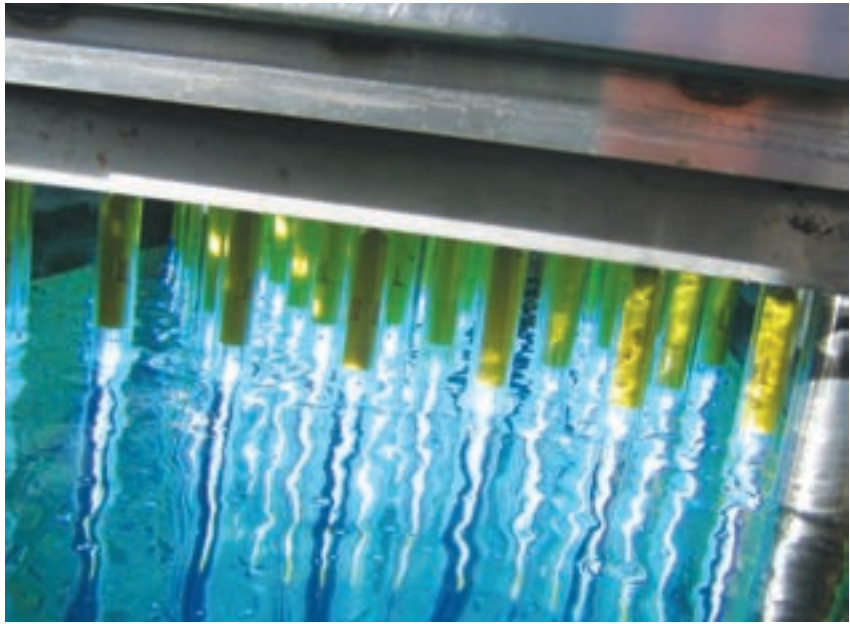


PRODUCT EMPHASIS

WRF uses UV lamps to increase treatment capacity, not footprint



Shining Light on Bacteria Disinfection

By Daryl Weatherup & Jon Mays

In 2005, the Town of Erie, Colo., installed a Barrier Sunlight V Series ultraviolet (UV) disinfection system from Siemens Water Technologies at its Erie Water Reclamation Facility (WRF). Erie replaced its aging UV disinfection system with new low-pressure, high-intensity (amalgam) lamp technology. This action resulted in increased plant capacity and improved disinfection capability, while maintaining footprint and enduring minimal construction impact.

Then

Erie's previous UV system consisted of two vertical lamp modules provided by another supplier. The old system had low-pressure/low-output lamp technology, with lamps that lasted approximately 7,500 hours.

Erie's former system also included electromagnetic ballast technology that could be plagued by poor efficiency and high heat generation. To clean the old system, operators removed a bank of modules every two weeks and soaked it in an acid wash. This process required the effluent flow to be shut down while the cleaning was performed.

"We needed to upgrade the plant so it could handle increased plant flows," said Bob Smith, Erie WRF technician III and Class A operator. "We knew our existing legacy system couldn't do all we needed."

The rated capacity of the WRF was initially 0.6 million gal per day (mgd) based on a 30-day average flow condition. In addition to increased capacity, Erie's new system had to be retrofitted into the existing channel, as the plant could not afford extensive new construction. A standard-size vertical module would not fit in the channel, so other options were sought.

Now

The Erie WRF was one of the first plants in the U.S. to incorporate a small-footprint amalgam lamp

system to treat more wastewater without new construction. The Siemens Barrier Sunlight V Series consists of three modules in series, with 25 lamps in each module. Installing the new technology into the existing channel design allowed Erie to increase the UV-C output without sacrificing efficiency or increasing footprint. After the upgrade, the WRF is rated for a 1.6-mgd average flow and a 4.5-mgd peak flow.

Each lamp is individually housed in a quartz sleeve that is oriented vertically within the effluent channel. Because the quartz sleeve is domed on the submerged end, no O-rings or seals are required below the freeboard of the effluent channel. Therefore, all electrical connections, including lamp-to-ballast connections, are made above the water surface in the channel. Lamps can be accessed while the module is in the channel—unlike in horizontal lamp configurations, where racks of lamps or entire modules must be removed to perform routine preventative maintenance.

A special internal coating that prevents the lamps from solarizing helps increase lamp life. This coating also helps the lamps perform better in extreme water temperatures, which is important given the temperature fluctuations between winter and summer months in the high plains.

The new system uses energy-efficient electronic ballasts that consume minimal power, generate modest heat



Erie WRF's new UV modules allow it to increase UV-C output without sacrificing efficiency or increasing footprint.

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UV, wastewater disinfection, amalgam lamp
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and are marginally affected by surges, sags and power interruptions. Siemens' vertical systems have integral closed-loop cooling that use an environmentally friendly coolant pumped through a heat exchanger located in the effluent to draw heat from the ballasts. This large volume of water flowing past the system is substantially cooler than the typical operating temperature of the ballasts, so it is a suitable and efficient cooling medium to pass across the heat exchanger. Forced air ventilation is often problematic because the air above the effluent channel can often be hot, humid, dirty and generally incompatible with electronic components.

With the integral closed-loop cooling system, the electronics are sealed off from ambient conditions without requiring external air-conditioning units that often draw considerable power for operation. According to Smith, ballasts operate better when they are kept cool, so operators regularly check and maintain the integral cooling system to make sure it is functioning properly.

Each UV module is a complete, functioning disinfection system. In series, they can be combined to accommodate unlimited plant flows through future expansion. Programmable logic controllers (PLCs) located inside each UV disinfection module locally control the ballasts, lamps and cooling and



Operators can clean the new UV system in less than an hour by pulling a UV bank from the water every two weeks and hosing it off.

cleaning system within that module. A master PLC control panel is at the foot of the channel to facilitate total system operation, receive and communicate signals from the plant SCADA system and allow for ease of operator interface. By controlling the modules as a complete integrated system, the plant can achieve either complete module or incremental additive flow pacing, preserving lamp life and eliminating excess power consumption.

At the Erie WRF, flow-pacing the system translates to an average three-year replacement interval for the lamps while optimizing disinfection results. The amalgam lamps are warranted for 12,000 hours and typically last longer, although they are replaced after 9,000

run hours in accordance with state regulations. Replacement costs are factored into the life-cycle operating cost benefits of these systems.

The WRF's in-house lab program ensures that the wastewater effluent is sufficiently treated to meet and surpass federal- and state-mandated regulations as well as discharge permit limits. Erie's permit is fairly strict, with 126 most probable number/100 mL *E. coli* average on a monthly basis.

Smith said the plant has not had a single violation since installing the new UV systems. The facility continues to achieve excellent bacterial disinfection results that consistently remain at or below 20 colony-forming units per 100 mL of water. **ww**

Technology Overview

The Barrier Sunlight V UV system is a vertical open-channel system ideally suited for wastewater and water reuse applications. The most significant benefits of the system are its compact design, easy maintenance—including easy-to-access lamps—and energy-efficient electronic ballasts. Additional benefits include ease of upgrading to increase treatment capacities and retrofitting to existing chlorine contact chambers; an integrated closed-loop cooling system; built-in redundancy; automatic flow-pacing through partial module switching; and an integral, automatic quartz sleeve cleaning system.

California Title 22 certification (per National Water Research Institute guidelines) for water reuse applications is pending.

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