



# REICHWELT

"The Purity, Demonstrated."



**Liqui-Cel™** Membrane Contactors are leading gas transfer devices that have been used in many industries around the world for over 20 years.

Although other degassing technologies, such as vacuum towers and forced draft deaerators have existed for many years, these older methods are being rapidly displaced by Liqui-Cel™ Membrane Contactors due to the smaller footprint, lower installation costs and the modular nature of membrane contactor systems.

Contactors are easily piped together and can be readily expanded to meet growing capacity even after initial installation.

<b>Applications</b>	
Deoxygenation	VOC Removal
Decarbonation	Osmotic Distillation
Carbonation	Liquid/Liquid Extraction
Nitrogenation	Humidification of Gases
Hydrogenation	Dealcoholization
Debubbling	Ammonia Removal
	Many More



**Liqui-Cel®** membrane contactors come in multiple variants designed to maximize efficiency while considering flow rate and footprint requirements for different applications.

### **Extra-Flow**

Liquid flows around the outside (shell side) of hollow fibers. A baffle in the middle directs the liquid radially across the membrane array. A strip gas or vacuum is applied on the lumen side (inside) of the hollow fibers.

### **High Pressure**

Similar to the Extra-Flow design with a baffle directing liquid radially across the membrane. Uses an RO-style pressure vessel capable of much higher operating pressure compared to standard Extra-Flow modules.

### **Radial Flow**

Uses a plugged center tube forcing the liquid to flow radially across hollow fibers. The 1×3 and 2×6 SuperPhobic® membrane contactors use this design and are mainly used for degassing low surface tension fluids.

### **MiniModule®**

No baffle design. Liquid flows through the inside of the hollow fibers (lumen side). Vacuum or strip gas is applied on the shell side (outside of the fibers).

### **MicroModule®**

Liquid enters through the inlet, crosses the hollow fibers, and exits through the opposite port. No baffle is used. Vacuum or strip gas can be applied to either gas port.





## BWM - Brackish Water RO Elements

### BE Series

High Rejection  
RO elements for  
Brackish Water

Model Name	Flow Rate(GPD)	Salt Rejection(%)	Effective Area(ft <sup>2</sup> )	Feed Spacer(mil)
RE8040-BE440	12,000	99.7	440	28
RE8040-BE34	11,000	99.7	400	34
RE8040-BE	11,000	99.7	400	32
RE4040-BE	2,400	99.7	85	32
RE4021-BE	1,200	99.5	35	32
RE2540-BE	1,000	99.5	27	28
# Test Conditions	40" : NaCl 2,000 mg/L, Pressure 225 psi, Temperature 25°C, pH 6.5-7.0, Recovery 15% 21" : NaCl 2,000 mg/L, Pressure 225 psi, Temperature 25°C, pH 6.5-7.0, Recovery 8%			

### BL Series

Energy Saving High  
Flux Elements

RE8040-BLN440	13,000	99.5	440	28
RE8040-BLN	12,000	99.5	400	32
RE8040-BLR440	11,000	99.6	440	28
RE8040-BLR	10,000	99.6	400	32
RE4040-BLN	2,600	99.4	85	32
RE4040-BLR	2,100	99.6	85	32
RE4021-BLN	1,200	99.2	35	32
RE4021-BLR	1,000	99.4	35	32
RE2540-BLN	930	99.2	27	28
RE2540-BLR	740	99.4	27	28

# Test Conditions 40" : NaCl 1,500 mg/L, Pressure 150 psi, Temperature 25°C, pH 6.5-7.0, Recovery 15%  
21" : NaCl 1,500 mg/L, Pressure 150 psi, Temperature 25°C, pH 6.5-7.0, Recovery 8%

### BLF Series

Ultra Low Pressure  
High Productivity  
Elements

RE8040-BLF440	12,650	99.2	440	28
RE8040-BLF	11,500	99.2	400	32
RE4040-BLF	2,500	99.2	85	32
RE4021-BLF	1,200	99.2	85	32
RE2540-BLF	930	99.2	27	28

