

Municipal UV  
Applications &  
Product  
Training



nuvonic

*formerly Aquionics, Berson, Hanovia and Orca GmbH*



**America's Nuvonic Division**  
**Charlotte, USA**  
(Sales & Service)

Regional Sales Offices = Louisiana,  
San Diego and Mexico

**Global Head Quarters,**  
**Slough, UK**  
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**Asia Division**  
**Shanghai, China**  
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Singapore

**Europe & Middle East Division**  
**Nuenen, Netherlands**  
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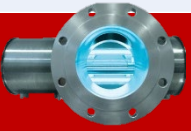
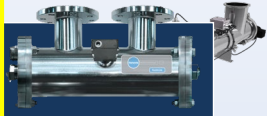
A HALMA COMPANY



## **Nuvonic UV**

- Recently in 2023 Aquionics (our former company name) rebranded and merged 3 other Halma companies under the name Nuvonic UV. To date this is our 100-year anniversary.
- Nuvonic has a product range that has over 500+ municipal installations in North America.
- Nuvonic reactors are chemical-free, therefore no harmful chemicals to transport, no storage or safety concerns. No dechlorination needed in any of the process.
- Nuvonic reactors have gone through CFD modeling to ensure peak performance under a variety of flow and water quality conditions. Internal baffles ensure that the water is pushed toward the center of the reactor, maximizing mixing and efficiency while ensuring that the highest velocity water is where the UV is most intense.

## Product Portfolio

|                                       | <br>Pools & Leisure | <br>Pharma | <br>Food & Beverage | <br>Marine | <br>Municipal | <br>Aquaculture |
|---------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| POOL WATER TREATMENT                  | SwimLine<br>PQ EO                                                                                    |                                                                                               | PureLine<br>PQ EO<br>PQ IL<br>PQ AF<br>PQ AL                                                           |                                                                                               | ProLine<br>PQ WW AL /IL<br>PQ IL<br>PQ AL<br>PQ AF                                               | RasLine<br>PQ                                                                                      |
| PERFORMANCE QUALIFIED<br>DISINFECTION |                                                                                                      | PharmaLine<br>PQ AF<br>PQ IL                                                                  |                                                                                                        |                                                                                               |                                                                                                  |                                                                                                    |
| DISINFECTION                          | SwimLine<br>PH                                                                                       | PharmaLine<br>D<br>DH                                                                         | PureLine<br>D EO<br>D AF<br>D PH                                                                       | Ballast Water                                                                                 | ProLine<br>WW IL<br>OpenLine                                                                     | RasLine<br>D PH<br>D EO                                                                            |
| CHLORINE REDUCTION                    |                                                                                                      | PharmaLine DC                                                                                 | PureLine PH<br>DC / DCD                                                                                |                                                                                               |                                                                                                  |                                                                                                    |
| OZONE REDUCTION                       |                                                                                                      | PharmaLine DO                                                                                 | PureLine<br>DO PH<br>DO AF                                                                             |                                                                                               |                                                                                                  |                                                                                                    |
| SUGAR SYRUP DISINFECTION              |                                                                                                      |                                                                                               | PureLine<br>S PH                                                                                       |                                                                                               |                                                                                                  |                                                                                                    |

|                                                                  | <br>AQUATICS | <br>INDUSTRIAL | <br>DRINKING<br>WATER | <br>WASTE-<br>WATER | <br>REUSE |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 3 <sup>RD</sup> PARTY VALIDATED<br>DISINFECTION (PQ x 5 systems) | ✓                                                                                              | ✓                                                                                                 | ✓                                                                                                        | ✓                                                                                                      | ✓                                                                                            |
| DISINFECTION (WW and Open<br>In-Channel systems)                 | ✓                                                                                              | ✓                                                                                                 |                                                                                                          | ✓                                                                                                      |                                                                                              |
| CHLORINE DIOXIDE                                                 |                                                                                                | ✓                                                                                                 |                                                                                                          |                                                                                                        |                                                                                              |
| CHLORINE REDUCTION                                               |                                                                                                | ✓                                                                                                 |                                                                                                          |                                                                                                        |                                                                                              |
| OZONE REDUCTION                                                  |                                                                                                | ✓                                                                                                 |                                                                                                          |                                                                                                        |                                                                                              |
| SUGAR SYRUP DISINFECTION                                         |                                                                                                | ✓                                                                                                 |                                                                                                          |                                                                                                        |                                                                                              |



## Validations for the PQ Line

### 1. USEPA

- PQ IL
- PQ AL
- PQ AF
- PQ EO

### 2. NWRI

- PQ IL
- PQ AL

### 3. DVGW

- PQ DVGW IL

### 4. WQA

- PQ DVGW IL 200
- PQ AL
- PQ IL
- PQ AF



- Arizona "Class A+" - California "Title 22"
- Hawaii "R1" - Florida "High Level"



**United States Environmental  
Protection Agency**



Deutscher Verein des Gas und Wasserfaches  
DVGW European Certification of UV Systems  
SAFETY AND QUALITY IN GAS AND WATER  
SUPPLY

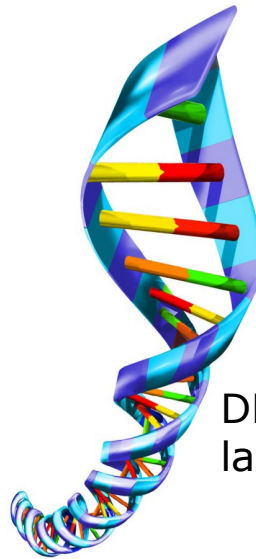


**CERTIFIED DRINKING WATER  
SYSTEM COMPONENTS**

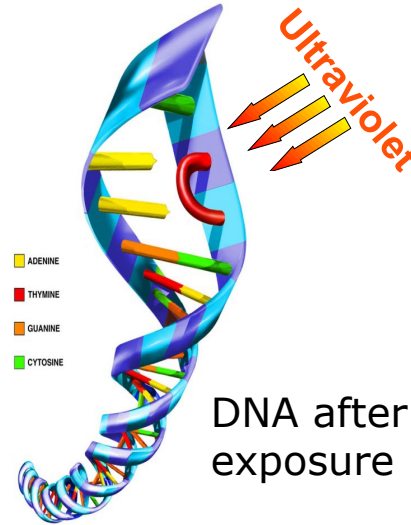
*NSF/ANSI/CAN 61 - 2022: Drinking Water  
System Components*



