Maintain Water Quality Throughout the Distribution System

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Water Advanced Solutions

ready for the resource revolution

SUEZ

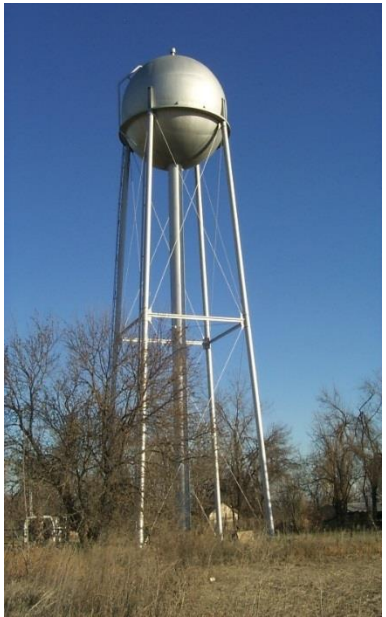
Distribution Assets from the water source to the tap.

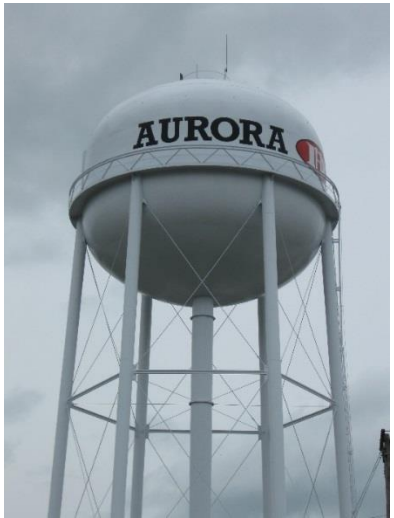
- Water Mains
- Water Storage
- Water Towers
- Water Tanks
- Concrete Clearwells
- Concrete Storage Tanks

Asset Condition Assessments uncover the needs

Elevated Water Tower Washout Inspection

WATER TOWERS/TANKS





WHY INSPECT? Because we want clean water!

- COMPLIANCE WITH REGULATORY AGENCIES
  - MO DNR
  - AWWA
  - NSF
  - OSHA
  - FAA
  - FCC

WHAT TO INSPECT

Six categories of items to inspect:

1. Sanitary Conditions
2. Structural Conditions
3. Safety Equipment Conditions
4. Coating Systems Conditions
5. Security Conditions
6. General Details

Bio-Film


LUNCH??

NO Divers in my drinking water

WHAT TO INSPECT
SANITARY CONDITIONS

Roof openings

Access hatches

Low spots in roof plates

Vents

Overflows

SANITARY CONDITIONS

SANITARY CONDITIONS


AQUAFINA
Pure Water • Perfect Taste

Live Frog in Potable Water Tank

Found ?? Inside Water Tank

SAFETY CONDITIONS

- OSHA Standards
- Ladders
- Fall prevention devices
- Handrails
- Access hatches
- Confined space
- Radiation hazards

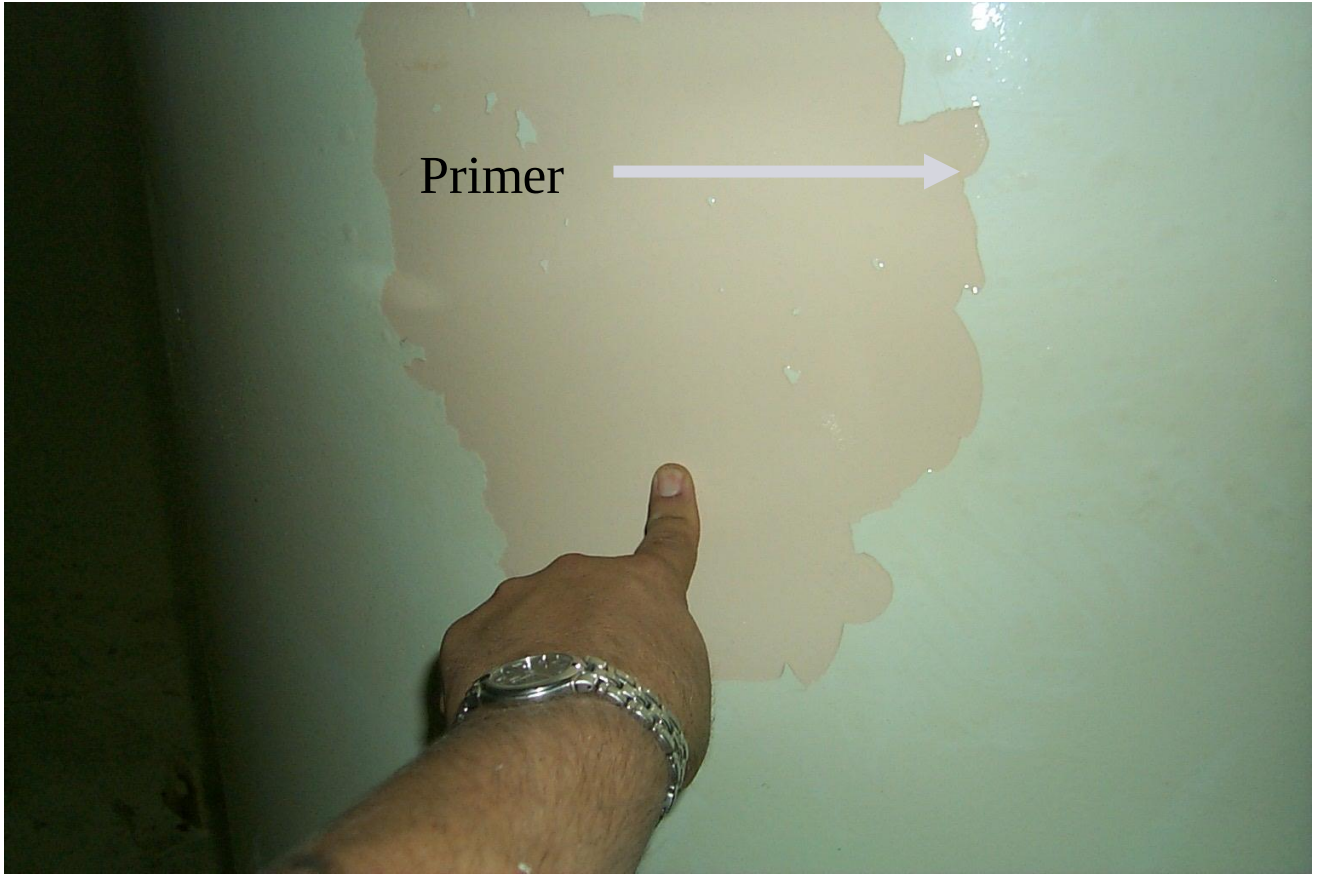
Important Upcoming Changes to Regulations for Potable Water Linings

On January 1, 2023, NSF will implement a new health requirement called NSF/ANSI/CAN Std. 600 (NSF 600) which will require all coatings in contact with potable water to meet new, lower extraction levels.

These new limits will severely restrict available product offerings from most coating and lining manufacturers and only coatings with extractables of xylene less than 0.09 mg/L, ethylbenzene less than 0.14 mg/L and toluene less than 0.06 mg/L, will be certified for use on potable water structures and components.

100% Solids by Volume Epoxy Linings

Inter-coat Adhesion Failure (Interior Epoxy)



BLISTERS IN COATING

SECURITY CONDITIONS

Exterior ladders terminate at least 12 feet above grade fitted with ladder guard

Properly fenced site

All hatches and doors locked

Secure vents

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Why Coat Concrete?

