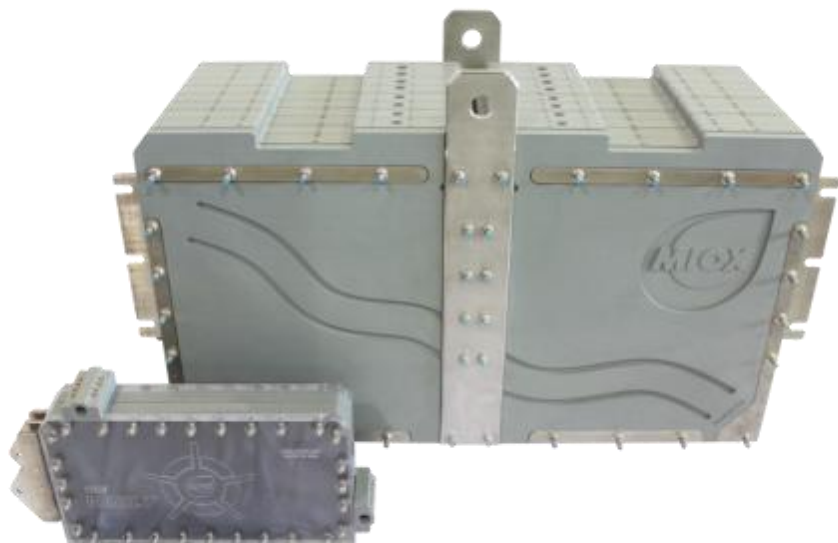




ON-DEMAND CHEMISTRY 

# Cooling Towers

2014

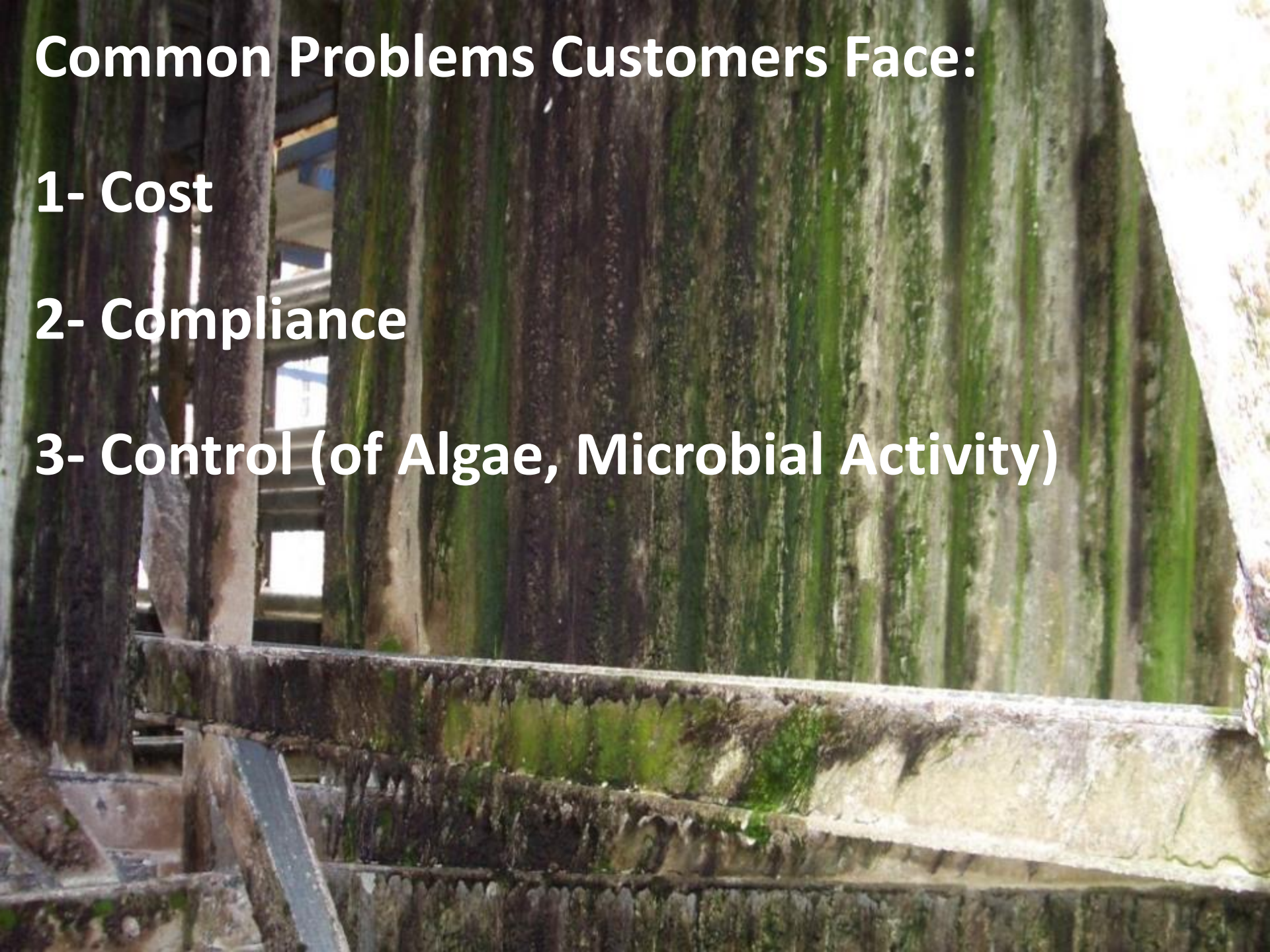


# Common Problems Customers Face:

**1- Cost**

**2- Compliance**

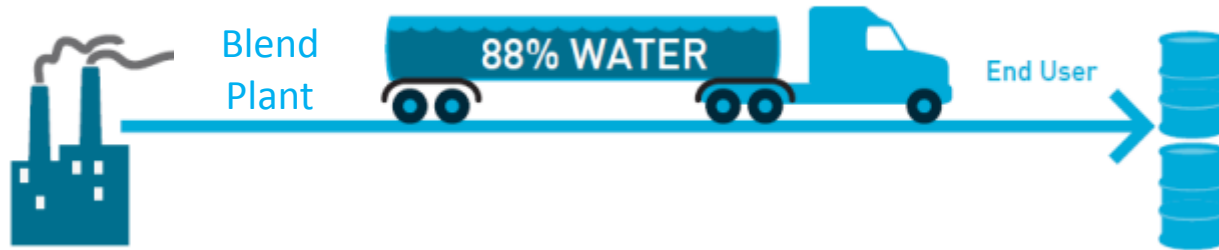
**3- Control (of Algae, Microbial Activity)**



# Cost

*Customers pay too much for Delivered Chemicals for Cooling Towers*

## TRADITIONAL CHEMICALS



- ▶ Chemicals are diluted ~50%-75% water
- ▶ Unique chemicals with limited outcome
- ▶ Prices went up by 3X in the past decade



\*US Price purchase index of aggregate industrial commodities

# Compliance

## *Incidences forcing companies take action*



### Quebec explosion latest hit to rail system

Toronto Star - 17 hours ago

Over 200,000 people were evacuated because of fear that **chlorine gas**, which was stored in one of the cars, would be spread into the air.



### 55 hospitalised after inhaling chlorine gas

The Copenhagen Post - Jul 5, 2013

An investigation concluded the group became sick after the air sensors in the building malfunctioned, leading to a build up of **chlorine gas**.

- ▶ Chemical Spills – search for safer solutions
- ▶ Chlorine Gas leak – search for safer alternates
- ▶ Non-public incidences in 2013 (Paper Mill, Ammonia Producer)

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# Control

## *Imperative to Control the Microbiological Activity of the tower*



June 6, 2013 – Diaego Distillery Cooling Tower Contamination; 80 people affected, 1 died

