UV DISINFECTION EFFLUENT LEVEL CONTROL

Ultraviolet (UV) disinfection is a chemical-free process often employed by wastewater treatment operations as the last stage of treatment to meet tight bacterial limitations on plant discharges. The reliability and efficiency of a UV system is critical to mitigating the threat of permit violations and fines for the discharge of improperly disinfected wastewater effluent. For UV systems with horizontal or slanted lamp orientation, the means to control water levels in the channels is a known trouble spot often stemming from the method of actuation used to regulate said levels.

During the UV disinfection process, treated wastewater is exposed to UV light, causing cellular damage to any microorganisms present, effectively inactivating them. Pathogens such as viruses and bacteria will be incapable of reproducing or infecting anyone after this process. The key to successful disinfection is proper UV exposure: otherwise, some micro-organisms may be discharged without being effectively inactivated. For UV systems with lamps installed horizontally or slanted, proper regulation of wastewater levels in a channel is imperative to ensuring sufficient UV exposure to contaminants. Too much wastewater could dilute the exposure of pathogens to UV light, causing the potential release of microorganisms not properly inactivated and possibly resulting in permit violations or fines for the plant. On the contrary, an under filled channel has less volume of wastewater to absorb UV light. This can cause the lamps to overheat beyond their design set-points, potentially leading to premature lamp replacements that adds to operating expenditures. To address these requirements, some method of level control is required on the effluent end of each channel. The most critical requirement for many UV disinfection systems is availability. This is particularly true during wet weather months when high flow events can cause rapid flow changes for a wastewater plant. Capacity adjustments based on dynamic flows is imperative for any UV system. The means for responding to changing flow conditions must therefore be 100% reliable. To properly maintain wastewater levels in the face of potentially dynamic flow conditions, modulating level control for the effluent end of the channel is the best approach. Originally, weir gates with multi-turn electric actuators were used as the industry standard for UV effluent level control.

Problem

Multi-turn electric actuators are best suited for limited duty-cycle, open-closed services. When used for a modulating application, the design limitations of these actuators are quickly exposed.

Electric actuators are all gear based devices that are very susceptible to gear wear the more they operate. Over time, gears can become misaligned or seize up, resulting in actuator downtime that can limit the availability of a UV channel.

Electric actuators are also inaccurate modulating devices, only capable of following a control signal with a resolution of ~2% accuracy, at best. For a level control gate service, electric actuators will often "hunt" around a target set-point, making small adjustments above and below a target level they cannot reach due to poor positioning resolution. This "hunting" can fluctuate effluent levels in a channel, potentially causing improper disinfection (if the effluent levels get too high) or overheating of the lamps (if the effluent levels get too low). With time, gear wear of electric actuators will further degrade the resolution of these actuators, exacerbating both "hunting" and gear wear.

Recognition of these issues in the field caused many UV disinfection system suppliers to steer clear of using electric actuators for modulating control of their channel effluent gates. Weighted flap gates are often employed in lieu of electric actuators. This approach reduces maintenance costs and improves reliability, but it has a trade-off: weighted flap gates reduce the efficiency of each UV channel by eliminating the ability for real time control to regulate effluent levels during changing conditions. Some UV system suppliers use serpentine or fixed weirs for level control, rather than an automated effluent gate. While a simpler approach, a greater footprint is required for such installations. In addition, there can be concerns about algae growth in the serpentine effluent channels, adding another negative consideration. All the problems and concerns associated with methods for controlling effluent levels in a UV channel can be addressed with the usage of a proper actuator designed for reliable modulating duty cycle.

Solution

For UV disinfection systems, REXA has demonstrated unmatched ability to eliminate the problems commonly experienced by other methods of effluent level control.

- Continuous modulating duty cycle control with gate position accuracy as tight as 0.05% resolution, ensuring that your effluent levels are properly maintained regardless of dynamic flow conditions.

- Fail-in-place & fail safe options that can position or hold any gate as required during a loss of power or emergency condition. This can be used to provide isolation via a gate closure in an emergency condition, if your operation requires such a fail-safe.

- 5 year product warranty as well as an expected 10-20 year maintenance free cycle, offering the most reliable option to ensure availability of each UV channel in the face of changing flow conditions.

No other actuator can provide the peace of mind offered by REXA to consulting engineers or wastewater operations for reliable operation of your UV Effluent Level Control Gates. Join other wastewater agencies who have learned from experience that the sure way to properly and reliably expose your effluent to UV light is to rely on REXA.

Headquarters & Factory

REXA, Inc.
4 Manley St.
West Bridgewater, MA 02379
Tel: 508-584-1199

Sales, Service, & Training

REXA, Inc.
20338 Telge Road, Building E
Tomball, TX 77377
Tel: 281-944-4490

Sales & Service

REXA, Inc.
7110 Oak Ridge PKWY. Suite 170
Austell, GA 30168
Tel: 770-857-0003

An ISO: 9001 Company

www.rexa.com