

LPHO Amalgam UV Pilot Study at DSRSD

Patrick Bollman, PE

Municipal Operations Manager

Engineered Treatment Systems (ETS), LLC

Acknowledgments

- Dublin San Ramon Services District Wastewater Treatment Facility (DSRSD-WWTF)



**DUBLIN SAN RAMON
SERVICES DISTRICT**

Water, wastewater, recycled water

- Carollo Engineers



- Rain for Rent



- BioVir Laboratories



Presentation Outline

- Company
- Why / What to Validate for Reuse
- ETS Pilot
- Closed Vessel UV Disinfection
- Conclusion

Company

- Founded in 2005 as a joint venture with atg UV Technology
- Initial focus on recreational water applications – now all applications including municipal and industrial
- Began manufacturing in Beaver Dam, WI in January 2008
- Over 4,500 units (2,000+ sites) installed in the US
- 12 MP validations for “clean water”
- 9 LPHO validations for “dirty water”
- New 40,000 ft² factory opened in 2012



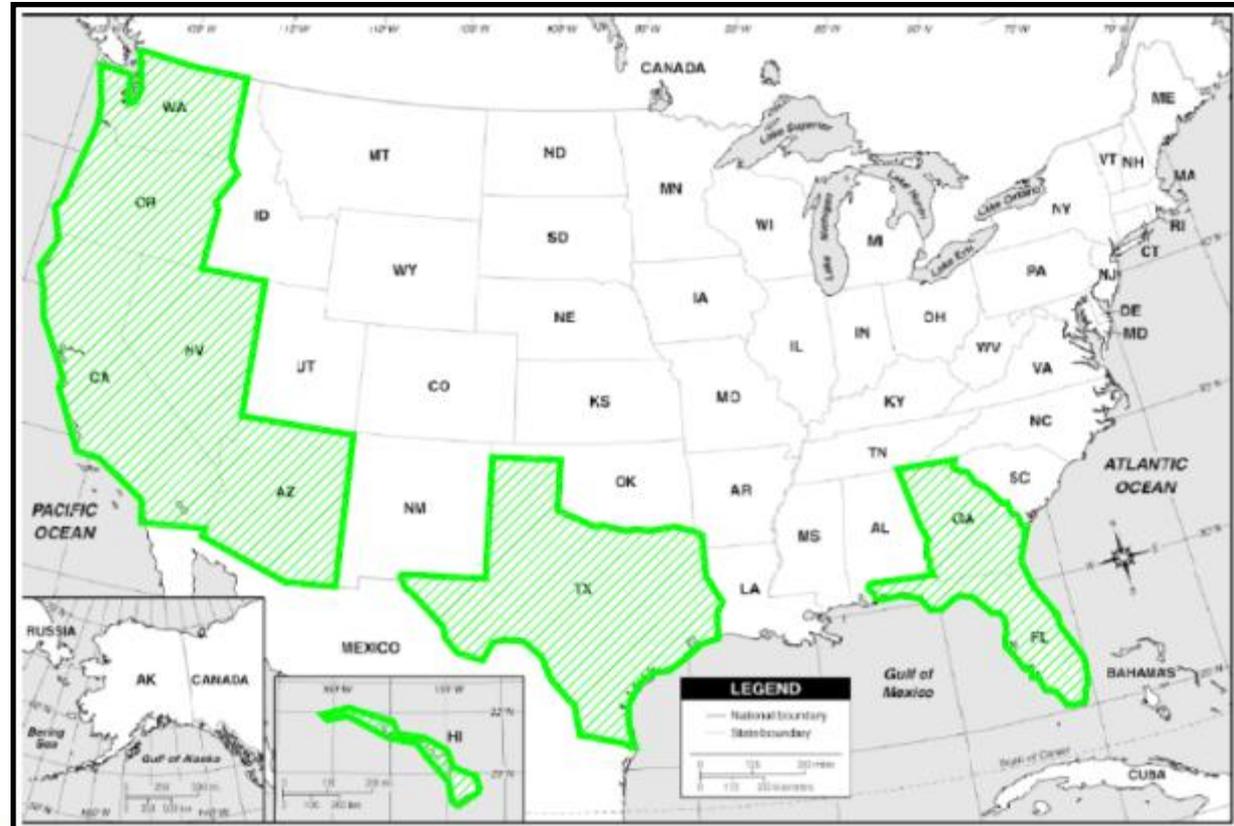
Why / What to Validate for Reuse

- Why
 - Increasing water demands
 - Droughts and limited potable water supply
 - Environmental and public health protection
- What
 - Small footprint option
 - Installation flexibility
 - Low component count
 - Energy efficiency

High Reuse Users

- Arizona
- California
- Florida
- Georgia
- Hawaii
- Nevada
- Oregon
- Texas
- Washington