Protection of the asset

Protect the concrete from acid and sulfate attack
Protect the rebar structure from corrosion and chlorides

Aesthetics

Ensure the public water supply is in contact with an NSF 61 (NSF600) compliant material

Bare concrete is NOT NSF certified

Inherent Problems with Concrete

Two types of concrete:

Concrete that has cracked
Concrete that will crack

Concrete is not concrete is not concrete

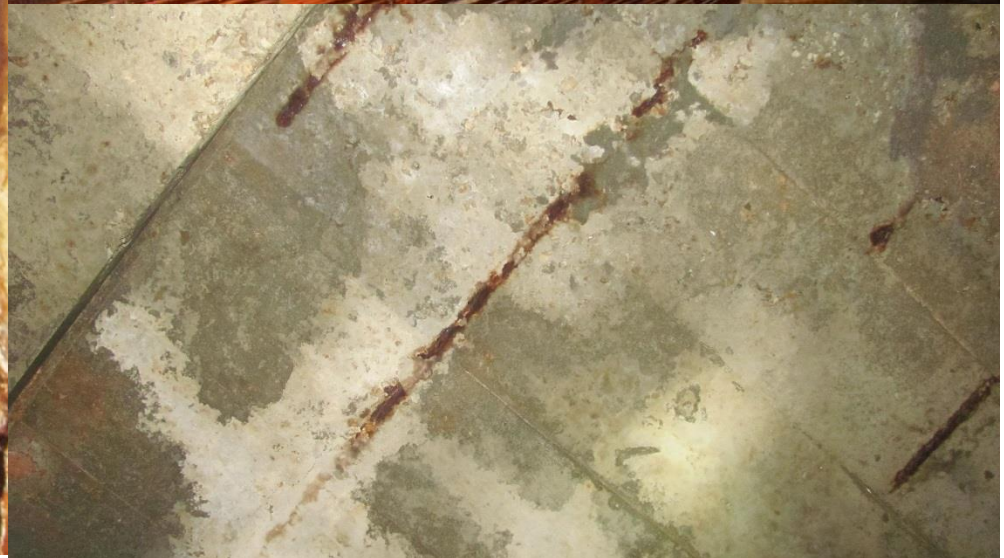
By definition concrete is a heterogeneous mixture.
Different batches can have very different properties, even on construction of the one structure.

Concrete as a substrate is not as predictable or stable as steel

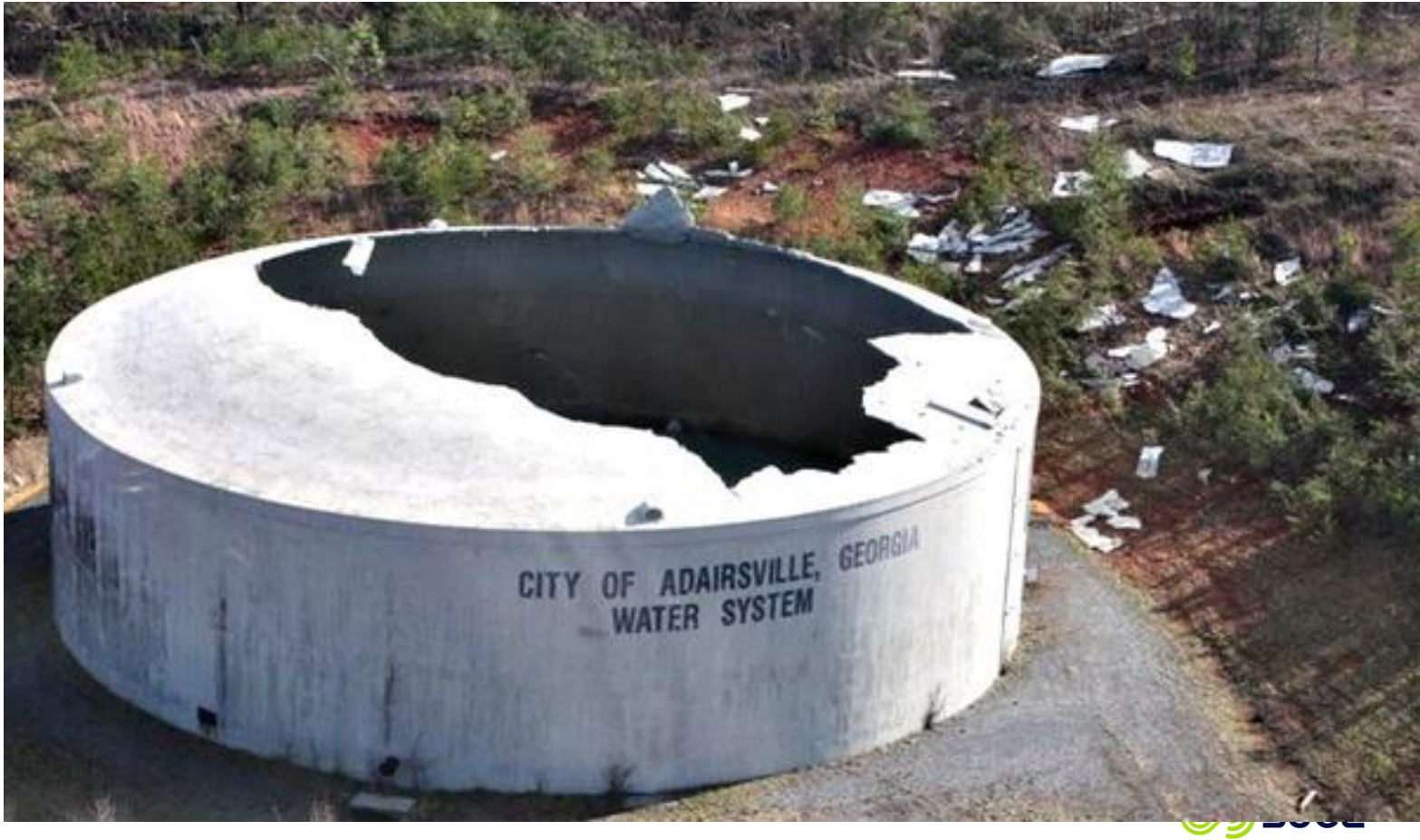
New concrete tank design standard (AWWA) even allows for a .05% per 24 hour leakage rate

Example: 5MMG concrete GST, allowable loss = 2,500 gallons per day!

Concrete Clearwell



MAINTENANCE FREE ????

