AWT 2021

Annual Convention & Exposition

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Rhode Island Convention Center | Providence, Rhode Island

IoT Augmented Water Treatment

Purpose

- Influence market to view IoT devices as a leverageable resource to help manage water treatment businesses.

- Tactics
  - Recap market maturity of Internet of Things (IoT) Devices.
  - Identify trends within core AWT market space and adjacent market spaces
  - Highlight current real world use cases.
  - Theoretical current use cases.
  - Near future technological progression.

The Trend

Infancy

- 1991 MCT210
- Dial in and see reports - Pulsaworks
- Phone calls on upsets
- Time Consuming, difficult to configure, expensive

Current State

- Dichotomy of technophilic and phobic companies
- 40% of controllers online capable only ~4-5% of middle market controllers are actively online.
- Industrial water connectivity market estimated between the $1.78B - $3.3B (Market Data Opt Connect)
- Generational Shift

Near Future

- Smart water management is poised to grow considerably in the next 5 years.
- Further unification of process efficiency and water treatment equipment - BMS
- Possibility for additional regulatory requirements
- Labor Shortage/Knowledge Gap

Current State: Use Case – Tower Water

- New York City Chapter 8 Title 24 requires frequent manual testing or online visibility of evaporative cooling systems
  - Manual compliance requires physical testing three times per week with no more than two days between tests.
  - Online compliance requires daily reports of temperature, pH, conductivity, and biocide concentration from cooling controllers.
- Tower Water, AWT member company, based in NJ, servicing New York City has found out the hard way that implementing online connectivity to meet regulatory compliance can be challenging.
- New Challenges Include bringing controllers in-house for initial configuration, constant policing for controller connectivity, and need for more core competency in the IT space

"Several setup steps have now been added to our standard start-up procedure…Initial connectivity can require changing which cellular carrier the modem connects to or feeding long antenna wires up a few floors where there is better cell signal." - Russell Baskin, CWT President of Tower Water

Current State: Use Case - Evapco

- EVAPCO's Pass-Protect® Passivation process enables customers to put immediate heat load on a newly installed cooling system while preserving system longevity.
- The process itself is a two-step process:
  - Step 1: A factory applied pre-treatment
  - Step 2: A tightly monitored and controlled in-field passivation process.

"the response from our partners is that they like getting the daily reports to see how the passivation numbers are trending. The ability to see real time data reduces site visits and improves the passivation outcomes for our customers." - Jamie Downie, Startup and Commissioning Specialist at EVAPCO Water Systems

- The in-field portion of the passivation requires site specific chemistry, a Factory Authorized local service partner, support from installing contractors, and EVAPCO's online feed and control panels. Remote monitoring of this process through Pulsafeeder's Pulsalink online portal allows for 24/7 visibility to critical system parameters during the infield passivation process to help EVAPCO and their Partners identify potential issues before they become problems.