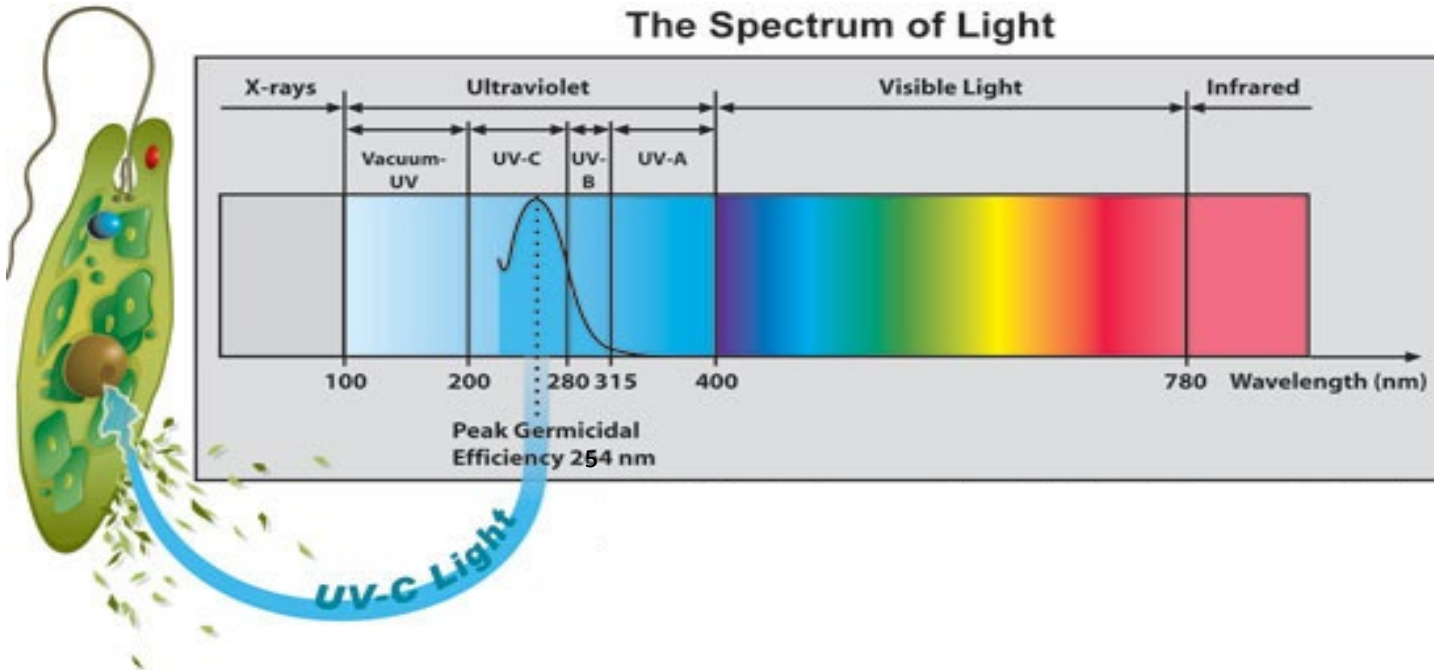
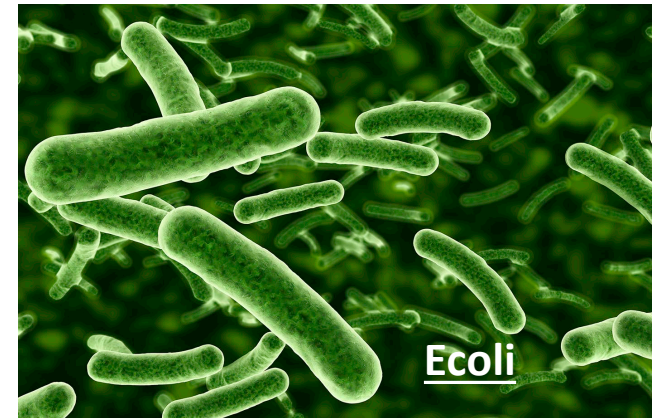
## What does UV do?



DNA before  
lamp exposure



DNA after lamp  
exposure



UV light waves penetrate cell walls. This disrupts the RNA, DNA and the enzyme bonds preventing cell reproduction. **Peak Germicidal Efficiency is 254nm.**

# Design Factors for UV

## When is UV used?

- When chemical disinfection is not acceptable against pathogens that are tolerant to chlorine. “Super bugs”.
  - Cryptosporidium
  - Giardia

## Required Parameters: to size a UV system

- **Flowrate** (minimum, and peak flows)
- Water quality = **UVT, TSS**, dissolved organics
- Required disinfection = **Dose (mJ/cm<sup>2</sup>)** / Log reduction
- **Plant hydraulics** = new plant/retrofit/gravity/pumped
- **Redundancy** requirements / validation requirements

## UVT Transmittance

| <u>Water Source</u>  | <u>UVT%</u> |
|----------------------|-------------|
| Ultrapure Water      | 100%        |
| Distilled Water      | 98%         |
| Drinking Water       | 85-95%      |
| Membrane (WW)        | 70-80%      |
| Secondary Filtered   | 65-70%      |
| Secondary Unfiltered | 50-65%      |

**UVT Transmittance** – measure the amount of UV light that can penetrate through the water being treated, tested from a sample of water. A collimated beam test may be required at some sites for their correct parameters.



## General Components of a Nuvonic UV system

- Chamber – stainless steel
- UV Lamp – provides UV disinfection. This lamp is inserted into a quartz sleeve.
- Quartz Sleeve – protective quartz crystal tube sealed inside the chamber. Negative charge / water particles are a positive charge = heated up leads to fouling
- UV Intensity Monitor – the sensor is used to monitor the intensity of the lamp used to determine the actual UV dose. Factory recalibrate after 15 months for validation
- Temperature Sensor – senses the temperature of the chamber or water to prevent the lamps to continue to operate in an event of over-temp.
- Automatic Wiper – motor driven assembly to wipe away scale or debris from the outer surface of the quartz sleeve. This allows the UV light to pass without shadowing.
- Cabinet – electrical cabinet that provides power and control to the UV system and ballast output for the lamps.

