

Something New in Water Treatment...

Plus a Little Review Along the Way



Wisconsin Healthcare
Engineering Association_®

Today's Presenters

Jeff Freitag

Director of Sales, Watertech of America, Inc.

Kyle Pachowitz

Director of Water Safety, Watertech of America, Inc.

Dennis Kwasny

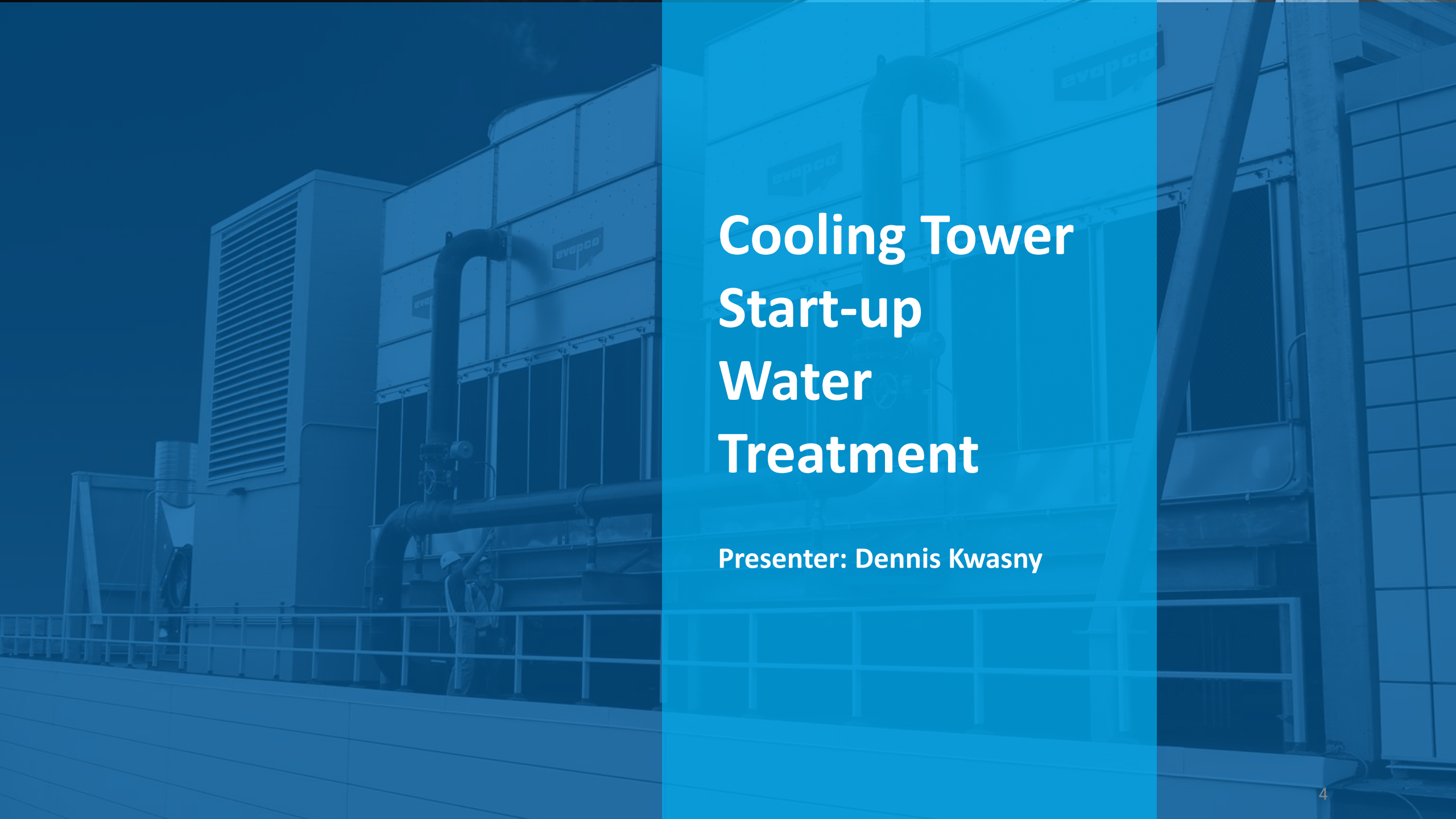
Territory Manager, Watertech of America, Inc.



Today's Topics

- Cooling Tower Start-up Water Treatment
- Modern Water Treatment Program
- Water Safety
- Innovations In Water Treatment





Cooling Tower Start-up Water Treatment

Presenter: Dennis Kwasny

Why all the fuss?

Premature equipment failures and unscheduled downtime will result if water systems are not properly maintained and chemically treated.



Water Quality

	City of Milwaukee Linnwood Plant	City of Waukesha Sunset Drive (Well #6)
Total Alkalinity (CaCO ₃)	115	260
Aluminum	0.18	—
Carbon Dioxide (free)	1.47	—
Calcium Hardness (CaCO ₃)	89	205
Chlorides	9.1	2.0
Copper	0.013	—
Fluoride (CaCO ₃)	0.21	1.33
Hardness, Total (CaCO ₃)	138	316
Iron	0.01	0.34
Magnesium (CaCO ₃)	49	111
Manganese	0.016	0.04
Nitrates	0.19	0.5
Oxygen, Dissolved (@ 68° F)	18.9	—
pH	8.23	8.0
Silica	1.03	7.0
Sodium	6.3	6.0
Sulfate	27.5	64
Conductivity (mmhos)	295	627



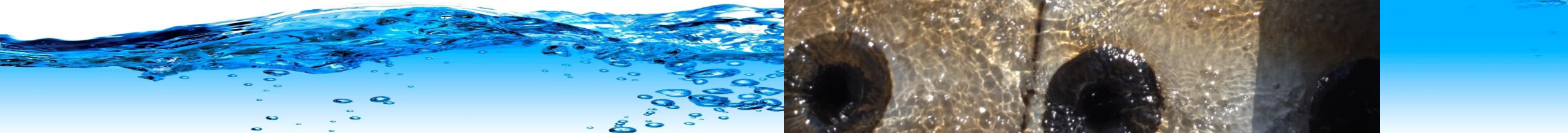
Cooling Season Start-up



Clean and Remove All Dirt

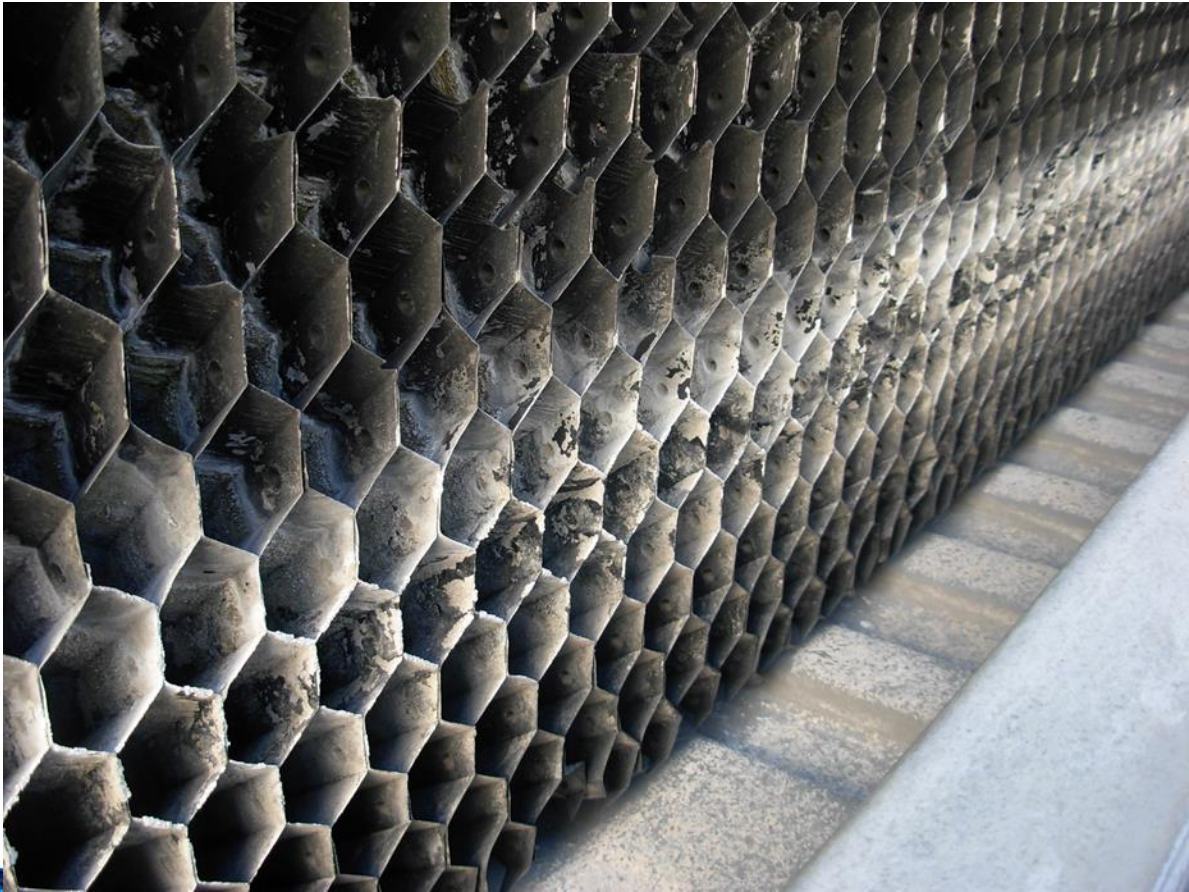


Chip Scale



Typical Tower Fill

Light pressure wash or chemical cleaning may be required



Ideal Conditions – Clean!



- Lubricate fan & motor bearings
- Change Oil in gear reducer assembly
- Check belts, motor pulley, & mounts
- Inspect electrical connections
- Check motor operating condition
- Clean float valve assembly & proper operation
- Check operating conditions & set points
- Read water meter at start of season



Evapco Maintenance



Recommended Maintenance Schedule

PROCEDURE	FREQUENCY
1. Clean pan strainer	Monthly or as needed
2. Clean and flush pan**	Quarterly or as needed
3. Check bleed-off valve to make sure it is operative	Monthly
4. Check operating level in pan and adjust float valve if necessary	Monthly
5. Check water distribution system and spray pattern	Monthly
6. Check drift eliminators	Quarterly
7. Check the fan blades for cracks, missing balancing weights, and vibrations	Quarterly
8. Check sheaves, bushings, fan shafts and fan hubs for corrosion. Scrape and coat with ZRC	Annually
9. Lubricate fan shaft bearings*	Every 1000 hours of operation (or every three months)
10. Check belt tension and adjust	Monthly
11. Sliding motor base – Inspect and grease	Annually or as needed
12. Check fan screens, inlet louvers and fans. Remove any dirt or debris	Monthly
13. Inspect and clean protective finish - Galvanized: scrape and coat with ZRC - Stainless: clean and polish with a stainless steel cleaner.	Annually
14. Check water quality for biological contamination. Clean unit as needed and contact a water treatment company for recommended water treatment program**	Regularly
15. Check AXS (crossflow) hot water basins for debris and corrosion	Monthly

OPTIONAL ACCESSORIES:

1. Gear Reducer – Check oil level with unit stopped	24 hours after start-up & monthly
2. Gear Reducer/Piping – Do visual inspection for oil leaks, auditory inspection for unusual noises and vibrations	Monthly
3. Gear Reducer – Replace oil	Semi-annually
4. Oil Pump – Do visual inspection for leaks and proper wiring	Monthly
5. Gear Reducer/Coupling – Check alignment of the system	24 hours after start-up & monthly
6. Coupling/Shaft – Inspect flex elements and hardware for tightness, proper torque & crack/deterioration	Monthly
7. Heater Controller – Inspect controller and clean probe ends	Quarterly
8. Heater – Inspect junction box for loose wiring and moisture	One month after start-up and semi-annually

* See maintenance manual for start-up instructions and lubrication recommendations.

