Big Data and the Future of Water Treatment

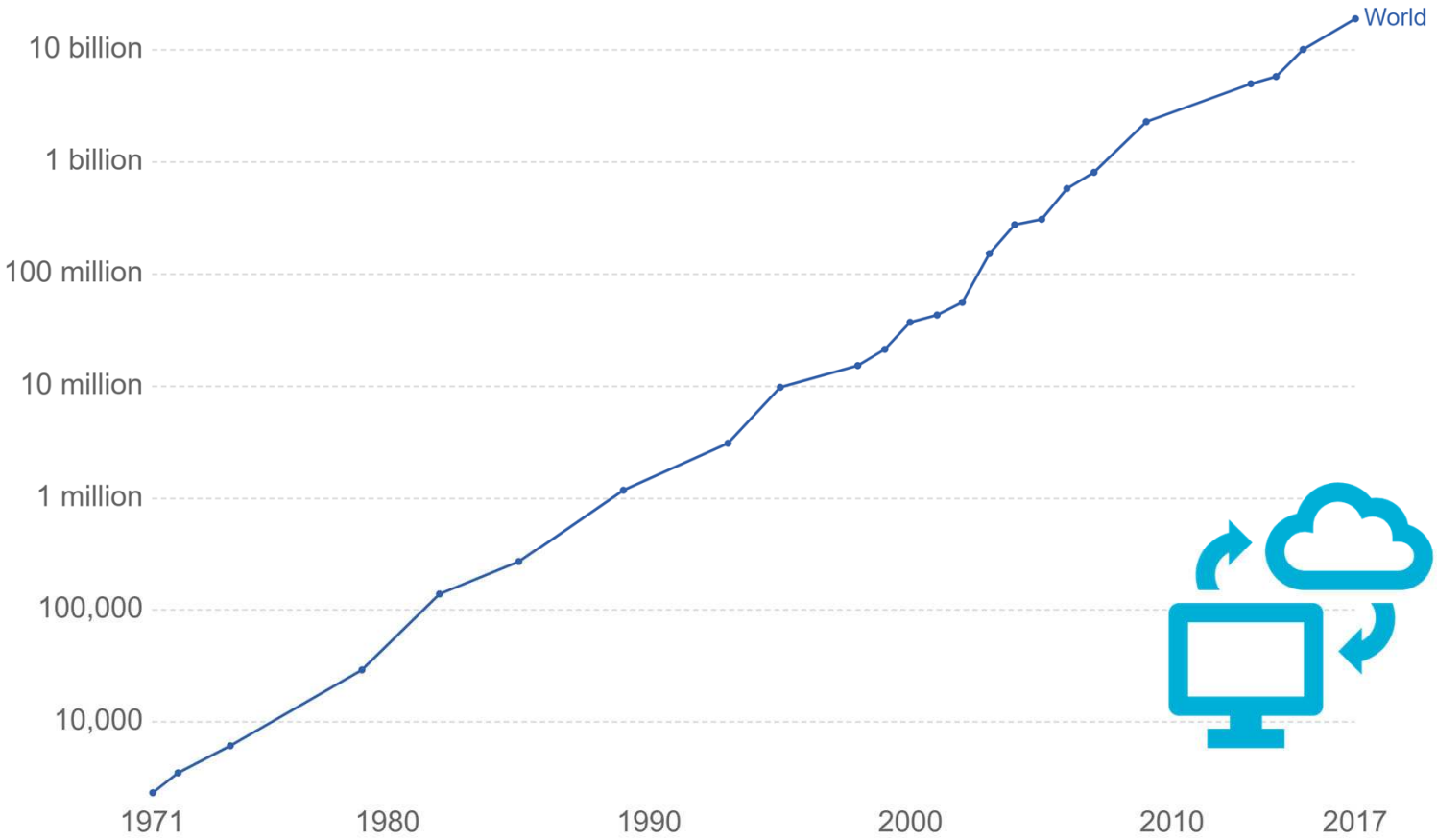
Facility management teams should

1. embrace data-driven technology for water treatment
2. with a people-centered strategy
3. or run the risk of
   a) embarrassing system failures
   b) and lost returns on investment.

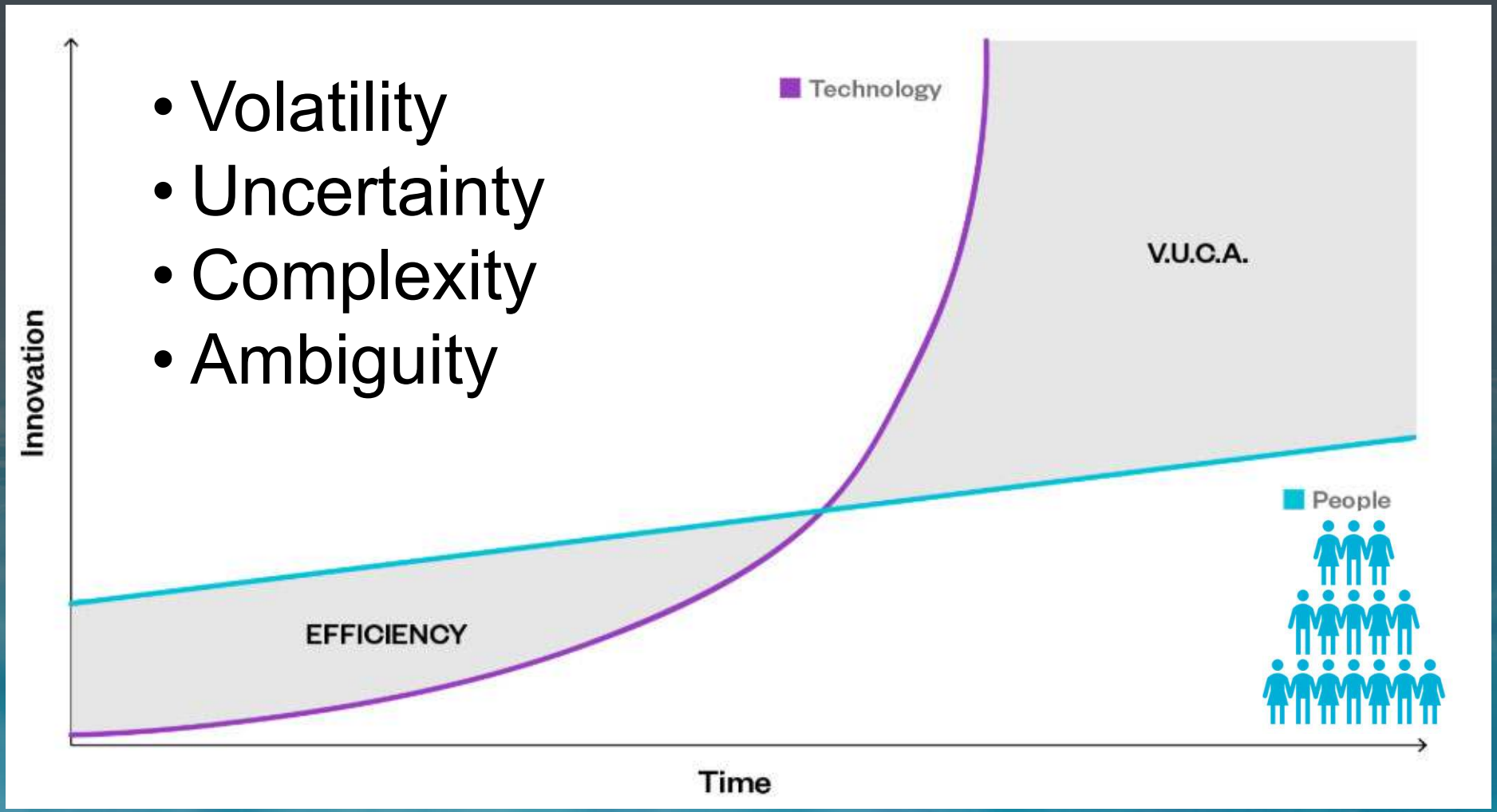
Moore's Law: Transistors per microprocessor

Our World in Data

Number of transistors which fit into a microprocessor. This relationship was famously related to Moore's Law, which was the observation that the number of transistors in a dense integrated circuit doubles approximately every two years.

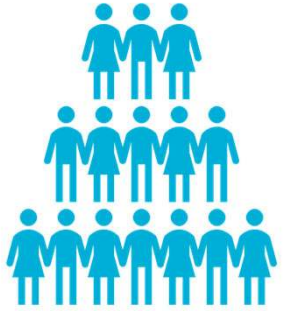


Source: Karl Rupp. 40 Years of Microprocessor Trend Data.

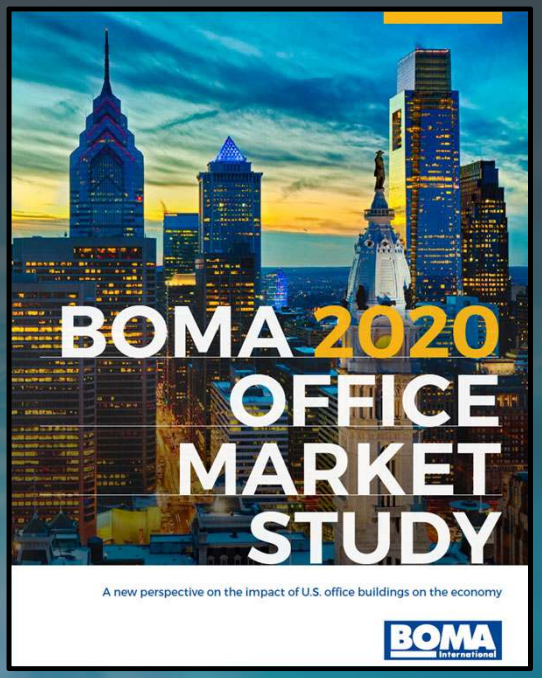

• Volatility
• Uncertainty
• Complexity
• Ambiguity
Technology
V.U.C.A.
People
EFFICIENCY
Innovation
Time