# Test Conditions 40" : NaCl 500 mg/L, Pressure 100 psi, Temperature 25°C, pH 6.5-7.0, Recovery 15%  
21" : NaCl 500 mg/L, Pressure 100 psi, Temperature 25°C, pH 6.5-7.0, Recovery 8%

### FEN Series

Industry Leading  
Fouling Resistant  
Elements

Model Name	Flow Rate(GPD)	Salt Rejection(%)	Effective Area(ft <sup>2</sup> )	Feed Spacer(mil)
RE8040-FEN440	12,000	99.7	440	28
RE8040-FEN34	11,000	99.7	400	34
RE8040-FEN	11,000	99.7	400	32
RE4040-FEN	2,400	99.7	85	32
RE2540-FEN	1,000	99.5	27	28

# Test Conditions NaCl 2,000 mg/L, Pressure 225 psi, Temperature 25°C, pH 6.5-7.0, Recovery 15%

### FL Series

Energy Saving  
Fouling Resistant  
Elements

RE8040-FLR34	10,000	99.6	400	34
RE8040-FLR	10,000	99.6	400	32
RE8040-FLF440	13,000	99.6	440	28
RE8040-FLF34	12,000	99.6	400	34

# Test Conditions NaCl 1,500 mg/L, Pressure 150 psi, Temperature 25°C, pH 6.5-7.0, Recovery 15%



Innovation by Chemistry

Toray Brackish Water RO Product Lineup

Brackish Water RO		
Model	Permeate flow [ gpd( m <sup>3</sup> /d ) ]	Salt r ejection [%]
	Nominal	Nominal
<b>High Rejection - TM700D Series</b>		
TM710D	2,600(9.8)	99.80
TM720D-400	11,000(41.6)	99.80
TM 7 20 D -440	12,100(45.7)	99.80
TestCondition:225psi(1.55MPa),2,000mg/LNaCl, 77 °F (25°C)		
<b>Low Pressure - TMG (D) Series</b>		
TMG10D	2,650(10.0)	99.7
TMG20D-400	12,120(45.8)	99.7
TM G 20 D -440	13,300(50.3)	99.7
Test Condition: 150psi (1.05MPa), 2,000mg/L NaCl, 77 °F (25°C)		
<b>Ultra Low Pressure - TMHA Series</b>		
TMH10A	2,400(9.1)	99.3
TM H 20 A-40 0 C	11,000(41.6)	99.3
TM H 20 A-440 C	12,100(45.7)	99.3
Test Condition:100psi(0.60MPa),500mg/L NaCl,77 °F (25°C)		
<b>High Neutral Molecule Rejection - TBW-HR Series</b>		
TBW-400HR	6,900(26)	99.8
TB W -440 H R	7,900(30)	99.8
Test Condition: 110psi (0.75MPa), 500mg/L NaCl, 77 °F (25°C) IPA rejection 95%*, SiO2 rejection 99.7%* (* reference)		



Toray RO

60 years of Pioneering Towards Sustainable Water

Toray Industries, Inc. has been developing Reverse Osmosis membranes since 1968. Today we offer a full lineup of membranes backed by our sixty years of experience. Our advanced membrane technologies and global operations ensure the success of any project.

At the Toray Group, we consider sustainability to be the most important global issue of the 21st century. Toray's Sustainability Vision for water treatment aims to triple the water treated annually with our membranes by 2030 (compared to 2013). We will continue to provide advanced membrane technology such as RO membranes, further strengthen our technical services, and contribute to solving water problems worldwide.