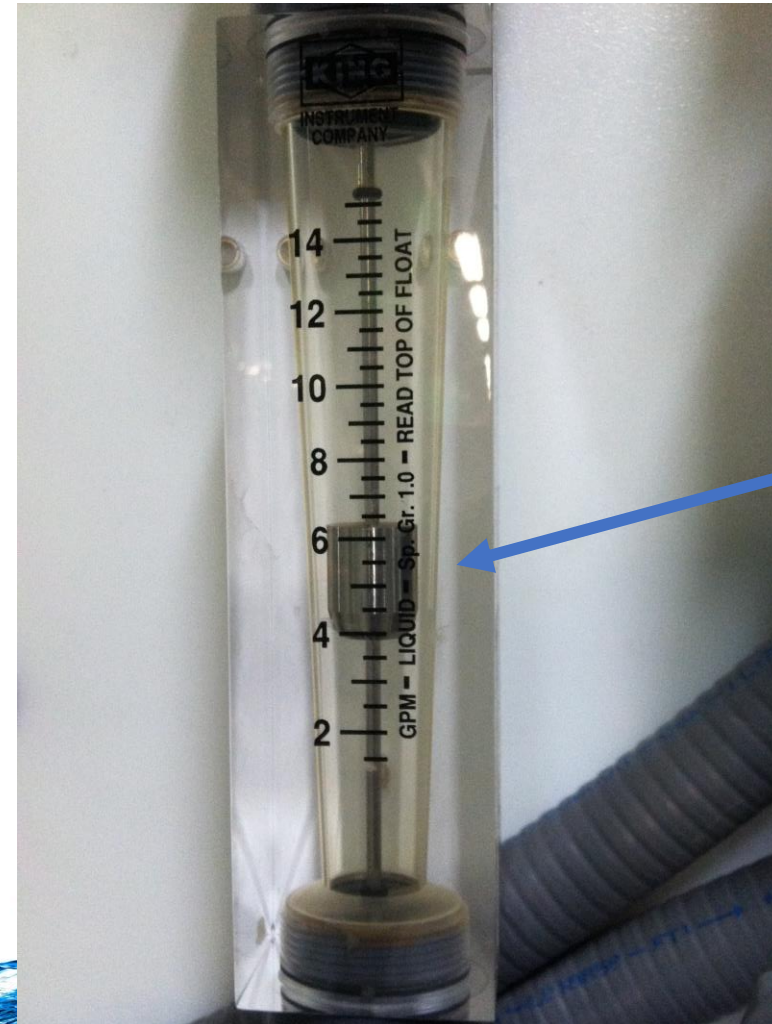
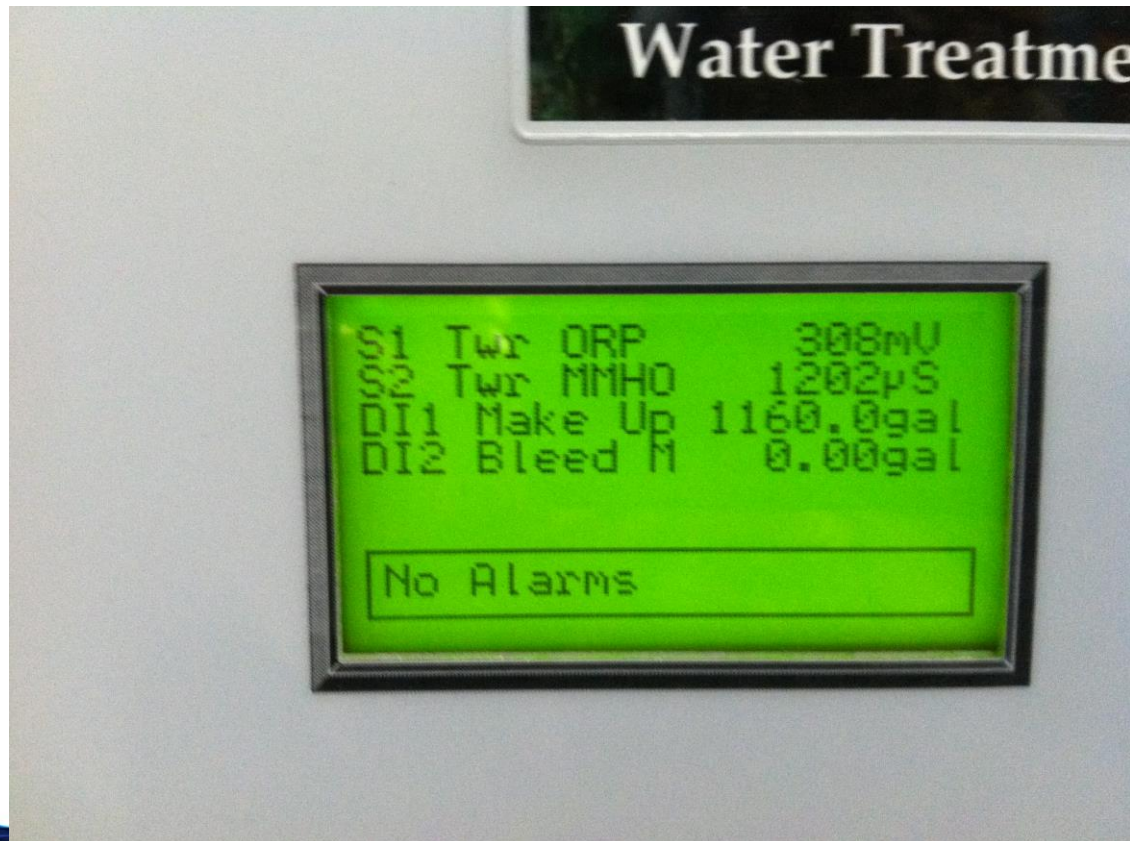
** Cooling Towers must be cleaned on a regular basis to prevent the growth of bacteria including Legionella Pneumophila.

Condenser Pump Strainers



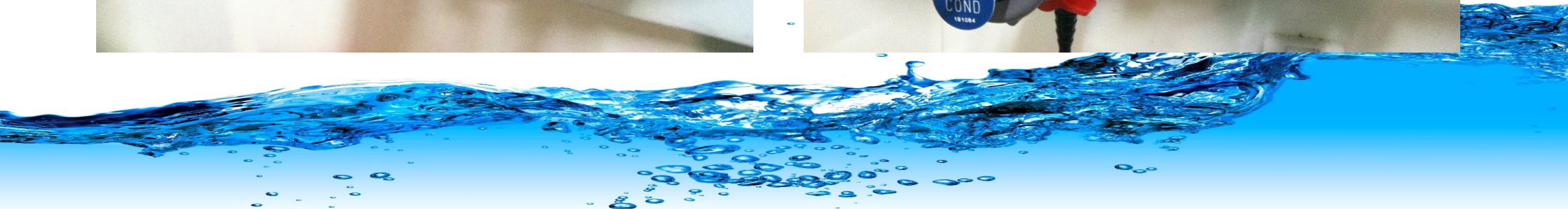
Validate proper flow through
sensor & corrosion coupon rack

Turn on Water treatment controller
and check all settings & functions



5-7 gpm

Inspect and Clean Sensors



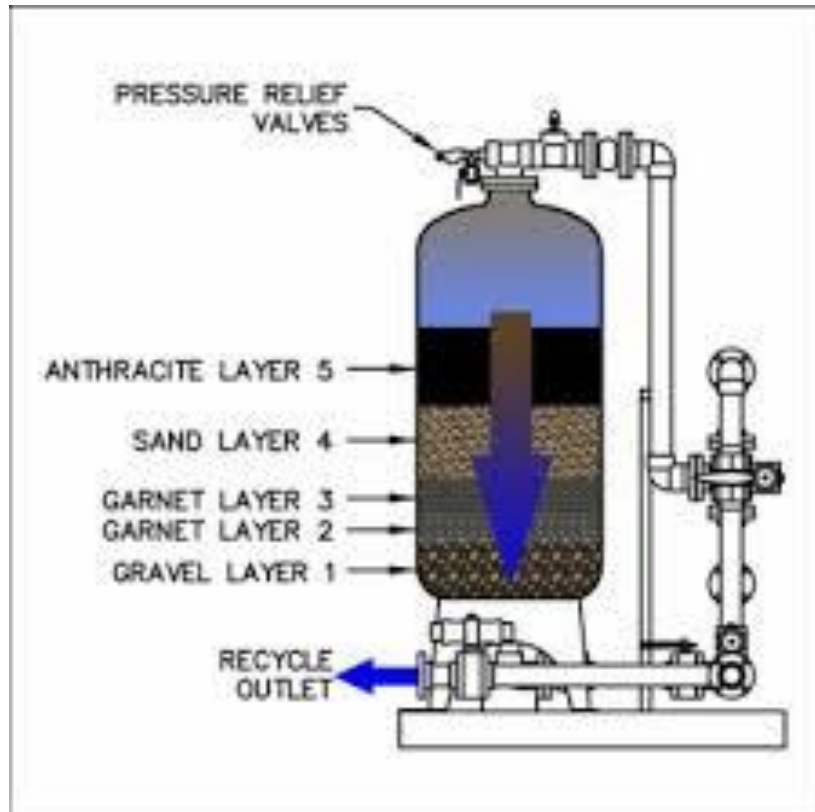


Check Inventory Levels in All Chemical Tanks!

- Check all chemical pumps for prime
- Shock feed both inhibitor & biocide to shock treat the system
- Check with your water treatment expert for proper amounts



Types of Filters



TOWER & CLOSED LOOP WATER TEST CONTROL CHART

Test	Range	Corrective Actions
Tower Conductivity	3000-3300 mmho	- If conductivity is out of range, check operation of blowdown controllers and solenoid. - Calibrate as necessary - Check for an uncontrolled water loss in the system.
Organophosphonate (WT 5777)	18-23 drop	- If levels are out of range check to see that the pump is primed and pumping. - Check conductivity levels. High or low conductivity will cause high or low OP levels. - Check to see that the <u>make up</u> water meter is turning and registering flow.
Free Chlorine (WT-5213)	.2-.8 ppm	- If free chlorine levels are low or high, check the ORP level. ORP should be operating between 350-500 mV. - Check for proper operation of the <i>WT-5213</i> pump. Check inventory. - Check for a “time-out” alarm on the <i>WT-5213</i> pump on the eController.
Total Hardness	30-100	- If hardness levels are high, check the softener for hard water. - High chlorine levels can interfere with hardness readings.
Closed Loops		
Nitrites (WT-5581)	500-800 ppm	- If Nitrite levels are low, increase the amount of <i>WT-5581</i> in the system. - Check for uncontrolled losses in the system. - Check conductivity and pH readings for abnormal changes.

Control Chart



What should I do to prepare my cooling system for startup?

The checklist below outlines preventive maintenance that should be addressed prior to seasonal start-up of your cooling system.

CHEMICAL REVIEW

- ☐ Review all cooling water treatment chemicals used in the system.
- ☐ Identify the purpose of each chemical and confirm feed method and schedule.
- ☐ Review safety procedures for all chemicals used in the system.
- ☐ Review testing and recording procedures.
- ☐ Inventory reagents used for testing and note if any have expired.

COOLING TOWER MECHANICALS

- ☐ Clean all debris within and around the sump and distribution decks, flush as required.
- ☐ Check and clean strainers, bleed, overflow and drain.
- ☐ Follow manufacturer's recommendations to lubricate fan and motor bearings.
- ☐ Follow manufacturer's recommendations to change oil in gear reducer assembly.
- ☐ Check belts, motor pulley and motor mounts. Replace and adjust as required.
- ☐ Inspect electrical connections, contactors, relays and operating/safety controls.
- ☐ Check motor operating conditions.
- ☐ Clean float valve assembly and check that it is operational.
- ☐ Check operating setpoints. Adjust as required.
- ☐ Read water meter prior to filling the system to determine system capacity. Record in log book.