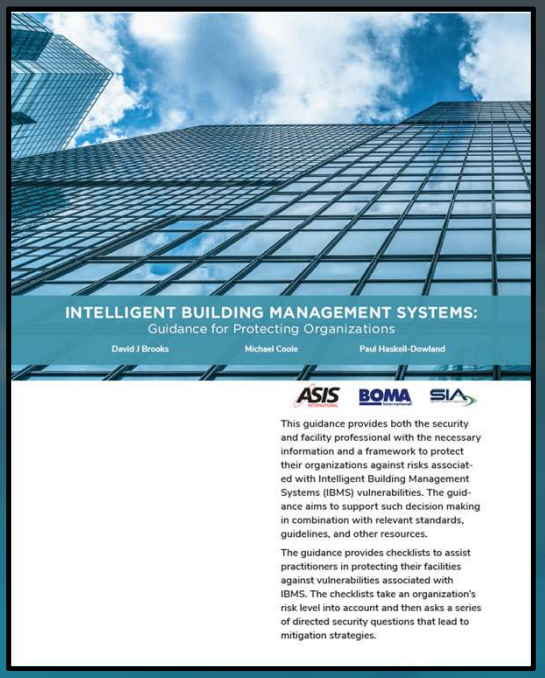
It all adds up to you having to:

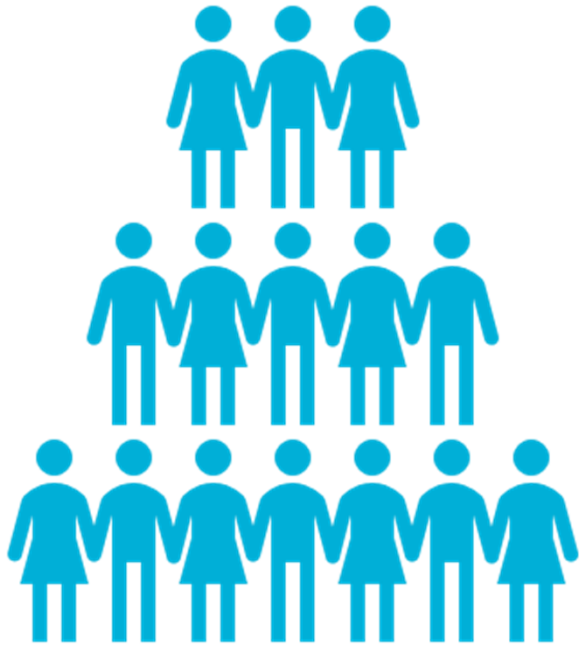
1. Learn more and faster than ever
2. Do more with less resources
3. Manage up in your organization



Supporting Resources from BOMA







Fuel the problem & the SOLUTION

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How are you looking at water?

Another thing on your list.

Fundamental to your operation.

How does water work in your BODY?

How does water work in your BUILDING?

Additional Building Water Use Info from the EPA

look for WaterSense Labeled EPA Certified

Saving Water in

Office Buildings

Commercial and institutional buildings use a large portion of municipally supplied water in the United States. With so many businesses making up the commercial and institutional sector, there are great opportunities to conserve water. *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* promotes water-efficient techniques that can be applied across a wide range of facilities with varying water needs.

Water used in office buildings accounts for approximately 9 percent of the total water use in commercial and institutional facilities in the United States.[1] The three largest uses of water in office buildings are restrooms, heating and cooling, and landscaping.

End Uses of Water in Office Buildings

Created by analyzing data from: New Mexico Office of the State Engineer, American Water Works Association (AWWA), AWWA Research Foundation, and East Bay Municipal Utility District.

THE BUSINESS CASE FOR WATER EFFICIENCY

Over the past 10 years, the costs of water and wastewater services have risen at a rate well above the consumer price index. Office building managers can expect these and other utility costs to continue to increase in order to offset the costs of replacing aging water supply systems.

The business benefits of implementing water-efficiency measures in and around office buildings can include reducing operating costs, as well as meeting sustainability goals. In addition to water savings, facilities will see a decrease in energy costs because of the significant amount of energy associated with heating water.

Energy saved from reducing the amount of water supplied will not only save money, but reduce the building's carbon footprint as well. Many commercial building managers are subject to sustainability goals, which can be met by decreasing water and energy use.

Likewise, water-efficient practices can assist with achieving green certifications and demonstrating leadership in environmental management.

Because bathroom plumbing fixtures account for a significant portion of water use in office buildings, it is smart to assess the age and functionality of existing fixtures.

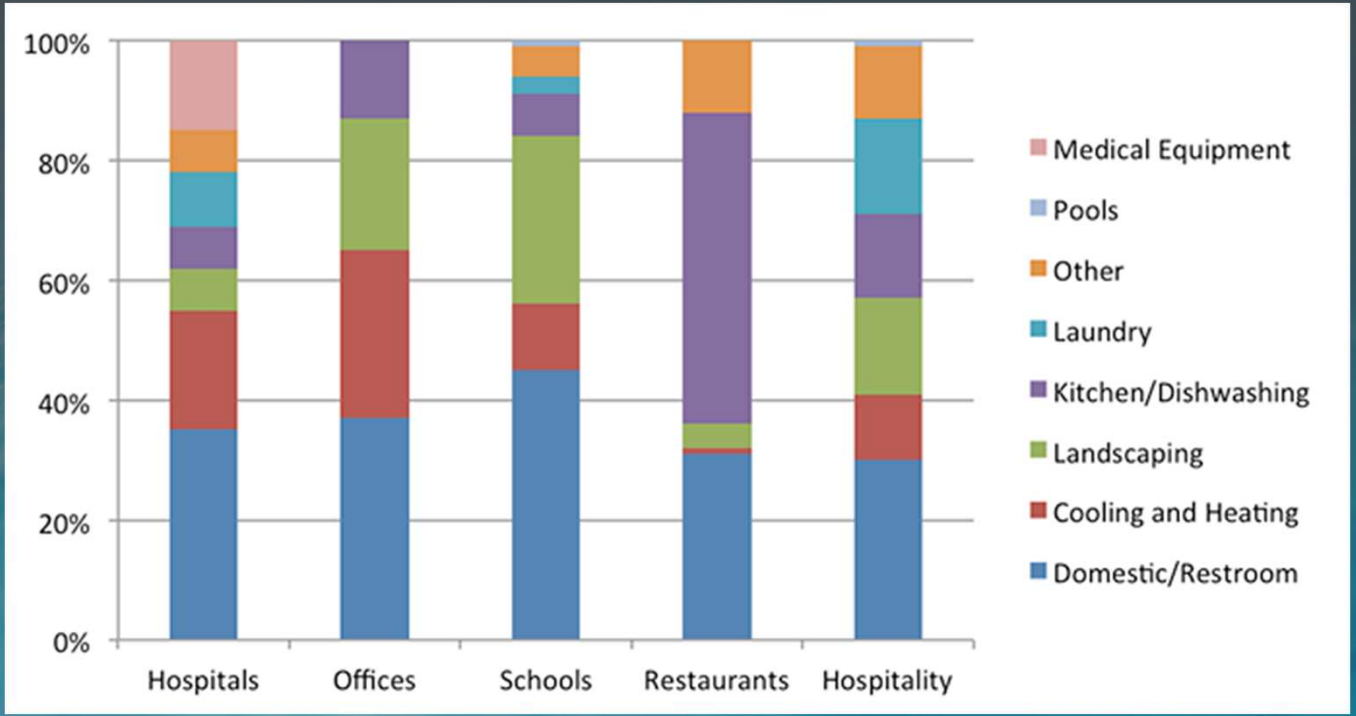
Putting Water Efficiency to Work

After upgrading its irrigation system, an office complex in Plano, Texas, reduced its outdoor water use by about 40 percent, saving nearly 12.5 million gallons of water in 2009. These retrofits helped the office complex earn water-efficiency credits toward LEED® Gold certification and saved more than $47,000 in 2009. With these savings, the project paid for itself in less than a year and a half!

PHONE (866) WTR-SENS (987-7367) WEBSITE www.epa.gov/watersense EMAIL watersense@epa.gov

EPA EPA-832-F-12-032 November 2012

End Uses of Water in Various Types of Commercial and Institutional Facilities



Water can set you back when neglected and help drive you forward when managed intelligently.

The Fundamental Return on Investment of Water Treatment

Assets Protected

Water Conserved

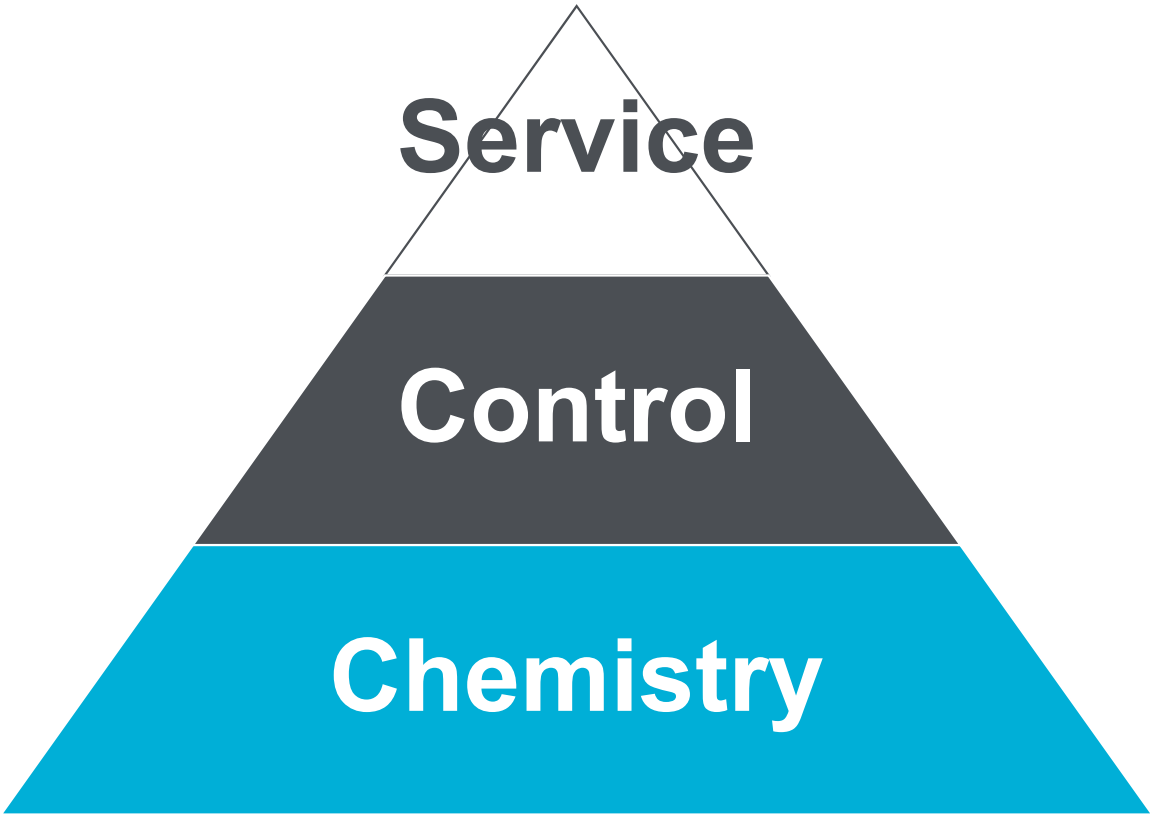
Energy Saved

Where Water Works.