**Toray RO accumulated plant capacity :**  
**136,000,000 m<sup>3</sup>/day**

(March, 2024)



## Pressure Vessel Product Line

### R25E Series



Low Pressure Vessel

High Pressure Vessel

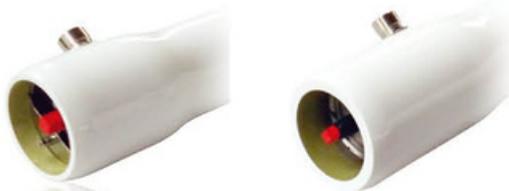
### R40E Series



Low Pressure Vessel

High Pressure Vessel

### R40S Series



Low Pressure Vessel

High Pressure Vessel

### R80E Series



Low Pressure Vessel

High Pressure Vessel

### R80S Series



Low Pressure Vessel

High Pressure Vessel

### R80U Series



### R160E Series



### R160S Series



## Certifications

ROPV continues to innovate by developing numerous registered patents related to our manufacturing process and product designs. We've successfully developed a number of OEM products for UF, EDI, large diameter membranes, and emerging water treatment technologies, and is certified by various international-standard-setting bodies.

### CERTIFIED BY

ASME Section X, RP	ACS
CNAS	CE
ISO 9001:2000	WRAS
ISO 14001	NSF 61

### PATENTS

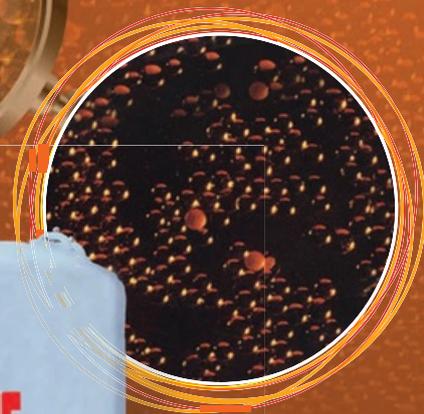
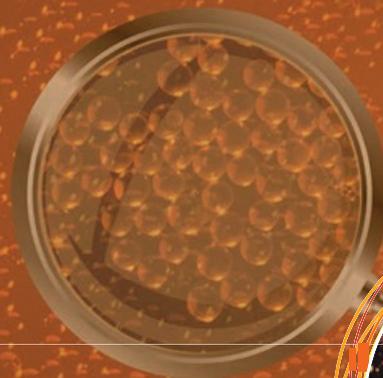
#### FRP Pressure Vessel Patents for Water Treatment

ZL 00 2 12602.8	ZL 2004 3 0015079.2	ZL 2004 2 0018590.2	ZL 2005 3 0020421.2
ZL 00 2 12601.X	ZL 2004 2 0018592.1	ZL 2004 3 0058756.9	ZL 2006 2 0021795.5
ZL 03 3 11187.1	ZL 2004 2 0018591.7	ZL 2005 3 0020422.7	
ZL 03 2 12280.2	ZL 2004 3 0058755.4	ZL 2005 2 0020969.1	

# Ion Exchange Resins

Thermax Chemicals is one of the world's major leading manufacturer of a gamut of TULSION® brand Ion Exchange Resins for over 35 years. TULSION® is a premium brand and enjoys a global reputation in the field of water treatment and process application technologies, based on Ion Exchange Resins.

Our business is about 'effective customer solutions' through innovations and development, service and co-operation. Our dynamic teams focus their energy and resources to offer the very best solutions to customers needs.



## Industrial Water Treatment Resins

Water treatment is traditional and one of the largest application fields of Ion Exchange Resins. Constantly growing demands on water quality require increasing sophistication of both the Ion Exchange Resins and the related application technologies. Tulsion® Ion Exchange Resins are particularly designed

to meet these demands and offer numerous advantages to our customers.

We have specialized in tailor made solutions for DM system upgradation / capacity enhancement through our value added products.