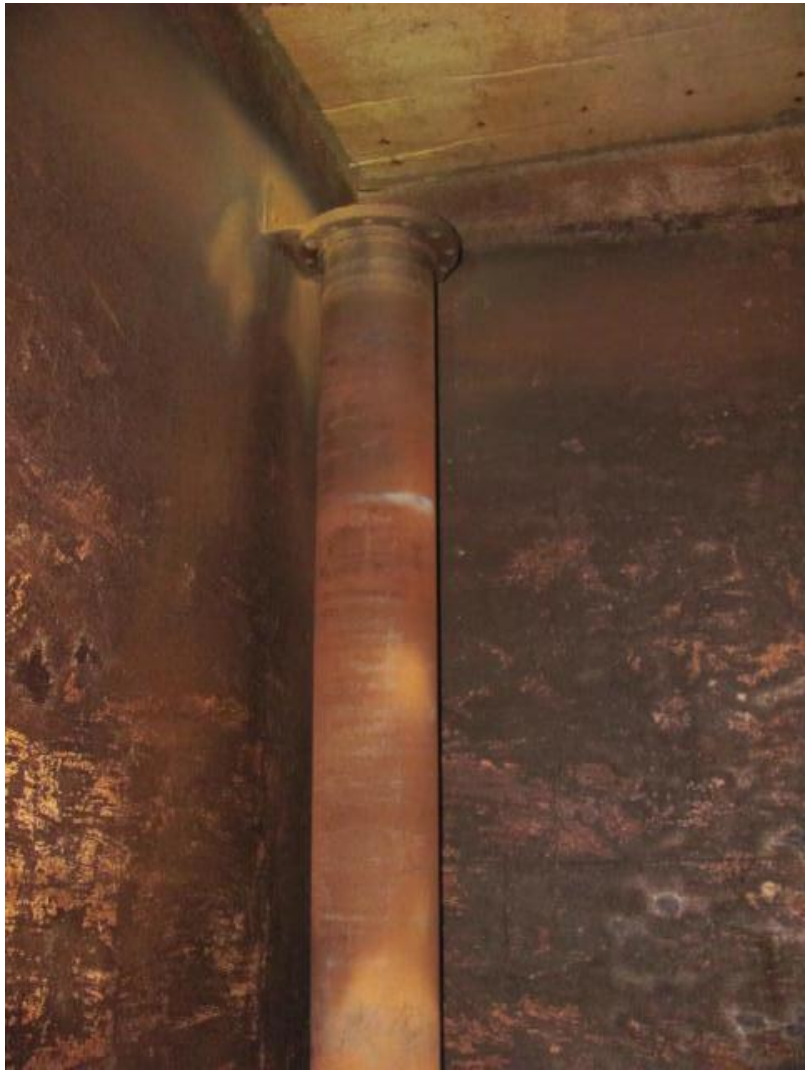


Ground Water Intrusion

Concrete Clearwell Interior

Concrete Clearwell Interior

Concrete Clearwell Interior

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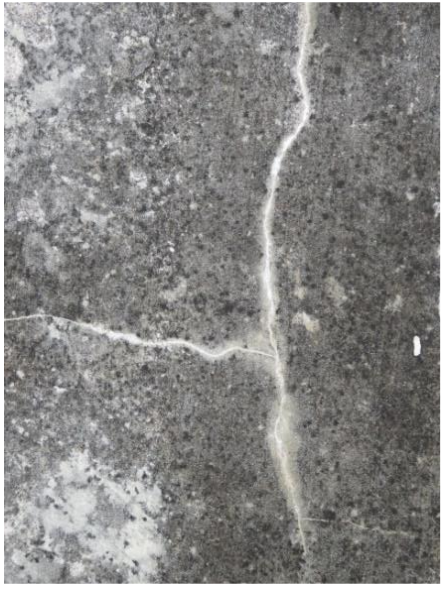


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100% Solids by Volume Epoxy Lining

- 1 Coat epoxy lining system
- Rapid Cure

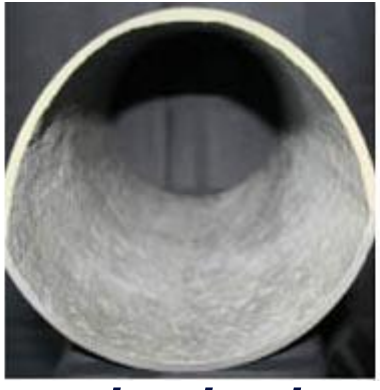
Spray in-place Pipe Rehabilitation

Structurally Enhance & Reinforce

Before

Severely corroded

During



Completely cleaned

After

Epoxy lined

The Solution

We provide the perfect solution for the restoration of aging underground piping systems, for both cast iron and ductile infrastructures. Our equipment includes state of the art robotic spray application rigs, computer-controlled for more refined application and curing. Our material bonds to your piping system– preventing and sealing cracks– and moves with the structure, abating leaks caused by settlement.

New Solution

Spray-In-Place Pipe (SIPP)

Clean: Through cleaning of host pipe

Camera: CCTV Inspection

Coat: Spay host pipe with epoxy resin

- **Advantages:**
  - Minimal Excavation
  - No reinstatement of service connection required
- **Disadvantage:**
  - Requires completely clean and dry host pipe

SIPP Solution

Spray-In-Place Pipe (SIPP)

- Trenchless pipe rehabilitation technology uses a computer-controlled, robotic spray application rig to apply an NSF 61-approved (NSF 600) , 100%-solids epoxy pipe lining in-situ
- Once cured, epoxy coating creates an internal seal preventing leaks and protecting against contaminants leaching into the system
- Works with most piping materials including cast iron, pvc, HDPE, etc. Suitable for small diameters, turns and bends (4 to 36 inches)

- **Extend service life of pipes**
  - Protects against future corrosion
  - Once cured, the lining moves with the structure, abating leaks caused by settlement
- **Improve water quality and system efficiency**
  - Could reduce the leaching of lead from soldered joints
  - Enhanced flow capacity - Provides thermal isolation
- **Minimize maintenance costs**
  - Reduce frequency of maintenance
  - Rapid cure and minimal disruption

SUEZ's Spray-In-Place Pipelining Process

1. System Diagnosis

- Map system
- Utilize computerized pipe video surveillance to inspect and digitally record findings
- Review findings with property management
- Diagnose and identify restoration plan

2. Repair/Replacement

- Repair or replace damaged pipe sections
- Flushing & drying
- Tuberculation removal
- Grit blasting

3. Abrasive Cleaning

- Abrasive cleaning with conical spray head to near-white metal finish *(as specified by manufacturer)*
- Pipe is now in a good state of repair

4. Epoxy Lining and Reassembly

- Pipe's state of good repair enhanced with epoxy lining
- Extends life of repaired or replaced pipe
- Prevents corrosion and biological buildup
- Enhances flow capacity
- Dampens vibration

5. Final Inspection & System Testing

- TV inspection
- Epoxy inspection of pipe lining for thickness
- and need for coating repair
- Hydrostatic pressure testing
- Leakage pressure testing
- Bacteriological disinfection
- Leaching test
- Restoration of system

Sioux Falls, SD – 3,200ft of 16in & 20in

	SUEZ Epoxy Cleaning and Lining	Traditional Pipe Replacement
Time Required	**6 weeks**	N/A due structures in place
Access Requirements	**8 access points needing just 3 feet of pipe access**	Trench the entire street causing severe and long traffic disruptions

Tank Mixing

Active 24/7 mixing

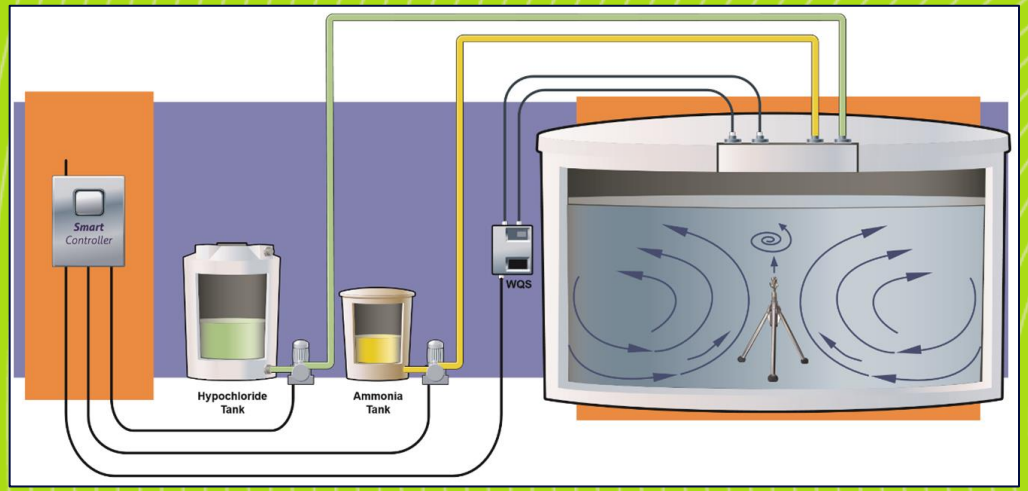
Eliminates thermal stratification

Eliminates Icing and Ice damage

Helps to maintain water quality

Power Vent with Mixing reduces THM’s in the water tower

RCS- Chloramine & Free Chlorine Residual Optimization and Management in the Distribution Network