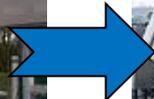
- Spain
- Australia



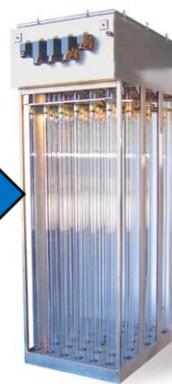
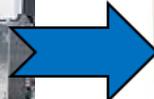
UV NWRI Evolution



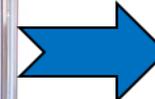
LPHO
250 or 320 W



MP
3200 W



LPHO
400 W



MP
2500 or 5000 W

UV NWRI Evolution



LPHO
250 or 320 W



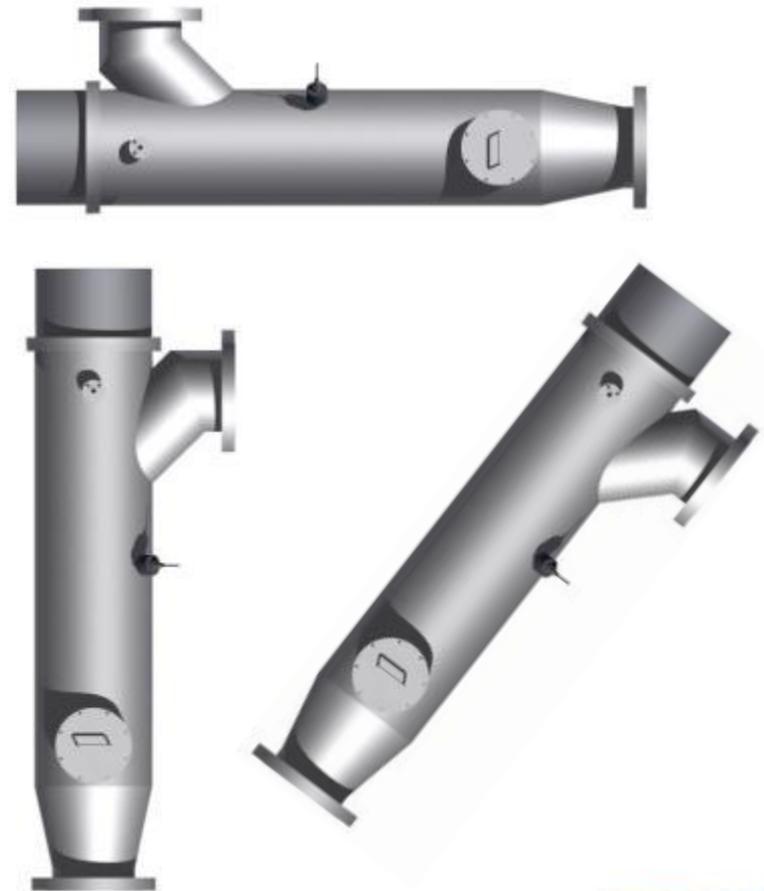
LPHO
500 W



LPHO
800 W
ETS UVLW
Pilot at
DSRSD

UVLW

- Closed vessel
- 800W low pressure high output amalgam lamp
- Horizontal or vertical installation
- Multiple effluent locations to fit site requirements



ETS Pilot

- Nine closed vessel UVLW reactors
 - Variable lamp quantities and operating levels
 - Variable chamber body diameters
 - Variable flange sizes
- Variable water transmittances
- Variable flow rates
- Variable dose levels

UVLW



- Installed system in TX
- 4 parallel reactors
- 3 MGD per reactor

NWRI Validation

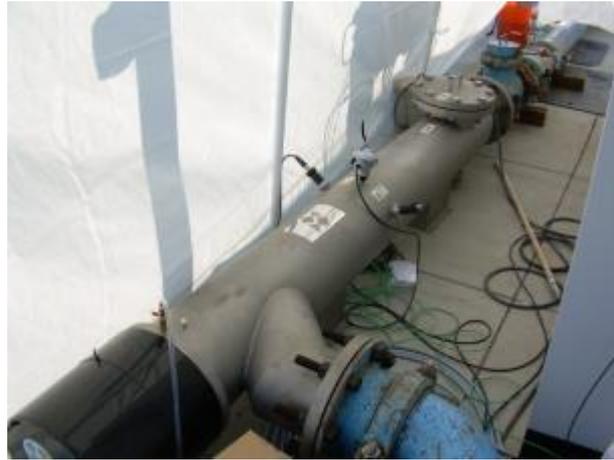
Reactor	Flow 55% and 100 mJ/cm ² (gpm)	Flow 65% and 80 mJ/cm ² (gpm)
1	Contact ETS for Performance Information	
2		
3		
4		
5		
6		
7		
8		
9		