PRODUCT	APPLICATION
Tulsion® T-40 / T-42 Na / T-52 Na	Tulsion Resins for water softening
Tulsion® T-42H / T-52 H / T-5202	Tulsion Resins for demineralisation
Tulsion® A-23 / A-32 / A-36 / A-2332 / A-27 MP	Tulsion Resins for demineralisation
Tulsion® CXO-9 / CXO-12 / CXO-12 MP	Tulsion Resins for dealkalisation
Tulsion® MB-106 / MB-110 / MB-115 / T-46 H	Tulsion Resins for mixed bed polishing
Tulsion® T-48 / T-50 / T-52 / A-21 / A-29	Tulsion Resins for condensate polishing

# Specialty Ion Exchange Resins

Our aim is to provide our customers with innovative, high quality products and the support of the full scope of our expertise in all application

areas. Today our expertise has reached to the tune of supplying resin for every known application

## Thermax offers an entire range of Specialty Resins including:

- Resins for Purification-Separation-Recovery-Removal
- Polymeric Adsorbent Resins
- Polymeric Catalyst Resins
- Chelating Resins
- Nuclear grade Resins
- Effluent treatment Resins
- Food grade Resins
- Amphoteric Resins
- Oilcoalescent Resins
- Fine mesh Resins
- Chromatographic Resins



**Tulsion®** Resins find number of applications as special media in Chemical Process , Hydrometallurgy, Pharmaceutical Formulations, Chemical Synthesis, Waste Water Treatment, Natural products Extracts ,Chromatographic Separations, Biotechnology and other applications\* classified as below:

- MEG cycle water purification
- Ground water remediation & purification
- Brine decalcification / brine purification
- Glyoxal deacidification/purification
- Caprolactum purification
- Flouride removal from smelter wash water
- Removal / recovery of metals
- Applications in biodiesel
- Sorbitol purification
- Resins for biotechnology
- Waste water treatment
- Uranium recovery
- Acid catalyzed reactions
- Solvent dehydration
- Oil removal
- Separation of amino acids
- Camphor applications
- Sugar decolourisation
- Deashing of liquid glucose
- Decolourisation of fermentation products
- Eomycin & Gentamycin recovery
- Alkaloids recovery from natural plant extracts
- Deacidification of process streams
- Deashing of gelatin
- Ultrapure water for electronics & pharma industry
- Juice debittering
- Isotopes separation
- Investment casting
- Perchlorate removal
- Separation of enzymes, polypeptide & proteins
- Lysine purification
- Corn syrup applications
- PTA applications
- Glass interleaving products
- Purification of organic acids

## Impact Filtration Filter Housing

The **Impact Filtration Filter Housing** adopts a single-unit design that perfectly matches **iFILTRATION® HF Filter Cartridges**. Based on the plant environment, the housing and filter cartridges can be designed as a single unit or modular with RO systems to optimize space usage. FRP's high corrosion resistance and strength provide an absolute advantage in seawater desalination and zero liquid discharge applications.

The standard design outflow flow rate of a single unit is designed between 15-50 m<sup>3</sup>/h. An infinite outflow is achieved by a modular design. CNC winding process and high-quality raw materials provide a gloss finish inner surface to prevent the growth of bacteria and an easy-to-clean feature.

### FEATURES

- Modular Design
- Effective space utilization
- Easier to assemble and disassemble the modular unit
- Easier for filter cartridge replacement
- Gloss finishes inner surface, easy to clean
- High corrosion resistance for Seawater or Brine applications
- Optional for vertical or horizontal installation
- Optional inlet flow selection: End Port / Side Port
- Optional material: 304SS & 316LSS



### APPLICATIONS

- Seawater Desalination
- UF, RO, EDI and security filtration
- UF and RO CIP Cleaning
- Pretreatment filtration or security filtration

### SPECIFICATION

#### Materials of Construction

<b>Housing / Shell</b>	FRP / 304SS / 316LSS
<b>End Cap</b>	ENGINEERING THERMOPLASTIC 304SS / 316LSS
<b>Ports</b>	FRP / 304SS / 316LSS
<b>Seals</b>	EPDM / FKM / SILICONE