WATER TREATMENT

Open Cooling Systems

- ☐ Clean and calibrate sensors, verify all controller settings and functions, inspect water meters, and validate proper operation of the flow switch and bleed valve.
- ☐ Chemically test the system water for proper bleed rate and treatment levels. Adjust accordingly.
- ☐ Visually inspect open portions of the system for evidence of corrosion, scale or slime and algae growth.
- ☐ Slug feed biocide and antifoam (if applicable) to control slime and algae growth. Conduct microbiological test.
- ☐ Confirm all chemical pumps are free of leaks, fully functional, and primed.
- ☐ Inspect all chemical tubing for cracks.
- ☐ Inventory the remaining water treatment chemicals and re-order as required.

Closed Cooling Systems

- ☐ Chemically test the system water for proper treatment levels.
- ☐ Adjust the treatment level for proper operation.
- ☐ Conduct microbiological test in chilled or process loops.
- ☐ Record results of the test and inspection including recommendations in log book.
- ☐ Install new filters in filter housing.

Do you need help with your cooling system startup? Ask your Watertech representative to help with the waterside of your system.

Cooling systems that are idle over winter can provide excellent conditions for bacteria to grow.

When starting a cooling system after layup, some basic steps should be followed to ensure peak performance and minimize risk of Legionella.



 414.425.3339

 info@watertechusa.com

 WATERTECHusa.com

Watertech of America
5000 S. 110th Street
Greenfield, WI 53228

Chilled Water Loops

Concerns with Chilled Water Loops

- Corrosion
- Scale (less likely)
- Particulate
- Microbiological growth

What is important to protecting chilled water loops?

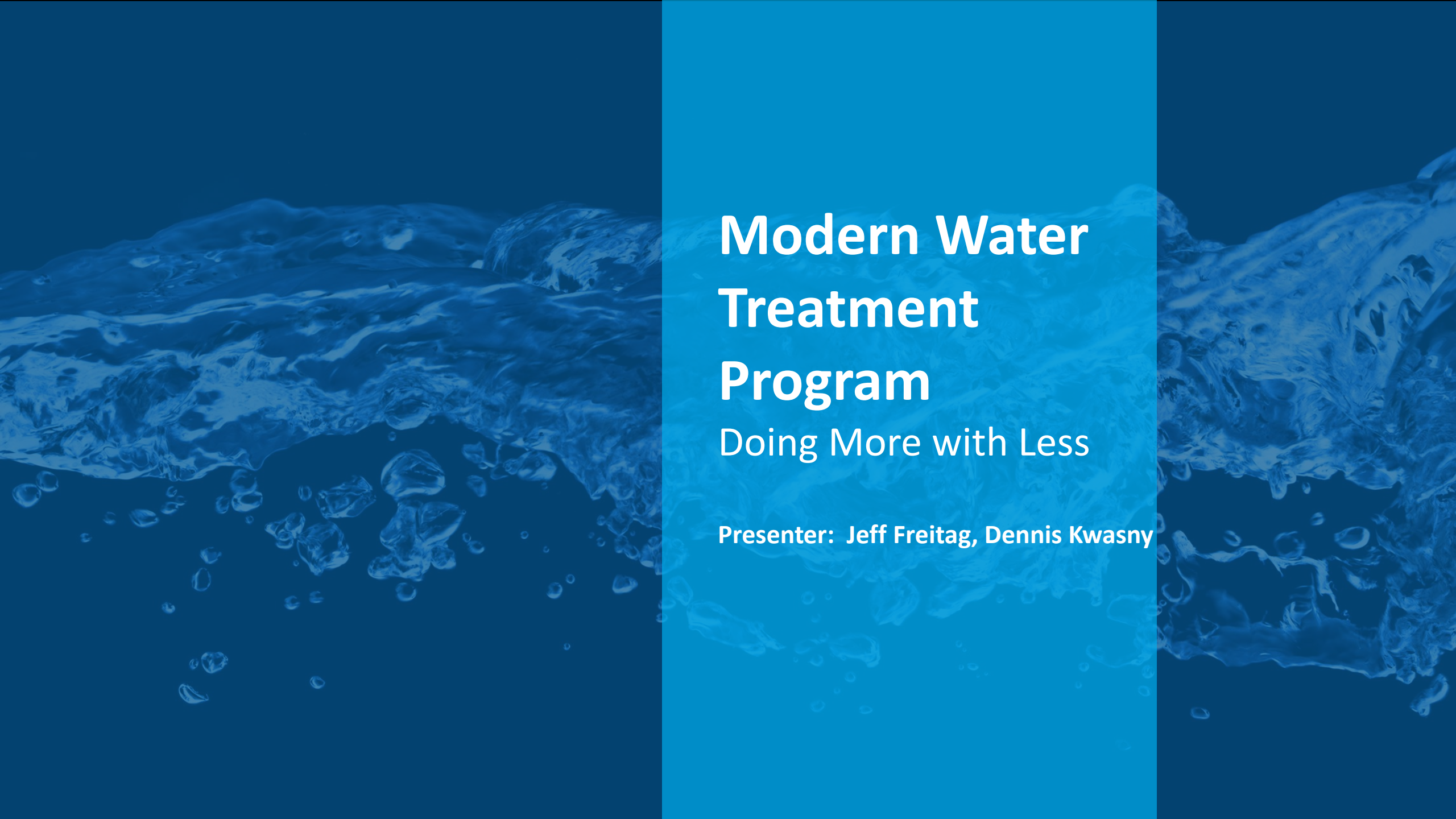
- Corrosion inhibitor
- Filtration
- Biocide



