TROJANUV3000PLUS™

Wastewater Disinfection

TROJAN UV™

Water Confidence™

The Reference Standard in UV

Proven, chemical-free disinfection from the industry leader

UV is the most effective, safe and environmentally friendly way to disinfect wastewater. It provides broad-spectrum protection against a wide range of pathogens, including bacteria, viruses and chlorine-resistant protozoa (such as *Cryptosporidium* and *Giardia).*

The TrojanUV3000Plus™ is one of the reasons why UV treatment is now a favored technology in wastewater treatment. This highly flexible system has demonstrated effective and reliable performance around the world. It is well suited to wastewater disinfection applications with varying flow rates and influent. These include particularly challenging influents such as combined sewer overflows, primary and tertiary wastewater reclamation and reuse.

The proven infrastructure of the TrojanUV3000Plus has been continuously refined to enhance friendly operation. The result is more dependable performance, simplified maintenance and maximized UV lamp output at end-of-lamp life. The TrojanUV3000Plus also incorporates innovative features to further reduce operation and maintenance (O&M) costs, such as variable output electronic ballasts and our revolutionary ActiClean™ automatic chemical/mechanical sleeve wiping system.

TROJAN UV3000PLUS™

Designed for efficient, reliable performance

System Control Center (SCC)

The SCC monitors and controls all UV functions to ensure proper disinfection performance while conserving power and extending lamp life. The microprocessor-based Touch Smart Controller is housed in a small panel and features a user-friendly, touch-screen Human Machine Interface (HMI) along with Modbus Ethernet or Modbus RTU for SCADA connectivity. Along with dose-pacing control, the Touch Smart controller logs data for trending and analysis (flow, power, UVT, UV intensity and dose). A Programmable Logic Controller (PLC) can be supplied for larger systems (with more than 2 channels) for the advanced controls required for multiple channel operation and automatic slide/ sluice gate control.

Alarms

Extensive alarm reporting system ensures fast and accurate diagnosing of system process and maintenance alarms. Programmable control software can generate unique alarms for individual applications.

Power Distribution Center (PDC)

The PDC powers each bank of modules. Its ergonomic, angled design provides easy access to module power cables and hoses for the ActiClean cleaning system. The robust stainless steel enclosure is mounted across the channel, with module fuses and interlock relays visually aligned with module receptacles for fast diagnostics. Modules are individually overload-protected for safety. Like all TrojanUV3000Plus components, the PDC can be installed outdoors and requires no shelter, Heating, Ventilation or Air Conditioning (HVAC).

UV Intensity Sensor

The UV intensity sensor continually monitors UV lamp output. The ActiClean system automatically cleans lamp and sensor sleeves simultaneously.

Electronic Ballasts

The variable-output (60 - 100% power) electronic ballast is mounted in its own TYPE 6P (IP67) rated enclosure within the module frame. Features “quick connect” electrical connections. Cooling is by convection.

ActiClean Cleaning System

The system consists of two components:

1. Hydraulic System Center (HSC)

The HSC actuates the ActiClean cleaning system, and is mounted close to the channel in a stainless steel enclosure. It contains the pump, valves and ancillary equipment required to operate the cleaning system and links to the extend/retract hoses of the module wiper drives via a manifold located on the underside of the PDC.

2. ActiClean Wiper Assembly

A submersible wiper drive on each UV module drives the wiper carriage assembly along the module. Attached wiper canisters surround the quartz sleeves, and are filled with ActiClean-WW Gel. The gel uses food grade ingredients and contacts the lamp sleeves between the two wiper seals. Cleaning takes place while the lamps are submerged and while they are operating.

Water Level Sensor

The system includes an electrode low water level sensor for each channel. If effluent levels fall below defined parameters, an alarm will be activated.

UV Modules

UV lamps are mounted on modules installed in open channels. The lamps are enclosed in quartz sleeves, and positioned horizontally and parallel to water flow. A bank is made up of multiple modules placed in parallel. All ballast and lamp wiring runs inside the module frame.