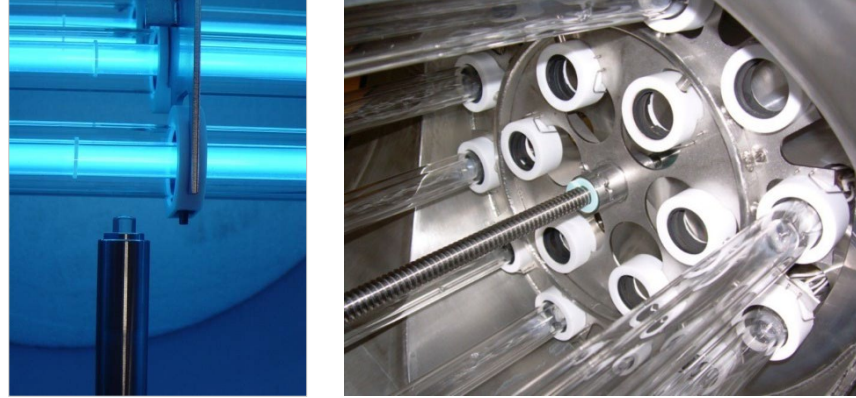


### UV Intensity Sensor

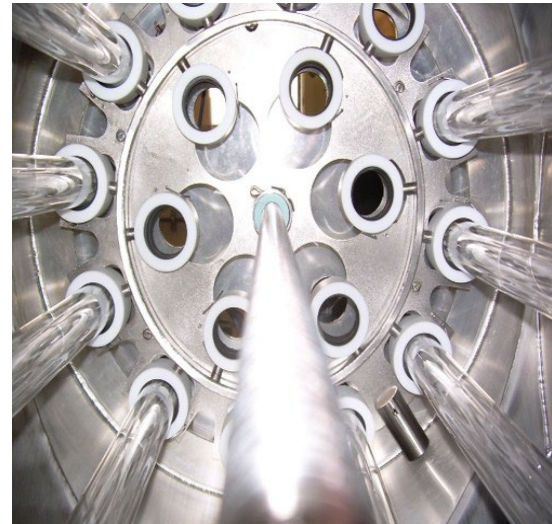


- Measures the clarity of the water exposed to UV light
- Measures wavelengths between 240nm – 290nm (100% daylight blind)
- High Accuracy
- Factory Calibrated

### Automatic Wiper



- Consist of a yoke and vitron wiper rings
- High torque drive motor
- Adjustable wiper time frequency
- Wiped sensor window



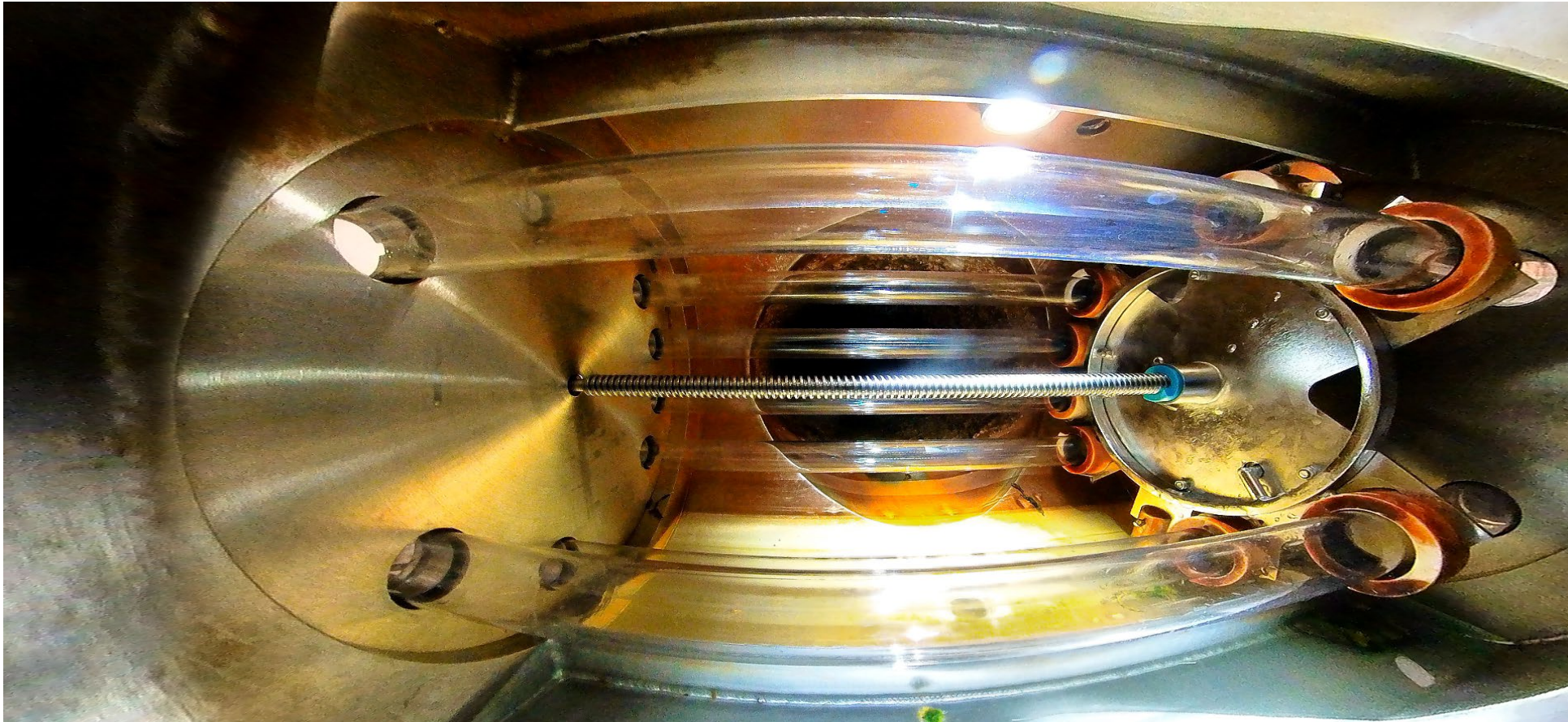
### UltraWipe Cleaning System



- A chemical assist Ultrawipe™ mechanism is available for factory install or retrofit for existing reactor in the field
- The Ultrawipe™ injects citrus based cleaning solution around the quartz sleeve from external storage with every wipe



# **AUTOMATIC CLEANING SYSTEM**



## Medium Pressure and Low Pressure Lamps – ProLine series



Lifetime hours 8,000 to 12,000

**Low-pressure (LP) Lamp** – a mercury-vapour lamp that operates at an internal pressure of 0.0145 PSI max and electrical input of **40 – 150 watts**. Mercury vapour is ionized and emits a light in the ultraviolet region. This results in ***monochromatic*** light output at 254 nm. (1 nm = 1 millionth of a millimetre).

**Monochromatic** – light output at only one wavelength.



Lifetime hours 6,000 to 10,000

**Medium-pressure (MP) Lamp** – a mercury vapor lamp that operates at an internal pressure from 2 to 200 psi and electrical input of **1000-15,000 W**. This results in a ***polychromatic*** (or broad spectrum) output of UV and visible light at multiple wavelengths, including wavelengths in the germicidal range.