ETS Pilot

- Multiple intake and discharge points
- Multiple pumps and configurations
- Pipe
- Flowmeter
- Injection points for MS2 and SuperHume™
- Influent and effluent sample ports
- Power analyzer
- Test a reactor – results – refine CFD – manufacturer/alterations – test a reactor – etc.
- 2003 and 2012 NWRI data analysis

UVLW 800W Amalgam Design

- Unique design features
 - Effluent configuration
 - Influent sleeve support ring
 - Non uniform lamp spacing





Closed Vessel UV Systems

Primary UV selection except for wastewater, including:

- Beverage and Brewery
 - Ultrapure Water Applications
- Swimming Pools, Water Parks, and Splash Pads (indoor and outdoor)
- Aquaculture
- Ballast Water
- Surface and Air
- Aquifer Storage and Recovery Wells
- Drinking Water

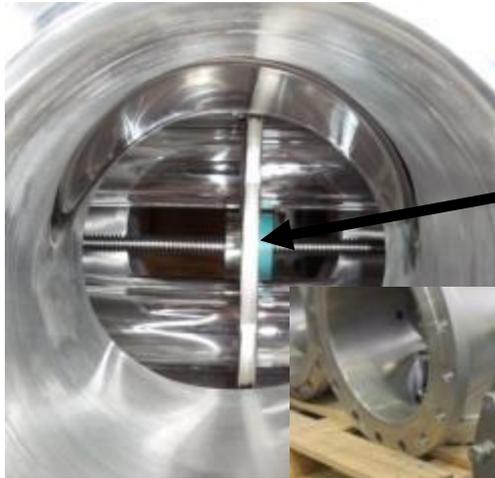
Advantages to Closed Vessel

- Installation
 - Smaller footprint
 - Lower costs, easier, quicker
 - Eliminate the need of precision alignment of poured concrete walls and floors (and steel slip linings)
 - Chambers can be installed in horizontal or vertical pipe runs providing design flexibility
 - Estimates show 60% installation cost reduction
 - Installed vs. constructed UV solution

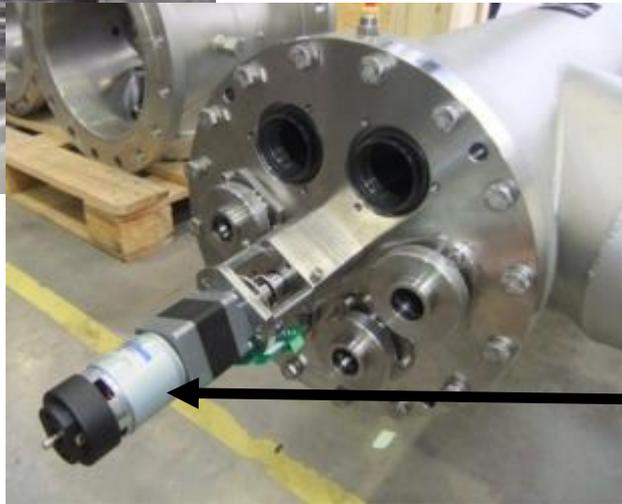
Advantages to Closed Vessel

- Maintenance
 - Wiping mechanism is external to water
 - The motor is coupled to an internal threaded screw which turns and drives the wiping carriage across the quartz sleeves and UV intensity monitor
 - It is critical to keep all optical paths free from fouling to ensure optimum disinfection
 - Wiper rings can be replaced without removing wiping carriage from chamber
 - Individual lamp and sleeve replacement