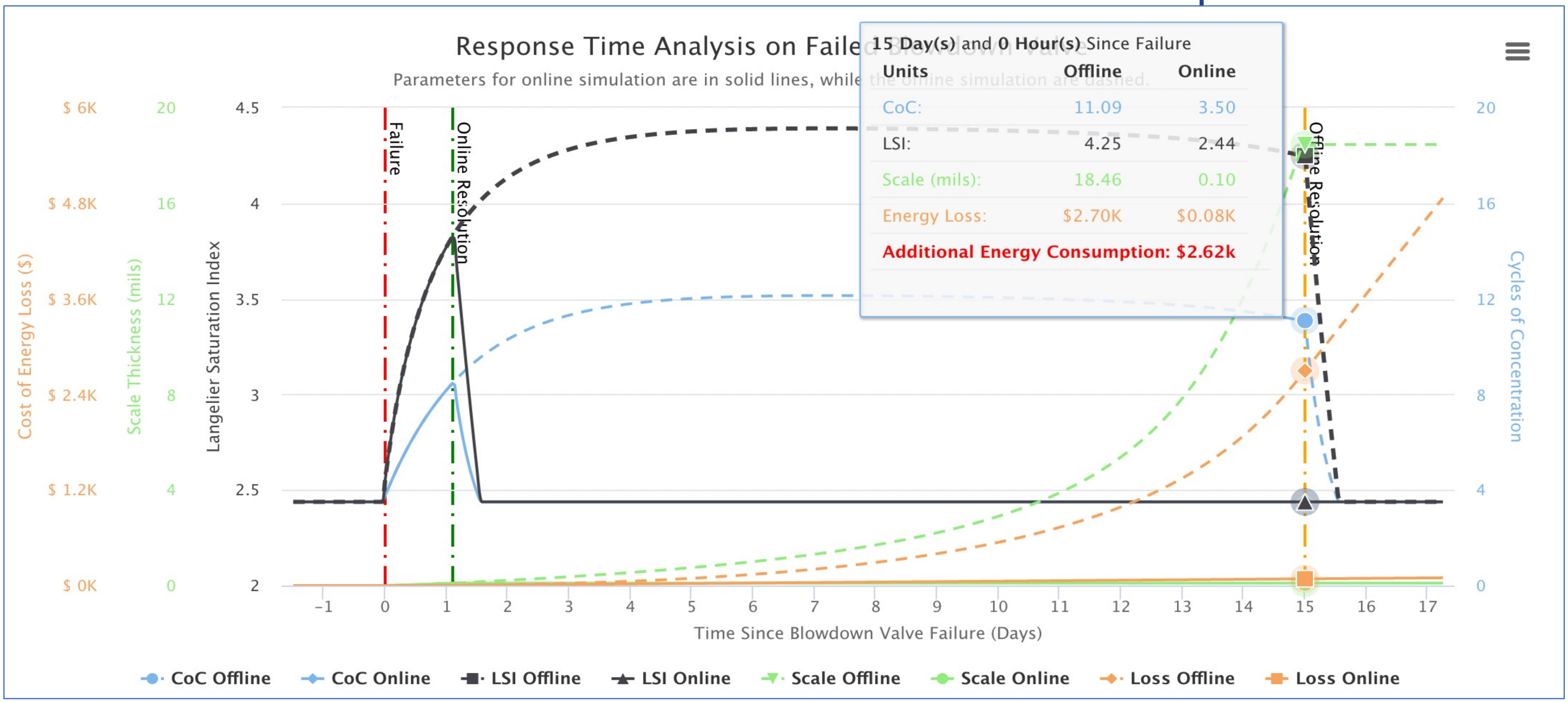
Current State: Theoretical Simulated Example

- Simulation of failed closed blow down valve in the closed state.
- With system load, response time is evaluated between a networked and non-networked controller.
- Emphasis on opportunity cost and performance differences.

Simulated Parameters

Parameter	Value
Frequency of Service	30 days
Cycle of Concentration Setpoint	3.5
Makeup Conductivity	150 μS/cm
Makeup Total Alkalinity	120ppm
Makeup Calcium Hardness	40ppm
System Tonnage	500
Drift Rate	0.05%
Cost of Power	15 c/kWh
Load	70% @ 100% time

Current State: Theoretical Simulated Example



After Effect

- Typical energy cost of operating a 500 ton chiller is $220,000/year (at 6,500 hours w/ 70% average load)
- Each 10 mils of calcium carbonate results in ~9% energy efficiency loss.
- Delayed response time versus swift causes delta efficiency of 16.2% less efficient and operating costs would increase by over $35,640/year

Current State – Quality Control Mechanism

- We only analyzed one failure mode
  - Solenoid Valve Closed - High Conductivity
- Others:
  - Low Conductivity
  - Biofilm – Microbiological/Energy Efficiency
  - pH – Corrosion/Scale/Water Consumption
  - ORP/Chlorine/Bromine Levels – Microbiological
  - Trace Levels – Corrosion/Scale
  - Level Sensors – Quality of service
- Possibility for future value add sensors/IoT Devices, Camera

Current State - Resource Management

- Avoid wasting resource allocation
  - A controller in high conductivity alarm from a long bio lockout
  - Controller in high alarm and bleed relay on for hours
- Arrive on site prepared, knowing the issue ahead of time allows you to bring the right components new valve, KOPkit™, replacement probe, ect.
- Fix the issue the first time and decrease double or triple trips.

When the probe measurements do not match our control measures, something is wrong

Near Future - Market Needs

- Connectivity improvement – 5G/LoRaWAN
- Probe Reliability
  - Identification of fouled probes – fallback routines
  - Introduction of higher performance probes at market price point
- System Integration
  - Identify out of compliance reporting
  - Fleet management software/ticketing system w/ prioritization

Conclusion

- The capabilities of online controllers has never been more functional.
- The cost of getting online and connected is continuing to decrease.
- The availability of labor is at an all time low and the cost is increasing.
- Regulatory oversight is likely to become more stringent in the future.
- The opportunity cost of any system upset can cause immense damage in a short amount of time.
- IoT presents us with a way to augment the things we do and multiply our time