**Polychromatic** – light energy output at several wavelengths.



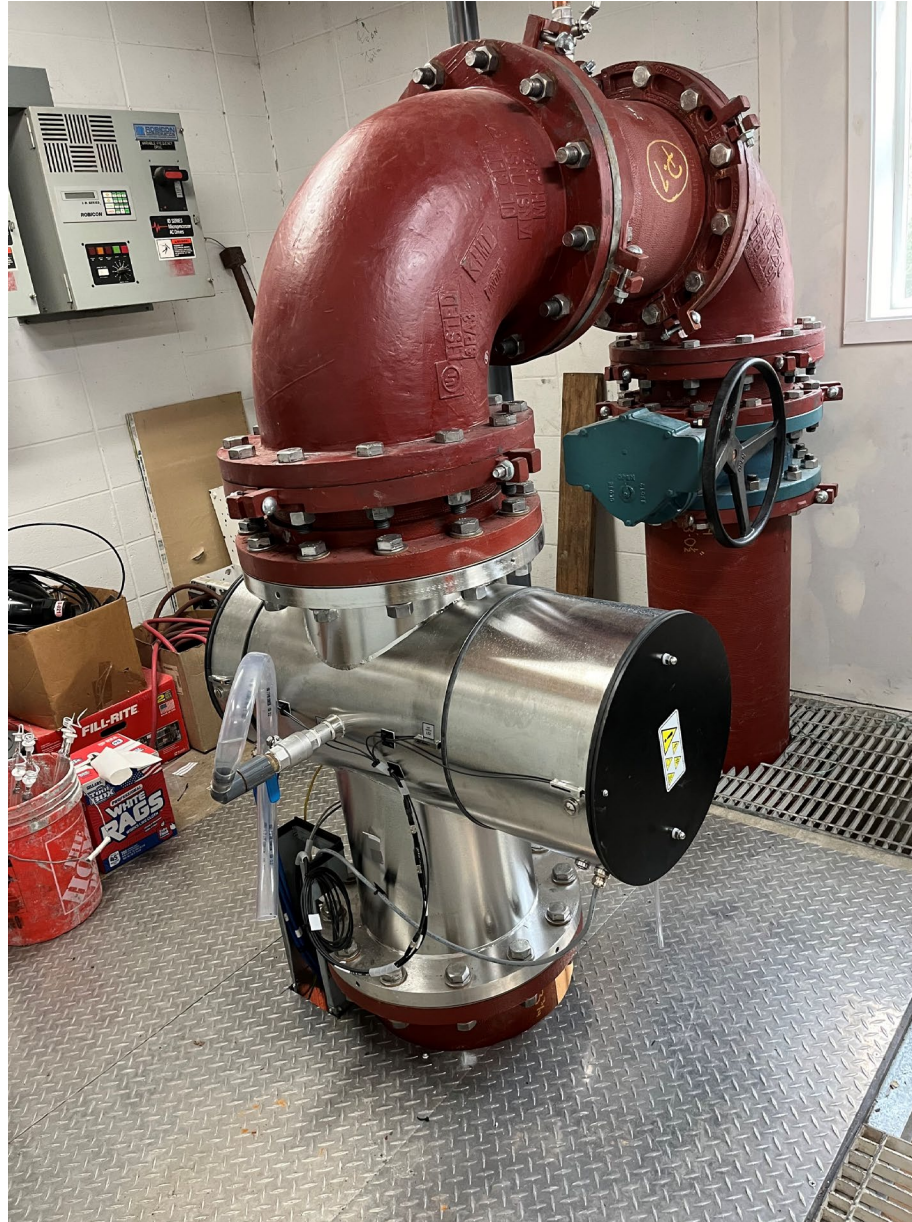
## Vertical and Horizontal applications

### Chamber Mounting:

Flow horizontal or  
vertical (lamps  
horizontal  
only)

**Left:** Duvall WWTP WA  
PQ WW IL 5000

**Right:** North Bend WA  
PQ WW IL 5000





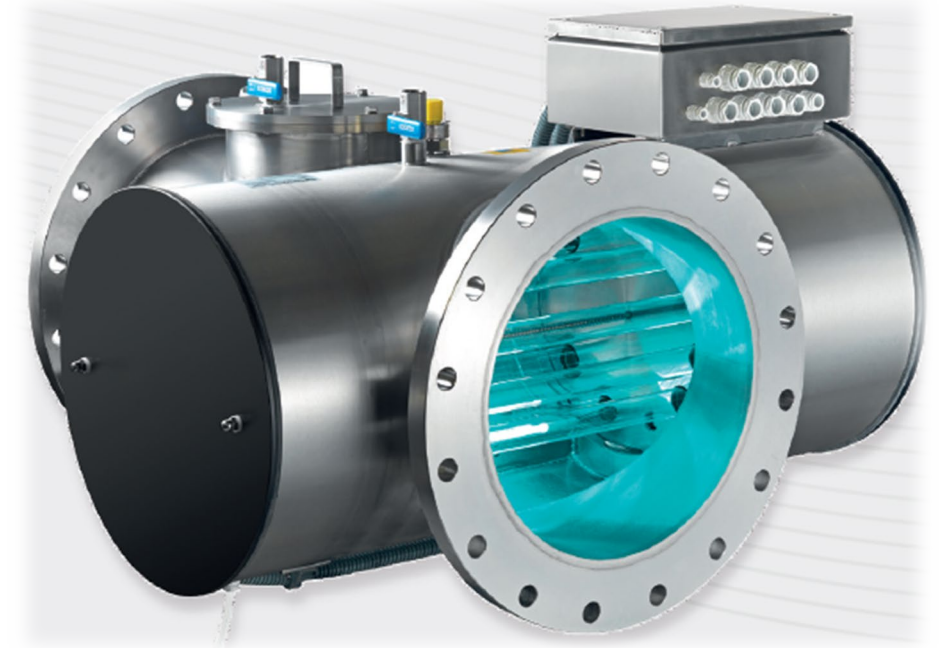
## Validated Municipal Product Line – ProLine PQ series

- **ProLine PQ WW IL: Wastewater & Reuse**

### Validations:

- USEPA -2006 – Drinking Water 45%-98% UVT
- NWRI – 2012 – Reuse (MBR best fit)
- DVGW – 2006 – RED of 40 mJ/cm<sup>2</sup> (reduction equivalent dose)
- **WQA Certified Gold Seal** – Drinking Water

- Wide range of WW Reuse for UV solutions: MBR's
- Design is compact, gravity fed or pumped
- No external lifting equipment
- Mounted horizontally or vertically
- In-Pipe Install
- The UV units have variable flows by optimizing power
- Proven performance treatment after sand filters and membrane filters
- OnLine chemical Assist – Ultrawipe



**0.09 MGD – 14 MGD**



## Validated Municipal Product Line – ProLine PQ series

- **ProLine PQ IL: Reuse & Drinking Water**

Validations:

USEPA – 2006 – Drinking Water 45%-98% UVT

NWRI – 2012 – Reuse (MBR best fit)

**WQA Certified Gold Seal** – Drinking Water

RED of 40 mJ/cm<sup>2</sup> (reduction equivalent dose)

**Proline PQ (IL)**

Our ProLine PQ IL UV systems are designed to provide third party validated UV treatment for **municipal drinking water**.

