

WASTEWATER DISINFECTION





The reference standard in UV

Proven, chemical-free disinfection from the industry leader

Trojan Technologies Inc. is an ISO 9001 registered company that has set the standard for proven UV technology and ongoing innovation for more than 25 years. With unmatched scientific and technical expertise, and a global network of water treatment specialists, representatives and technicians, Trojan is trusted more than any other firm as the best choice for municipal UV solutions. Trojan has the largest UV installation base – over 4,000 municipal installations worldwide – and almost one in five

North American wastewater treatment plants rely on our proven, chemical-free disinfection solutions. The TrojanUV3000Plus™ is one of the reasons why. This highly flexible system has demonstrated its effective, reliable performance around the world in over 400 installations. It is well suited to wastewater disinfection applications with a wide range of flow rates, including challenging effluent such as combined sewer overflows, primary and tertiary wastewater reclamation

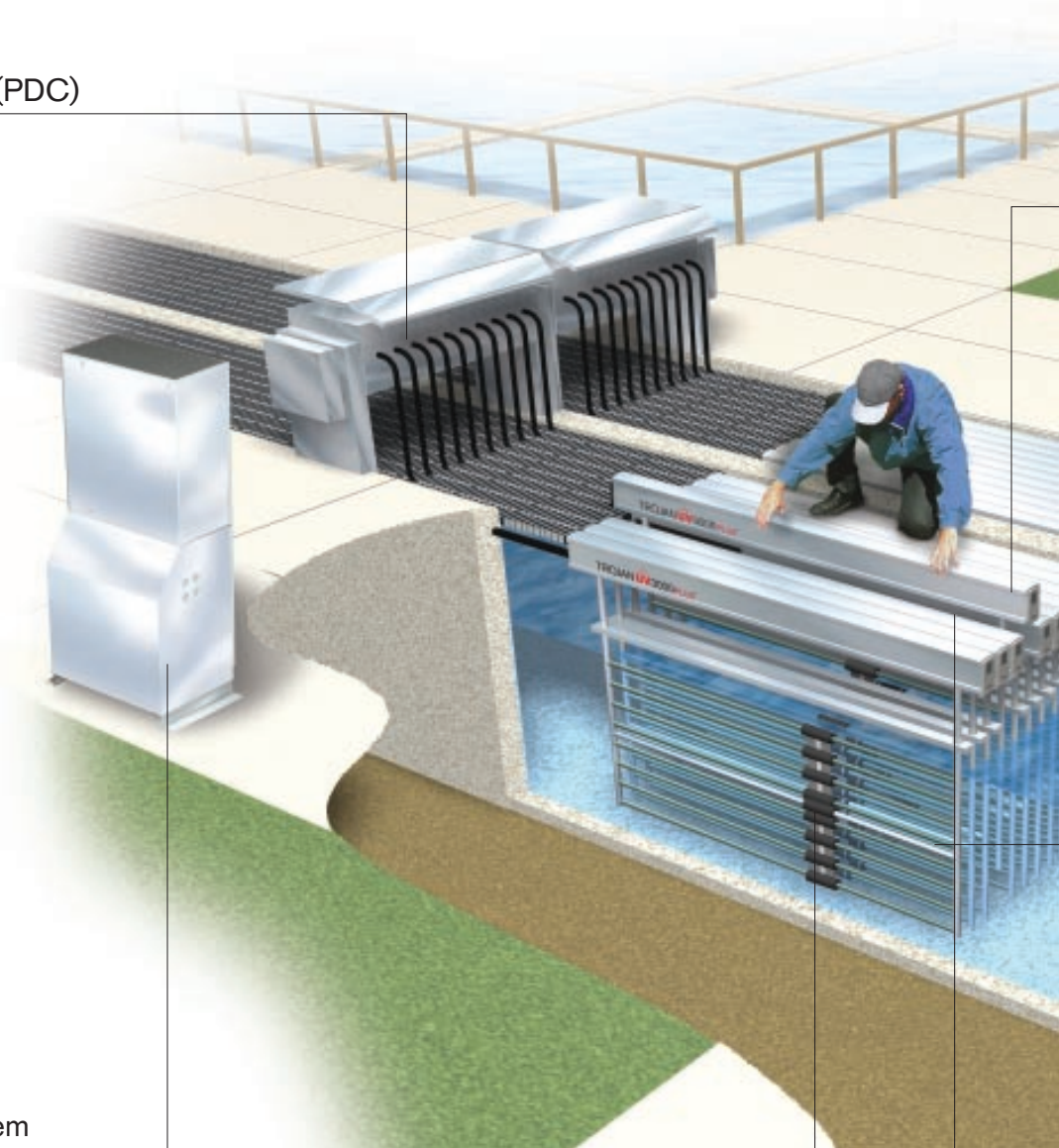
and reuse. Engineered and built for dependable performance, the TrojanUV3000Plus™ requires minimal maintenance, and delivers long lamp life. It also incorporates innovative features to reduce O&M costs, including variable output electronic ballasts and Trojan's revolutionary ActiClean™ system – the industry's only chemical/mechanical sleeve cleaning system.

