

Hydro-Optic™ Technology
Boiler Feed Make-Up Water Disinfection

Trimble County Generating Station Installs Hydro-Optic™ UV for Non-Chemical Disinfection of Boiler Feed Make-up Water

Trimble County Generating Station, a Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU) facility located near Bedford, Ky., has installed the Hydro-Optic™ (HOD) UV treatment system as a non-chemical disinfection method to replace the use of chemical disinfectants and protect boiler feed make-up water from anaerobic and aerobic bacterial growth and associated biofouling. The HOD UV technology was installed in January 2016 to accommodate a flow rate of 600 gpm (136 m³/h) and since then the facility has achieved non-chemical boiler feed make-up water disinfection using this environmentally friendly and sustainable approach.



The Trimble County Station comprises Unit 1, a 514 MW coal-fired electric generating facility, and Unit 2, a 760 MW pulverized-coal-fired facility, and uses a multiple barrier treatment approach consisting of coagulation, clarification, gravity filtration, multi-media filters, HOD UV, micron filters, and reverse osmosis (RO) filtration, and demineralizers to treat incoming source water from the Ohio River with UV transmittance values of 90% UVT.

In 2015, the facility stopped the use of chlorine disinfectant and sodium bisulfite (SBS) neutralization to eliminate the risks of chemical exposure on the membrane elements (membrane halogen damage) and chemical handling, storage and use to the staff. Without the use of a disinfectant, the facility experienced bacterial contamination on the 5-micron filters and replaced them weekly. The HOD UV system (Model RZB163-13) was installed upstream of the 5-micron filters in advance of the two-stage single-pass RO trains in January 2016. Since the installation of the HOD UV technology, the micron filter replacement frequency reduced from weekly to monthly. The system features an advanced control and monitoring system that includes a dedicated UV sensor per lamp, integrated UVT sensor and feed from a flow meter to guarantee the required UV dose while effectively operating the system to reduce energy use.

Protecting the RO membrane elements from fouling is essential to minimizing the operational impacts of biological contamination on operating costs, which include increased membrane element and microfiltration cartridges replacement costs, decreased water quality production, and/or increased operating pressure. Whereas Trimble County was previously installing new membrane elements every two and a half years, the use of the HOD UV has extended the membrane life. The installation of the HOD UV technology has been a viable non-chemical means for biological control and membrane protection for Trimble County.

HOD UV Technology: Principles of Operation

The system's patented Total Internal Reflection (TIR) technology, which is similar to fiber optic science, recycles UV light energy within the HOD UV chamber to ensure homogenous UV dose distribution while exhibiting superior power (kW) efficiency compared to conventional UV systems (Figure 1).

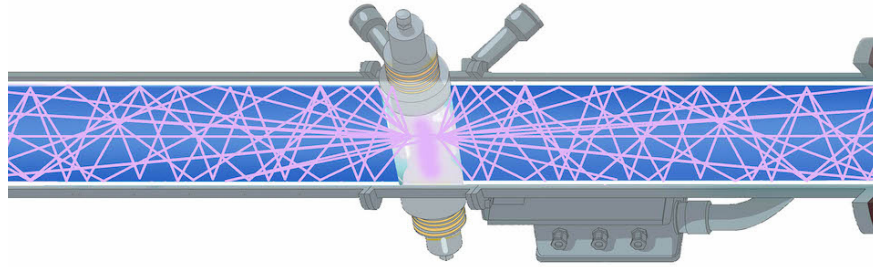
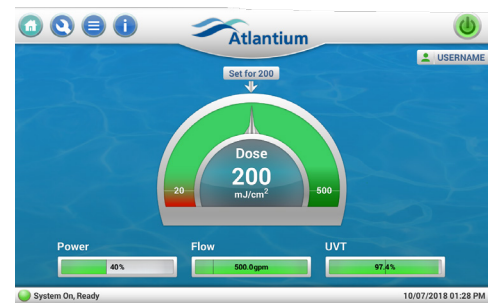


Figure 1: Atlantium Hydro-Optic™ UV Lamp and Chamber

The proprietary system also features a comprehensive control and monitoring system that includes a dedicated UV sensor per lamp, integrated UVT sensor, and feed from a flow meter to maintain the required UV dose. This advanced control and monitoring approach is unique to the HOD UV technology and ensures system performance, biosecurity and water safety through a cost-effective non-chemical solution.

Advanced Control and Monitoring

Every HOD UV system comes equipped with an advanced intuitive, user-friendly and comprehensive control interface, unmatched in the industry, to track system operation in real-time and provide operators with live data on the operation of their system and its treatment efficacy. The dashboard continuously displays UVT, flow, power and UV dose. The controller features built-in data logging capabilities for up to six months and can be customized with user settings for alarm values to control the valves and user-based management with changeable usernames and passwords. The controller can be fully integrated with a site's control SCADA system.



Enhanced HOD UV Light

All HOD UV systems feature proprietary medium-pressure (MP) UV lamps that provide a broad germicidal spectrum of polychromatic UV light (200-415 nm). MP lamps effectively inactivate and prevent the recovery of a wide range of bacteria, microorganisms, and viruses that are more resistant to low-pressure (LP) monochromatic UV light (254nm). The high-density performance of the Atlantium MP UV lamps, coupled with the unique HOD UV chamber design, enables the use of fewer UV lamps per system while significantly reducing lamp-related maintenance.

Lamp performance is continuously monitored in real time by a dedicated UV sensor per lamp on all HOD UV systems, a feature unique to Atlantium, ensuring the required UV dose is delivered at all times. Robust protection of the HOD UV lamps is provided through the use of a quartz sleeve that is five times thicker than conventional quartz sleeves and does not need to be periodically replaced. The HOD UV system also features safe, quick and easy lamp replacement that does not require emptying of the water lines or depressurization of the HOD UV system.



Atlantium Technologies

www.atlantium.com
info@atlantium.com

For more information, contact your Atlantium representative

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