Closed Loop Feeder Systems

- Chemical pot feeder
- Smart feed





Modern Water Treatment Program

Doing More with Less

Presenter: Jeff Freitag, Dennis Kwasny

Control Panel

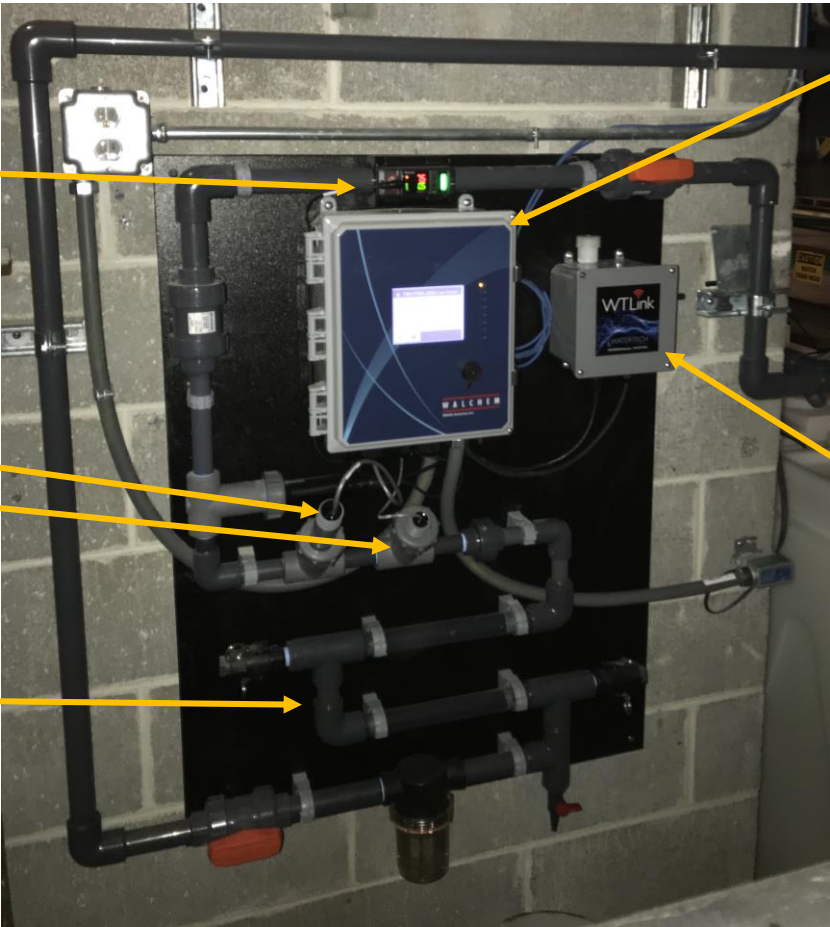
Keyence
Flow Sensor



Walchem ORP Electrode
& Conductivity Sensor



Coupon
Rack



Walchem 900
Controller



WTLink



Metering & Reporting

Controller Data

- System optimization
- Root cause analysis

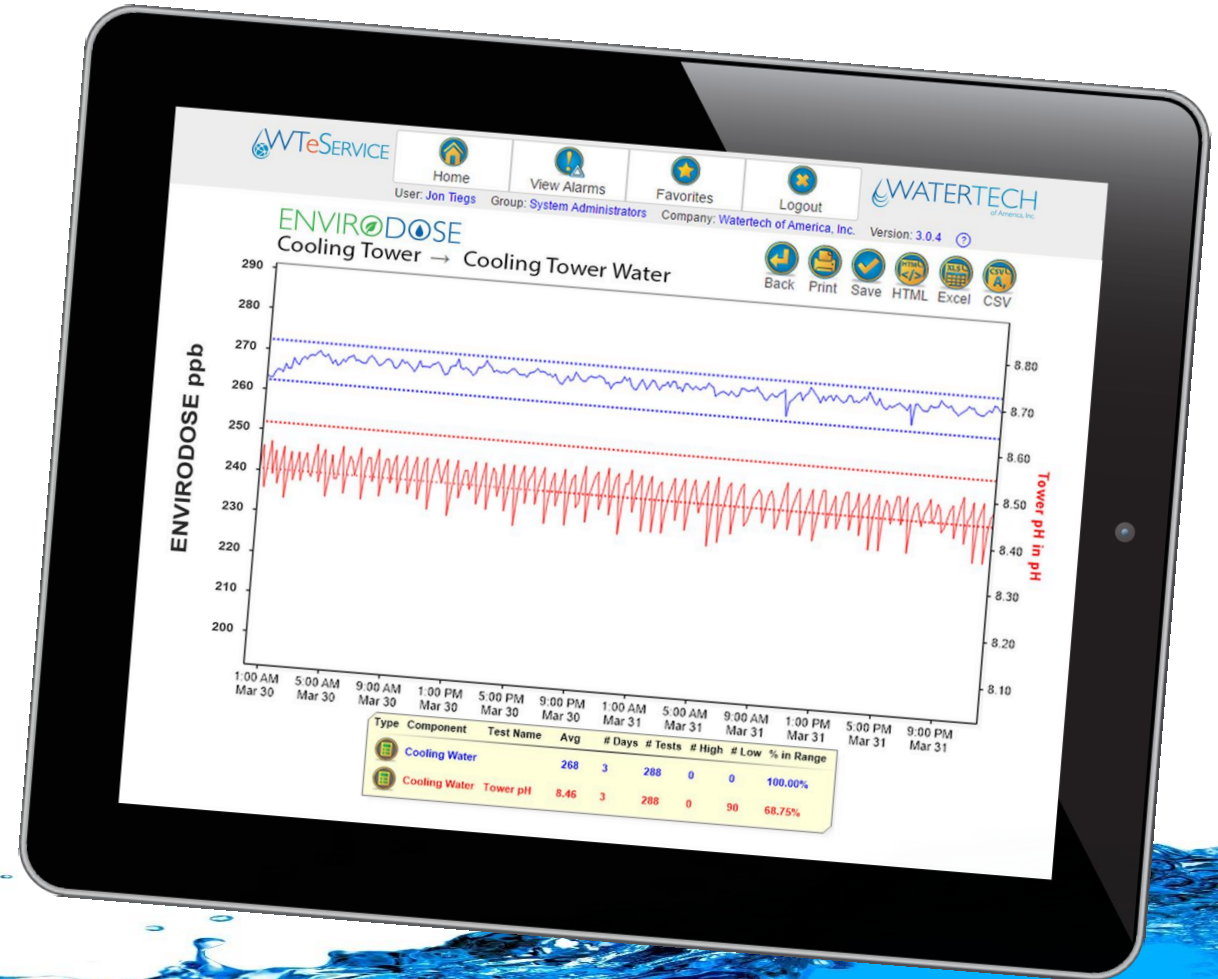
Manual Data

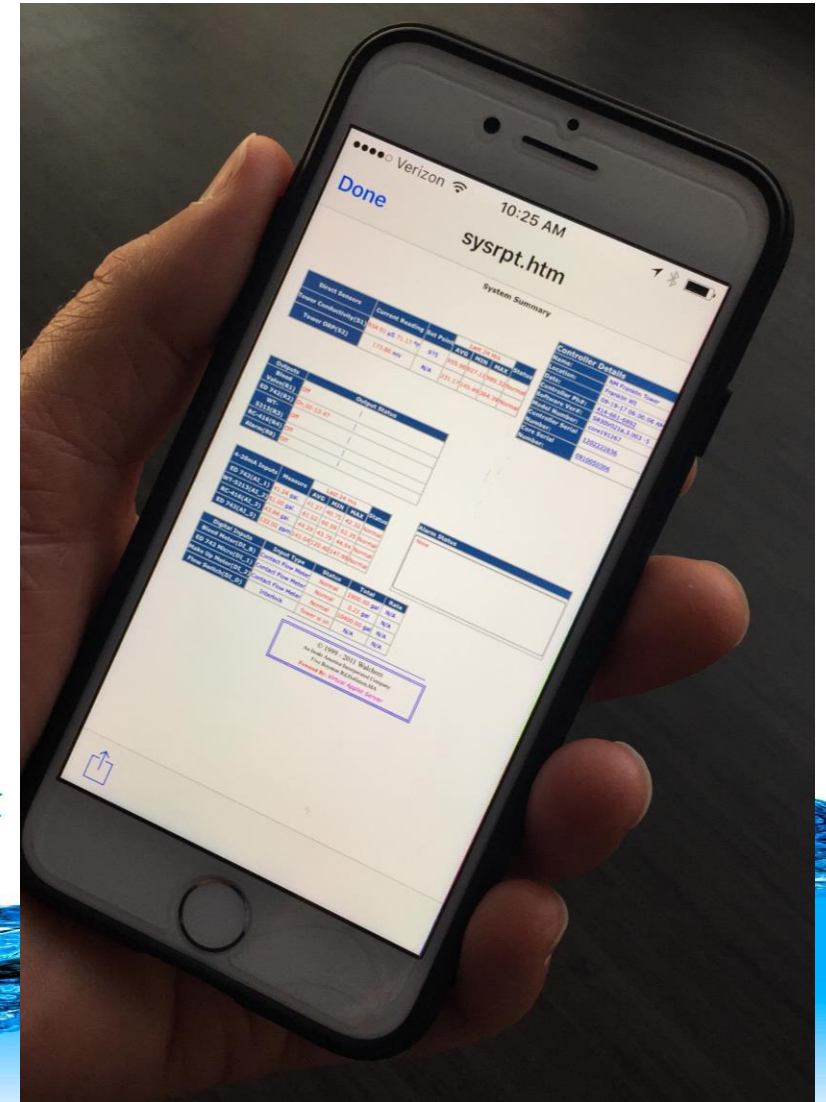
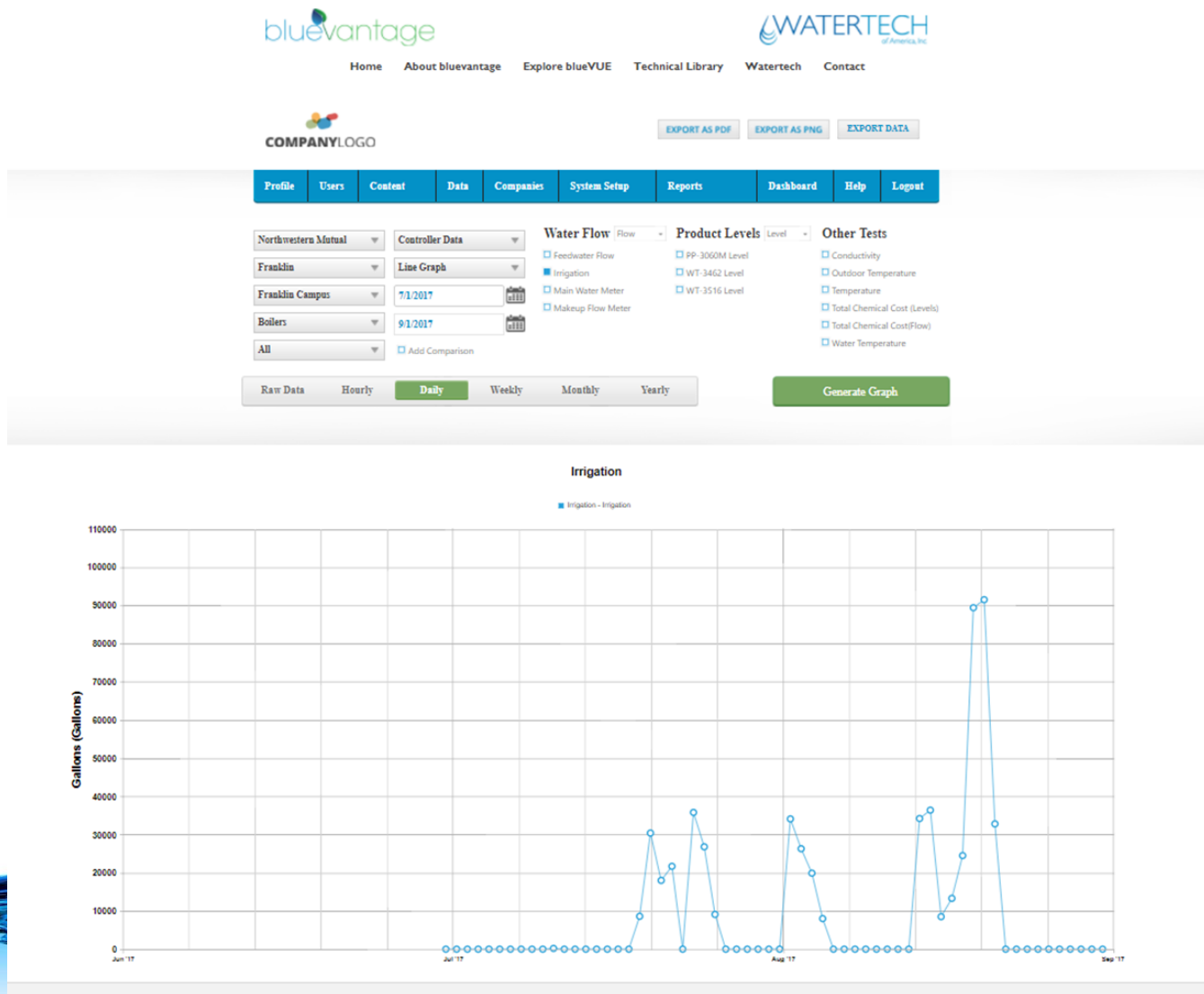
- Assist in operator training
- Identify automation problems

Advanced Metrics

- Cycles of concentration
- Tons of Cooling
- Water usage
- Cost of treatment

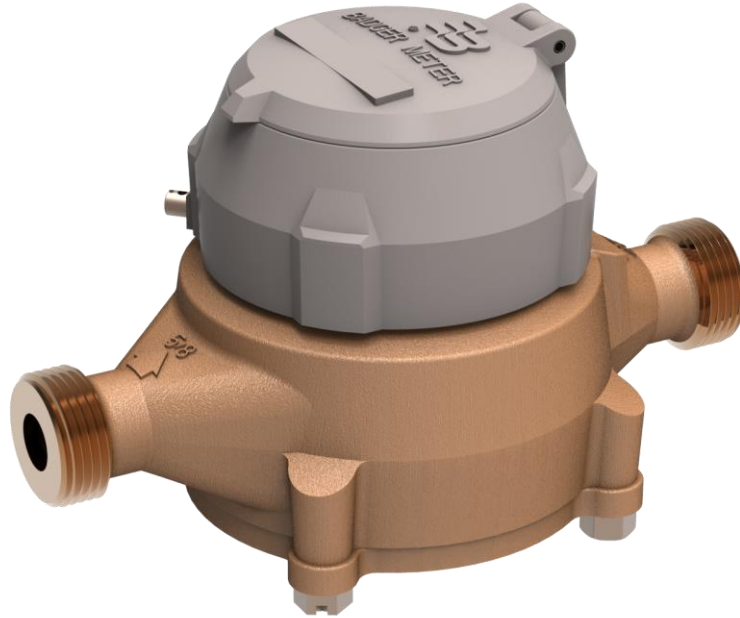
System Performance Measurement







Water Meters



Recommendation → blueVUE™



Water Analytics

- Custom Graphs
- Compare Date Ranges
- Grouping of Water Meters
- Daily Reports of Water Usage and Flow
- Alarms



Result ➡ Daily Reports

Equation Name	Total	DA - 7 Days	DA - 30 days	DA - 12 Months	YTD Total
Clarifier In	3,136,125	3,049,518	3,154,704	3,184,136	373,184,375
Clarifier Sludge Out	385,625	363,714	343,988	286,102	51,991,125
Clarifier Out	2,750,500	2,685,804	2,810,717	2,898,034	321,193,250
1 & 2 pm	811,594	674,103	694,547	650,144	75,536,250
1 PM Machine Chest	106,344	114,585	120,706	107,489	15,070,156
1 PM - MC	705,250	559,518	573,841	542,655	60,466,094
Showers	75,906	66,798	75,640	66,481	7,151,172
1PM Aisle	0	0	0	4,492,859	1,644,386,402
2PM	629,344	492,720	498,202	-4,016,686	-1,591,071,480
3 PM & Sulfite	2,880,875	2,807,000	2,747,075	2,648,461	299,288,250
No. 3 PM	1,871,219	1,824,589	1,709,896	1,624,114	181,041,375
North Branch	964,875	940,214	977,245	919,775	106,633,000
South Branch	906,344	884,375	732,651	704,339	74,408,375
3PM Silo	-72,344	-59,813	-29,510	-9,591	-996,313
3PM Aisle	978,688	944,188	762,161	713,930	75,404,688
Sulfite Plant	1,009,656	982,411	1,037,179	1,024,347	118,246,875