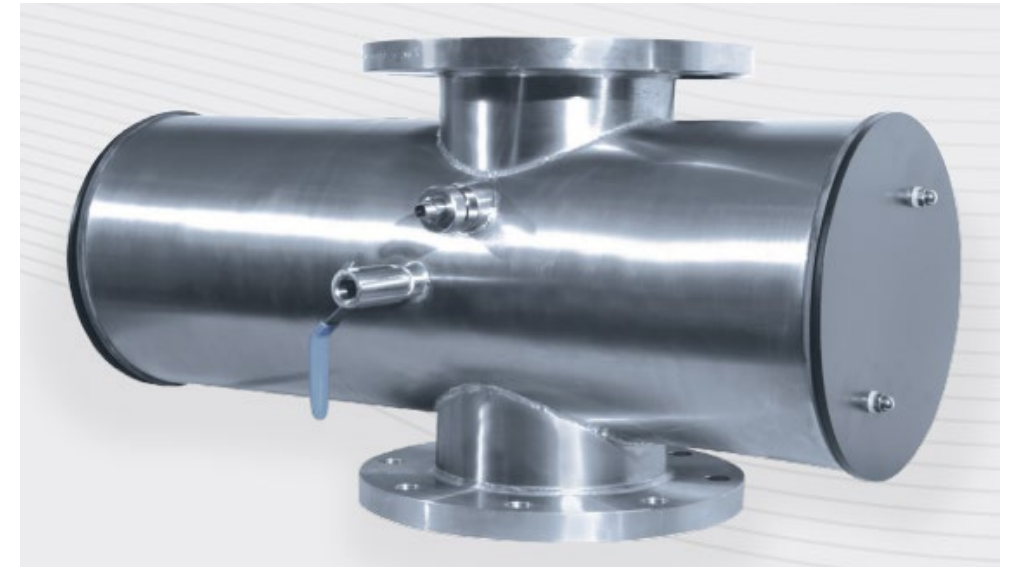
Each system comes with a certified dry UV sensor to measure the germicidal output and a UV dose.

Continuous verification of performance with real time **RED dose reading** and in-built low dose warning alarms.

**Benefits**

Protects your drinking water from microbiological contamination including chlorine resistant Cryptosporidium and Giardia.

Can be retrofitted to existing process



**0.06 MGD – 3.8 MGD**

## Validated Municipal Product Line – ProLine PQ series

### ProLine PQ AL: Reuse, Drinking Water

#### Validations:

USEPA – 2006 – Drinking Water 45%-98% UVT

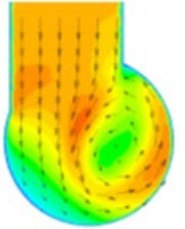
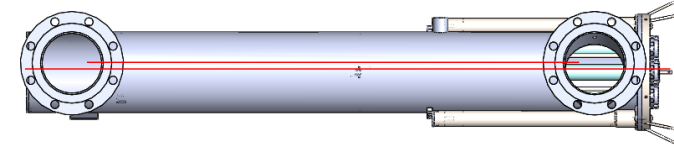
NWRI – 2012 – Reuse (MBR best fit)

WQA Certified Gold Seal – Drinking Water



**0.06 MGD – 3.8 MGD**

#### ProLine PQ AL (Amaline)



- Offset Inlet produces turbulent flow
- Outlet flanges remain inline (bolt pattern) for install
- Low Solids 5-10ppm
- No Internal Baffles
- 50% Ballast turndown, **4 x Low Pressure Lamp 500W**
- **Validation 100 AL for 4-log virus removal at low flows**
- **Easy Pull-Out Handles with Support Arms**
- Sleeves and wiper can change out quickly and easily
- Low Pressure Lamp electrical input 40-150 watts = 254nm

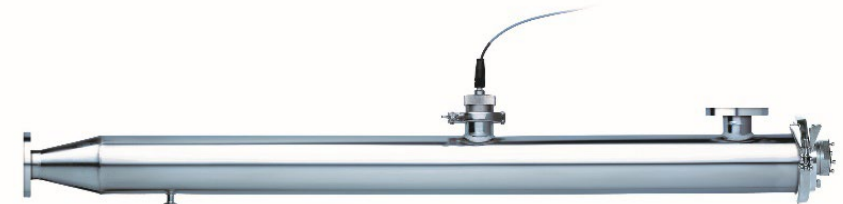
### ProLine PQ AF: Municipal Reuse/Rainwater

#### Validations:

USEPA – Drinking Water 60%-98% UVT

WQA Certified Gold Seal – Drinking Water

- Drinking Water best suited for smaller communities
- Intermittent flow, reuse/rainwater where validation is required
- **Single Amalgam Lamp, at low pressures**
- Skid mountable, single cable connection, easy install
- Low Pressure Lamp electrical input 40-150 watts = 254nm