Water Level Controller

A fixed weir, motorized weir gate, or Automatic Level Control gate (shown), is required in the channel to maintain the appropriate water level over the lamps. Trojan engineers will work with you to select the appropriate level control device for your application.

Key Benefits
TrojanUV3000Plus

Increased operator, community and environmental safety.
No disinfection by-products are created, and no chemicals are transported, stored or handled.

Most efficient UV system available. Compared to competitive low-pressure, high-output (LPHO) or amalgam lamp-based systems.

Reduces operating costs by as much as 30% per year. Long-lasting amalgam lamps and variable-output ballasts optimize UV output to meet wastewater conditions and maximize system efficiency.

Validated disinfection. Real-world, field performance data eliminates sizing assumptions resulting from theoretical dose calculations.

Dual-action sleeve cleaning system improves performance and reduces labor costs. Automatic ActiClean chemical/mechanical cleaning system maintains sleeve transmittance of at least 95%, and works online – eliminating the need to remove modules from the channel.

Reduced installation costs. The compact TrojanUV3000Plus can be retrofitted into existing chlorine contact tanks, and comes pre-tested, pre-assembled and pre-wired to minimize installation costs.

Outdoor installation flexibility. Can be installed outdoors, eliminating the need and costs of a building, shelter and HVAC for ballast cooling.

Guaranteed performance and comprehensive warranty. Includes a Performance Guarantee and the best lamp warranty in the industry.

ActiClean Dual-Action, Automatic Cleaning System

Chemical/mechanical cleaning system eliminates sleeve fouling

Benefits:

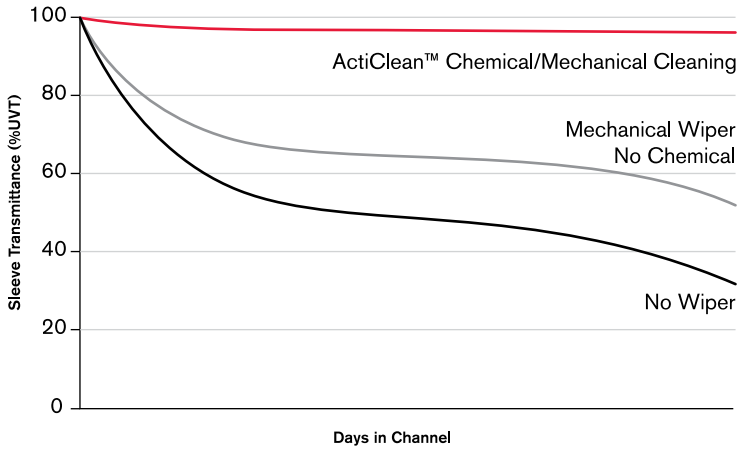
- Cleans 50% more effectively than mechanical wiping alone
- Improves lamp performance for more reliable dose delivery
- Reduced fouling reduces equipment sizing requirements and power consumption
- Automatic, online cleaning reduces O&M costs associated with manual cleaning
- Combination of chemical and mechanical cleaning action removes deposits on quartz lamp and sensor sleeves much more effectively than mechanical wiping alone
- Innovative wiper design incorporates a small quantity of ActiClean-WW Gel for superior, dual-action cleaning
- Automatic cleaning avoids the need to shut down the system during routine cleaning, reducung O&M costs.
- Proven in hundreds of systems around the world, including use in plants where heavy fouling had previously prohibited the use of UV disinfection technology
- Can be added to an installed TrojanUV3000Plus not originally equipped with a cleaning system

ActiClean-WW Gel is Safe to Handle

- ActiClean-WW Gel is comprised of food-grade ingredients
- Quick connect on cleaning system allows for easy refill of gel solution
- Lubricating action of ActiClean-WW Gel maximizes life of wiper seals

The dual-action, chemical/mechanical cleaning with the ActiClean system provides superior sleeve cleaning and reduces maintenance costs. Fouling and residue build-up on quartz sleeves reduces system efficiency. ActiClean maintains at least 95% transmittance, ensuring sleeves are clean and the system is consistently delivering accurate dosing while reducing power consumption.