Controllers







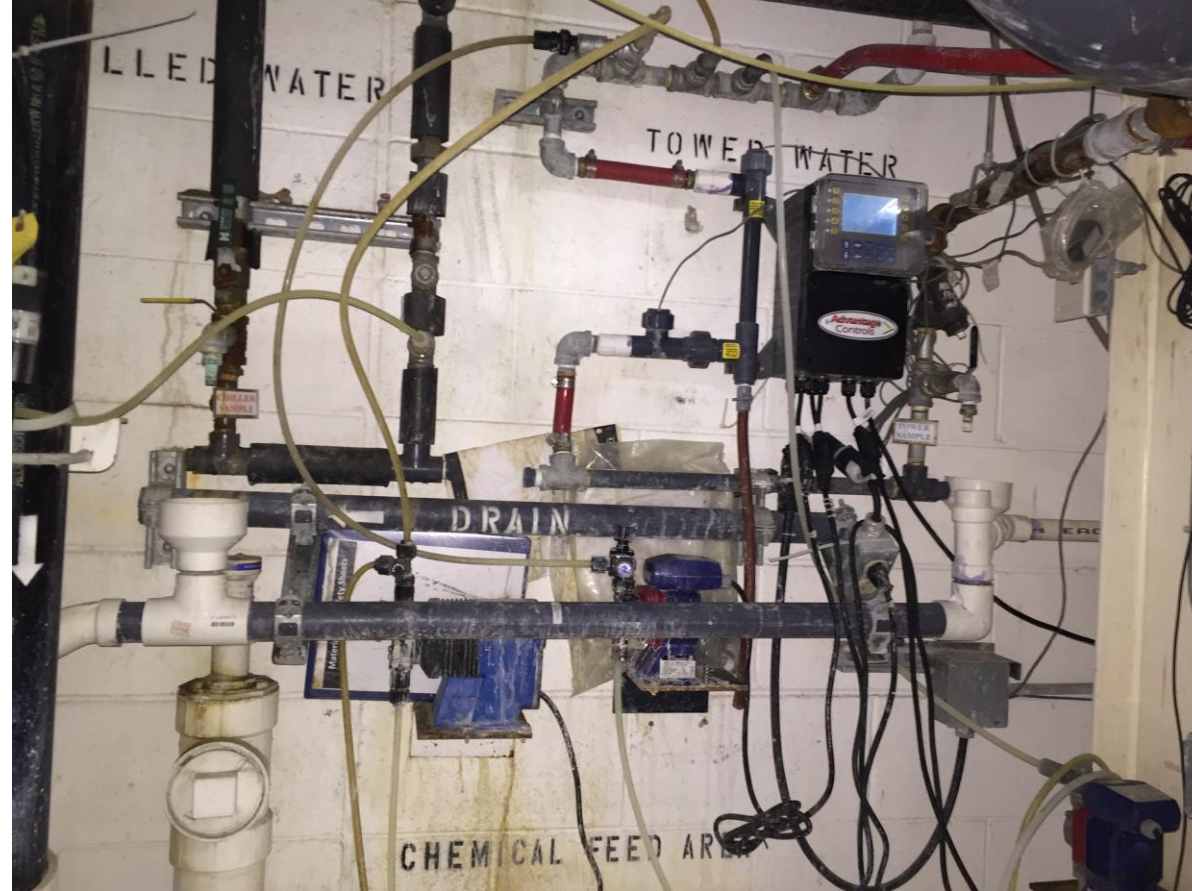
S





Controller Installation – What Not to do

- Safety Hazard
- Proper flow?
- Proper control?
- Where to start troubleshooting?



Controller Installation

- All components located in one location
- Easy to access
- Isolation valves
- Quick release sensors
- Sample/drain valve
- Wiring



Unplanned Install

Inconsistent
footprint



Tangle
of tubing

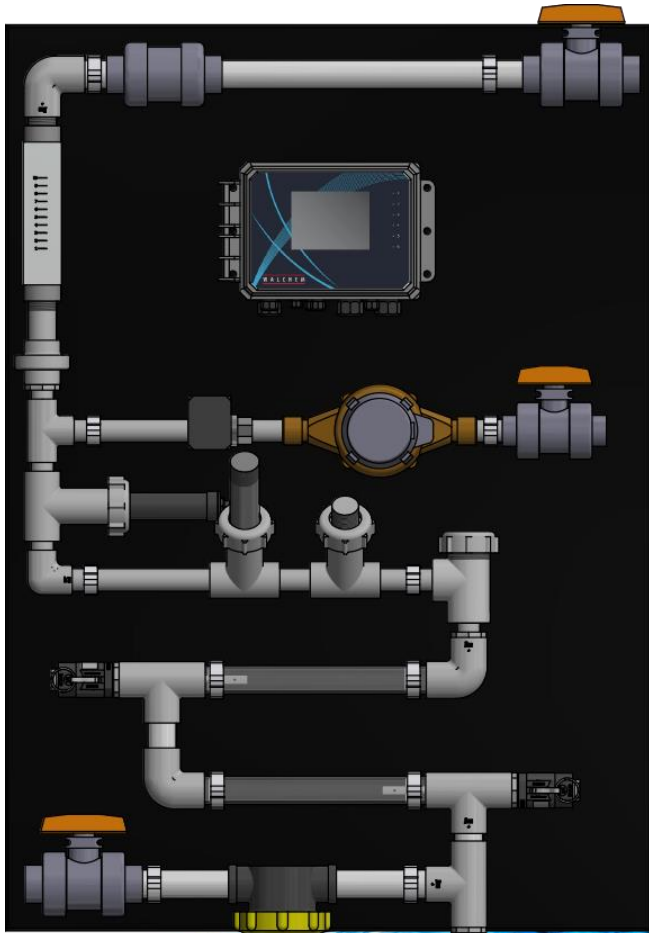


Spill Hazards

Electrical
Hazards



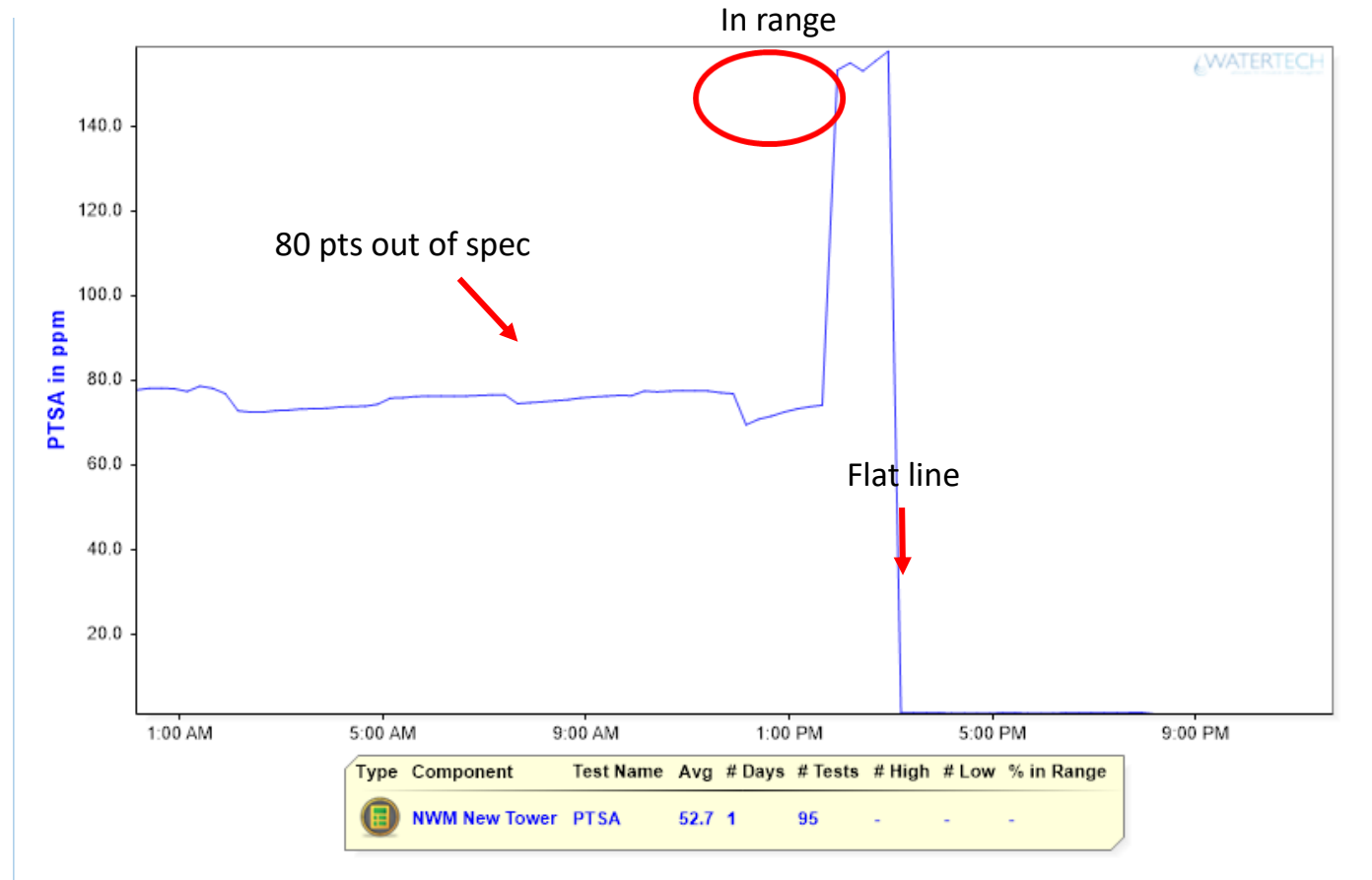
Liquid Chemistries done RIGHT



Cooling Tower – Problem

PTSA (inhibitor) Sensor Issues:

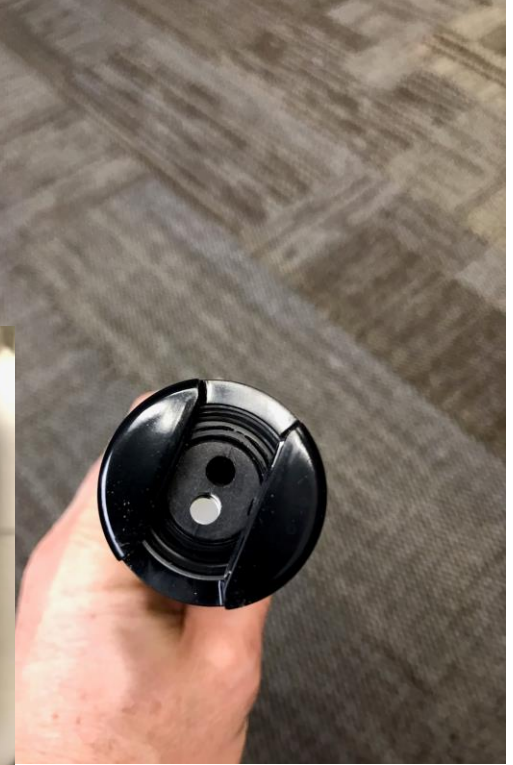
- PTSA Sensor is acting up
- Calibrated several times
- Replaced w/ new sensor
- Read perfect for 3 hours
- Dropped to near zero and stayed