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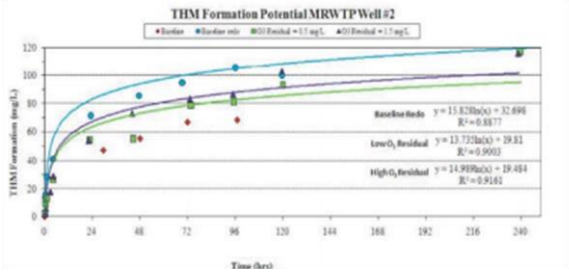
Utilities have no “free lunch” as the choice of secondary disinfectant will determine the problems they will contend with:

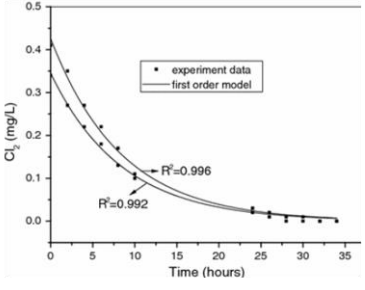
Free Chlorine

- Boosting to offset degradation
- DBP formation (THM and HAA5 issues)



Chloramines

- Chloramine degradation (ammonia formation)
- Nitrification (nitrite and nitrate MCLs)

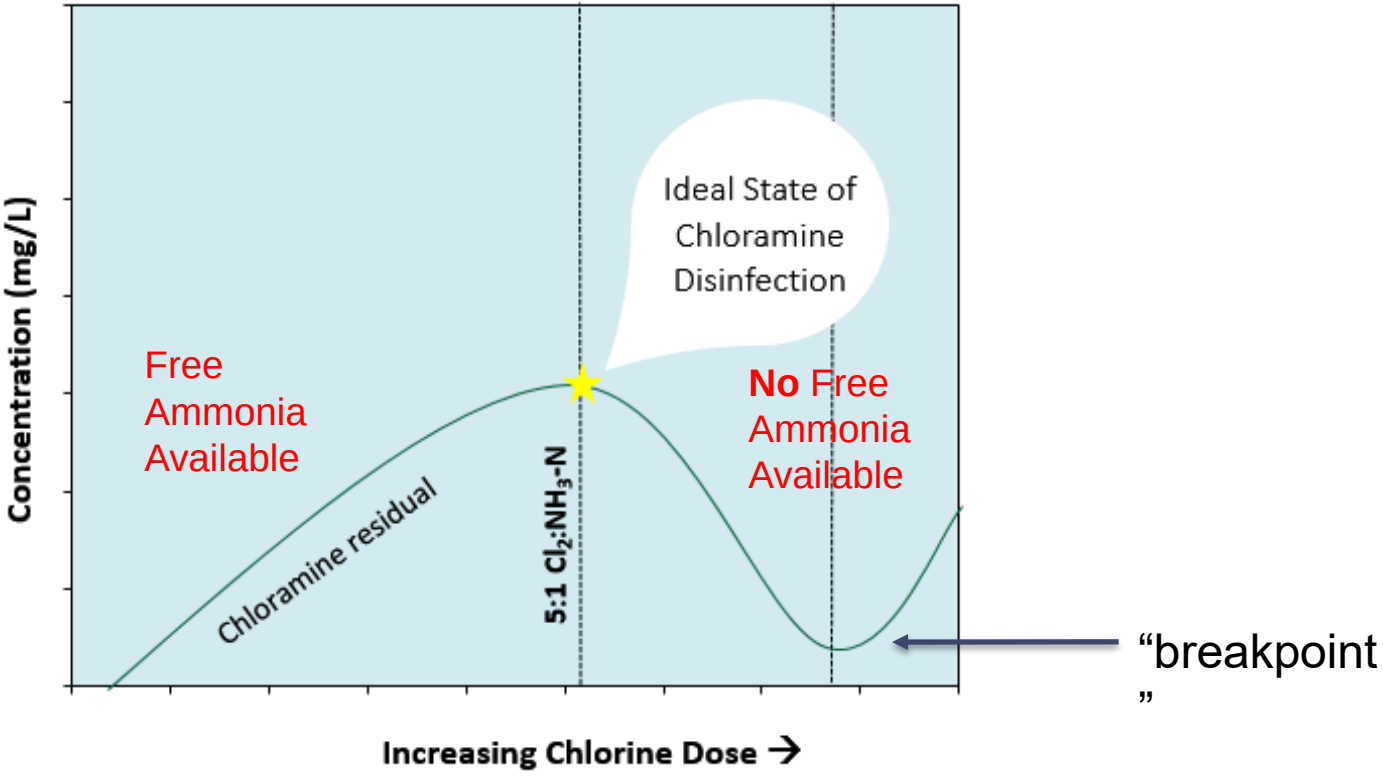


Chloramines, used in about a third of municipal water systems, provide longer protection in distribution systems and are less prone to encourage DBP formation

$$NH_3 + OCl^- \leftrightarrow NH_2Cl + HO^-$$

Monochloramine is formed by the reaction of chlorine and ammonia with a chlorine atom substituting for one of the three ammonia hydrogen atoms

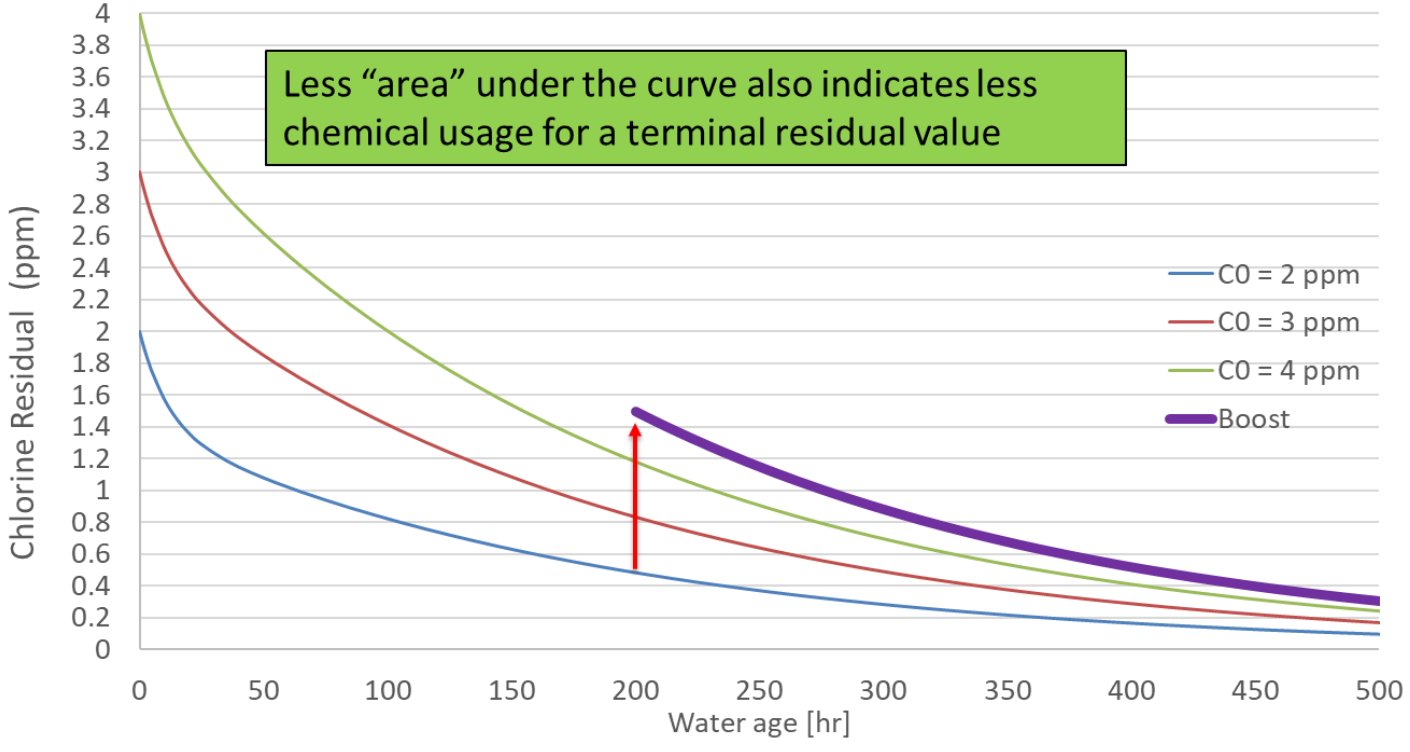
A tank's residual position on the "breakpoint curve" determines the action to take to improve residual levels