The Fundamental System Failures of Water Treatment

- Operating Expense Waste
- Unplanned Downtime
- *Legionella* Cases
- Early Replacement of Assets

Water Treatment Program Basics



LEVEL 5
WATER CARE

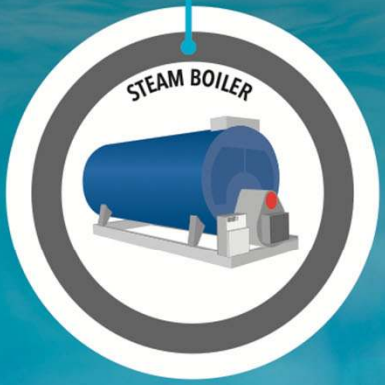
- Optimize Performance
- Extend Asset Life
- Ensure Safety
- Eliminate Hassle
- Measure & Track ROI

Water Safety

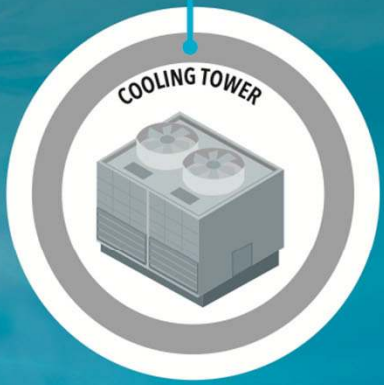
Bulk Delivery

Achieve Maximum Efficiency & Automation of Your Energy-Consuming Heat Transfer Systems

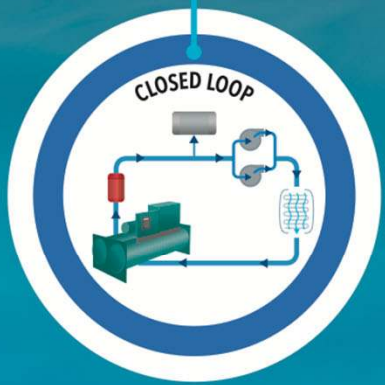
Smart Controls



Steam Boiler



Cooling Tower

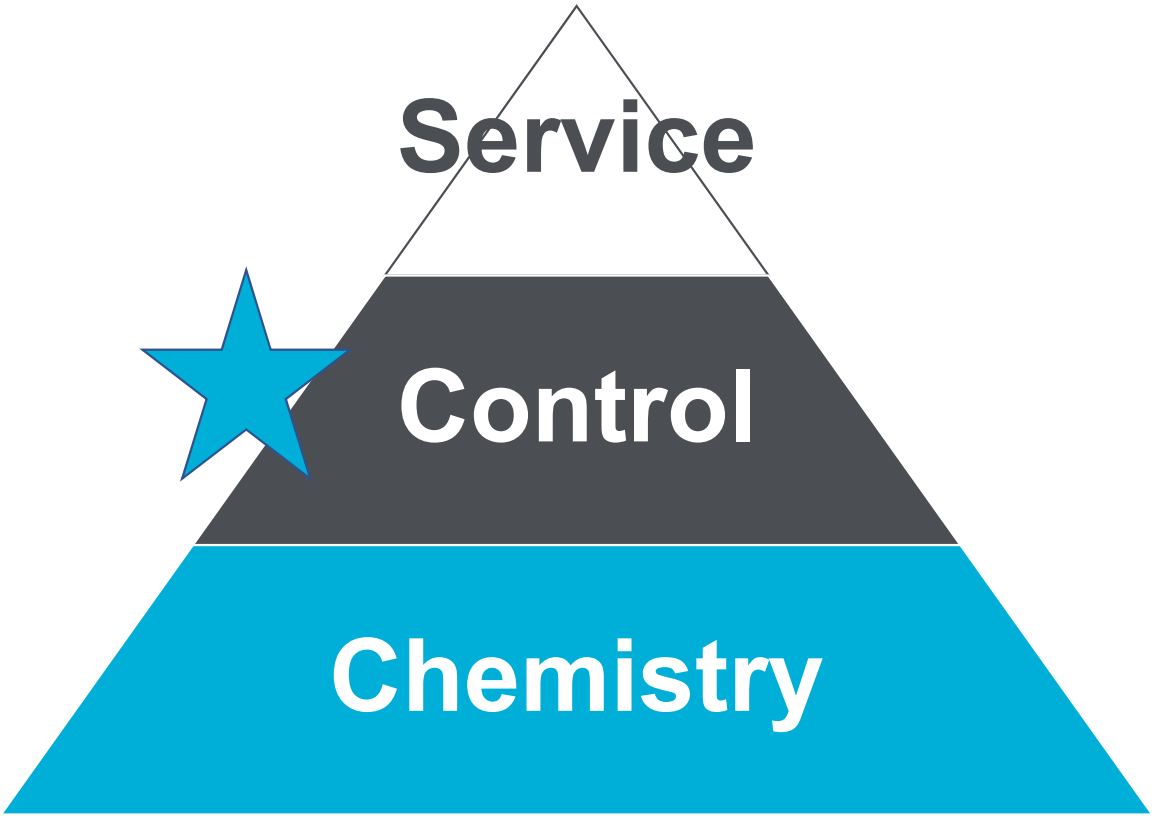


Closed Loop

=

Results You Can See

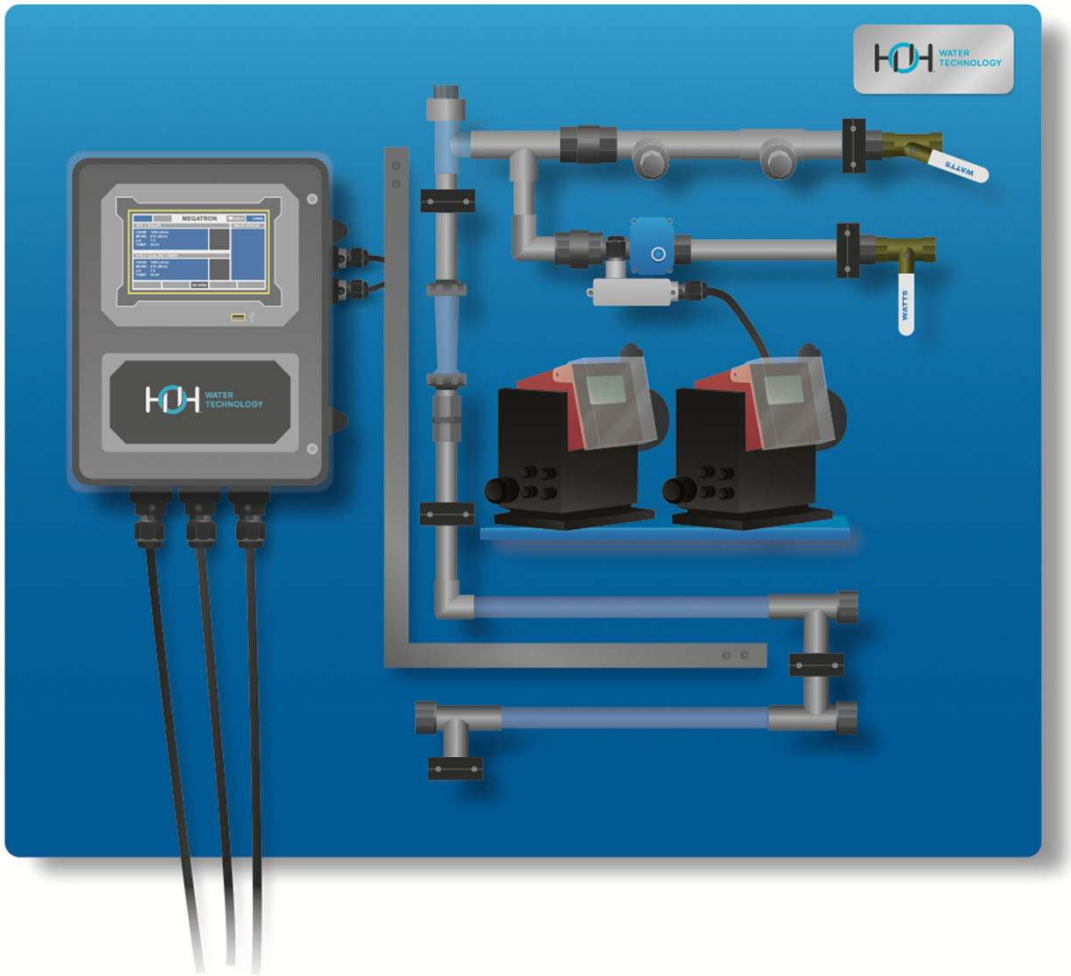
Water Treatment Program Basics



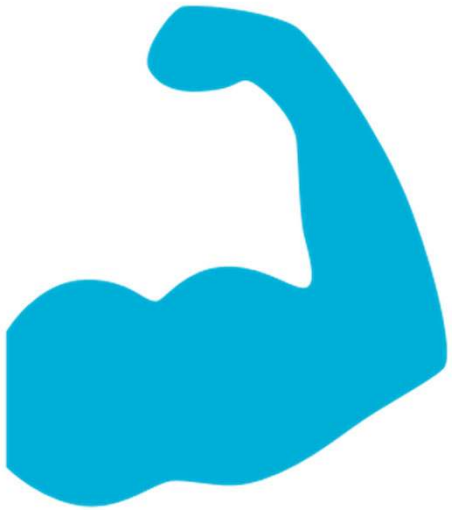
Smart Control Technology

DASH 360°

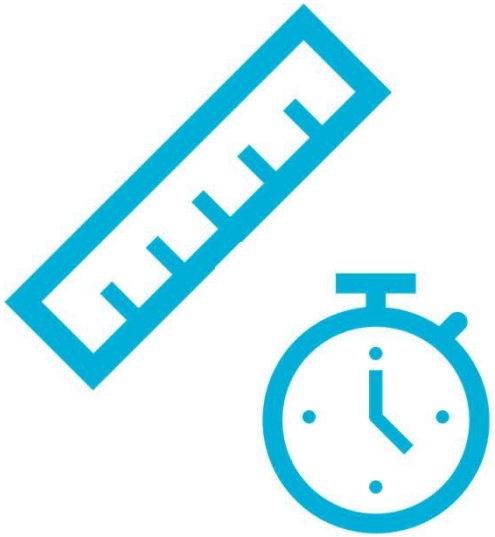
- Automate key functions
- Manage system remotely
- Get timely performance data
- Use auto-alerts to keep you ahead of potential issues
- Track and trend water and energy savings



