HP with DPM) were commissioned. Each system accommodates a flow rate of 127.2 m³/hr (560 gpm) for water quality conditions with percent UV transmittance as low as 89.5 %UVT. The proprietary medium pressure UV systems were supplied with a deposit control mechanism, %UVT monitor, UV dose monitor, and flow meter (existing). To confirm water was flowing flow meter were used at end of the power house on the inlet side of the HOD system. This feature provided full control of all features of the HOD UV system to flow pace and control real time operator selected dose.

The HOD UV systems were installed immediately after the strainer on the 6" Schedule 80 PVC cooling water line supplied with raw water from the Housatonic River Supply in the power house. The UV systems were placed horizontally with adequate spacing for maintenance (30" on each side for ease of UV bulb removal and located 2-3' above the floor). Additionally, a bypass was installed so each unit could be taken out of service for annual maintenance while ensuring adequate flow to the cooling water for the generators. The slightly longer length of the inlet pipe as compared to the outlet pipe allows for laminar flow so that air bubbles are not created inside the UV chamber. The flow meter is used to detect when to signal the UV bulbs to shut down when no flow exists or fluid has drained out of the UV chamber. All electrical components (480V – 3 Phase) are located in a weather-proof room, dry area, that does not exceed 100°F. The system's communication is accomplished by providing TRACS and signals are taken to a lab top for monitoring the system alarms and operating parameters.

Following the full-scale installation of the Hydro-Optic UV technology at Stevenson, the technology has proven to be an environmentally friendly, non-chemical disinfection method to minimize the risk of mussel fouling by preventing invasion and infestation. The Hydro-Optic UV system is an environmentally friendly, non-chemical disinfection method to minimize the risk of mussel fouling by preventing invasion and infestation at Stevenson.

Hydro-Optic™ UV Technology: Principles of Operation

Unlike chemical treatment approaches, UV systems employ a physical process for disinfection. When bacteria, viruses and protozoa are exposed to the germicidal wavelengths of UV light, they are rendered incapable of reproducing.

Medium pressure (MP) UV lamps provide polychromatic UV light (200–415nm), while low pressure (LP) lamps provide monochromatic light (254nm). MP lamps produce a high-density broad-spectrum UV light inclusive of wavelengths responsible for disinfecting certain resistant viruses.

Since different microorganisms are sensitive to different UV wavelengths, MP lamps can easily inactivate more microorganisms, such as algae, adenovirus, and IPN, through their broad UV germicidal spectrum.

When a microorganism has been inactivated by a LP UV system, it can still repair using its own cell-repair mechanism or by summoning host repair mechanisms. In a MP UV system, the various wavelengths work together to disable cell repair mechanisms. MP lamps disable the proteins and enzymes needed to trigger repair, achieving permanent microbial inactivation at a lower dose than LP systems.

The Hydro-Optic 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.

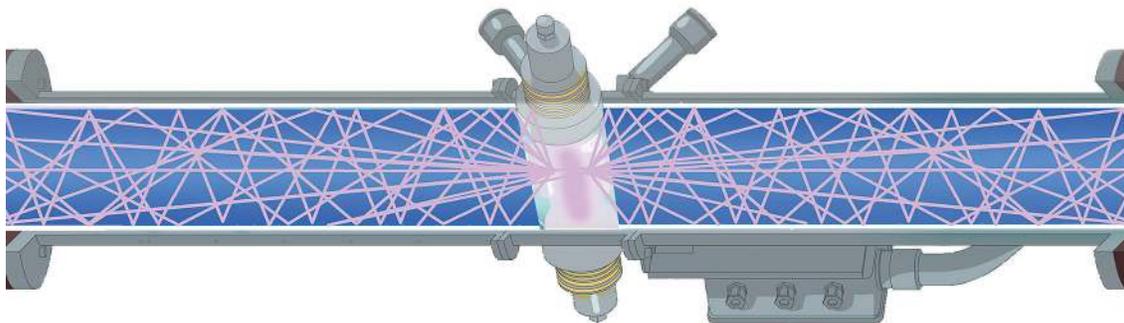


Figure 1: Atlantium Hydro-Optic™ UV Lamp and Chamber

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.



Atlantium Technologies

www.atlantium.com
info@atlantium.com

For more information, contact your Atlantium representative
© 2020 Atlantium Technologies. All rights reserved. 06/20