Operators use many tactics to try to control nitrification and lack-of-residual issues

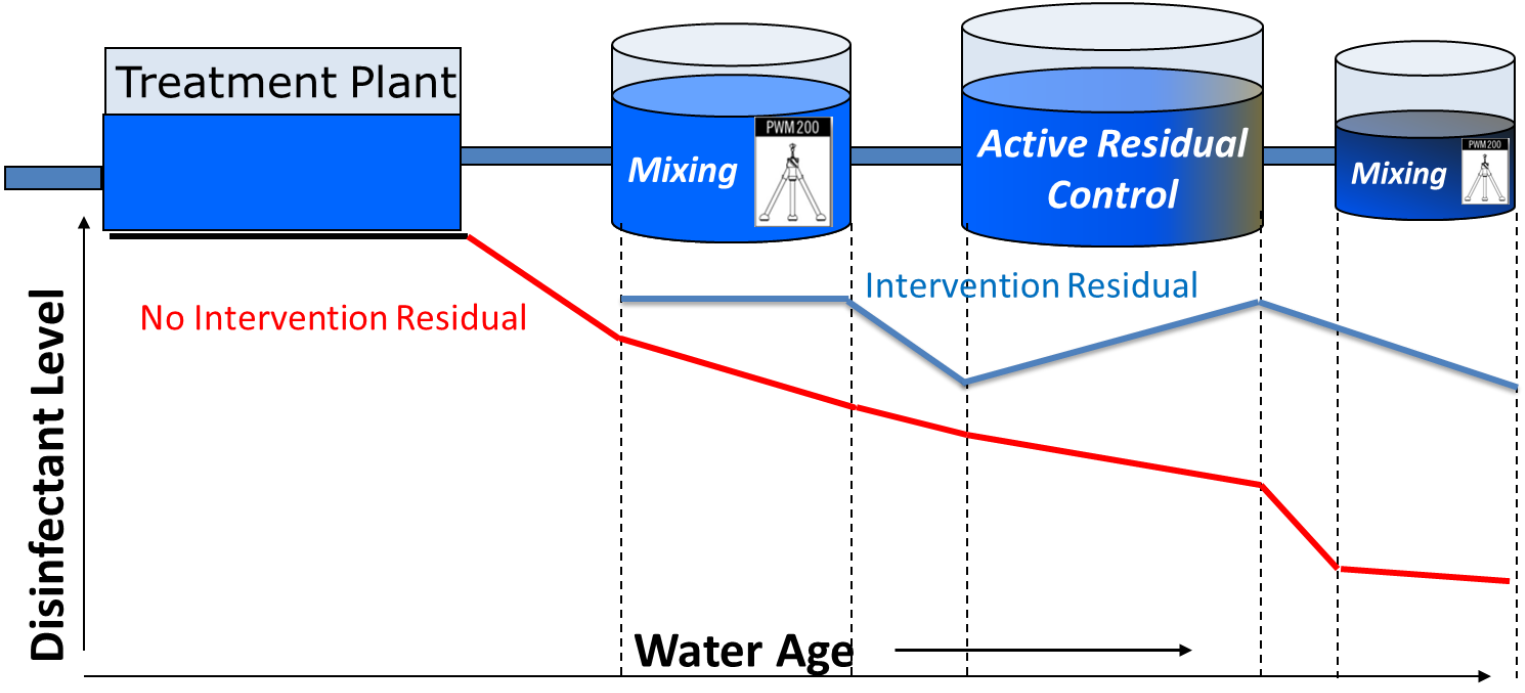
Operational Tool	Description	Downside
Tank Cycling	Decreasing water age by moving "fresh" chlorinated water rapidly through system	Very high power cost to pump high volumes of water
Line Flushing	Move water through system to decrease water age; generally open hydrants and dump volume to sewer	High pump cost and loss of produced water
Tank Mixing	Adding mixing devices to tanks to prevent stratification of chemical	Inability to actually boost in a zone beyond residual from plant
Increase "Entry" Residual Levels	Boosting chemical residual levels exiting WTP during high chlorine demand periods	Taste and odor issues, high chemical costs
Increased Testing and Boosting	More laboratory or field testing with emergency manual boosting with manual calculations	Labor intensive with unplanned overtime and callouts

Boosting in the network raises residuals at higher water ages without the taste and odor issues of high “entry” level residuals



Utility Service Group

Optimal disinfectant residual control involves mitigation steps throughout a distribution network - analysis, mixing and controlled boosting