3 Stages of Innovation in Controls



Hand



Meter-Timer

Sensor

3 Stages of Innovation in Controls

Hand

Meter-Timer

Sensor

Why is data-driven technology for water treatment worth looking at now?

1. More Accessible

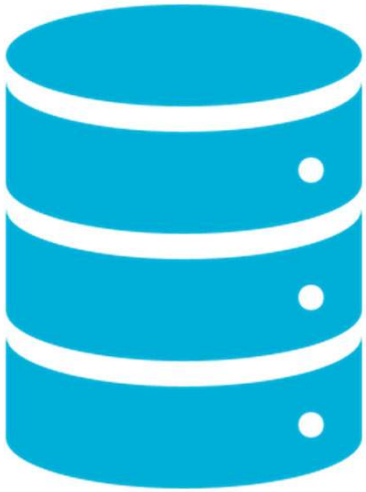
- ✓Costs continue to lower
- ✓Multiple manufacturers
- ✓Industry standardization

2. More Flexible

- ✓Open-source development
- ✓Unbundled solutions
- ✓Must-connect mindset

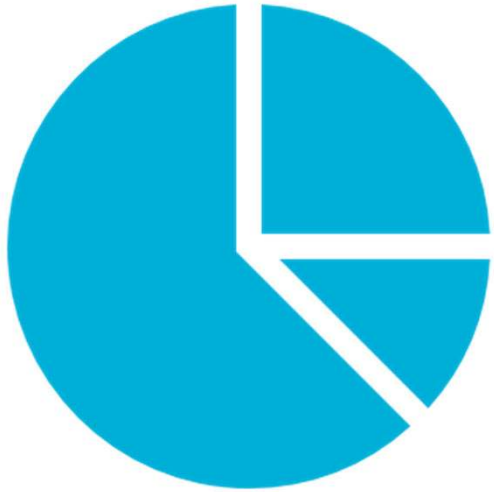
Our Connected Approach

3 Drivers of Accelerating Growth



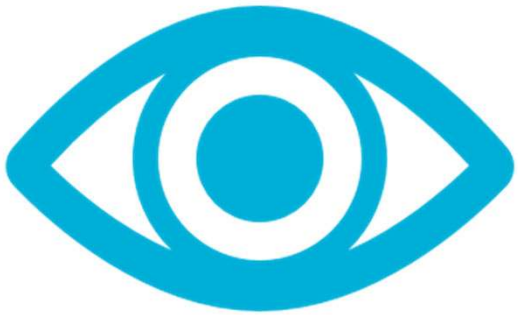
Data

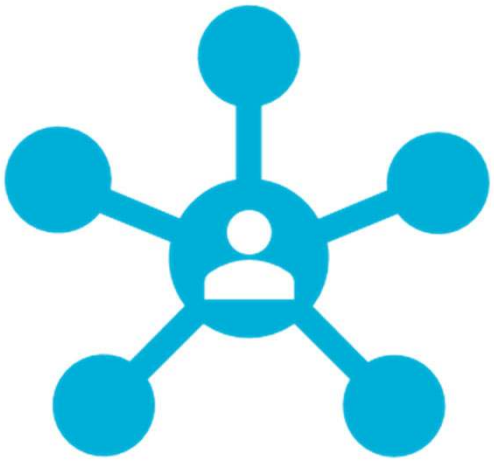
Speed



Analyze

What should I expect from my data-driven technology for water treatment?





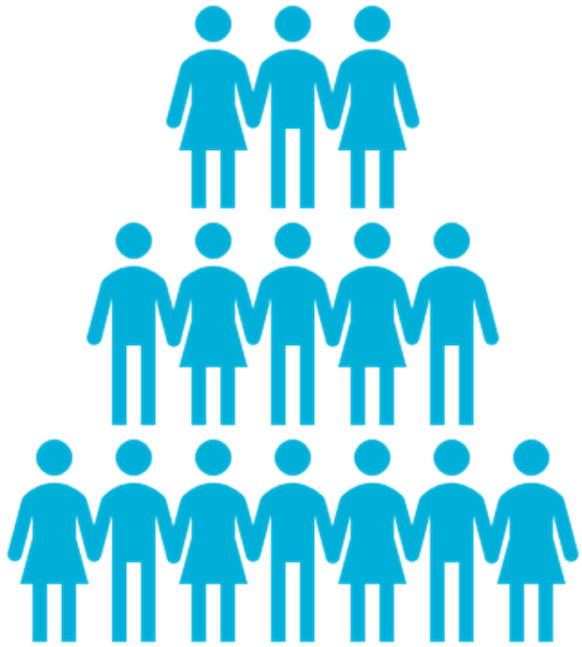
Visual

Interactive

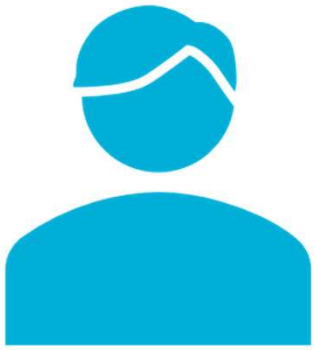
Personal

Data-driven technology empowers you to:

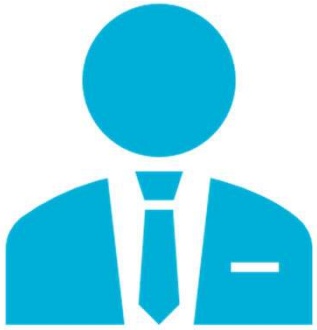
- Make smarter decisions with water faster
- Leverage your resources more efficiently
- Manage operations remotely
- Manage up the organization with confidence