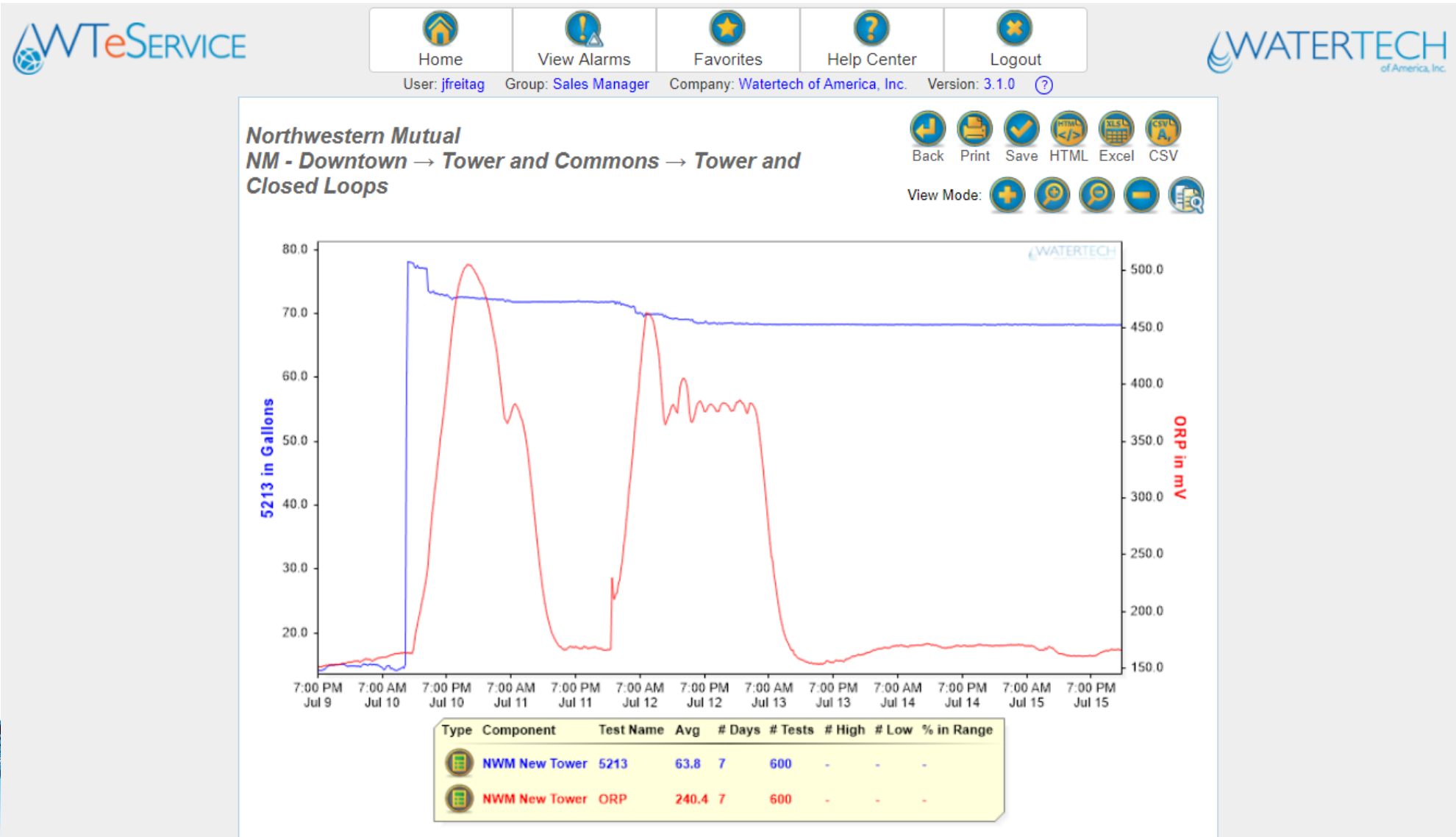
Cooling Tower – Result

PTSA (inhibitor) Sensor Issues:

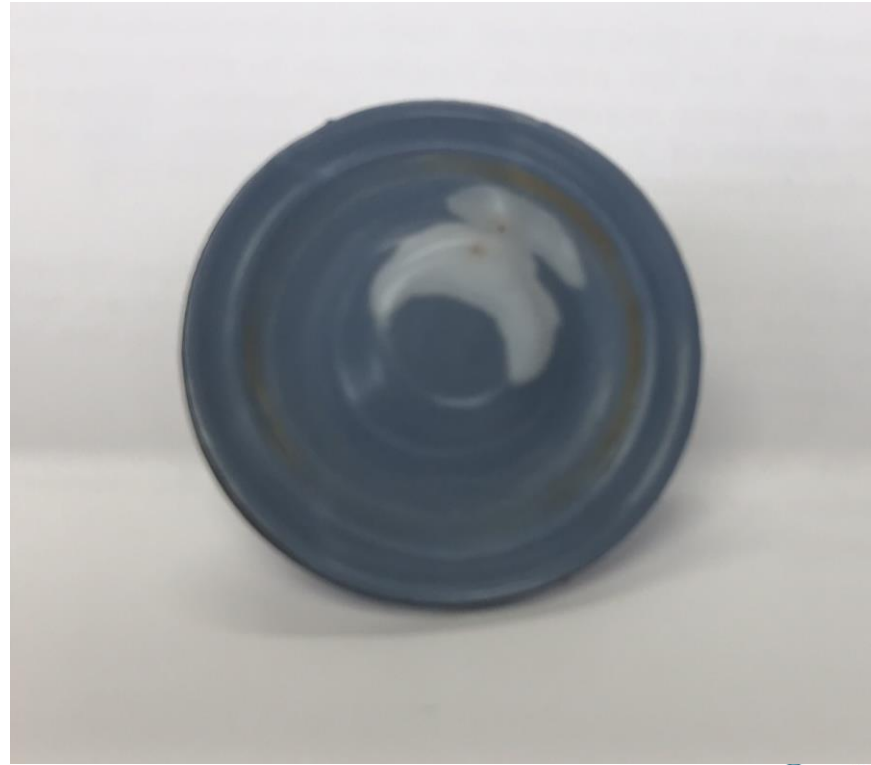
- Wiring was fine
- There was chemical in the system
- Flow across sensor is good
- Faulty sensor out of the box!

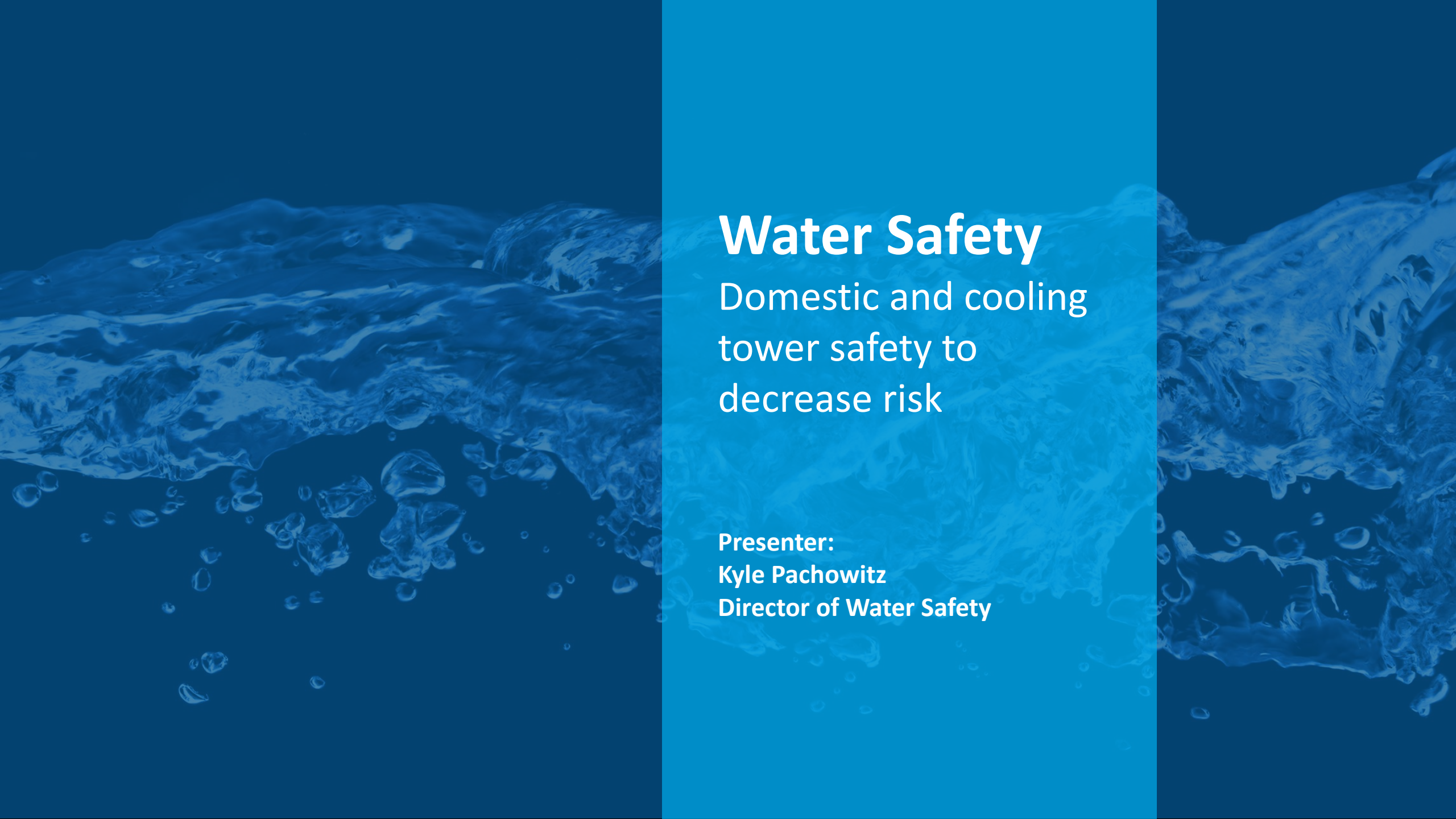


Problem: ORP Drops



Bad Diaphragm





Water Safety

Domestic and cooling
tower safety to
decrease risk

Presenter:
Kyle Pachowitz
Director of Water Safety

What is Water Safety?



CMS Update: 7-6-18

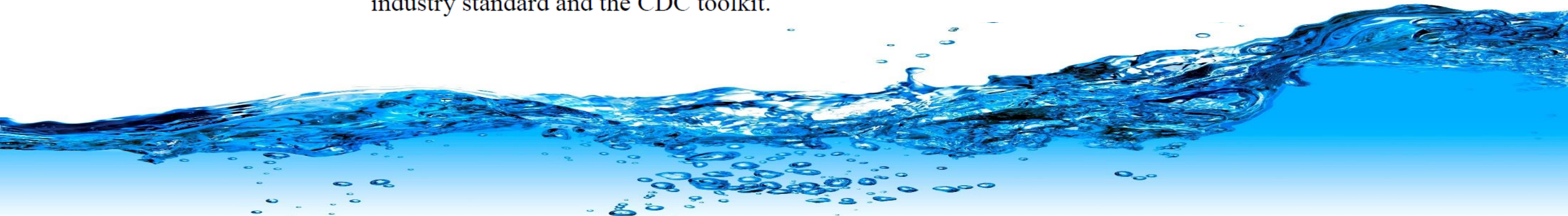
Requirement to Reduce *Legionella* Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD)

Expectations for Healthcare Facilities

CMS expects Medicare and Medicare/Medicaid certified healthcare facilities to have water management policies and procedures to reduce the risk of growth and spread of *Legionella* and other opportunistic pathogens in building water systems.

Facilities must have water management plans and documentation that, at a minimum, ensure each facility:

- Conducts a facility risk assessment to identify where *Legionella* and other opportunistic waterborne pathogens (e.g. *Pseudomonas*, *Acinetobacter*, *Burkholderia*, *Stenotrophomonas*, nontuberculous mycobacteria, and fungi) could grow and spread in the facility water system.
- Develops and implements a water management program that considers the ASHRAE industry standard and the CDC toolkit.



Conducting a facility risk assessment

Where can these opportunistic pathogens grow?