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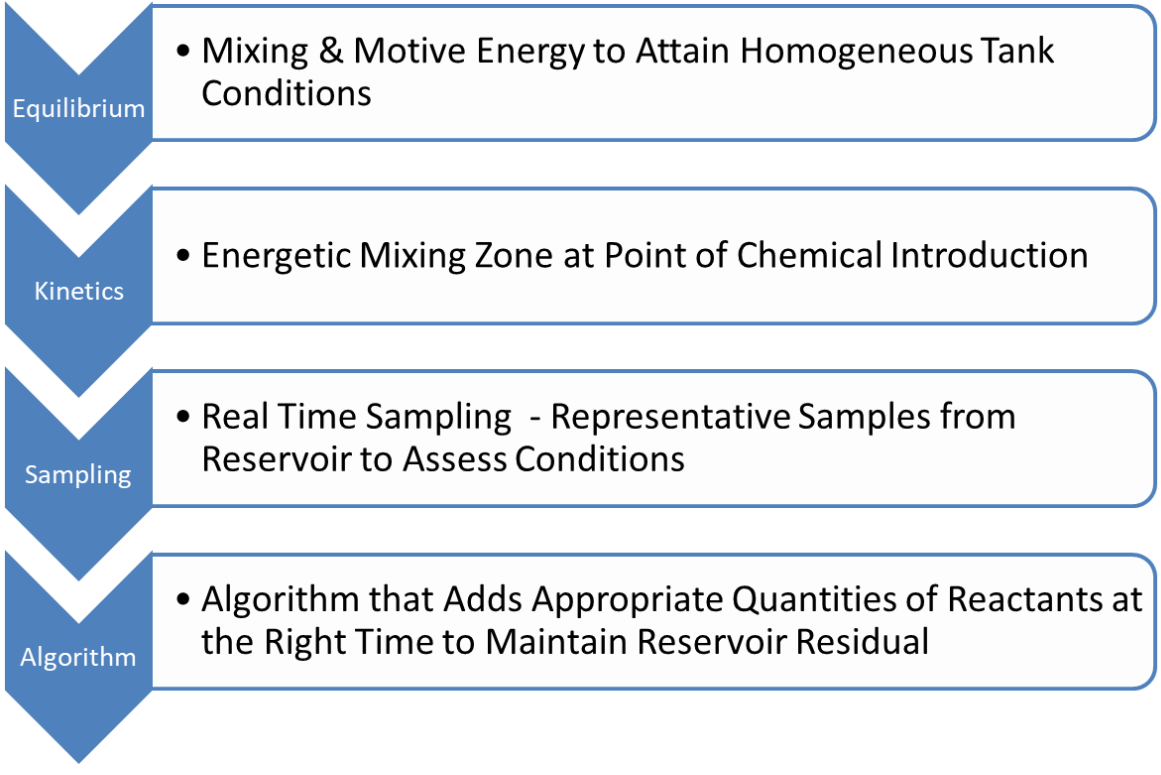
Automatic chloramine management has four necessary elements:



Effective mixing can come in a variety of configurations depending upon process objective and site constraints - RCS applications require higher mixing energy and must accommodate chemical injection

Tank Shark® Eductor Mixer

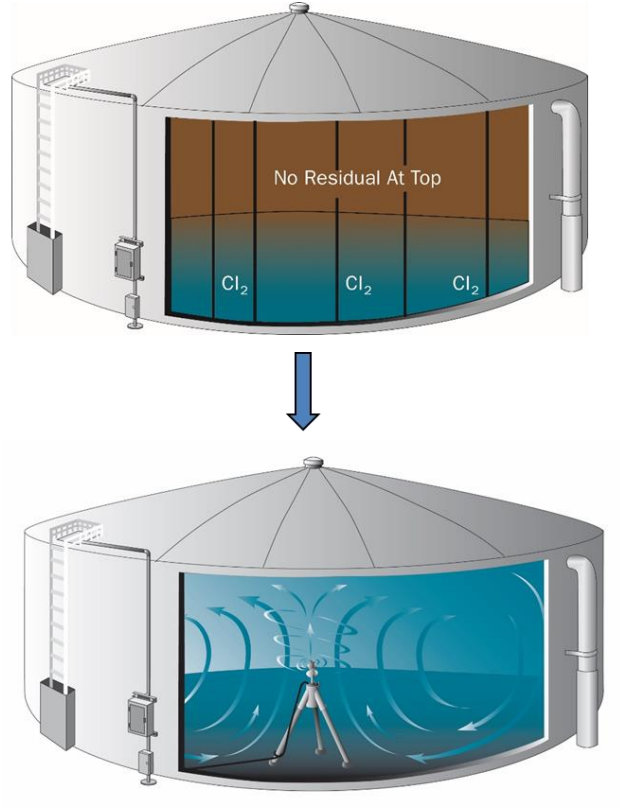
PAX Jet Mixer

Chemical Feed Version

PAX Impeller Mixer

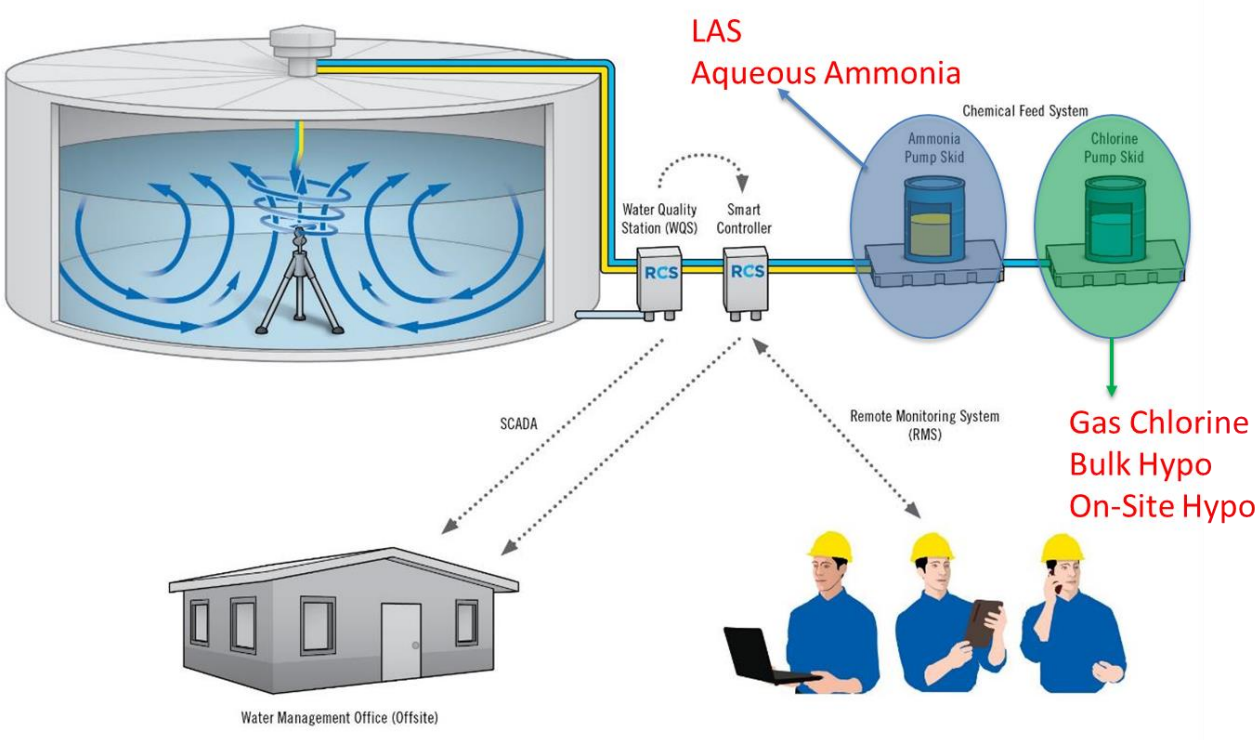
Utilizing water storage tanks as chlorine residual intervention points is a best practice; more effective than “in-line” boosting

- Tanks are a source of chlorine demand (sediment, bio-film etc.) - solve issue at source
- Tank volume provides a convenient “buffer” allowing a safe place to add chlorine and monitor before subsequent network experiences chlorine dose
  - Allows option to valve-off
  - Allows holding for adjustment
- Mixing of entire volume is ensured versus dosing into a pipe