Fuel the problem & the SOLUTION



Facility Manager

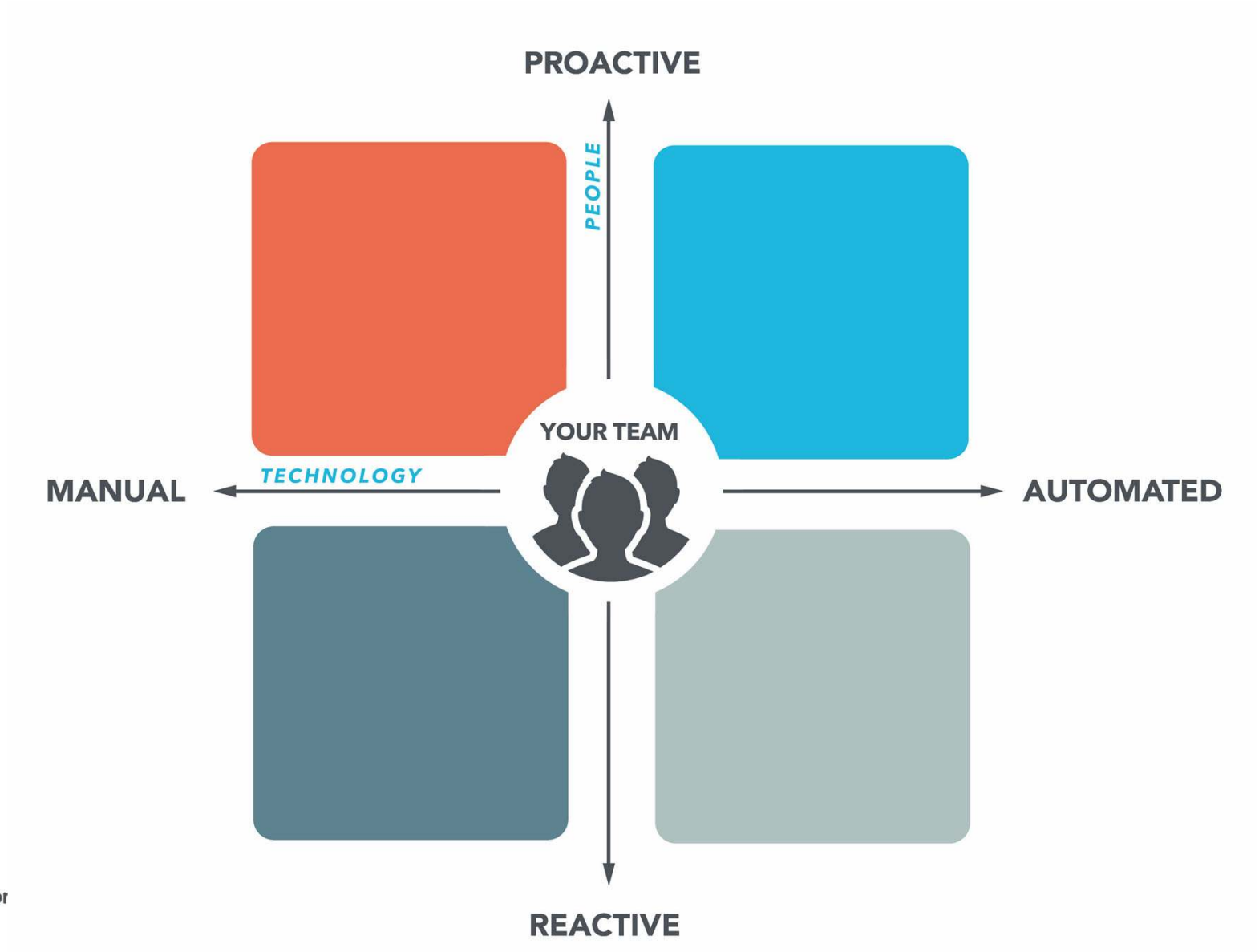


Executive C-Suite & Owners

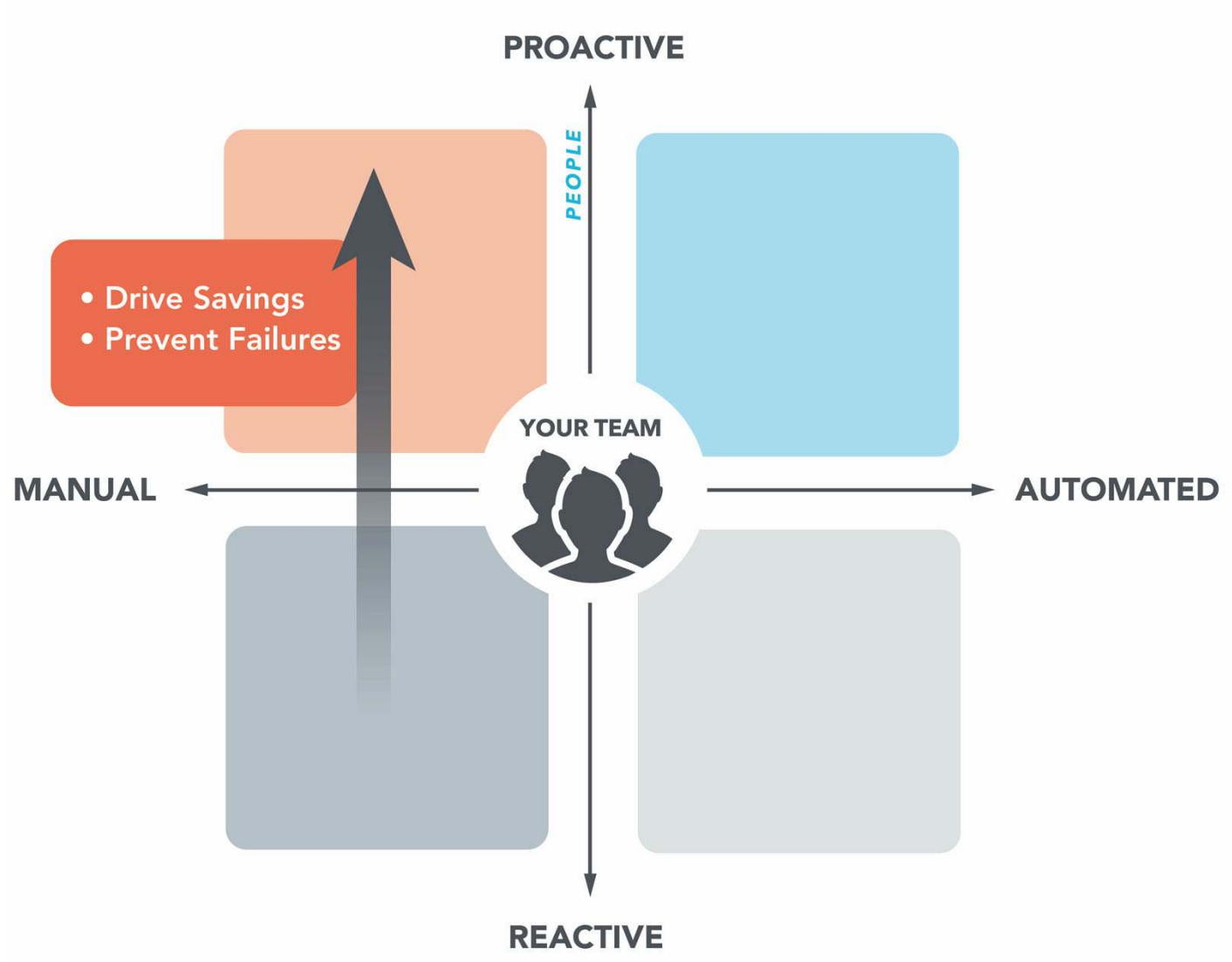
Water Treatment Pro

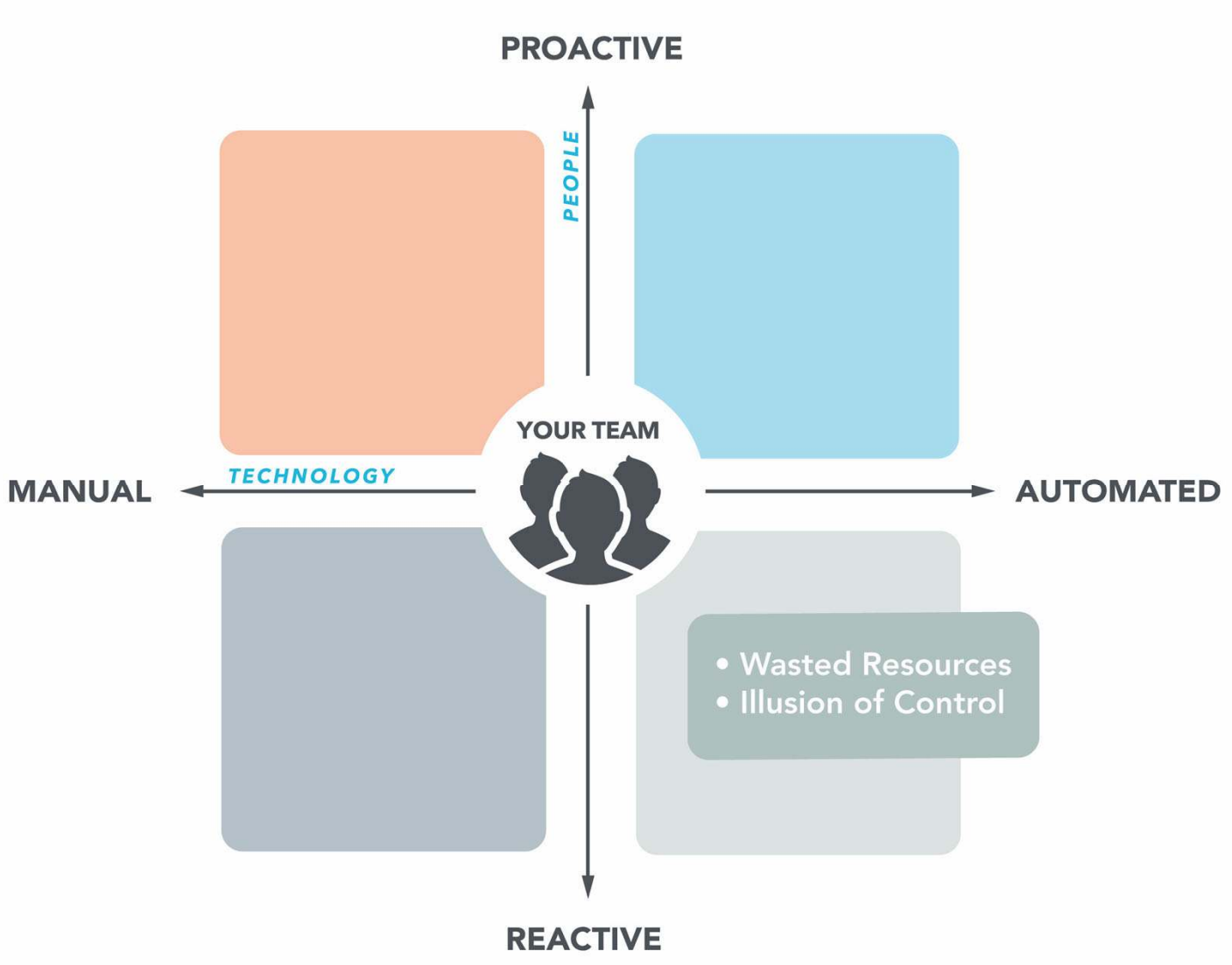
Water Treatment Service Partner

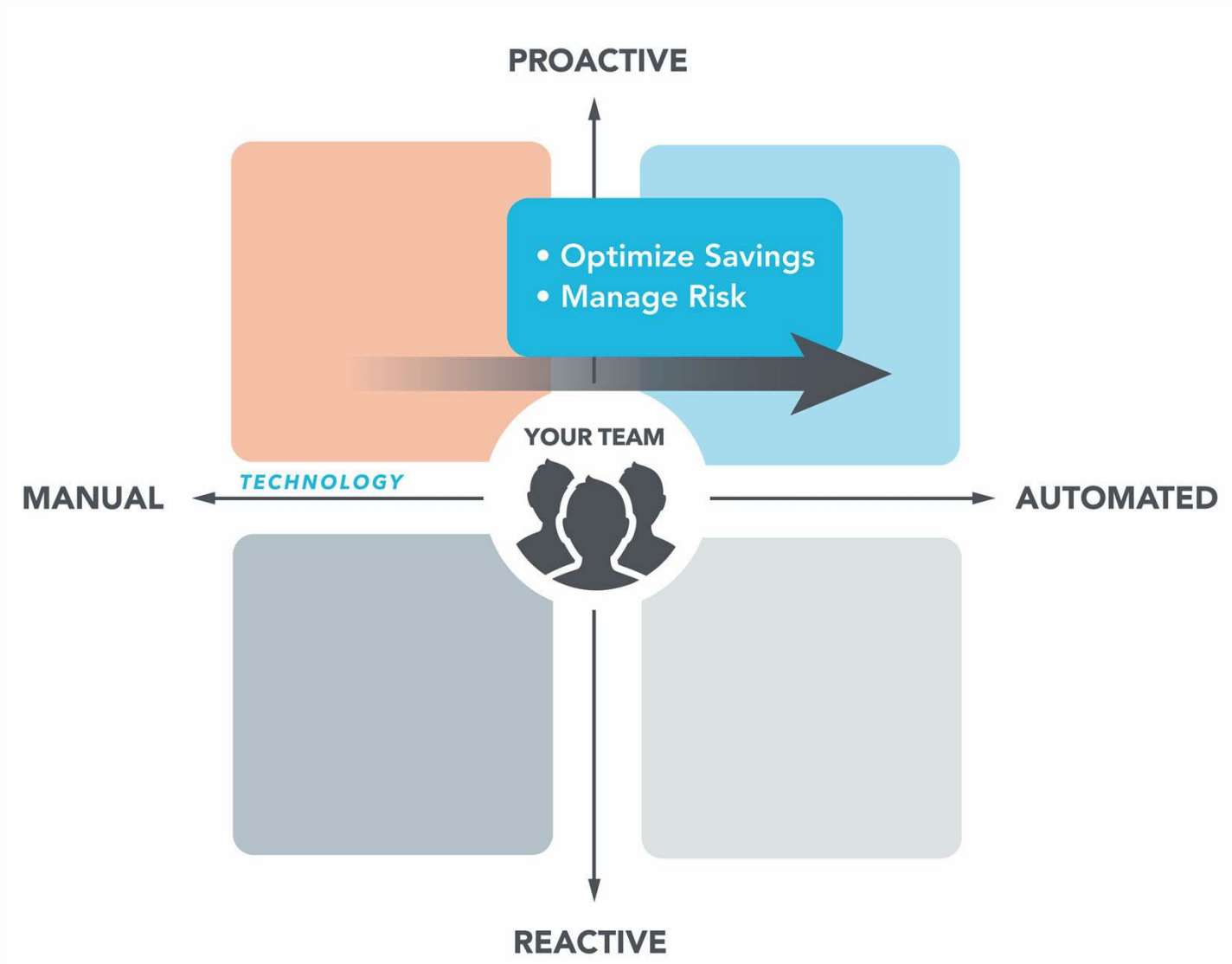
4 Key Roles to a People-Centered Strategy