Automatic Wiping Mechanism



Wiper Yoke



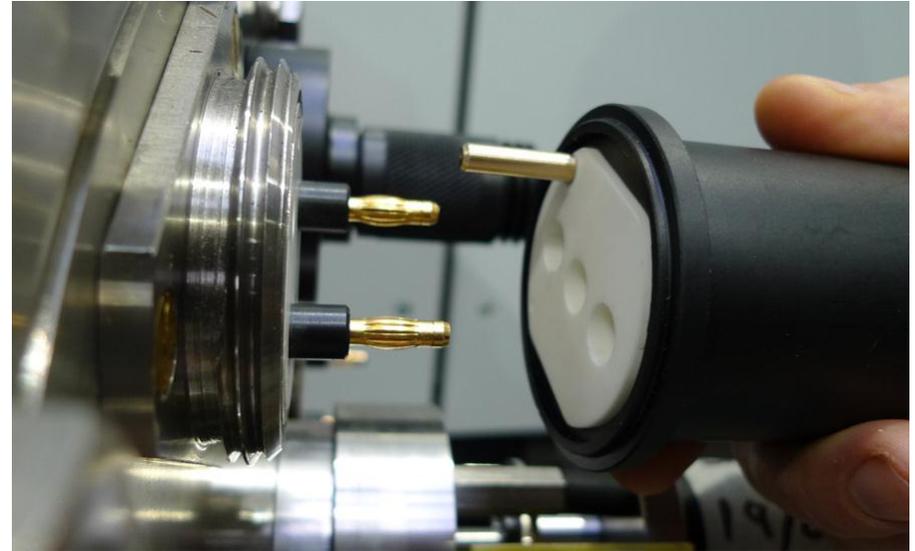
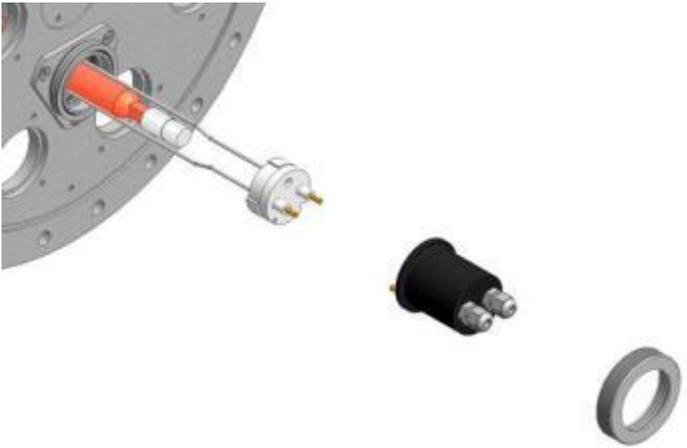
Low voltage motor leads to safer, smaller, and less expensive wiper without impacting performance and cleaning capabilities.

Automatic Wiping Mechanism



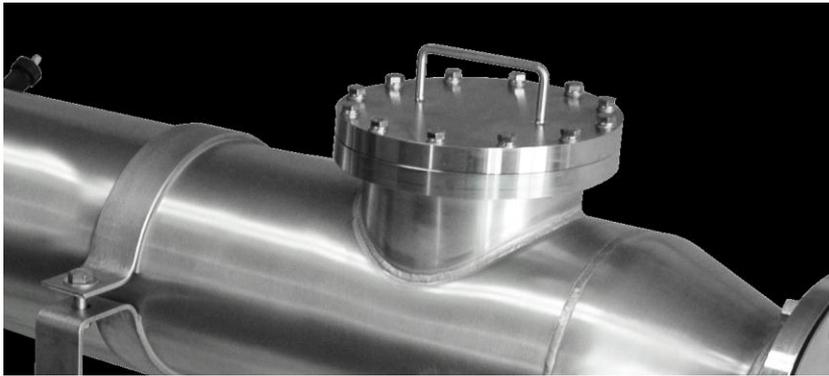
Optical counter used to stop wiping mechanism before reaching the chamber ends. Similar technology used in elevators to signal floor levels. No problematic limit switches are required.

Lamp Replacement

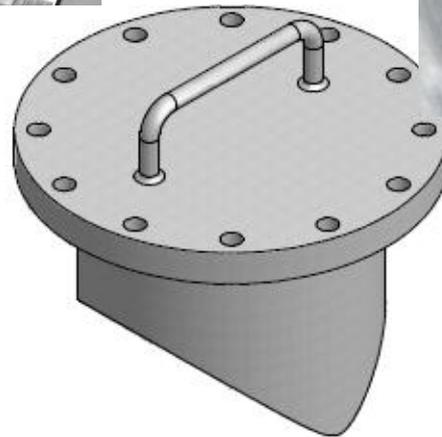


Single ended lamps utilizing a twist lock plug connection. No tools required, safer as UV light and electricity are isolated, water tight connection, and automatically centers the lamp.

Access Hatch



The profile of the hatch was designed to eliminate flow disruptions and air pockets.



Dry Monitoring



Allows for replacement of monitors and reference monitor checks without having to close valves and drain the reactor.



Advantages to Closed Vessel

- Safety
 - No open water surfaces
 - Lost/damaged tools, cell phones, etc.
 - Algae growth (most open channels become covered after operating for a short time or are covered during installation = closed vessel)
 - Reduced UV exposure
 - Burn exposed skin in seconds
 - Arc eye or welding flash are extremely painful and can lead to retina lesions, cataracts, and yellowing of the lens on prolonged exposure



Conclusions

- Various options/configurations available for UV disinfection
- Technology is improving
 - Smaller systems
 - Higher powered/high efficiency UV lamps
 - Reduced components
- Reuse/Recycled water is becoming more prevalent – including direct potable reuse beginning in TX

Questions????

Patrick Bollman, P.E.
Municipal Operations Manager
238 Commercial Drive
Beaver Dam, WI 53916
Phone: 877-885-4628
Cell: 859-760-7365
Fax: 920-885-4386
Email: pbollman@ets-uv.com
Web: www.ets-uv.com