**0.01 MGD – 0.5 MGD**



## Municipal Product Line – ProLine WW series

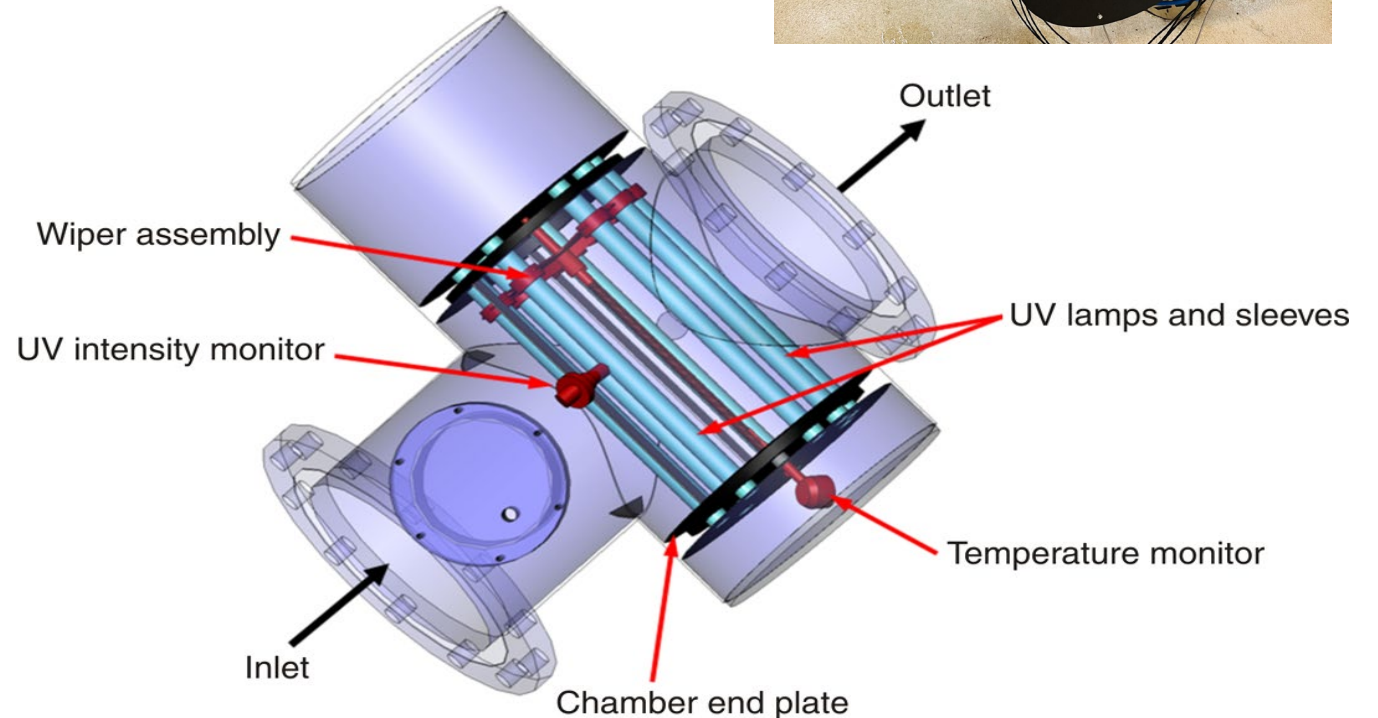
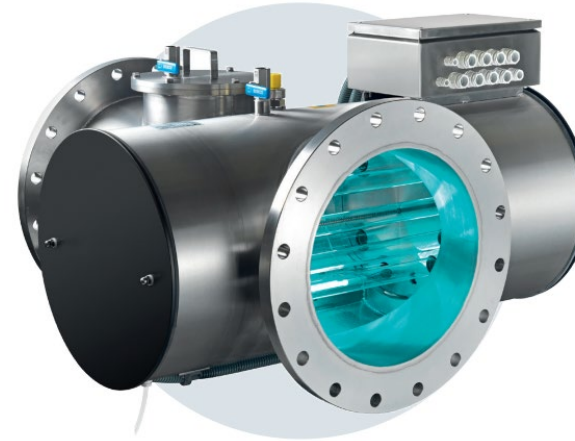
### ProLine WW IL: Wastewater, and Industrial

#### Validation:

UL 508A - Wastewater 50%-80% UVT 30 mJ/cm<sup>2</sup>

**0.1 MGD – 8 MGD**

- Compact closed vessel medium pressure lamp systems are cost effective
- Can be retrofitted to existing processes
- Chemical assist wiper – Ultrawipe which cleans the quartz sleeves despite high fouling potential
- Self cleaning to maintain performance
- UV Chamber 316, Cabinet NEMA 12 or NEXA 4x
- Modbus for SCADA connection
- Suited best for low UVT applications
- Number of lamps range from 2 – 18
- Working fluid temperature 33.8F – 140F
- Operating pressure is 6bar/87 PSI or 10bar /145PSI
- Provides a proven alternative to chlorination







formerly Aquionics, Berson, Hanovia and Orca GmbH

## Municipal OpenLine: Open In-Channel UV Treatment for Wastewater, Reuse and Industrial

- OpenLine UV systems provide an economical and efficient solution for the treatment of wastewater effluent. Using low pressure, high-output amalgam lamps, the OpenLine delivers a sustainable design while not compromising on quality or performance.

**NEW**



**OpenLine**  
Low Pressure, High Output

### Sizing for Phase 1

- Min. UVT 50%
- Outlet count 200 fcu/100ml
- Flow Capacity (0.53 US MGD to 11.79MGD)
- TSS maximum 30 mg/l
- Max. Particle Size <30 microns
- Iron concentration <0.3 mg/l
- Manganese Concentration <0.05 mg/l
- Hardness Concentration <400 mg/l

### Approvals

- **UL – UL508 (Panel Shop)**
- **FCC – Part 15 (NA EMC)**
- **Future Approvals – NWRI, IUVA**

The OpenLine is ideal for *small to medium sized treatment plants* that are looking for a low maintenance and easy to operate system.

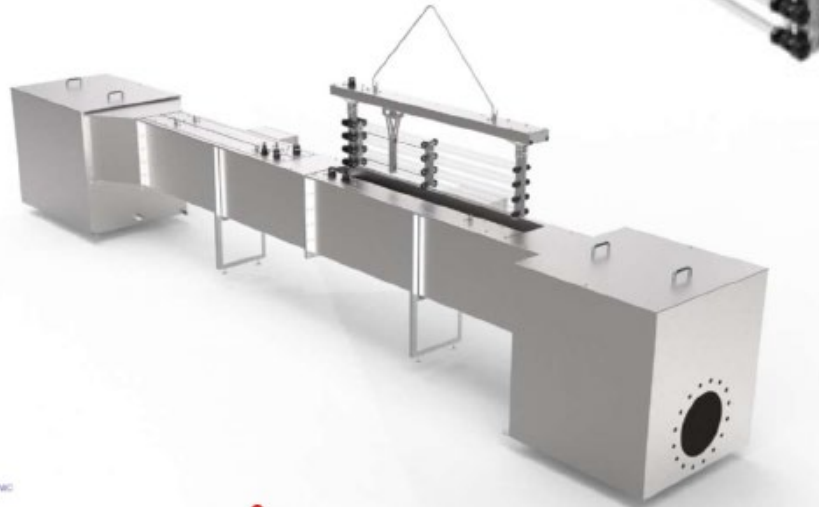


formerly Aquionics, Berson, Hanovia and Orca GmbH

# Municipal Open In-Channel UV System - Features

## Open Channel – Stainless Steel

- **Stainless Steel Trough**
  - Inlet/Outlet Boxes
  - Inlet Baffle
  - Channel Section(s)
  - Modules
  - Junction Box
  - Fixed Finger Weir
  - Low Level Probe
  - A-Frame Lifting Device
  - Site Safety Kit
- **Options**
  - UVT Meter (supplied locally)
  - Compressor (supplied locally)
  - Hoist (supplied locally)
- **Supplied by Others**
  - Inlet/Outlet bolts/hardware
  - Anchor bolts



## Lamps and Quartz Sleeves

- Lamps sit horizontal, perpendicular or at an angle to flow.
- Low Pressure UV Lamp: Amalgam 330W
- Phase 1 up to 32 Lamps
- Quartz Sleeve: F200 dome ended
- UV Sensor: SUV 1 (220-370nm)

## Controls and Software

- Connectivity – Ethernet and Modbus
- Inputs – flow, UVT, remote start/stop, remote restart, diagnostics, sensor settings, alarms etc.
- Volt Free Outputs
- 4-20 mA Outputs – UV Dose (per bank)



# Municipal Closed Vessel Market Applications

## Wastewater

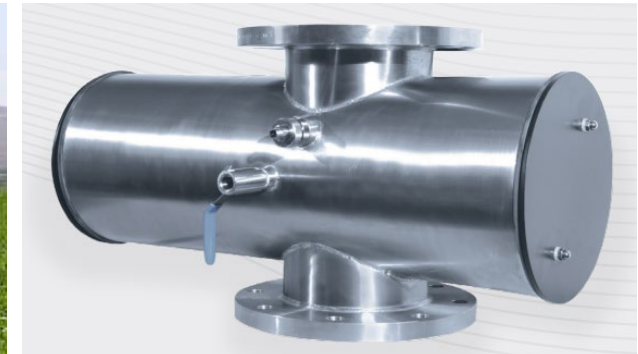
- Closed Vessel alternative to channel systems
- **Reduced footprint, which cuts cost overall** drastically. Systems can also be installed vertically to reduce footprint even more.

