



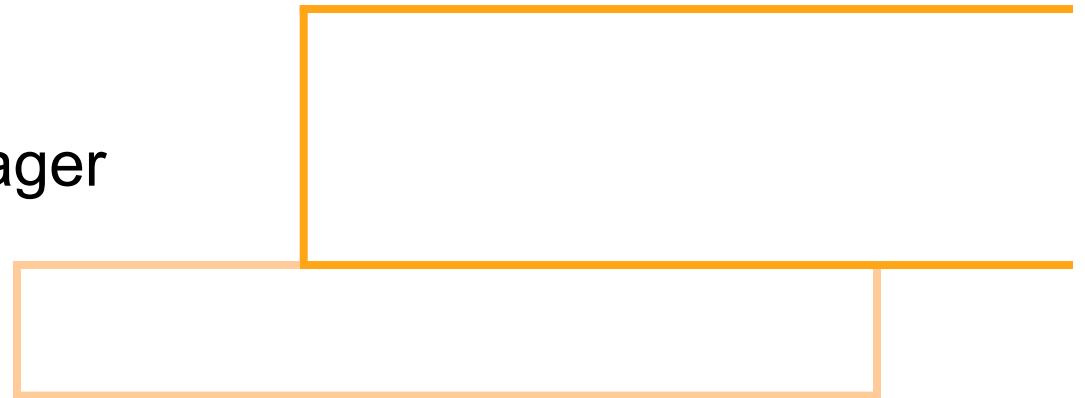
ITT

The first closed vessel UV installation for reuse in California

March 2010

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Engineered for life

Water & Wastewater

Outline of the Presentation

- Background
- NWRI at a glance
- LBX series – validation according to NWRI
- UV system design at Clovis STWRF, CA

Background



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Clovis Background

- Until early 1970's, groundwater was sole source of water
- As growth occurred in new developing areas, many wells going dry as groundwater levels dropped
- City turned to Fresno Irrigation District for access to surface water
- In 2001, Clovis City Council approved construction of a new water reuse facility due to projected water balance needs
- Goals of facility:
 - Reduce impact on groundwater sources (reduce consumption from 28 to 18%)
 - Create tertiary treatment system with multi-stage treatment and filtration
 - Treat wastewater to high quality “reuse” standards
 - Recycled water will be able to be reused for irrigation and recreation purposes (estimated to account for 5% of city's sources by 2010 and 13% by 2020)

Clovis Background

- City of Clovis hired CH2MHill to engineer, design, and construct the \$40 million plant
- Facility capable to treat ultimately 8.4 MGD, consisting in phases of 2.8 MGD each
- In November 2006, project bid through the design-build-operate procurement method
- Process train includes a membrane bioreactor (MBR), ultraviolet (UV) disinfection system, two-stage solids reduction process, all with automated control and remote monitoring

CITY OF CLOVIS SEWAGE TREATMENT/WATER REUSE FACILITY



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UV Disinfection System Selection

- UV selected for disinfection as it provides pure and safe chemical free water
- Highly selective bidding process
- Evaluation of medium pressure versus low pressure, high output lamp technologies
- Included both capital and 10 year life-cycle costs in analysis

- ITT Water & Wastewater's low pressure, high output UV selected due to

Power savings!!