– Class Action Lawsuit is ongoing

Tower collapse due to tower fill fouling  
Heat exchange efficiency loss



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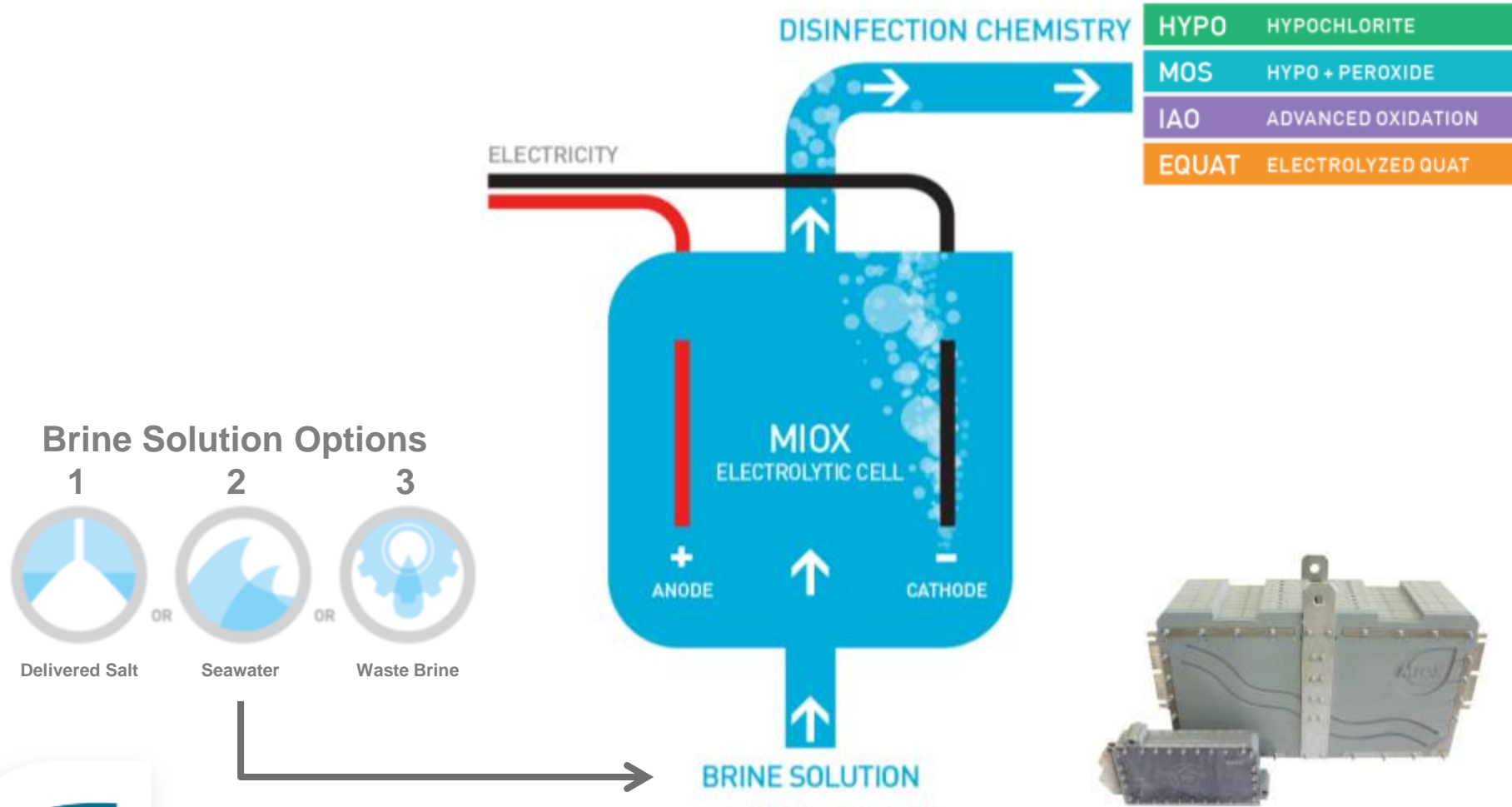
# How MIOX can help

- 1) Significantly lower total cost of ownership
  - ▶ MIOX and some competitive technologies can too
- 2) Price of the solution would stay flat year after year regardless of market (Oil, Commodities)
  - ▶ MIOX and some competitive technologies can too
- 3) Solution would be meet all future regulations in next 20 years (such as EU regulations on biocides)
  - ▶ MIOX and some competitive technologies can too
- 4) Complete peace of mind in controlling the microbiological activity of the tower
  - ▶ Only MIOX can do

The MIOX logo is a blue teardrop shape with the word "MIOX" in white, bold, sans-serif capital letters inside. It is set against a white circular background that has a slight drop shadow.