## Reuse

- Reduced footprint, cuts installation drastically with **high dose requirements for NWRI**. Systems can also be installed vertically to reduce footprint.
- Smaller footprint provides reduced maintenance costs and savings

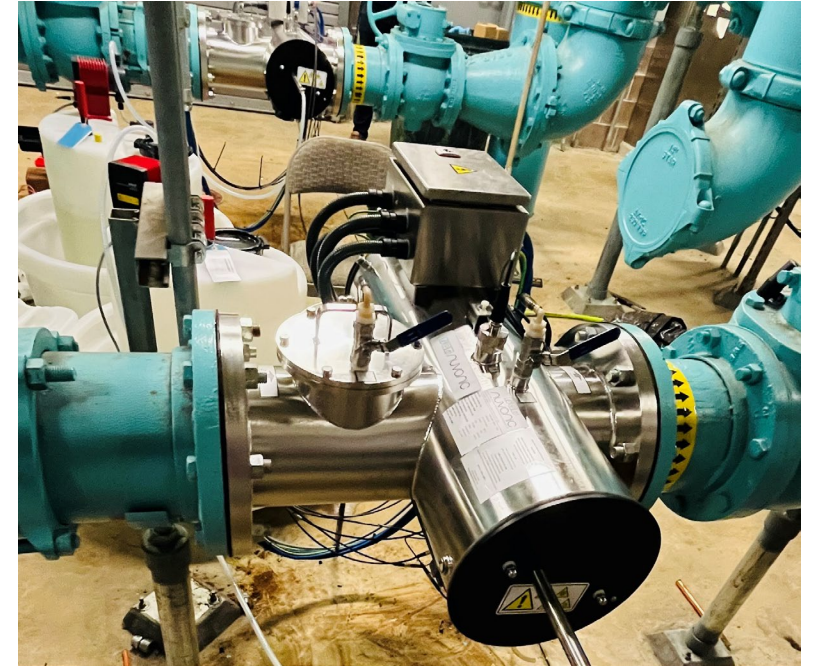
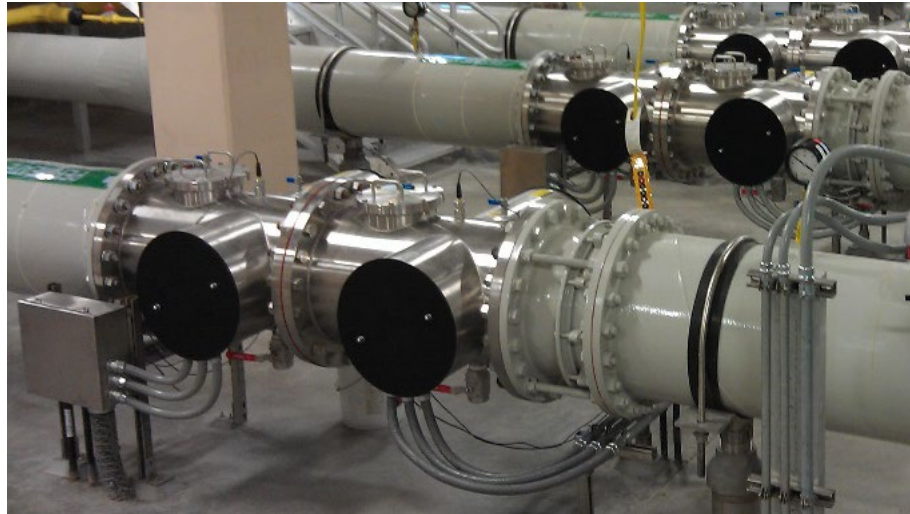
## Drinking Water

- Units are **validated with connection sizes in between competitors**, providing a perfect fit for various flow rates and treatment levels.
- Chemical assist wiping can be utilized as well.





# ProLine Installation Photos





# Water Installations – PQ IL 400

## Emory University Water Hub



### Design Parameters

- Flow = 280 gpm
- Total Suspended Solids < 3 mg/l
- UV Transmittance > 60%
- RED = 40 mJ/cm<sup>2</sup>
- Influent Count < 23,000 fc/100 ml
- Effluent Discharge < 23 fc/100 ml

### UV Reactor Details

- **2 x PQ IL 400**
- 6" ANSI
- 4 – MP lamps per unit

# Installations PQ WW IL 16000 x2



## Silverton, OR

### Design Parameters

- **Flow = 5 MGD/unit – 10 MGD wet Weather Flow; 1 MGD of reuse**
- **Total Suspended Solids < 30 mg/l**
- **UV Transmittance > 50%**
- **Dose = 40 mJ/cm**
- **Influent Count < 126,000 E.Coli/100 ml**
- **Effluent Discharge < 126 E.Coli/100 ml**

### UV Reactor Details

- **2 x PQ WW IL 16000**
- **20" ANSI**
- **12 – MP lamps per unit**
- **Includes Ultrawipe**



# Reuse Installations

## Applications - NWRI 2000 Reuse ("Title 22")

Irrigation of Golfcourses, Rec centers,  
Public spaces = reuse



### ***ProLine PQ WW IL 1250 - Reuse***

**No. of UV units:** 3

**Flow:** 160 m<sup>3</sup>/h

**Disinfection:** <23  
fc/100 ml

**UVT:** 65%

**Location:** Anthem  
WWTP, AZ



### ***ProLine PQ WW IL 7500 - Reuse***

**No. of UV units:** 4

**Configuration:** series

**Flow:** 17,000m<sup>3</sup>/day

**Disinfection:** <2.2  
cfu/100 ml

**Location:** Santa  
Maria Laguna  
California, U.S.A

# Water Installations – PQ AL 100

## Heritage Lake Resort WTP, IL

- Ground Water Source
- **2 x PQ AL (AmaLine) 100**
- 55 to 110 gpm
- UVT > 90%
- 4-log virus removal