TROJAN UV3000 PLUS™

Designed for efficient, reliable performance

Power Distribution Center (PDC)

Powers each bank of modules. Heavy-gauge stainless steel enclosure mounted across the channel. Consists of a service entrance and a bus bar power distribution system for incoming power. Power is relayed from the bus bar to individual UV modules through stainless steel receptacles. All UV modules are individually ground-fault and overload protected for safety. Like all Trojan UV3000Plus™ components, the PDC can be installed outdoors and requires no shelter or air conditioning.



ActiClean™ Cleaning System

The optional ActiClean™ Chemical/Mechanical Sleeve Cleaning System consists of two components:

1. Hydraulic System Center (HSC)

The Hydraulic System Center (HSC) actuates the cleaning system. Located close to the channel in a stainless steel enclosure (or mounted directly on the PDC) it contains the pump, valves and ancillaries for the cleaning system. Hydraulic fluid is pumped to manifolds located on the underside of the Power Distribution Center (PDC). Extend and retract hoses run from the manifolds to the wiper drive on each module and complete the hydraulic loop.

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 Trojan's ActiClean™ 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.





Electronic Ballasts

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

System Control Center

The SCC monitors and controls all UV functions and dose pacing. Consists of a PLC or microprocessor-based controller, operator interface, input/output connections and communications hardware mounted in a stainless steel enclosure. The dose pacing program conserves power and extends lamp life by varying lamp intensity and controlling bank on/off status according to flow variations. Remote monitoring capabilities allow technicians and operators to monitor lamp operating status, power levels, hours of operation, and other parameters remotely.

Alarms

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

PARAMETER	UNIT	MIN	MAX	STATUS	UNIT	MIN	MAX	STATUS
UV INTENSITY	μW/cm²	100	1000	OK	UV INTENSITY	100	1000	OK
UV DOSE	mJ/cm²	100	1000	OK	UV DOSE	100	1000	OK
UV DOSE RATE	mJ/cm²/min	100	1000	OK	UV DOSE RATE	100	1000	OK
UV LAMP HOURS	Hours	0	10000	OK	UV LAMP HOURS	0	10000	OK
UV LAMP CURRENT	Amps	0	10	OK	UV LAMP CURRENT	0	10	OK
UV LAMP VOLTAGE	Volts	0	1000	OK	UV LAMP VOLTAGE	0	1000	OK
UV LAMP POWER	Watts	0	1000	OK	UV LAMP POWER	0	1000	OK
UV LAMP TEMPERATURE	°C	0	100	OK	UV LAMP TEMPERATURE	0	100	OK
UV LAMP LIFE	Hours	0	10000	OK	UV LAMP LIFE	0	10000	OK
UV LAMP FAILURE	Count	0	10	OK	UV LAMP FAILURE	0	10	OK
UV LAMP ERROR	Count	0	10	OK	UV LAMP ERROR	0	10	OK

Water Level Controller

A fixed weir, motorized weir gate, or Automatic Level Control (ALC) gate 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.

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 positions. All ballast and lamp wiring runs inside the module frame.



UV Intensity Sensor

The UV intensity sensor continually monitors UV lamp output to ensure specified UV dose levels are maintained. The optional ActiClean™ cleaning system automatically cleans the sensor sleeve every time lamp sleeves are cleaned.

Key Benefits

TrojanUV3000Plus™

Increased operator, community and environmental safety.

The TrojanUV3000Plus™ uses environmentally-friendly ultraviolet light – the safest alternative for wastewater disinfection. No disinfection by-products are created, and no chemicals must be transported, stored or handled.

Well suited to changing regulations. Trojan UV systems do not have any negative impact on receiving waters and do not produce disinfection by-products, making them a strategic, long-term choice as regulations become increasingly stringent.