Efficacy of Cleaning Technologies to Control Sleeve Fouling



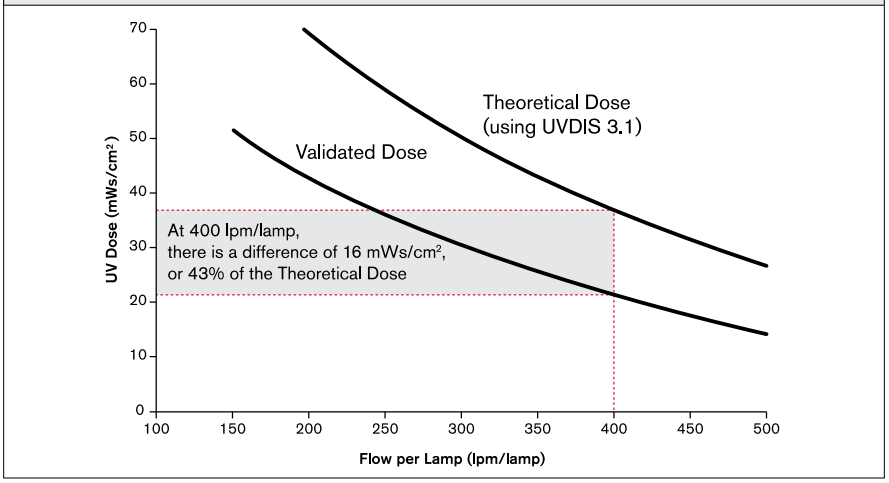
Regulatory-Endorsed Bioassay Validation

Real-world testing ensures accurate dose delivery

Benefits:

- Performance data is generated from actual field testing over a range of flow rates, effluent qualities, and UVTs
- Provides physical verification that system will perform as expected; ensures public and environmental safety
- Provides accurate assessment of equipment sizing needs
- In-field bioassay testing offers the peace of mind and improved public and environmental safety of verified dose delivery – not theoretical calculations
- The USEPA, NWRI and IUVA has endorsed bioassay as the cornerstone for UV reactor performance and UV dose delivery

Field Validated Dose vs. Theoretical Dose at 65% UVT
(Before Fouling & Lamp Aging Are Taken into Account)



This shows the validated dose of an actual working system and the theoretical dose calculated using UVDIS. Note that the UVDIS 3.1 dose calculation overestimates the system performance.

Amalgam Lamps Require Less Energy

Require fewer lamps and reduce O&M costs

Benefits:

- Draw less energy than competitive high-output systems – only 250 watts per lamp
- Stable UV output over a wide range of water temperatures
- Fewer lamps are required to deliver the required dose, which reduces O&M costs
- Can treat lower quality wastewater such as primary effluents, combined sewer overflows and storm water
- Fewer lamps allow systems to be located in compact spaces, reducing installation costs

Trojan's high-efficiency amalgam lamps generate stable UV output in a wide range of water temperatures.

- Produce significantly higher UV output than conventional low-output lamps
- Fast and simple lamp change-outs – replacing a 50-lamp system takes less than two hours and requires no tools
- Sealed inside heavy-duty quartz sleeves by our multi-seal system, maintaining a watertight barrier around the internal wiring while individually isolating each lamp and the module frame
- Pre-heated for reliable startup