Where Water Wor


PROACTIVE
PEOPLE
• Drive Savings
• Prevent Failures
YOUR TEAM
MANUAL
AUTOMATED
REACTIVE


PROACTIVE
PEOPLE
YOUR TEAM
MANUAL
TECHNOLOGY
AUTOMATED
• Wasted Resources
• Illusion of Control
REACTIVE


PROACTIVE
• Optimize Savings
• Manage Risk
YOUR TEAM
MANUAL
TECHNOLOGY
AUTOMATED
REACTIVE

Our Connected Approach

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Digital Dashboard:
A Real World Example

Commercial Office Building in Chicago with an HVAC system that utilizes an Evaporative Cooling Tower.

SUMMARY | DETAIL | PERFORMANCE | UTILITIES

Today is
August 6, 2020

Client

System
Cooling Tower

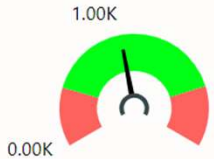
Sensor
Conductivity

Sensor	Units
Cond	µS/cm

Last Data Pull
8/6/2020 5:01:48 AM EST

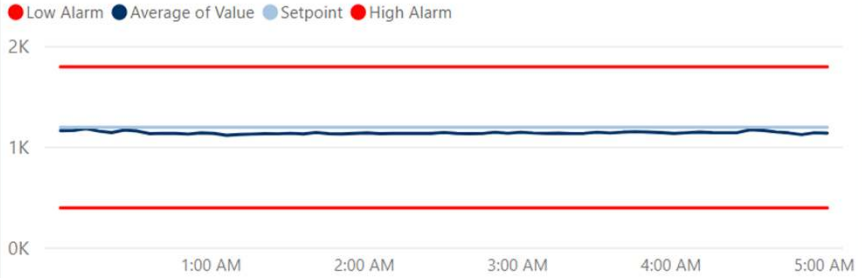
TODAY

Today's Average Value



1,002 µS/cm

Today's Test Results



Today's Make Up

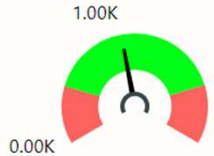
2,300
Gallons

HISTORICAL

DATE

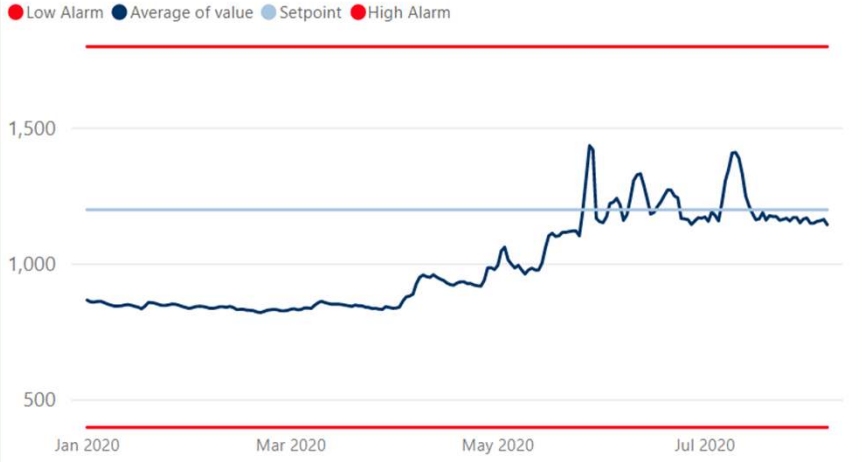
Last | 1 | Years
8/7/2019 - 8/6/2020

Average Value

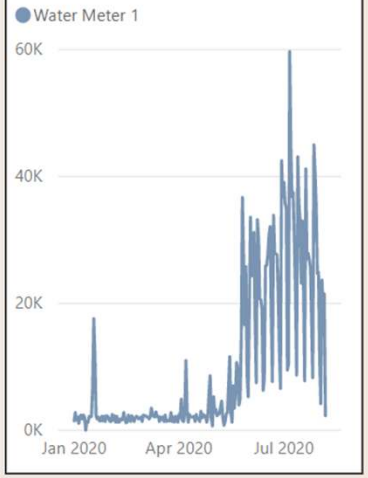


1,002 µS/cm

Historic Test Results



Historic Water Meter Results



SUMMARY | DETAIL | PERFORMANCE | UTILITIES

Today is
August 6, 2020

Client

System
Cooling Tower

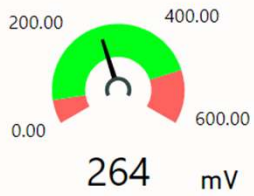
Sensor
Orp

Sensor	Units
Orp	mV

Last Data Pull
8/6/2020 5:01:48 AM EST

TODAY

Today's Average Value



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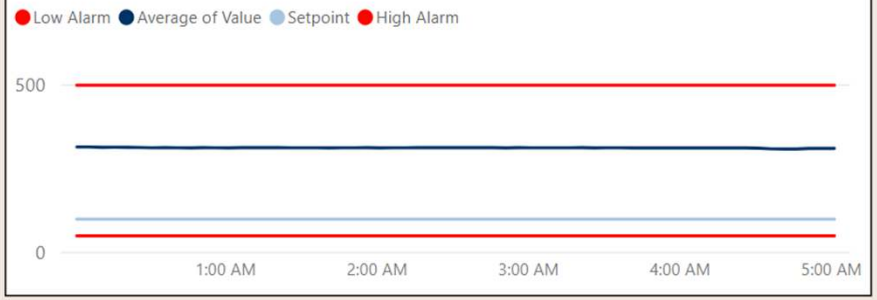

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2,300
Gallons

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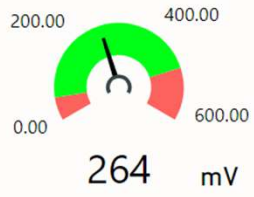

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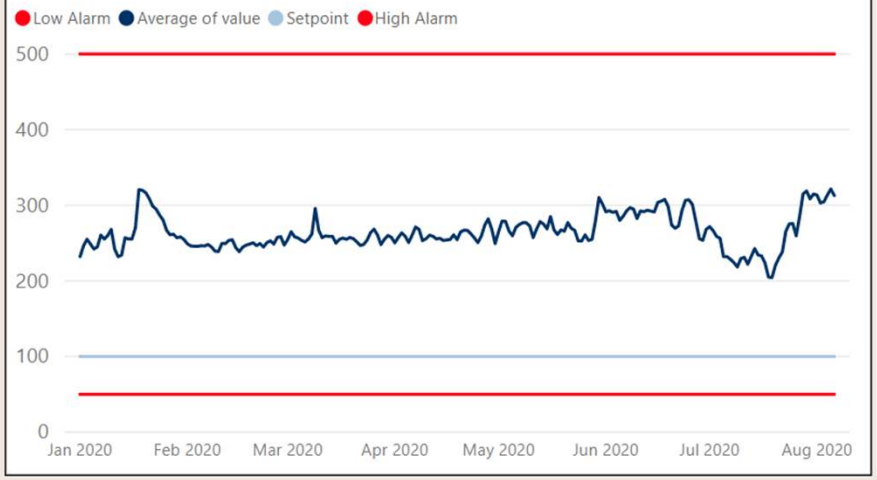

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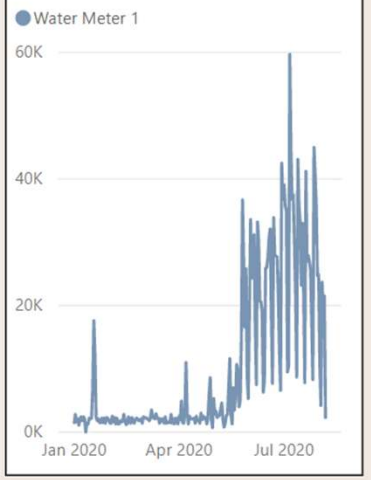