#### Operating Limits

<b>Design Pressure</b>	100 PSI (0.69 MPa) / 150 PSI (1 MPa)
<b>Design Temperature</b>	49°C (120°F)
<b>Min. Allowable Temperature</b>	-10°C (14°F) / 150°C (302°F)
<b>Medium</b>	Seawater / Brackishwater
<b>pH</b>	3 ~ 11

#### Model Selection

	INSTALLATION	FILTER LENGTH	MATERIAL	FEED	FILTER NUMBER	INLET/OUTLET	SEAL
<b>HQW-HF</b>	V = Vertical	20 = 20"	FRP	S = SIDE PORT	1 = 1 FILTER	G080 = DN80	E = EPDM
		40 = 40"	304 = 304SS	E = END PORT	2 = 2 FILTERS	G100 = DN 100	F = FKM
	H = Horizontal	60 = 60"	316 = 316LSS		10 = 10 FILTERS	G300 = DN 300	S = SILICONE

## Engineered Rack System for Cartridge Filtration

Optimized Flow. Modular Power. Non-Metallic Reliability.



Flow



Non-Metallic



Modular



FAT



Footprint

### What is OptiFlow ERS?

**OptiFlow ERS** is Impact Filtration's engineered cartridge filtration rack system—a modular platform integrating FRP cartridge housings, non-metallic header piping, and a structurally reinforced carbon-steel frame.

All wetted components are fully non-metallic, providing long-term corrosion resistance in filtered seawater and filtered brackish water environments.

Designed to optimize hydraulic performance, minimize footprint, and simplify installation, OptiFlow ERS supports flow capacities from **60 to 600 m<sup>3</sup>/h per rack (1,440 to 14,400 m<sup>3</sup>/day)** across **six standard configurations**.

#### Key Features

- Non-metallic flow path: FRP housings with HDPE/UPVC/CPVC pipelines
- Optimized hydraulic design
- Factory-assembled, FAT-ready integration
- Modular system architecture

### System Overview

**OptiFlow ERS** is engineered as a fully integrated cartridge filtration rack system, combining FRP cartridge housings with non-metallic header piping and a structurally reinforced steel support frame.

The system architecture is designed to optimize hydraulic balance and ensure consistent flow distribution across all housings—supporting stable performance under varying operating conditions.

All wetted components are completely non-metallic, making the system inherently resistant to corrosion in filtered seawater and filtered brackish water service.

### Why OptiFlow ERS?

- **Compact footprint** through optimized vessel spacing and vertical stacking
- **Fully non-metallic flow path** eliminating corrosion risks in seawater environments
- **Factory-built modular system** reducing on-site construction, alignment, and installation time
- **Direct replacement** for legacy cartridge filter systems utilizing carbon steel, hard rubber-lined, or FRP vessels

### Engineered for Every Scale

#### Applications

- |                   |                                |
|-------------------|--------------------------------|
| SWRO Pretreatment | Industrial Water               |
| BWRO Pretreatment | Power Plant Intake             |
| UF Filtration     | Refinery / Petrochemical Water |
| RO Brine Recovery | Cooling Tower Filtration       |

#### Capacity Overview

Each OptiFlow ERS accommodates scalable plant designs, from 1,440 m<sup>3</sup>/day (Type A) to 14,400 m<sup>3</sup>/day (Type F).

Multiple racks can be arranged in parallel to reach large-scale plant capacities.

#### Flow Capacity at a Glance

Series	Flow Capacity (up to)
F	(600 m <sup>3</sup> /h = 14,400 m <sup>3</sup> /day)
E	(360 m <sup>3</sup> /h = 8,640 m <sup>3</sup> /day)
D	(240 m <sup>3</sup> /h = 5,760 m <sup>3</sup> /day)
C	(160 m <sup>3</sup> /h = 3,840 m <sup>3</sup> /day)
B	(120 m <sup>3</sup> /h = 2,880 m <sup>3</sup> /day)
A	(60 m <sup>3</sup> /h = 1,440 m <sup>3</sup> /day)

#### Additional Offering

We can provide Design & Build CF Housing Systems for larger custom capacities.