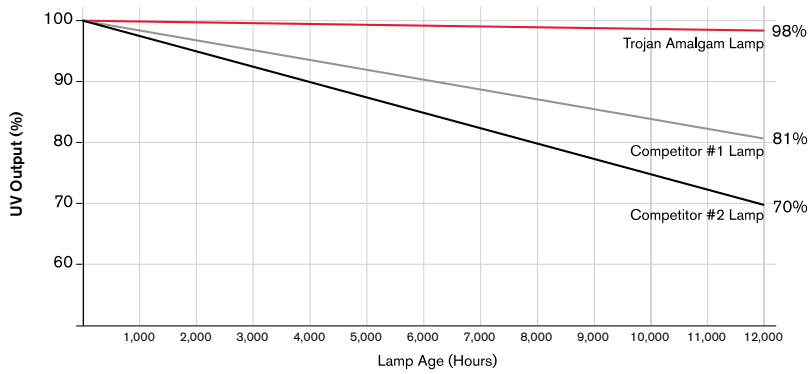
Amalgam Lamps Maintain Maximum UV Output

Trojan lamps deliver 98% of full UV output after more than one year of use

Benefits:

- Deliver the most consistent UV output
- Have 20% less decline in UV output after 12,000 hours of use compared to competitive UV lamps
- Validated performance assures you of reliable dose delivery and prolonged lamp life

Decrease in UV Lamp Output Over Time



The lamps used on the TrojanUV3000Plus system have been independently validated in accordance with standards set in the AwwaRF/NWRI 2003 Guidelines for Drinking Water and Water Reuse to maintain 98% of original output after 12,000 hours of operation.

Open-Channel Architecture Designed for Outdoor Installation

Cost-effective to install and expand

Benefits:

- Compact, open-channel design allows cost-effective installation in existing effluent channels and chlorine contact chambers
- System can be installed outdoors to reduce capital costs – no building, shelter or HVAC is required
- Gravity-fed design eliminates costs of pressurized vessels, piping and pumps
- Scalable architecture allows precise sizing – reduces capital and O&M costs associated with oversizing
- Modular design is readily expandable to meet new regulatory or capacity requirements
- Thorough design approach ensures that effluent quality, upstream treatment processes, and O&M needs are addressed in system configurations
- Horizontal lamp mounting delivers optimal hydraulic performance. This arrangement induces turbulence and dispersion, maximizing wastewater exposure to UV output

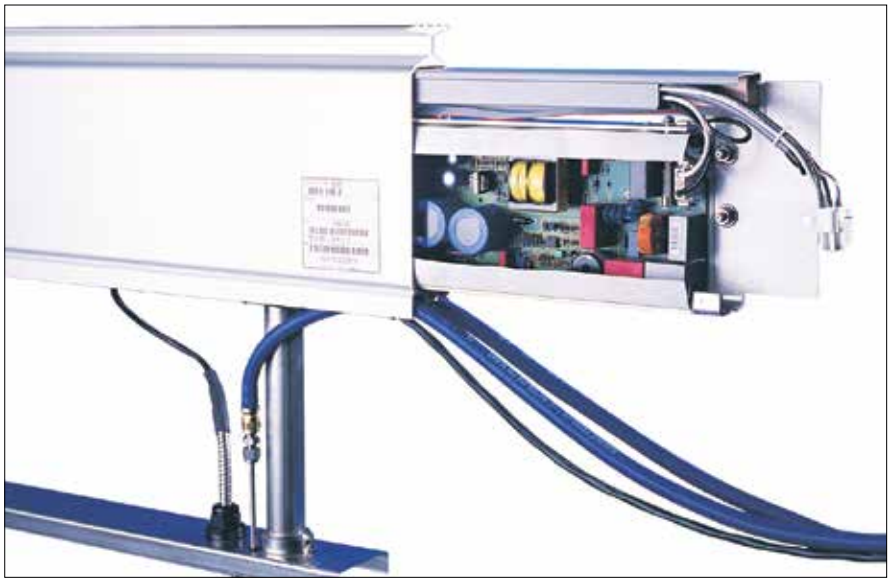
The TrojanUV3000Plus system delivers flexibility and cost savings through its simple installation in existing channels and chlorine contact chambers. The system can be situated outdoors with no additional building, shelter or cooling requirements.