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NWRI at a glance



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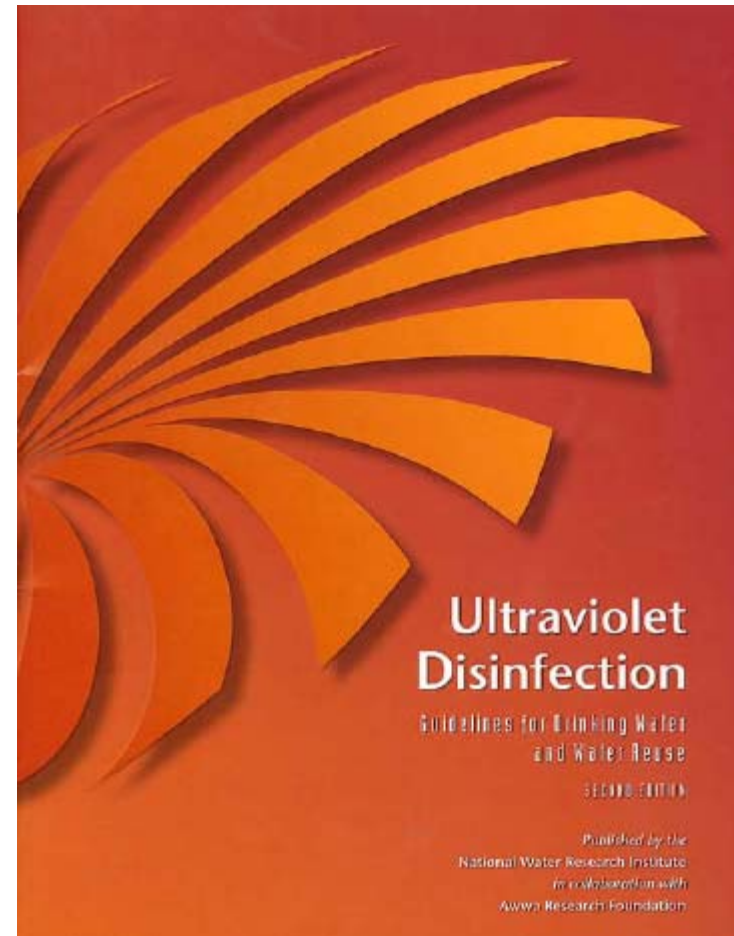
USA Reuse Requirements

State	Microbiological Reuse Requirement	
Arizona "Class A+"	Fecal Coliforms	not detectable in 4 out of 7 daily samples max. 23 CFU / 100 ml in any
	Enteric Virus	not detectable in 4 out of 7 monthly samples
California "Title 22"	Total Coliforms	2.2 MPN / 100 ml @ 7-day median
	Poliovirus	5 log inactivation
Florida "High Level Disinfection"	Fecal Coliforms	75% of samples below detection limit over 30 days max. 25 CFU / 100 ml in any sample
Hawaii "R1"	Fecal Coliforms	2.2 MPN / 100 ml @ 7 day median 23 MPN / 100 ml in max. one sample in 30 days
	Poliovirus	5 log inactivation

Benchmark

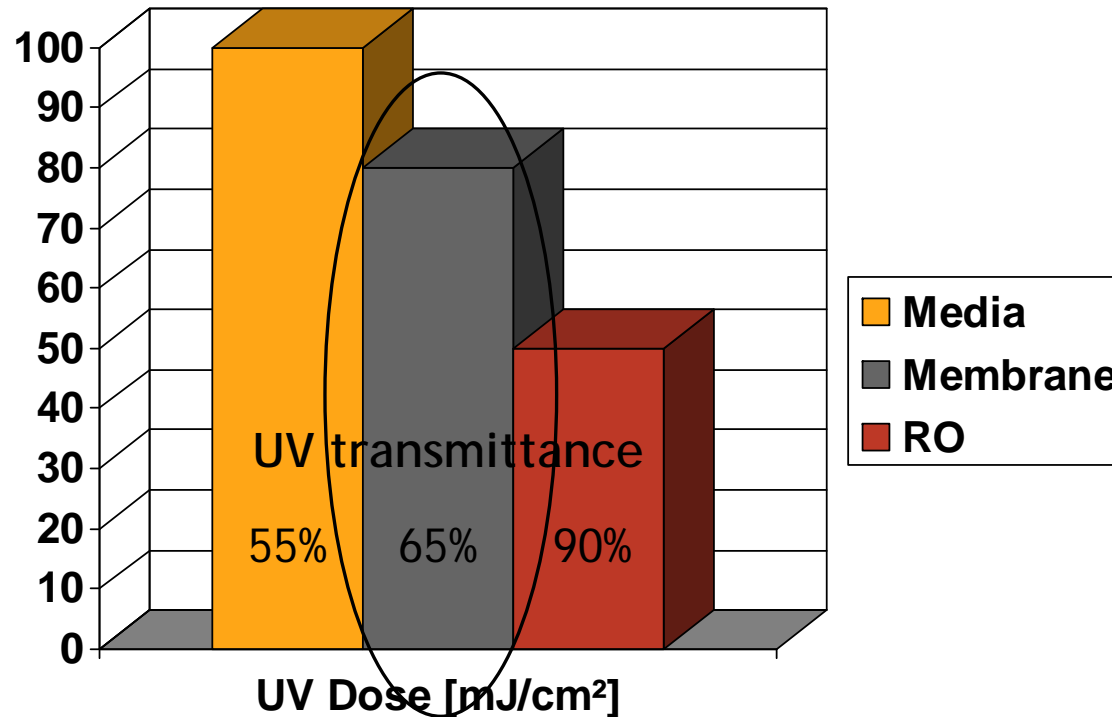
- Arizona “Class A+”
- California “Title 22”
- Hawaii “R1”
- Florida “High Level”