### Performance, Materials & Factory Readiness

#### Operating Conditions

- Operating Pressure:** Up to 8 barg
- Design Pressure:** 10 barg
- Temperature:** 18–40°C (design up to 60°C)
- Clean ΔP Drop:** Up to 1 barg
- pH Range:** 3–11
- Cartridge Rating:** 5 micron nominal

#### Materials of Construction

##### Wetted Components

- FRP housings
- HDPE / UPVC / CPVC headers
- UPVC drains/vents
- Non-metallic coupling clamps and blind inserts
- NBR gaskets (alternatives available)

##### Structural Components

- Precision-fabricated carbon steel frame (epoxy coated)
- Stainless-steel nameplate
- Optional coated or FRP-overlaid frame versions

#### Factory Acceptance & Delivery

##### Factory Acceptance Test (FAT)

- Hydrostatic testing at 110% of design pressure
- Pipe header hydrostatic test
- Dimensional verification
- Third-party witness testing available

##### Modular Delivery

- Supplied fully assembled or as modular kits
- Simple on-site positioning and connection
- Suitable for green-field, brown-field, or offshore applications

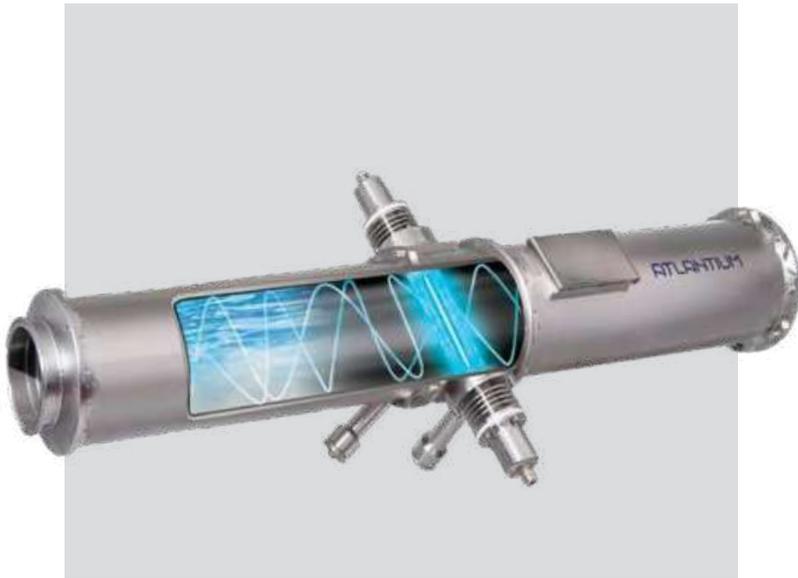
# ATLANTIUM

Pure Performance



## Proven Track Record

For more than two decades, Atlantium Technologies has helped to ensure water safety with its innovative HOD™ (Hydro-Optic Disinfection) UV technology and novel approach to performance, monitoring, and control. Atlantium's superior, environmentally friendly water treatment solutions ensure stable, efficient, and dependable production. With thousands of full-scale installations for leading brands in various industries globally, we're committed to consistently meeting our customers' water quality needs, ensuring pure results.