Advanced, Self-Contained UV Module

Dramatically reduces footprint size and eliminates costs of air conditioning

Benefits:

- Lamps are protected in a fully submersible, 316 stainless steel frame
- Waterproof module frame protects cables from effluent, fouling and UV light
- Electronic ballasts are housed right in the module, reducing the system footprint, minimizing installation time and costs and eliminating the need for separate external cabinets
- Ballast enclosures are rated TYPE 6P (IP67) – air/water tight
- Module leg and lamp connector have a hydrodynamic profile to reduce headloss
- The variable-output, electronic ballast is mounted in an enclosure integrated within the module frame
- Wiring is pre-installed and factory-tested



Module-mounted ballasts allow for compact installation, convection cooling and protect wires and cables from exposure to effluent and UV light.

- Cooling ballasts by convection eliminates costs associated with air conditioning and forced-air cooling

Module leg and lamp connector have a hydrodynamic profile to reduce headloss and potential for debris fouling.

Designed for Easy Maintenance

UV lamps are easily replaced in minutes without the need for tools.

- TrojanUV3000Plus lamps are warranted for 12,000 hours
- Modular design allows for maintenance on one module without disrupting disinfection performance
- Maintenance limited to replacing lamps and ActiClean Gel
- Automated ActiClean cleaning system reduces manual labor associated with cleaning sleeves

Quick connect allows for easy refill of ActiClean-WW Gel.

System Specifications

System Characteristics	TrojanUV3000Plus
Typical Applications	Wide range of wastewater treatment plants
Lamp Type	High-efficiency Amalgam
Ballast Type	Electronic, variable output (60 to 100% power)
Input Power Per Lamp	250 Watts
Lamp Configuration	Horizontal, parallel flow
Module Configuration	4, 6 or 8 lamps per module
Level Control Device Options	ALC, fixed weir or motorized weir gate
Water Level Sensor	1 electrode low water level sensor per channel
Enclosure Ratings:	
Module Frame / Ballast Enclosure	TYPE 6P (IP68) / TYPE 6P (IP67)
All Other Enclosures	TYPE 4X (IP56)
Ballast Cooling Method	Convection; no air conditioning or forced air required
Installation Location	Indoor or outdoor
Sleeve Cleaning System:	
ActiClean Cleaning System	Optional Automatic Chemical/Mechanical Cleaning System
ActiClean-WW Gel	Non-corrosive, operator-friendly
Recommended Fouling Factor	1.0
System Control Center:	
Controller	Touch Smart Controller or PLC-based
Analog Inputs (Typical)	Flow (4-20 mA) and UVT (4-20 mA)
Discrete Outputs (Typical)	Bank status, common alarms and SCADA communication
Maximum Distance from UV Channel	500 ft. (152 m)
Electrical Requirements:	
Power Distribution Center	208Y/120V, 3 phase, 4 wire + GND, 60 Hz (Max. 8 modules per PDC) 480Y/277V, 3 phase, 4 wire + GND, 60 Hz 380Y/220V, 3 phase, 4 wire + GND, 50/60 Hz 400Y/230V, 3 phase, 4 wire + GND, 50/60 Hz 415Y/240V, 3 phase, 4 wire + GND, 50/60 Hz
System Control Center (stand alone)	120V, single phase, 2 wire + GND, 60 Hz, 1.8 kVA 220/230/240V, single phase, 2 wire + GND, 50/60 Hz, 1.8kVA
Hydraulic System Center (for Sleeve Cleaning System)	208V, 3 phase, 3 wire + GND, 60 Hz 380/400/415 V, 3 phase, 3 wire + GND, 50/60 Hz 480 V, 3 phase, 3 wire + GND, 60 Hz or 2.5kVA HSC powered from PDC
Water Level Sensor	24VDC powered from PDC

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