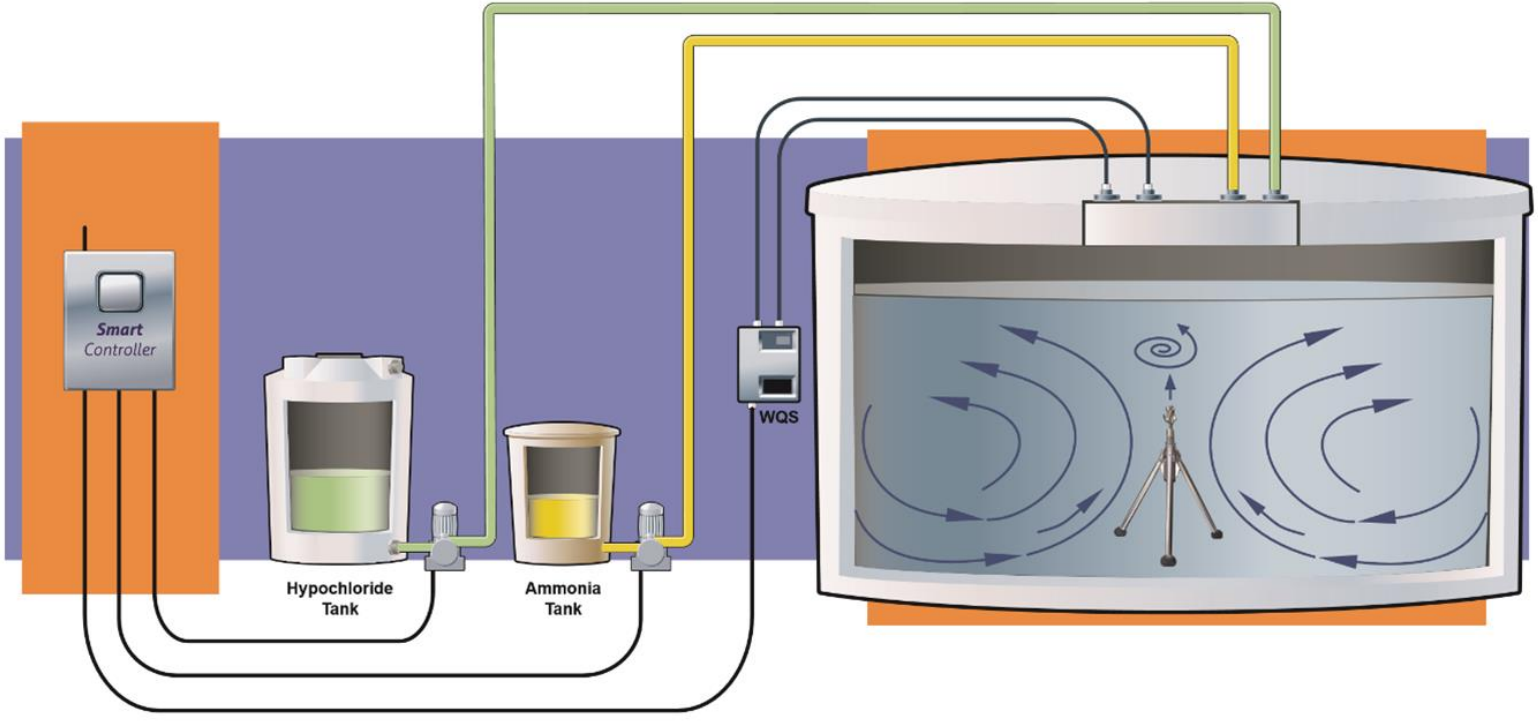


Suez Advanced Solutions - June 2019

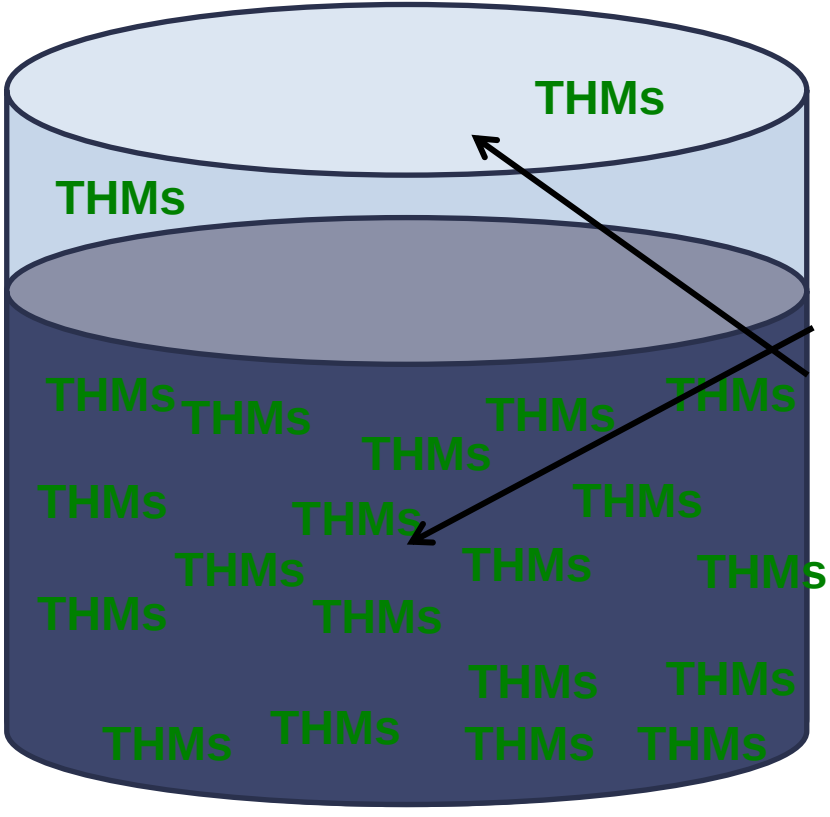
A residual control system automatically adjusts disinfectant residual to a pre-determined set-point and maintains that set-point with beneficial water quality impact to the zones it serves



Chloramine residual control systems can take on a number of different configurations depending on tank particulars and client preferences (chlorine, ammonia source for example)