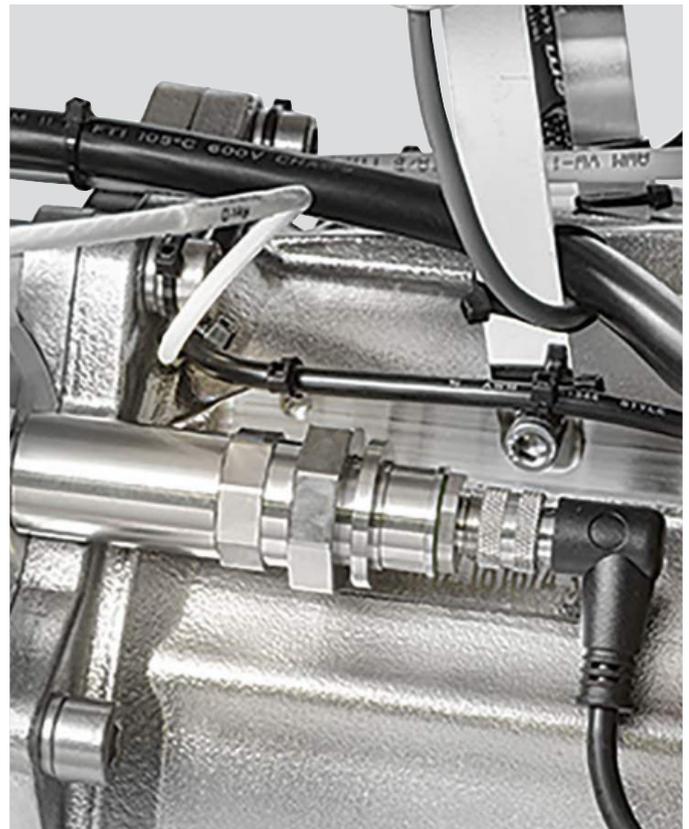


## Real-Time Lamp Performance Monitoring

- Dedicated UV sensor for each HOD UV lamp (unique to HOD UV technology)
- Continuously monitors HOD UV lamp output
- Ensures delivery of required UV dose at all times

## Enhanced HOD™ (Hydro-Optic Disinfection) UV Efficiency

- The HOD UV system features unique Total Internal Reflection (TIR) technology that recycles UV light energy, ensures homogenous UV dose distribution, and provides superior power (kW) efficiency compared to traditional UV.
- Medium-pressure high-intensity UV lamps provide a broad germicidal spectrum of polychromatic UV light
- (200-415 nm), enable fewer UV lamps per system
- Lamps are protected by a quartz sleeve 5 times thicker than conventional quartz sleeves
- Quick and easy lamp replacement; does not require emptying of the water lines





### Real-Time Water Quality Monitoring

- Integrated UV transmittance(UVT) sensor on each HOD UV system
- Continuously monitors UVT%
- Optimizes system performance for actual, not estimated, UVT% levels

### Advanced Control System

- Continuously displays UVT, flow, power, and UV dose
- Provides real-time data on operation and efficacy
- Features built-in data logging, up to six months
- Easy integration with the control SCADA system
- Customized with user settings for alarm signals
- Features user-based management with a smart authentication system



### We Work from the Future Backward

Atlantium leverages its technology to tailor superior water treatment solutions that consistently perform to your changing needs. Share your required results and we'll tailor your solution accordingly.

### Globally Trusted | 4,500+ Installations

Atlantium works alongside numerous tier-one companies across the aquaculture, food & beverage, biopharma, general industry, hydro, municipal, and power markets thanks to HOD UV's unique operational advantages.



Proprietary HOD UV Technology with 60+ Patents



Accredited and Validated to the Highest Regulatory Standards EPA, FDA, NVI, PMO



Cost-Effective Solution with Clear ROI

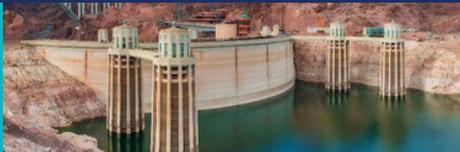
### HOD UV Provides Solutions for:

- Disinfection
- De-chlorination (FAC)
- Biofouling protection, including membrane protection
- Advanced oxidation process for chemical decomposition, including TOC reduction
- Macrofouling control (zebra/quagga mussel control)
- Cooling water treatment
- Boiler feed water treatment
- FGD service water
- Potable water
- Process water treatment
- Wastewater treatment
- Open Channel water treatment
- Simple Syrup disinfection

Atlantium develops innovative solutions that consistently perform to the changing needs of industries



Hydro



Industry



Ballast



Aquaculture



Food & Beverages



Municipal



Power



Bio Pharma