Most efficient UV system available versus 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 versus competitive UV systems.

Proven disinfection based on actual dose delivery testing (bioassay validation), and over 400 TrojanUV3000Plus™ installations worldwide. Real-world, field performance data eliminates sizing assumptions resulting from theoretical dose calculations.

Dual-action sleeve cleaning system improves performance and reduces labor costs. Optional 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. The entire TrojanUV3000Plus™ system can be installed outdoors, eliminating the need and costs of a building, shelter, and air conditioning for ballast cooling.

Guaranteed performance and comprehensive warranty. Trojan systems include a Lifetime Performance Guarantee, the best lamp warranty in the industry, and use lamps from multiple approved suppliers. Ask for details.

ActiClean™ Dual-Action Automatic Cleaning System

Optional chemical/mechanical cleaning system eliminates sleeve fouling

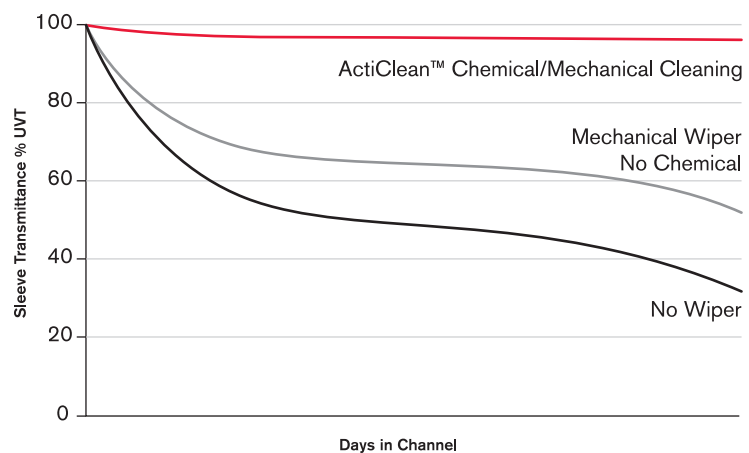
Benefits:

- **Cleans 50% more effectively than mechanical wiping alone**
- **Improves lamp performance for more reliable dose delivery**
- **Elimination of fouling factor 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™ Gel for superior, dual-action cleaning
- Cleans automatically while the lamps are disinfecting. There's no need to shut down the system, remove or bypass lamp modules for routine cleaning
- Trojan's ActiClean™ cleaning system has been proven effective in hundreds of systems around the world, including use in plants where heavy fouling had previously prohibited the use of UV disinfection technology
- ActiClean™ can be added to an installed TrojanUV3000Plus™ not originally equipped with a cleaning system



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



ActiClean™ Gel is Safe to Handle

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

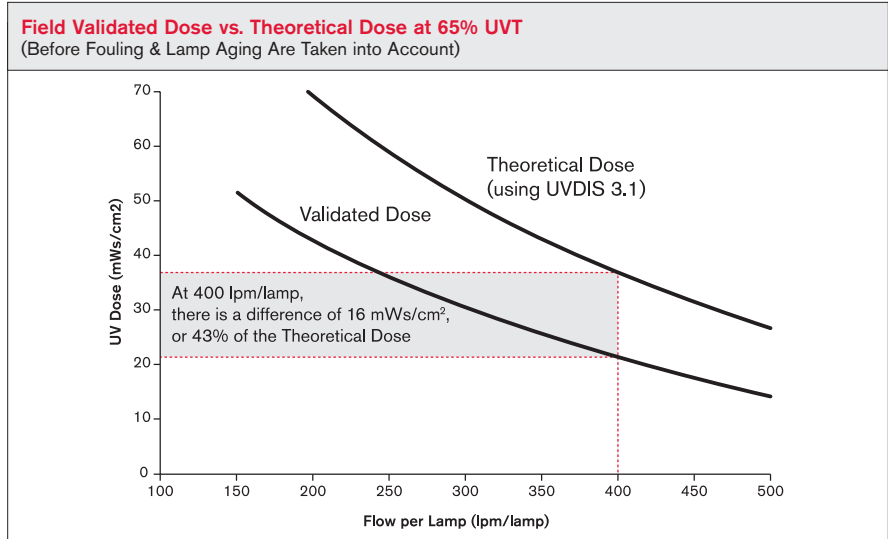
Regulatory-Endorsed Bioassay Validation

Real-world testing ensures accurate dose delivery

Benefits:

- Performance data is generated from actual field testing over a range of flow rates, effluent quality, and UVTs
- Provides physical verification that system will perform as expected; ensures public and environmental safety
- Provides accurate assessment of equipment sizing needs
- The Trojan UV3000Plus™ has been thoroughly validated through real-world bioassay testing under a wide range of operating conditions
- In-field bioassay testing offers the peace of mind and improved public and environmental safety of verified dose delivery – not theoretical calculations

- The USEPA has endorsed bioassays as the standard for assessment and comparison of UV technologies
- The disinfection performance ratings for the Trojan UV3000Plus™ are proof that what you see is what you actually get



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 amalgam lamps generate stable UV output in a wide range of water temperatures, and use energy very efficiently.

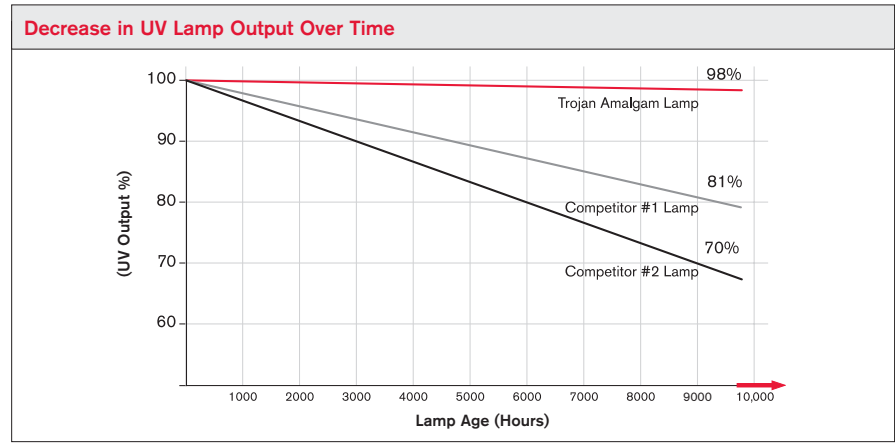
- Trojan's amalgam lamps produce significantly higher UV output than conventional low-output lamps
- Fast and simple lamp changeouts; replacing a 50-lamp system takes less than two hours and requires no tools
- The lamps are sealed inside heavy-duty quartz sleeves by Trojan's multi-seal system, maintaining a watertight barrier around the internal wiring while individually isolating each lamp and the module frame
- Lamps are pre-heated for reliable startup

Amalgam Lamps Maintain Maximum UV Output

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

Benefits:

- Trojan's high efficiency, amalgam lamps deliver the most consistent UV output over their lamp life
- Trojan lamps have 20% less decline in UV output after 9,000 hours of use compared to competitive UV lamps
- Validated performance data assures you of reliable dose delivery and prolonged lamp life



TrojanUV3000Plus™ lamp has been independently validated to maintain 98% of original output after 9,000 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 tank basins
- System can be installed outdoors to reduce capital costs – no building, shelter or air conditioning 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



The TrojanUV3000Plus™ system delivers flexibility and cost savings through its simple installation in existing channels and chlorine contact tanks. The system is totally stand-alone and can be situated outdoors with no additional building, shelter or cooling requirements.

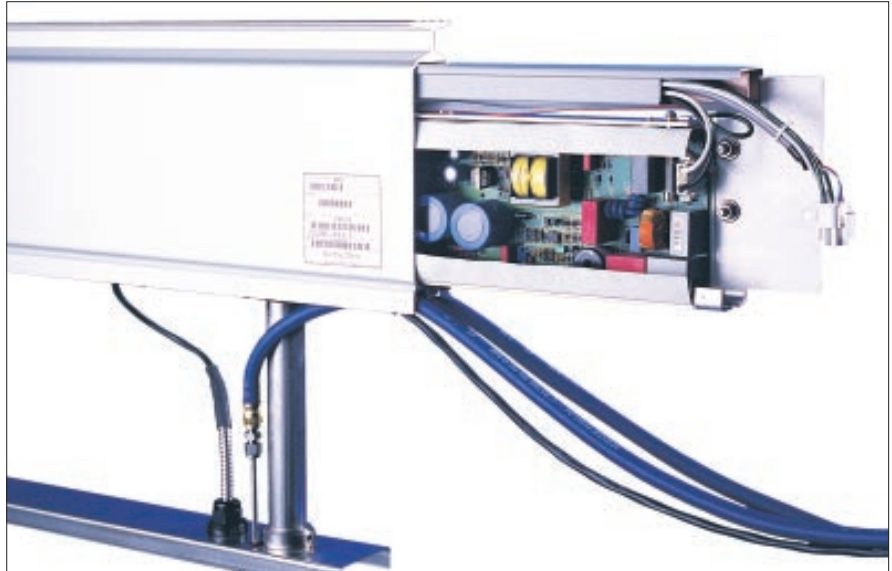
- Trojan's thorough design approach ensures that effluent quality, upstream treatment processes, and O&M needs are addressed in system configuration
- Horizontal lamp mounting delivers optimal hydraulic performance. Induces turbulence and dispersion, maximizing wastewater exposure to UV output