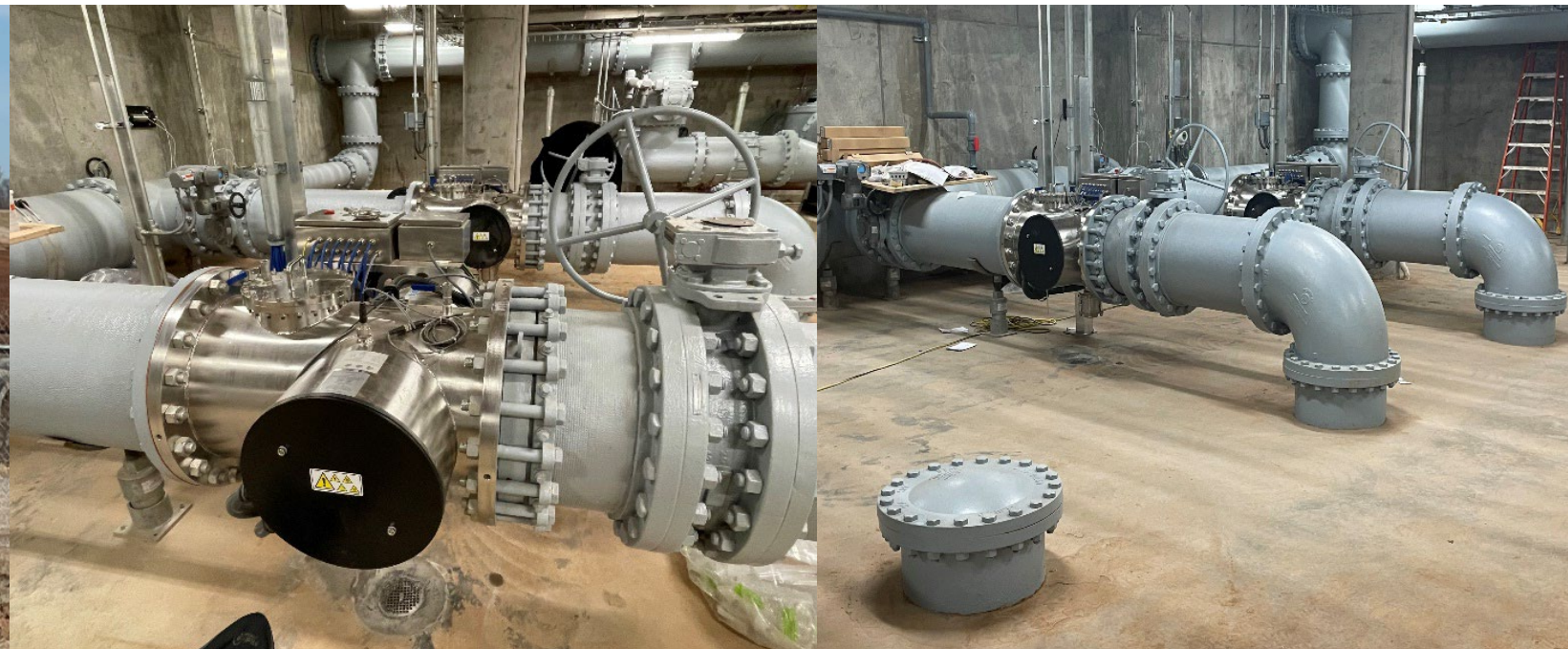




# SBR Installations

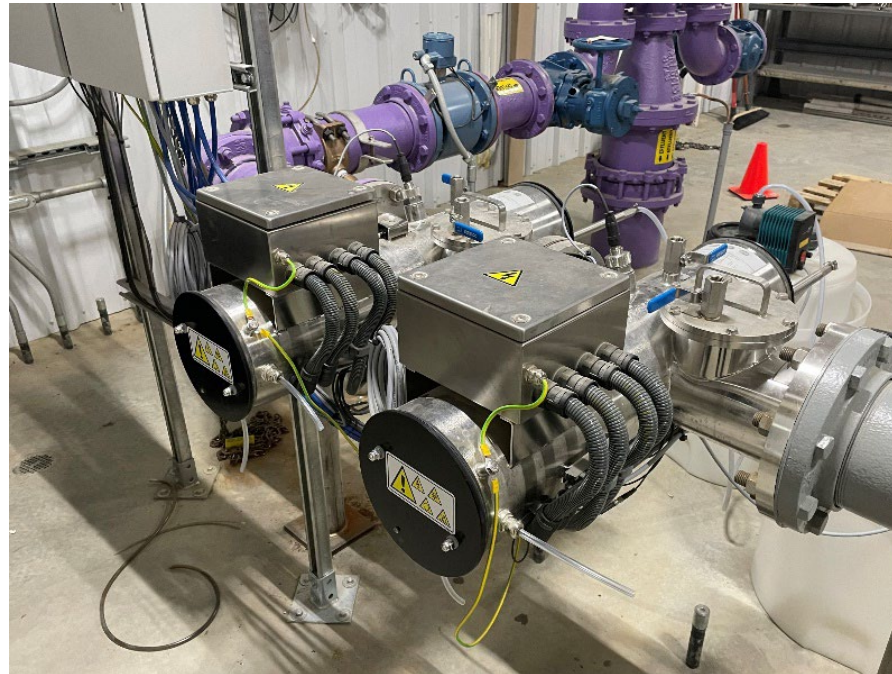
## 2021 SBR Plant Installation Bixby, OK.

**SBR PLANT WITH RECIRCULATION LOOP, DESIGNED FOR 8 TO 10 DECANTS PER 24 HOURS**





## 2021 SBR Plant Installation Independence, CO.





# MBR Installations

**MBR EFFLUENT REUSE – HENDERSEN NV  
UVT 65% - INLINE 18000+ - FLOW 13.6 MGD**





## **MEMBRANE PROCESS – ANTHEN, AZ**

**UVT 75% - INLINE 5000+ - FLOW 5 MGD**



**MBR EFFLUENT REUSE – KEY COLONY, FL.  
UVT 70% - INLINE 750 – FLOW 63 GPM**







*formerly Aquionics, Berson, Hanovia and Orca GmbH*

**Nuvonic UV has a long successful history of treating water, wastewater & reuse applications.**

**Two main types of UV systems:**

Closed Vessel & Open Channel Designs

**CLOSED VESSEL UV - 4 MAIN ADVANTAGES**

- Ease of installation
- Maintenance made easy
- Improved safety
- Smaller foot-print

## **Summary & Advantages**

- Small Footprint – efficient chamber design
- Lower Costs, easier & quicker installations
- Very little space required
- Closed vessels be installed horizontal or vertical
- Closed vessel units can also be stacked
- Units can treat gravity fed or pumped effluent
- No inhalation risk – POTENTIAL BACTERIA from open water installs
- Reduced UV exposure – EYE AND BURN INJURIES
- Our UV units are installed in a controlled building so you can work on the UV system at anytime, any weather conditions



**Thank you – Any Questions?**