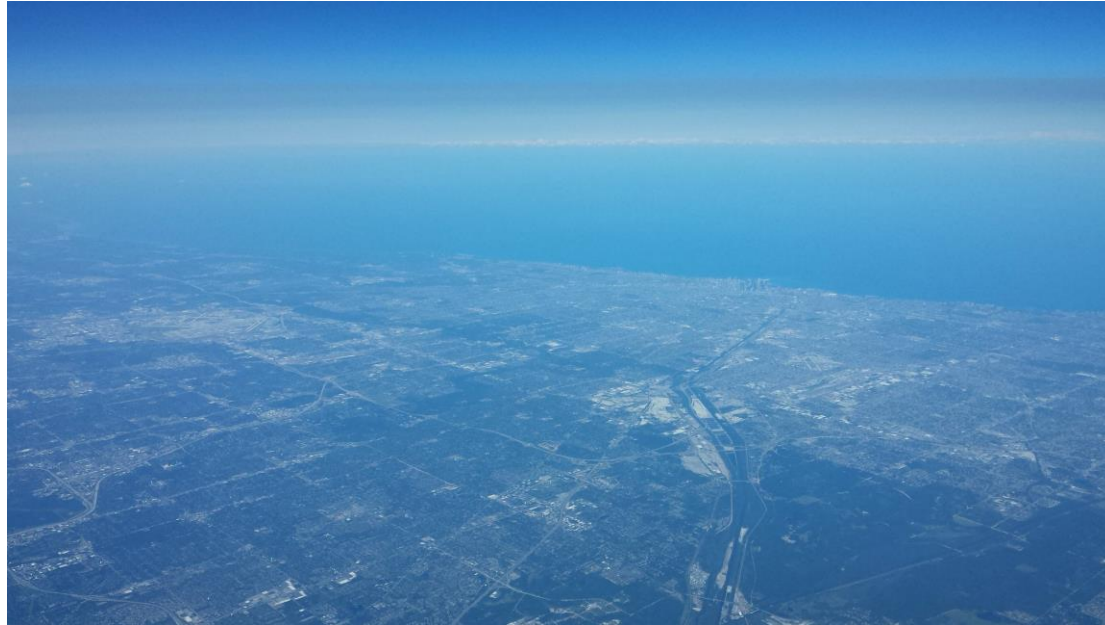
- Domestic water (specifically hot water systems)
- Cooling towers
- Decorative fountains (don't have one!)
- Ice machines (keep surfaces clean)



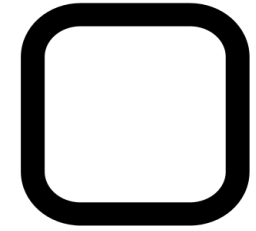
- A plan isn't just a binder or a website with a login/password
- A plan is an array of validation testing techniques and correcting the deficiencies.
- A plan is implementing new technologies that are scientifically proven to prevent and remediate water borne pathogens



**30,000 ft view-
COMPLIANCE driven**



**Scientific based evidence-
PATIENT SAFETY driven**



Domestic Water

ASHRAE Guideline 12

- Legionellae are more tolerant of chlorine than many other bacteria
 - Typical disinfectant provided by public water source
- Temperature range favorable for amplification is 77-108F
 - HWH temps, stagnant hot water,

AWWA disinfecting mains

- Are you chlorinating during minor or major shut-downs/construction?
- Unoccupied wings
- >5 days stagnation is amplification



What could be coming our way?

NY is the most advanced state

- Domestic Water
- Cooling Towers



Department
of Health



NY DPOH Domestic Water: What could be coming?

The new regulations require hospitals and residential health care facilities to:

- Perform or update an environmental assessment:
 - Evaluate the building and the potable water systems and identify sampling locations.
- Adopt and implement a sampling and management plan for potable water
 - Which includes routine *Legionella* culture sampling and analysis and immediate *Legionella* sampling and analysis under specific conditions, including where NYSDOH determines that one or more cases of legionellosis is or may be associated with the facility.
 - Conduct *Legionella* at intervals no greater than 90 days for the first year and annually thereafter.
 - Potable water systems that serve stem cell or organ transplant patients must be sampled and analyzed at intervals not to exceed 90 days.



New York Domestic summary

- Have a WMP
- Test for Legionella
- They require a minimum of 10 samples per round and the positivity has to be lower than 30% (doesn't matter which concentration of Legionella).



NHSN: National Healthcare Safety Network Hospital Survey

38. Do you regularly monitor the following parameters in your building's water system? (Check all that apply)

Disinfectant (such as residual chlorine)

☐ Yes

☐ No

If Yes, do you have a plan for corrective actions when disinfectant (s) are not within acceptable limits as determined by your water management program?

☐ Yes

☐ No

Temperature

☐ Yes

☐ No

If Yes, do you have a plan for corrective actions when temperatures are not within acceptable limits as determined by your water management program?

☐ Yes

☐ No

Heterotrophic plate counts

☐ Yes

☐ No

If Yes, do you have a plan for corrective actions when heterotrophic plate counts are not within acceptable limits as determined by your water management program?

☐ Yes

☐ No

Specific tests for *Legionella*

☐ Yes

☐ No

If Yes, do you have a plan for corrective actions when Specific tests for *Legionella* are not within acceptable limits as determined by your water management program?

☐ Yes

☐ No



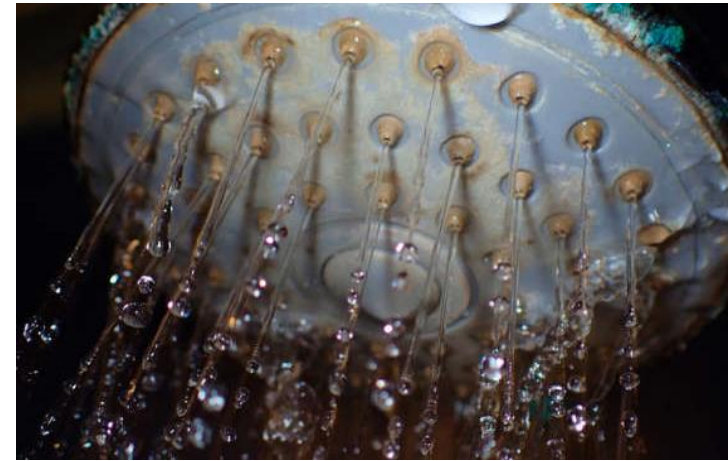
“If Yes do you have a plan for corrective actions”

Disinfectant testing

- City reliant disinfectant= no corrective action other than flushing
- The purpose is to gather data for potential future decisions

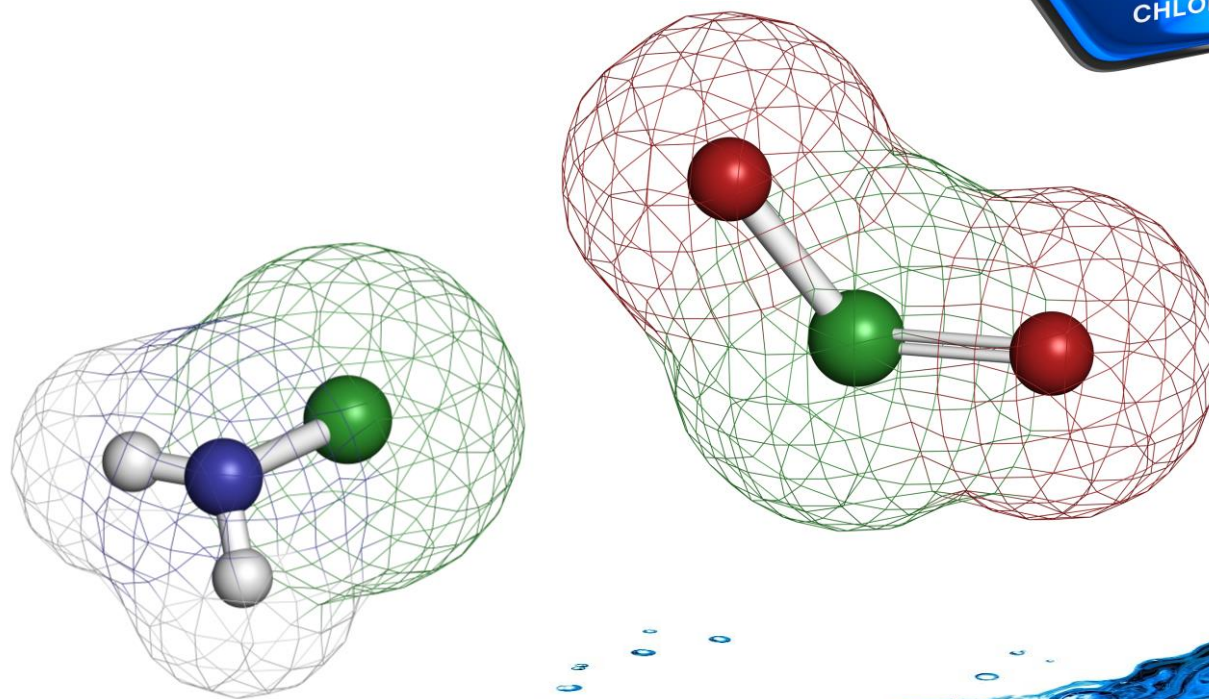
Typical observations

- Well water- 0 residual
- Chlorine- some residual in cold, rarely residual in hot
- Monochloramines- excellent residual in cold hot water differs with proximity to source



Long term supplemental disinfection technologies

- Chlorine
- Chlorine Dioxide
- Monochloramines*



Cooling Towers- Associated Standards



All have a similar stance on control, what do they recommend?



Major points that all three share

- Feeding dual biocides
- Automating chemical feed and monitoring oxidant residual (free chlorine probe or ORP)
- Keeping surfaces clean
- Minimizing stagnation
- Rotating pumps, chillers, and towers

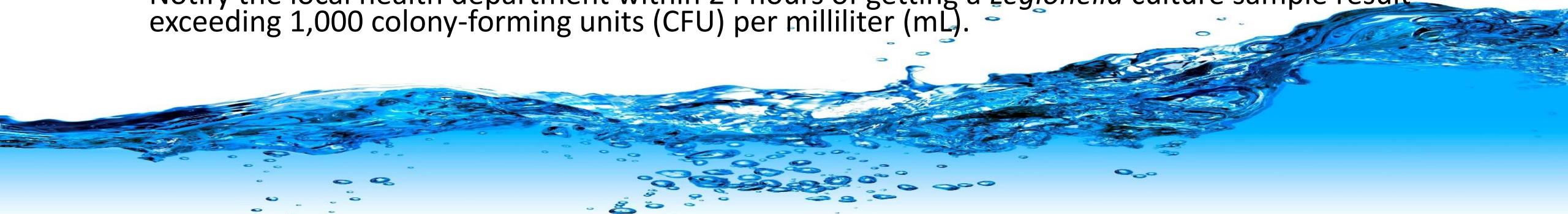


Cooling Tower Registry NYDOPH

What could be coming to other states?

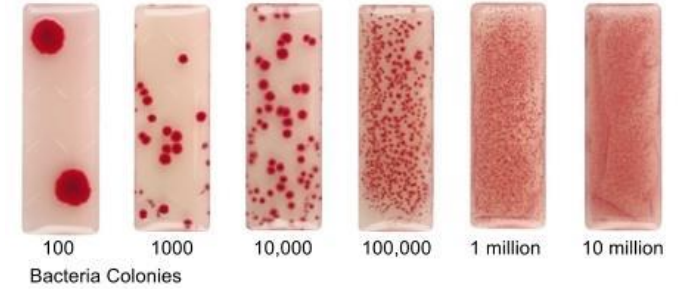
Under the new regulations, owners of cooling towers must:

- Register cooling towers in a statewide electronic system.
- Inspect cooling towers prior to seasonal start-up, following maintenance, and at intervals no greater than 90 days while in use. The purpose of the inspection is to check for deficiencies or problems.
- Have an updated maintenance program and plan by September 1, 2016 that includes a schedule for routine bacteriological culture sampling, routine *Legionella* culture sampling and analysis, and immediate *Legionella* culture sampling and analysis under specific conditions.
- Conduct *Legionella* culture sampling and analysis within two weeks after start-up for seasonal towers or within two weeks of start-up following maintenance for year-round towers and at intervals not to be greater than 90 days thereafter. Bacterial culture sampling and analysis must be conducted at intervals not to exceed 30 days while the cooling tower is in use.
- Notify the local health department within 24 hours of getting a *Legionella* culture sample result exceeding 1,000 colony-forming units (CFU) per milliliter (mL).



What can you do now to minimize risks

- Monitor for Legionella (CTIWTB-148 (08))
- Perform dip slides- make sure your WT professional has this on his/her report!
- Routine treatments
 - Continuous application of halogens
 - Dual biocide usage (bio dispersant or non oxidizing biocide)
- Routine on-line disinfections
- OSHA/CDC recommended cooling tower cleanings and offline disinfections 2x per year
 - Now is the time!