SUMMARY | DETAIL | PERFORMANCE | UTILITIES

Today is
August 6, 2020

Client

System
Cooling Tower

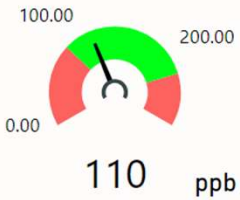
Sensor
PTSA

Sensor	Units
PTSA	ppb

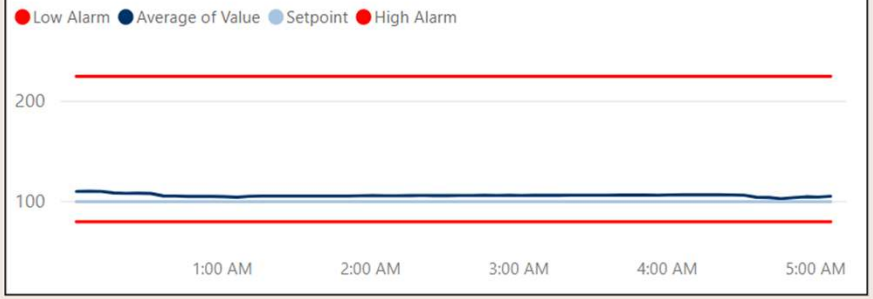
Last Data Pull
8/6/2020 5:01:48 AM EST

TODAY

Today's Average Value



Today's Test Results



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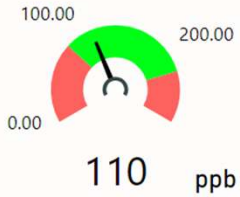

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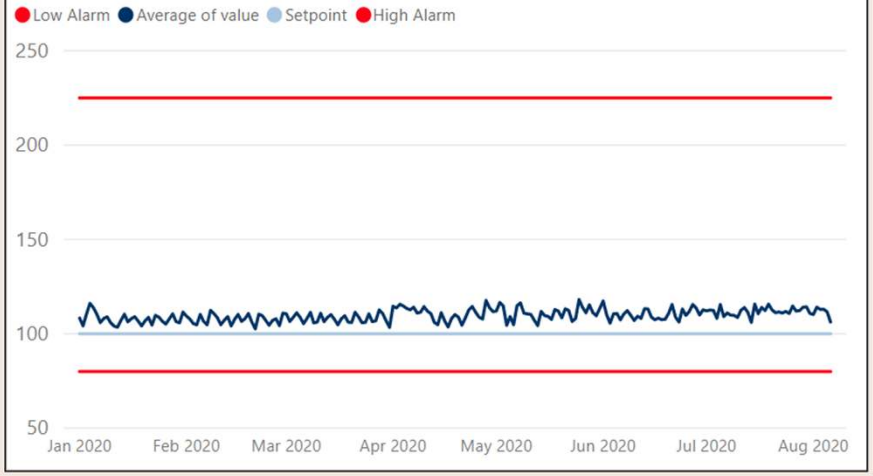

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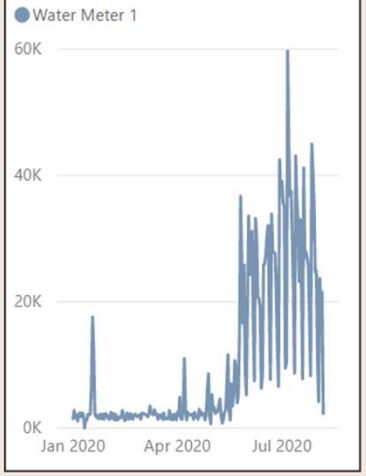


SUMMARY | DETAIL | PERFORMANCE | UTILITIES

Today is
August 6, 2020

Client

System
Cooling Tower

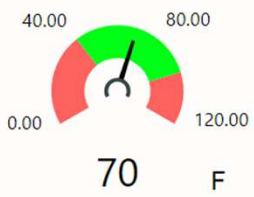
Sensor
Temperature

Sensor	Units
Temp	F

Last Data Pull
8/6/2020 5:01:48 AM EST

TODAY

Today's Average Value



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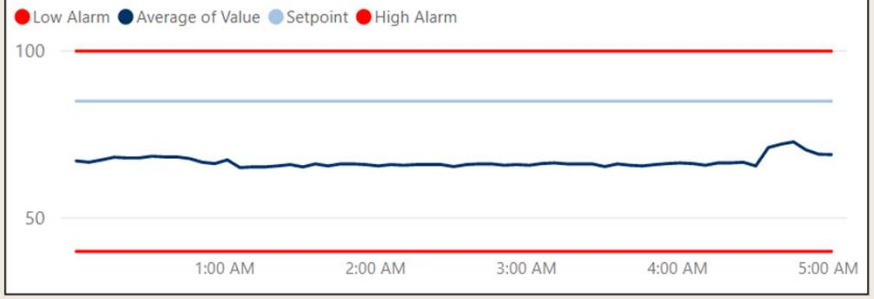

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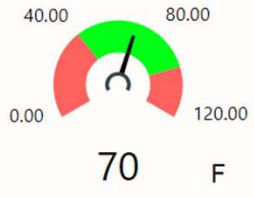

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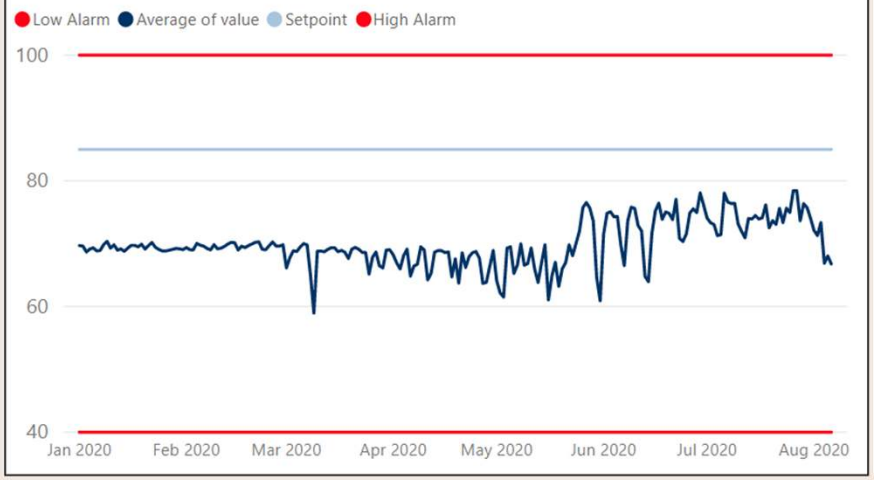
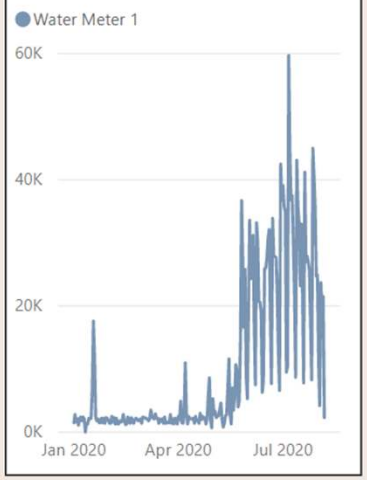


Historic Water Meter Results



SUMMARY | DETAIL | PERFORMANCE | UTILITIES

Today is
August 6, 2020

Client

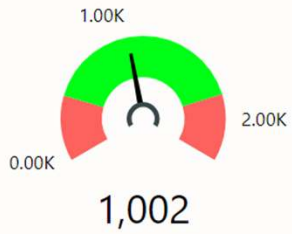
System
Cooling Tower

Date
Last 1 Years
8/7/2019 - 8/6/2020

Last Data Pull
8/6/2020 5:01:48 AM EST

Conductivity Test Details

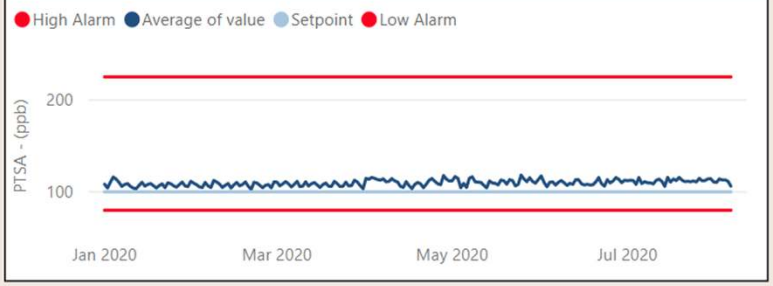
Average Value



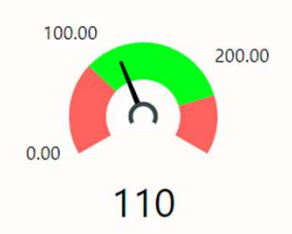
Water Meter

Test Type / Month	Water Meter 1 value	Units
January	88,300	Gallons
February	52,500	Gallons
March	63,100	Gallons
April	83,000	Gallons
May	240,200	Gallons
June	703,900	Gallons
July	912,700	Gallons
August	81,800	Gallons
Total	**2,225,500**	**Gallons**

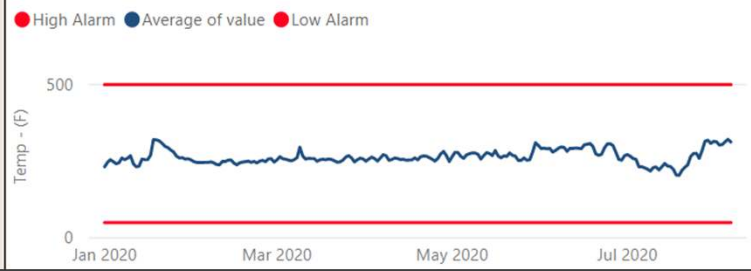
PTSA Test Details



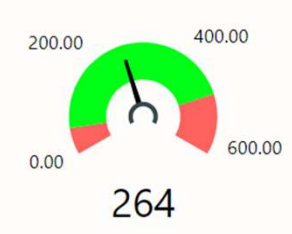
Average Value



ORP Test Details



Average Value



SUMMARY | DETAIL | PERFORMANCE | UTILITIES

August 6, 2020

Client

System

Cooling Tower

Date

Last 1 Years

8/7/2019 - 8/6/2020

Last Data Pull

8/6/2020 5:01:48 AM EST

C-7801 Inventory

88.1 Gallons

Brommax Inventory

77.5 Gallons

K-BAC Inventory

45.0 Gallons

Cycles of Concentration Performance

Average Cycles

3.46

Make-Up Savings (Gallons)

1,619,431

Blowdown Savings (Gallons)