MIOX

# What is MIOX Electrolysis?



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# Significantly Lower Cost of Ownership

To produce 1 lb of 100% Free Available Chlorine

## Salt

3 lbs salt at \$0.08/lbs  
(or delivered brine)



Salt Cost \$0.24

## Electricity

2.5 kW-hr power at \$0.07/kW-hr



Electricity \$0.18

## Operational Cost

MIOX Cost \$0.42

- per 1 gal equivalent delivered bulk Hypo at 12.5% concentration

Market Price Hypo (for delivered bulk Hypo per gal) \$0.85 ~ \$2.50

Market Price Bromine, Glut, IsoT \$1.50 ~ \$5.00

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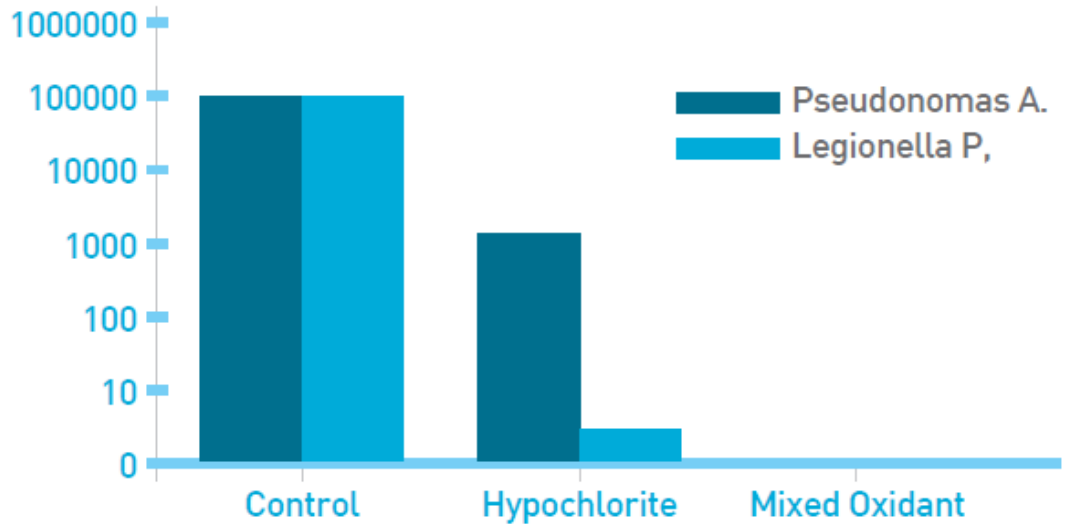