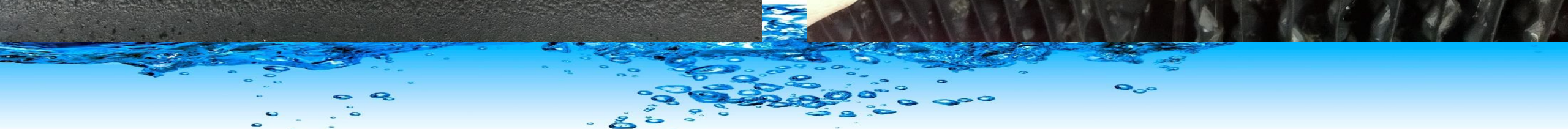


Mechanical Design considerations

- Drift eliminators
 - Prevention of entrained water droplets
- Plenum
- Siting and Flow
 - Away from air intakes
- Side stream filtration
 - Clean surfaces!
- Better chemical feed equipment and monitoring
 - See different controllers/automation packages in presentation



Thorough offline cleanings



Discuss brief process of tower cleaning

- Scrubbing surfaces
- Chlorine levels
- Vacuuming/spraying



Conclusion

- Validation/Verification – *Legionella* testing on critical control areas discussed.
- Test positive?
 - What are your temperatures and oxidant residuals?
- Low oxidant levels? You have options!
 - Choose the best technology for your application
- Clean your cooling towers
- Upgrade your equipment



The background of the slide is a photograph of a water treatment plant. It features large industrial tanks, pipes, and machinery. A prominent tank on the left has a label that reads "B-1". The entire image is overlaid with a semi-transparent blue filter. The title text is centered on this blue area.

Innovations in Water Treatment

Presenter: Jeff Freitag

Boiler Treatment with Aquafilm

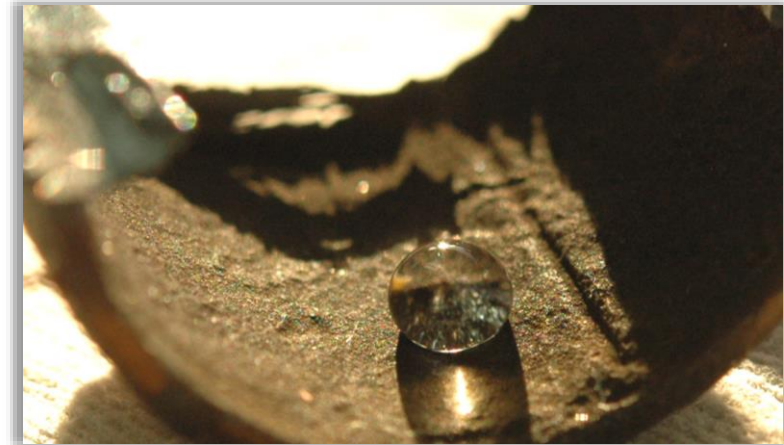
1. One product to replace up to FOUR chemistries allowing safer handling, less transport and testing
2. Reduces fuel consumption, in turn reducing CO₂ emissions
3. Forms an ultra-thin protective barrier on all metal surfaces to prevent corrosion and scaling
4. Improves heat transfer, lowering energy costs



New Form Filming Technology **Aquafilm**

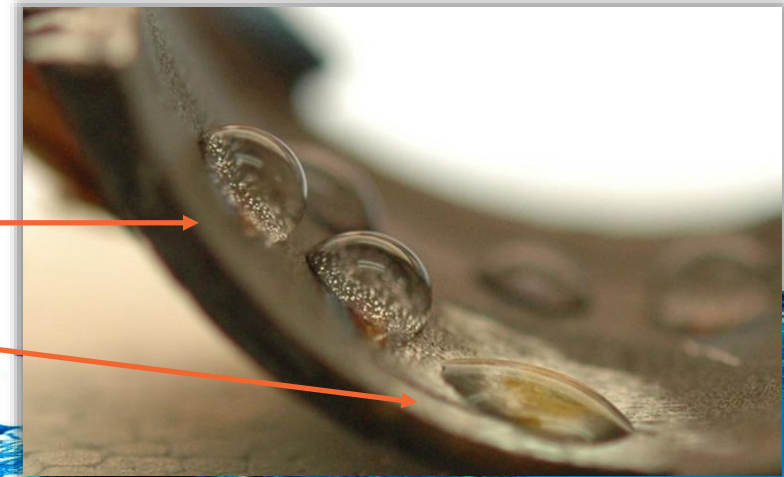
Changing the rules of boiler water treatment

- A uniform hydrophobic film controls corrosion by dissolved oxygen and carbonic acid
- The film will form on both clean and damaged surfaces
- The contact between water and metal surface is modified; surfaces becomes water repellent

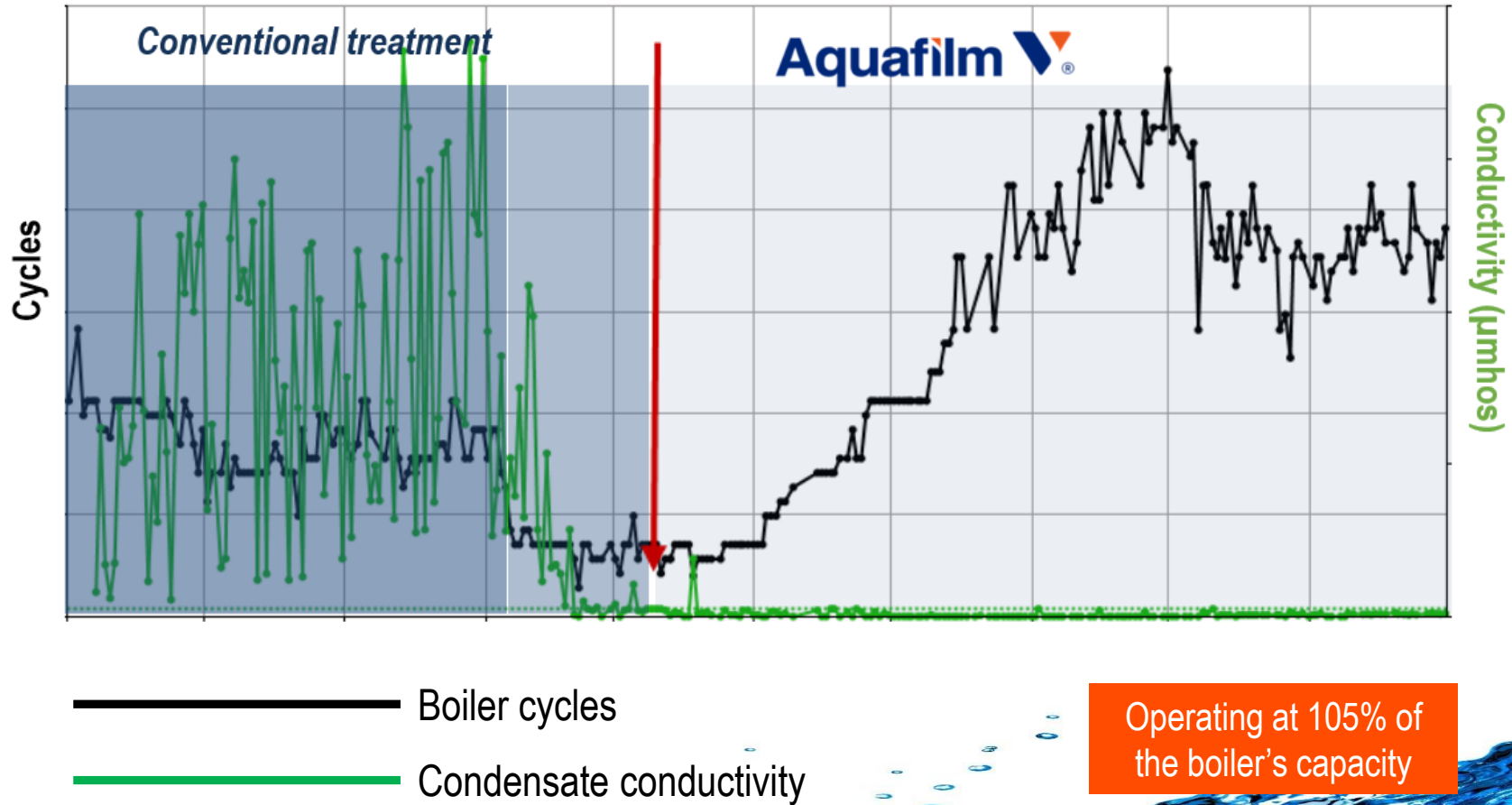


Protective film is present

Protective film has been scraped off



Operational improvements: Carry-over



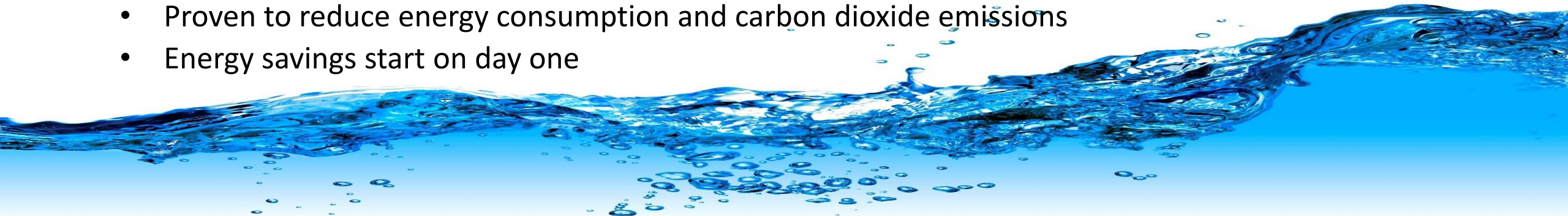
EndoTherm



Award winning energy savings additive distributed by Watertech.

EndoTherm Basics

- 100% Organic, biodegradable, legal to discharge
- Safe to use on all HVAC system materials; plastic, steel, aluminum stainless, rubber and copper
- Installed through a shot or filter feeder, or with small pump
- Compatible with a wide variety of inhibitors and glycols
- Proven for the past 9 years, in over 20,000 systems and with over 300 case studies..... And growing every day
 - Thermally stable with no evidence of breakdown to date
- Colorless so it will not dye a system
- Ease of use – Simply add to boiler or chiller water at 1% by volume
- Winner of multiple building and ecofriendly awards
- Proven to reduce energy consumption and carbon dioxide emissions
- Energy savings start on day one



EndoTherm Case Studies

CASE STUDY: Vancouver International Airport (YVR)
South Terminal, Vancouver, Canada



17.32
%

TOTAL SAVINGS

FINANCIAL SAVING

\$1,684

CO₂e SAVING

10,000 kg

CASE STUDY: Poirier Sports & Leisure Complex
City of Coquitlam, BC, Canada



13.56
%

TOTAL SAVINGS

FINANCIAL SAVING

\$7,302.66

CO₂e SAVING

28,900 kg

CASE STUDY: The Victorian, Apartment Complex
Bentall Kennedy



21.26
%

TOTAL SAVINGS

FINANCIAL SAVING

\$882.50

CO₂e SAVING

7,589 kg

CASE STUDY: Main Street Equity Corp,
29 Site Roll Out



11.39
%

TOTAL SAVINGS

FINANCIAL SAVING

\$42,977

CO₂e SAVING

273,978 kg

Cooling Tower Water Treatment



Pulse~Pure® Non-chemical
Water Treatment



Pulse~Pure® Applications



EVAPCO Water Saver

- Improves water efficiency by increasing operating cycles of concentration
- Reduces blowdown and treatment chemicals sent to drain



Questions?



Wisconsin Healthcare
Engineering Association_{inc}