→ NWRI/AwwaRF
Guidelines for Water Reuse



NWRI Guidelines – UV Dose Requirements

- Total coliform and Poliovirus removal requirement
- Dose requirement depending on pre-treatment



NWRI Guidelines – Safety factors

- Default factors have to be used, unless the manufacturer establishes better factors (by third party tests)

Lamp ageing factor (AF)

Default → 50% WEDECO → 88%

Fouling factor (FF)

Default → 80% WEDECO → 90%

LBX Series – Validation according to NWRI



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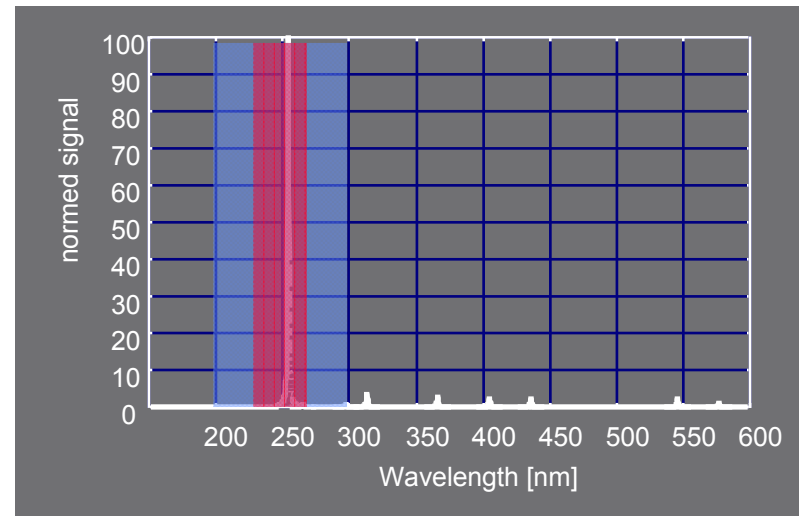
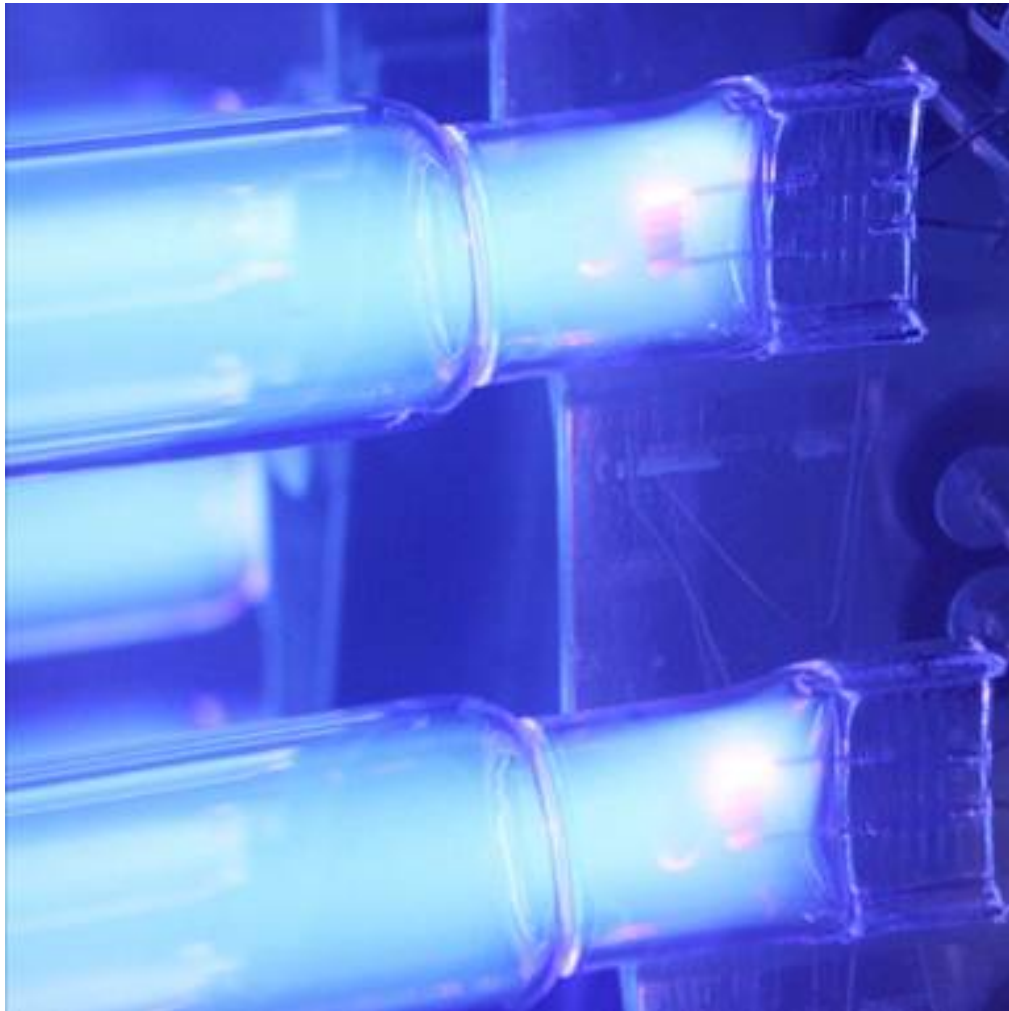
LBX Series