THM's in Equilibrium

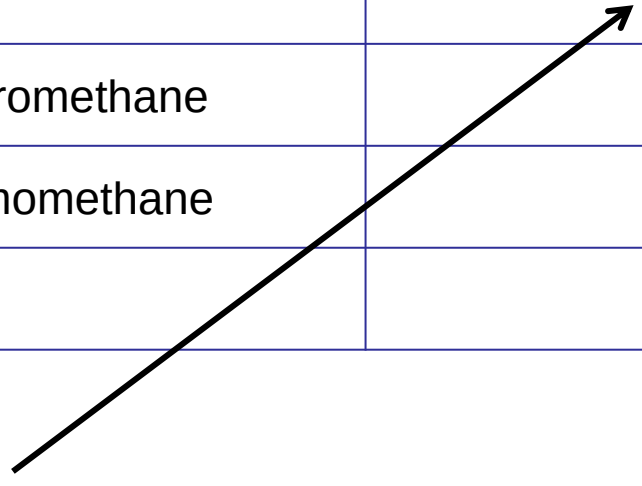


At equilibrium, it's a ratio in THM concentration between the air and the water

That ratio is the **Henry's Law constant**

Henry's Law constants for THMs

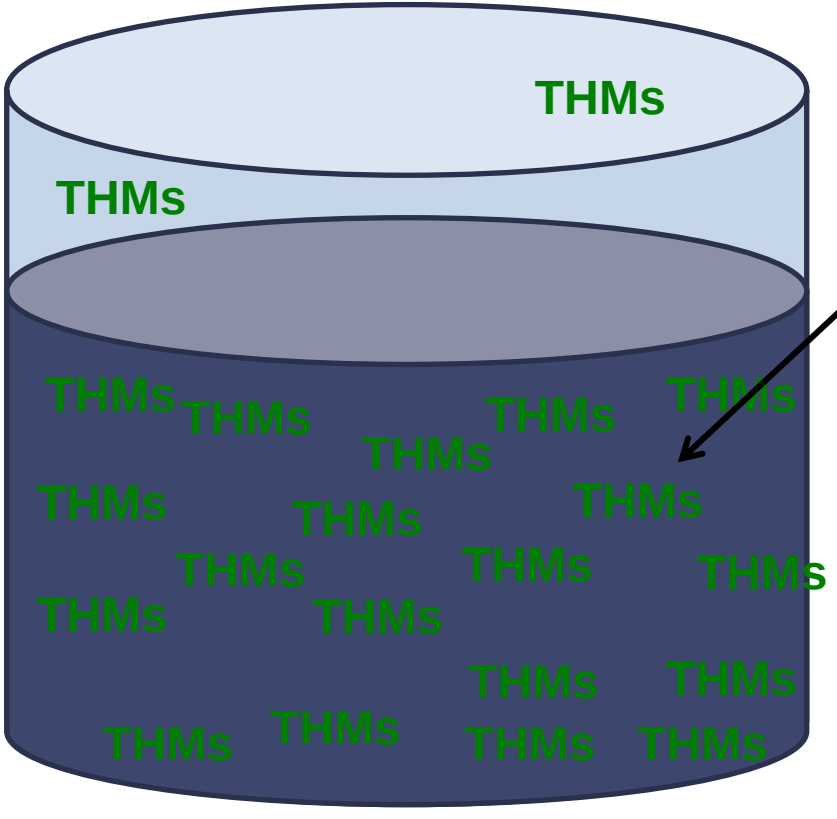
THM species	Henry's law constant @ 20 °C
Chloroform	0.13
Bromodichloromethane	0.08
Chlorodibromomethane	0.04
Bromoform	0.02



Chloroform is the most "volatile" (easiest to remove)

Bromoform is the least "volatile" (hardest to remove)

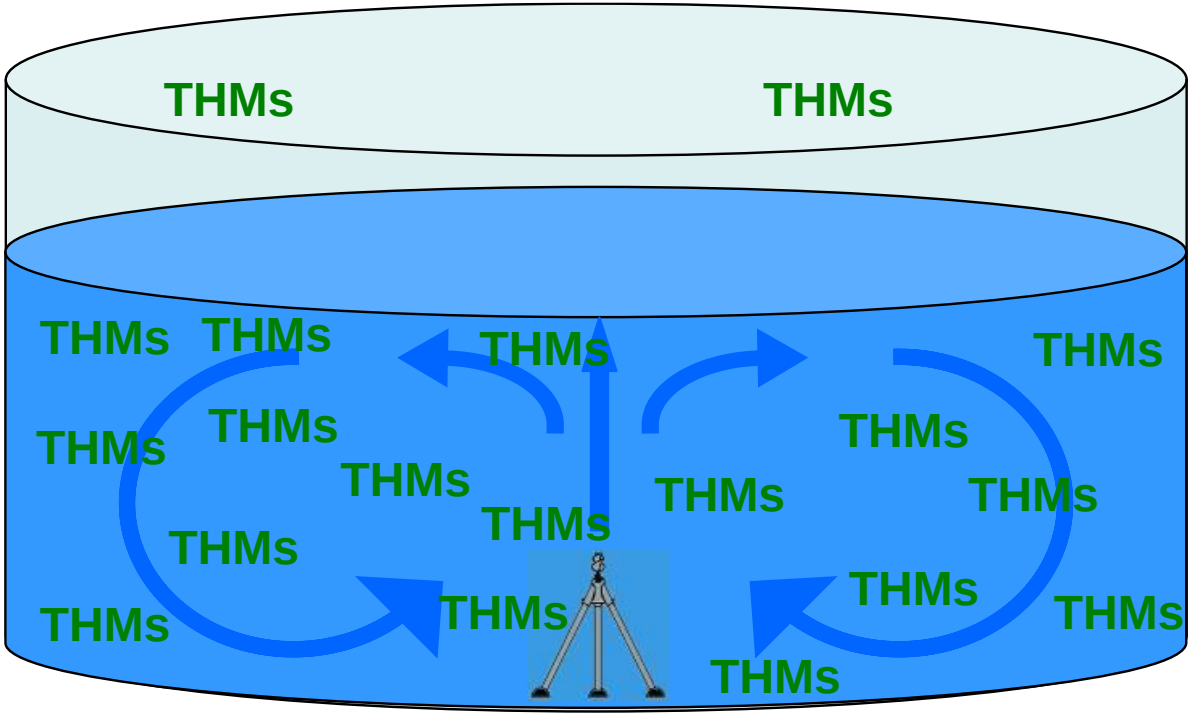
Some aeration happens all by itself…



Poor mixing prevents THMs below the surface from escaping

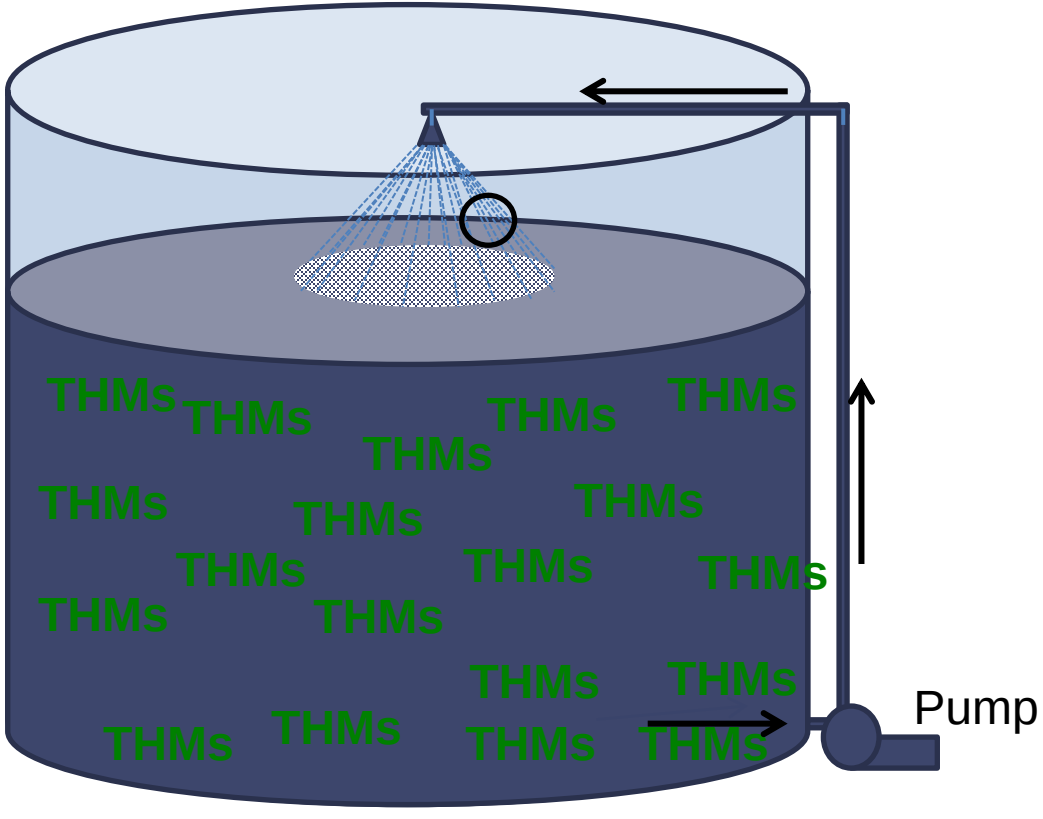
Evaporation stops

Mixing Enhances Aeration



But you need <u>STRONG</u> active mixing

Spray Aeration-THM reduction system



Conclusion

Asset Management Maintenance Programs can placed on all assets within water and waste facilities and greatly improve water quality


"That's
all
folks!"