# Control Legionella Better

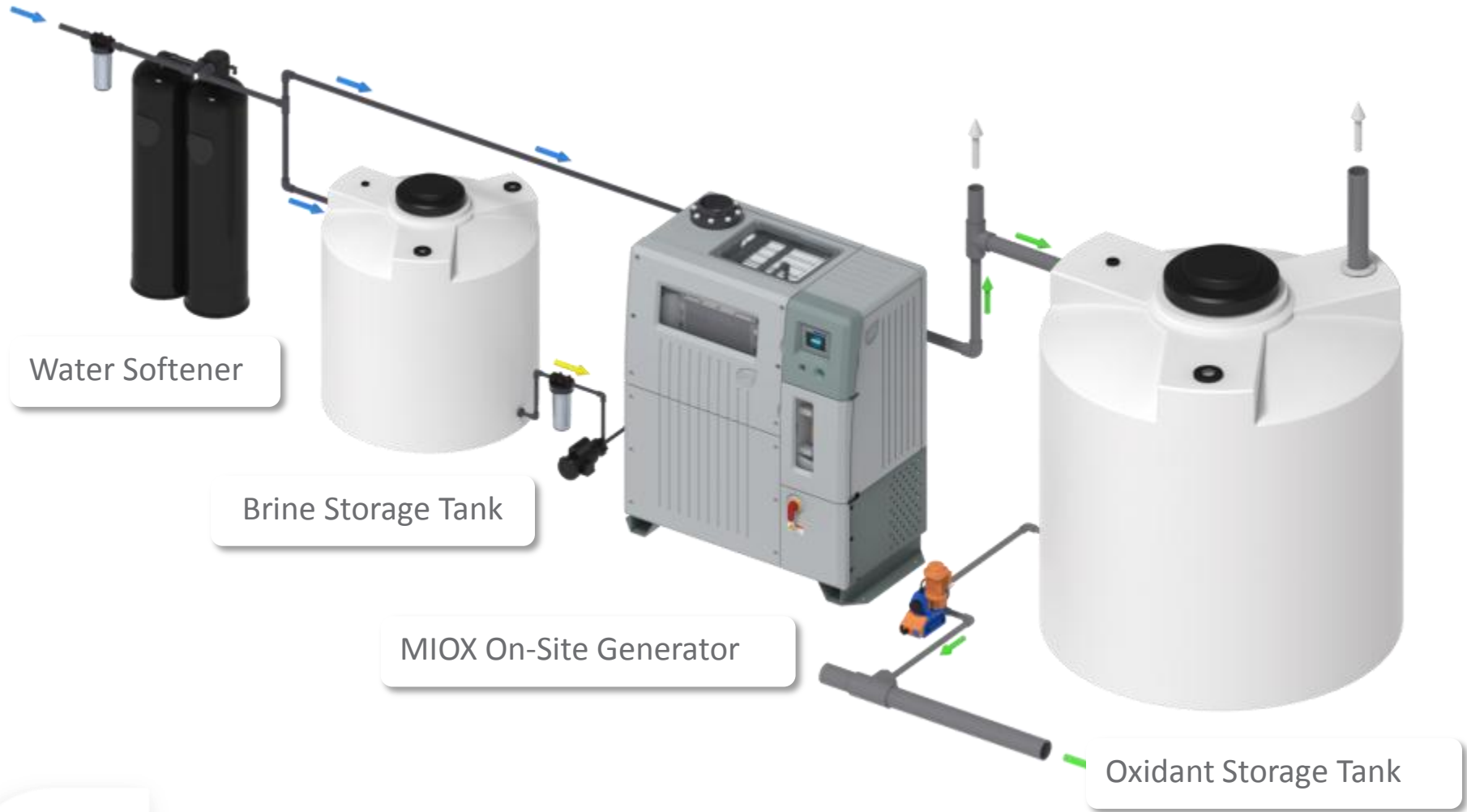
*By eliminating Pseudomonas harboring biofilm later*

## BETTER LEGIONELLA CONTROL

No Legionella detected at 2 mg/L Mixed Oxidant Solution (MOS) in 10 minutes. Study conducted by Larry Barton PhD, University of New Mexico, "Disinfection of Simulated Cooling Tower Water". Hypochlorite is a good Legionella disinfectant when the bacteria are planktonic (free floating). However Pseudomonas, a biofilm former organism, is more difficult to kill and can also form a protective biofilm layer for Legionella bacteria to harbor. MOS removes the biofilm and kills both microorganisms more effectively than hypochlorite.



# Simple Process Flow



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# Puerto Rico PREPA Power Plant

*Biofilm Removal → Increased Thermal Efficiency → ~7% Production Capacity Increase*

BEFORE MIOX



AFTER MIOX



## Problem

- ▶ Proprietary biocides could not control biofilm in 40,000 ton tower. Visible biofilm/scale build up.

## Results After Using MIOX

- ▶ Improved thermal efficiency; increased production load by average of 7%, equaling to multi million of extra capacity
- ▶ <3 months payback
- ▶ Reduction in 31,000 lbs delivered chemical/year
- ▶ 57% reduction in water consumption and O&M costs
- ▶ Mixed oxidant chemistry eradicated the biofilm. Replaced the biocide regime.

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# NIPSCO Power Plant

*Cleaner Condensers, Saving ~\$160,000/yr per tower, totaling ~\$640,000/yr*

BEFORE MIOX

AFTER MIOX



*Cooling Tower Condenser Tube Sheet*

## Problem

- ▶ Proprietary biocides could not control biofilm in 90,000 ton tower. Visible biofilm build up in the condenser (seen on the left)

## Results After Using MIOX

- ▶ Mixed oxidant chemistry eradicated the biofilm. Replaced the biocide regime.
- ▶ <36 months payback
- ▶ Reduced chemical cost with complete biofilm removal

*“Reducing our treatment regimen ...down to a single mixed oxidant product generated on site has resulted in substantial treatment chemical and labor cost savings.”*

--Paul Schrock, NIPSCO Senior Chemist

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# Thank You

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The MIOX logo is a white teardrop shape with a blue outline, containing the word "MIOX" in white capital letters on a blue background.

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