WEDECO UV systems
for disinfection of
pressurized wastewater

- WEDECO **LBX** series
- Optional automatic wiping system
- Low pressure, high intensity lamps
- **Validated according to NWRI protocol**



Lamp Type SLR32143HP



Spektrotherm Lamp Specification

Lamp No# **SLR32143HP**

Input watts: **360**

Output watts (254 nm): **150**

Lamplife rating: **12,000 hrs**

Turndown: **Linear turndown 50-100%**

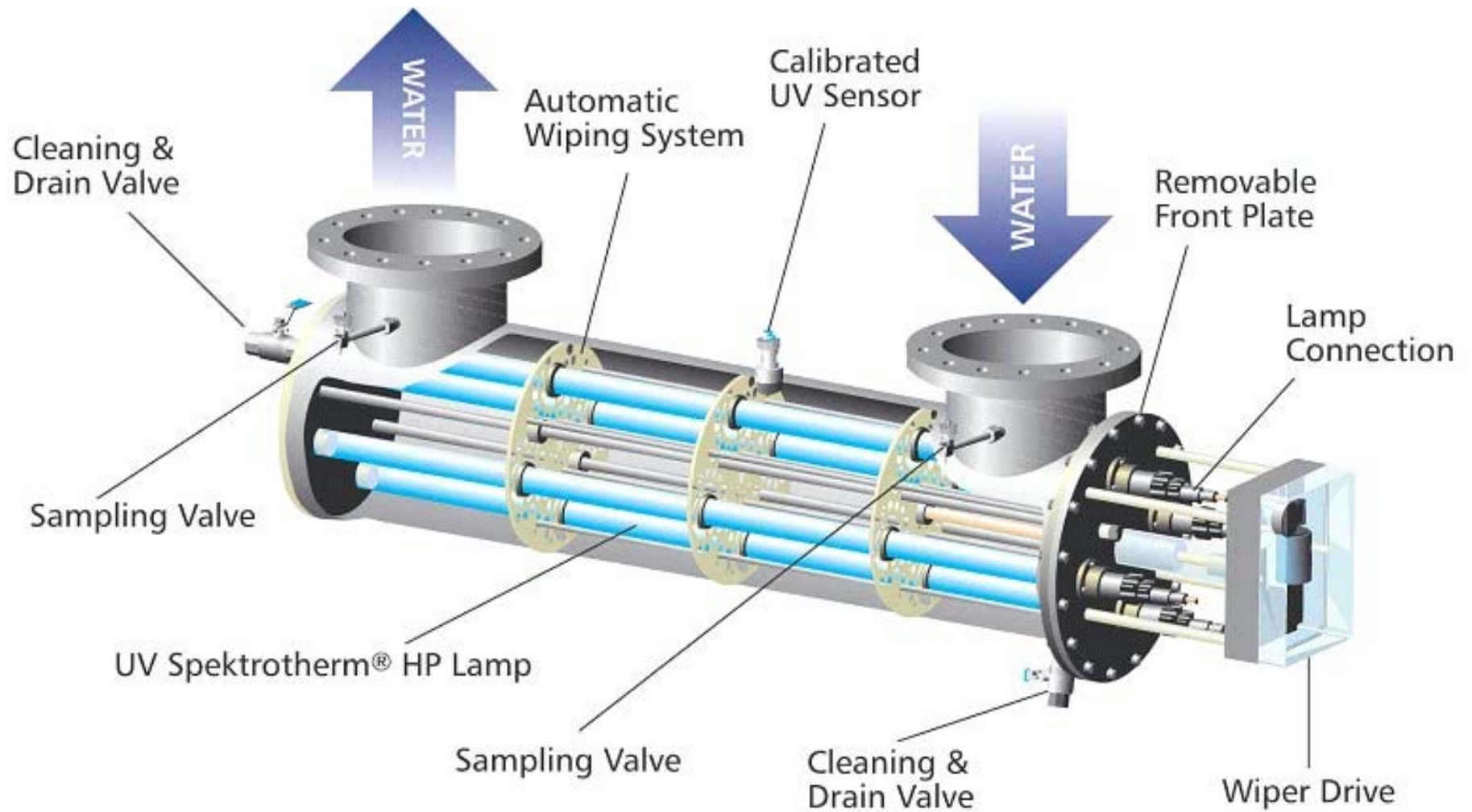
Lamp type: **Amalgam / Low Pressure**

LBX Models

LBX Model	# Lamps per Vessel
90	4
120	6
200	10
400	16
550	24
750	32
1000	40



Construction of LBX Series



Quality, Calibrated Sensors are the Cornerstone of Real Time Dose Delivery

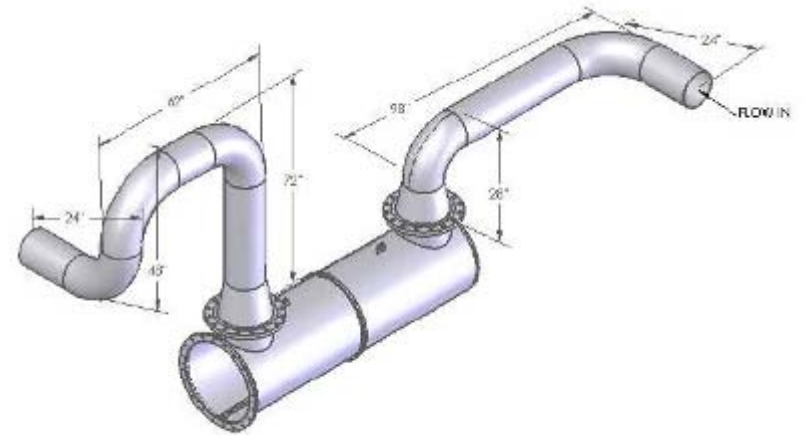
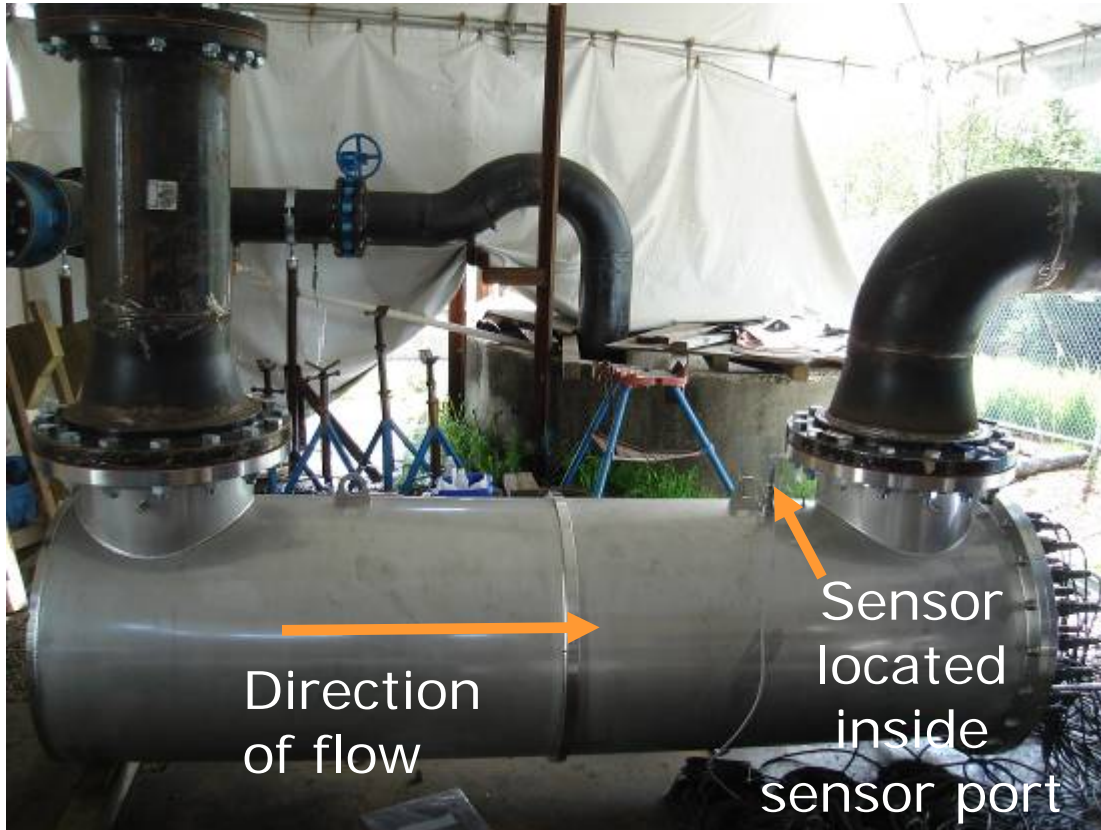
- Sensor based bioassay to achieve real time dose delivery
 - Sensors measure light intensity emitted from lamps
 - Dose = f(flow, sensor intensity)



Third Party and Validation Facility