468,675

Practical Scaling Index (PSI)

Corrosive = > 6.5

Low Scaling = 5.5 - 6.5

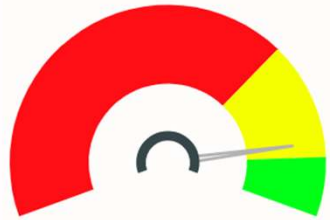
Moderate Scaling = 4.5 - 5.5

Heavy Scaling = 4.3 - 4.5

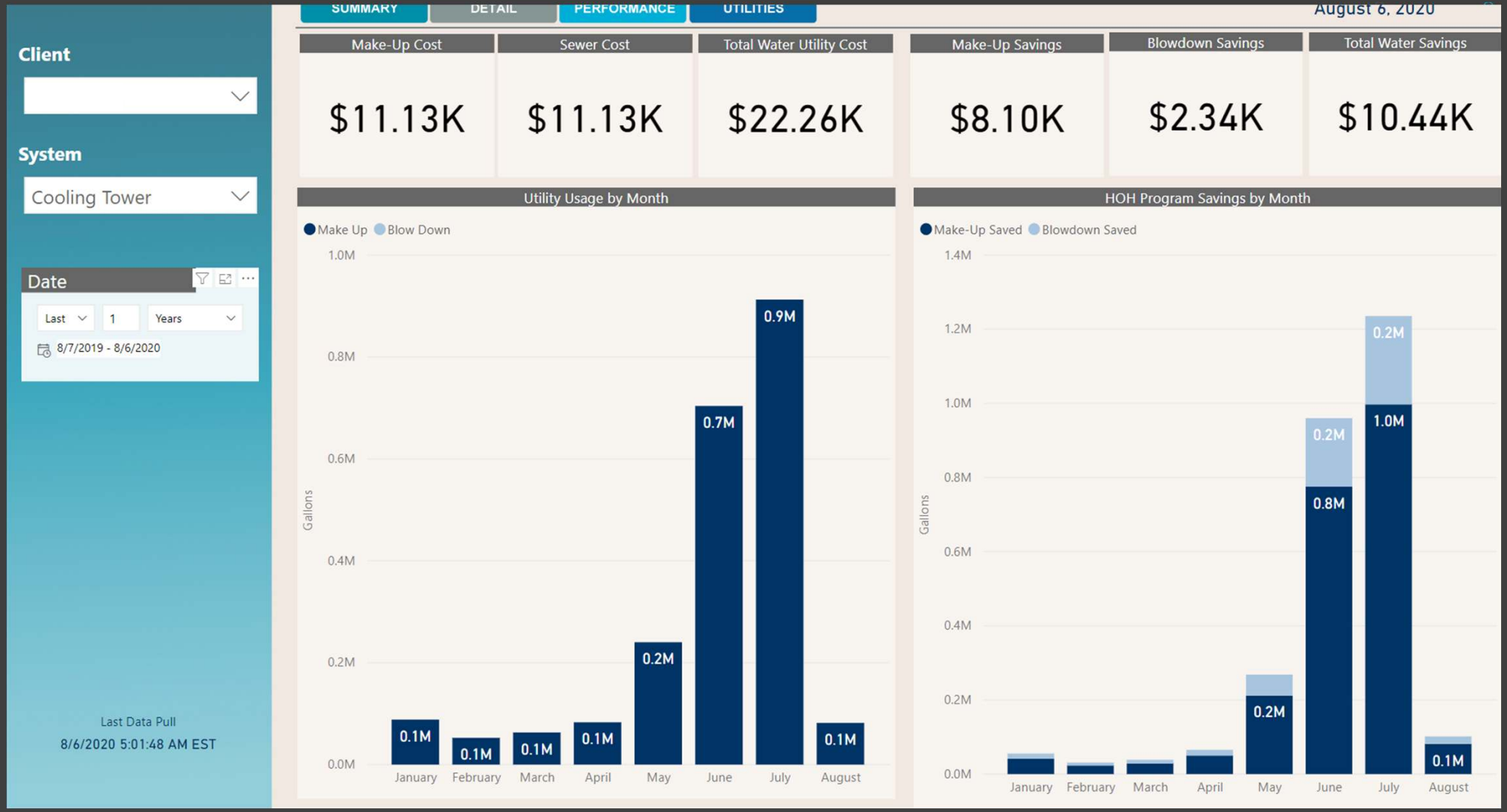
Extreme Scaling < 4.3

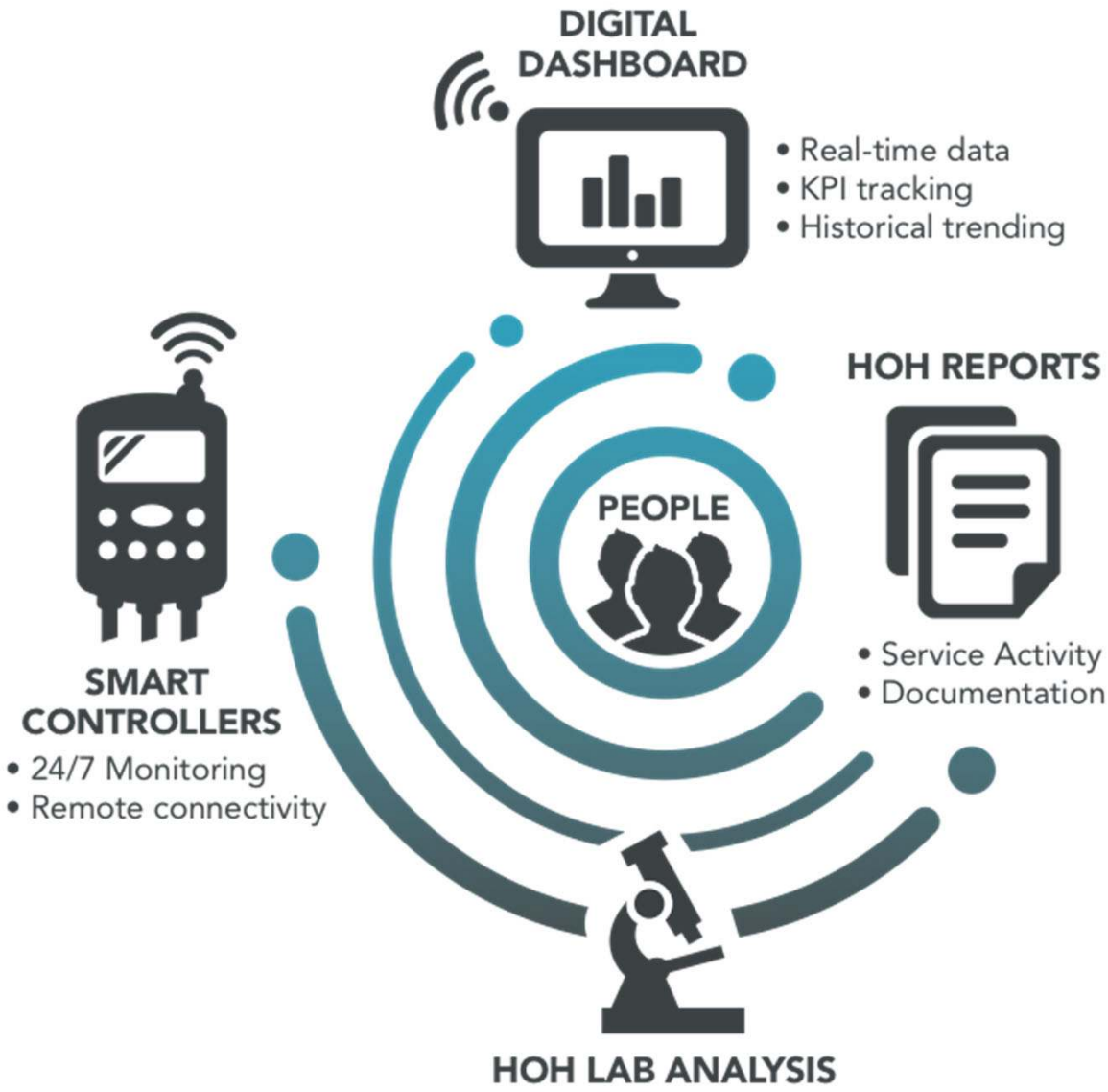
Program Performance - (Scaling Index)

Performance in Range



87 %


SUMMARY
DETAIL
PERFORMANCE
UTILITIES
August 6, 2020
Client
System
Cooling Tower
Date
Last
1
Years
8/7/2019 - 8/6/2020
Last Data Pull
8/6/2020 5:01:48 AM EST
Make-Up Cost
$11.13K
Sewer Cost
$11.13K
Total Water Utility Cost
$22.26K
Make-Up Savings
$8.10K
Blowdown Savings
$2.34K
Total Water Savings
$10.44K
Utility Usage by Month
Make Up
Blow Down
Gallons
1.0M
0.8M
0.6M
0.4M
0.2M
0.0M
0.1M
0.1M
0.1M
0.1M
0.2M
0.7M
0.9M
0.1M
January
February
March
April
May
June
July
August
HOH Program Savings by Month
Make-Up Saved
Blowdown Saved
Gallons
1.4M
1.2M
1.0M
0.8M
0.6M
0.4M
0.2M
0.0M
0.2M
0.2M
0.8M
0.2M
1.0M
0.1M
January
February
March
April
May
June
July
August


DIGITAL DASHBOARD
• Real-time data
• KPI tracking
• Historical trending
HOH REPORTS
• Service Activity
• Documentation
PEOPLE
SMART CONTROLLERS
• 24/7 Monitoring
• Remote connectivity
HOH LAB ANALYSIS

Facility management teams should

1. embrace data-driven technology for water treatment
2. with a people-centered strategy
3. or run the risk of
   a) embarrassing system failures
   b) and lost returns on investment.

A Practitioner's Perspective

4 Stories of Buildings in Chicago

1. Less Overhead, More Data

4 Stories of Buildings in Chicago

2. Water Safety & Peace of Mind.

4 Stories of Buildings in Chicago

3. Conveying Value of Work

4 Stories of Buildings in Chicago

4. Troubleshooting: Early Detection of Problems

4 Stories of Buildings in Chicago

Questions & Answers + Discussion