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, debris fouling and UV light
- Space-saving electronic ballasts are housed right in the module, so separate external cabinets are not required
- Ballast enclosures are rated 6P (air/water tight)
- Module leg and lamp connector have a hydrodynamic profile to reduce head-loss
- Ballasts are housed on the module, reducing footprint size, and minimizing installation time and costs
- The variable-output, electronic ballast is mounted in an enclosure integrated within the module frame
- Cooling ballasts by convection eliminates costs associated with air conditioning and forced-air cooling
- 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.



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

Trojan's Innovative Ballasts and Enclosures Provide Significant Advantages

Module-Mounted Ballasts	<ul style="list-style-type: none"> ▪ Take up less space and reduce footprint, minimizing installation time and costs
Convection Cooling	<ul style="list-style-type: none"> ▪ Housing the ballasts in the module allows for natural convection cooling to dissipate the heat of the ballasts into the air ▪ The ballasts are kept sealed and protected ▪ No air conditioning or forced-air cooling required
Clean, Water-Tight Protection	<ul style="list-style-type: none"> ▪ Some suppliers use external cabinets with forced-air cooling. This introduces dust and moisture onto circuit boards and other electronic components greatly reducing the life of these components ▪ Internal housing in Trojan's sealed module keeps all components dry and clean
Internal Cabling	<ul style="list-style-type: none"> ▪ All lamp-ballast wiring is contained within the module frame. This configuration protects wires and cables from exposure to effluent, debris fouling and UV light ▪ Internal cabling allows all electrical connections within the module to be factory-tested

Designed for Easy Maintenance



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

- Lamps are available from more than one source
- TrojanUV3000Plus™ lamps are warranted for 12,000 hours
- Modular design allows for maintenance on one module without disrupting disinfection performance
- Individual panels for power distribution and system control provide electrically independent and operator-friendly operation
- Maintenance limited to replacing lamps and cleaning solution
- Optional automated ActiClean™ cleaning system reduces manual labor associated with cleaning



Quick connect allows for easy refill of ActiClean™ Gel solution approximately every 12 months.

System Specifications	
System Characteristics	
Typical Applications	Wide range of wastewater treatment plants
Lamp Type	High-efficiency amalgam
Ballast Type	Electronic, variable output (60 -100% power)
Input Power per Lamp	250 Watts
Lamp Configuration	Horizontal, parallel flow
Level Control Device Options	ALC gate, fixed weir or motorized weir gate
Enclosure Ratings:	
All Enclosures	TYPE 4X (IP65)
Ballast Cooling Method	Convection, no air conditioning or forced-air required
Installation Location	Indoor or outdoor
Cleaning System Details:	
ActiClean™ Cleaning System	Optional Automatic Chemical/Mechanical Cleaning System
Recommended Fouling Factor	1.0
System Control Center:	
Controller	Microprocessor- or PLC-based
Inputs Required	4 - 20 mA flow signal
Typical Outputs Provided	Bank status, common alarms and SCADA communication
Location	Indoor or outdoor
Maximum Distance from UV Channel	500 feet (152m)
Electrical Requirements:	
Power Distribution Center(s)	50/60 Hz, 380 - 480V, 3 phase, 4 wire
System Control Center	50/60 Hz, 110 - 240V, single phase, 2 wire
Stand-alone Hydraulic System Center (for ActiClean™) OR Combined Hydraulic System Center and Power Distribution Center	50/60 Hz, 380 - 480V, 3 phase, 4 wire
Water Level Sensor	50/60 Hz, 110 - 240V, single phase, 2 wire

Find out how your wastewater treatment plant can benefit from TrojanUV3000Plus™ – call us today.

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