- Carollo Engineers, in discussions with the California Department of Public Health (CDPH), has determined the testing protocol for the LBX Series
- LBX UV reactors were validated at a test facility located at the Groundwater Pumping Station of the Columbia Southshore Wellfield in Portland, Oregon

LBX 1000 Validation



LBX Series

- Robust bioassays allow engineers to design with confidence
- Proven performance for WEDECO LBX series
 - 3rd party report by Carollo Engineers
 - Approval Letters from California Department of Public Health (CDPH)

UV system design at Clovis STWRF, CA



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Clovis UV Design

- Current design to treat 6.4 MGD (with future expansion to ultimate 8.4 MGD)
- Design for 65% UV transmittance, 80 mJ/cm² NWRI dose
- UV installed after membrane bioreactor (MBR)
- Achieve California Title-22 standards – 5 log poliovirus inactivation and <2.2 total coliform (7-day geometric mean)

- Design is eight (8) LBX1000 reactors totaling 320 UV lamps
 - Arranged in four trains [3 duty, 1 standby]
 - Automatic wiping system
 - Allen Bradley PLC control
 - Dose pacing including variable lamp power

Clovis Milestones

- Site construction began in July 2007
- Ultraviolet equipment shipped on-site and started up in December 2008
- Commissioning and performance testing as required per the NWRI guidelines completed in Spring 2009
- CA Approval Letter issued in June 2009

Clovis is the first closed vessel low pressure, high intensity installation in accordance with NWRI protocol in the world!



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Conclusions

- Clovis water reuse facility addresses declining groundwater supply issues and provides recycled water for recreation and irrigation
- “First of its kind” installation:
 - Facility demonstrates advancements in reuse in the market
 - First closed vessel low pressure, high intensity installation in accordance with NWRI protocols

Thank You For Your Attention!

Questions?

