Asset Management as a Business Approach to OWTS Service

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October 2026, Westminster, CO

Acknowledgements

- Presenter: Bruce Lesikar, Ph.D., P.E.
- The materials presented are the opinions of the author and not an official representation of NOWRA.

Overview

- What is the customer's vision and experience?
- What does the customer view as valuable?
- What are possible levels of service
- Reactive maintenance
- Proactive maintenance strategies
- Process monitoring strategies
- What is the customer's view of you as a service provider and your associated value?

What is the customer's vision?

- Home providing a safe environment for their family
- Ability to live without disruptions in sewer service
- Live their lives without the OWTS defining their lifestyle
- Enjoy their property
- Kids can play safely in the yard
- Access to knowledgeable, reliable, & dependable service professionals
- ASSET PROTECTION – FUNCTIONING WATER & WASTEWATER INFRASTRUCTURE REQUIRED TO MAINTAIN PROPERTY VALUE



What is your elevator speech?
Regulatory requirement or
Asset management

What is the customer experience?

Positive

- Knowledgeable, skilled, & highly-trained service provider
- Confidence in knowledge and abilities regarding OWTS service
- Communicates effectively
- Trustworthy
- Dependable and reliable
- Responsive
- Timely for appointments, contacts customer if delayed

Negative

- Limited understanding of OWTS function and process operation
- Uncertainty in OWTS operation and component function
- Everything is a secret
- Shifty character
- Unreliable
- No reaction to requests for service
- Late to appointments, frequent no-shows

What does the customer view as valuable?

Increasing levels of service

- Customer expects continuous operation from their OWTS
- No disruptions of their property use
- No loss of property value
- No blown engines – shift to proactive maintenance
- No public safety issues
- Identification of water leaks to reduce risk of excessive water bills
- App communicating current OWTS condition
- Service VALUE is driver, not COST

An App for everything



Web based example for automotive industry

Why offer multiple service contracts?

- What is the purpose of the service visit?
- What level of service is offered to the customer?
  - Multiple service plans: bronze, silver, gold, platinum
    - Based upon proactive maintenance strategies
- What multiple levels of service communicates to the customer?
  - Education: customer awareness of operation and maintenance activities
  - Included versus extra activities – everything not included
  - Sets minimum level of operational status: some malfunctions will be fixed before leaving site.
  - Customer must choose a level of service – critical to establishing customer responsibility

Maintenance: Reactive vs Proactive

- Reactive maintenance service visits
  - Responding to malfunctioning systems after problems occur
  - Fix malfunctioning components
  - Replace broken risers & lids, pumps, compressors, or plumbing issues causing a back-up into the home
- Proactive maintenance service visits
  - Performing routine maintenance on components extends component life

  - Repair mechanical components before catastrophic malfunction
  - Replace components before degradation of effluent quality.
  - Repair or replace components before malfunction

Reactive maintenance: system pumping

- Reaction prompted by either:
  - User cannot flush toilet
    - Flooded systems
    - Plumbing backups
  - Surfacing wastewater in the landscape
- The reaction is to pump tanks to remove liquid and solids



Reactive maintenance: replacing parts

- Malfunctioning equipment
  - Functions as a “parts changer”
  - Replaces malfunctioning parts
  - *No troubleshooting to identify root cause of malfunction*
- Surfacing wastewater in the landscape
  - Replaces dispersal field



Reactive maintenance - philosophy

- Owner reactive approach:
  - Contacts service provider when alarm is activated
  - Owner expects a “big bill” when the service provider is contacted
  - Limits contact with service provider
- Service provider reactive approach:
  - Only arrives at the site during extreme malfunctions
  - Service provider changes the “blown engine” of the day
  - Considers fixing disasters as a great revenue stream
  - No interest in identifying and fixing the “real problem”
  - Limits interaction with local regulatory program

Proactive maintenance: perform routine maintenance

- Does routine maintenance extend the life of system components?
  - Engine example: Do you need to add or change oil with a combustion engine? No, you just replace the “blown engine”!!!
  - Yes, performing routine maintenance on components extends component life
- Examples of routine maintenance: cleaning pump intake screens, cleaning and replacing air filters, cleaning drip filters, removing sludge from pump tanks, replacing riser lids, pumping biomass and sludge from OWTS

Proactive maintenance: troubleshooting as part of business

- Performs a root cause analysis of malfunctions
- Fixes the “real problem” when replacing components
- Reduces risk of having future malfunctions resulting from same problem
- Offers a total solution to owner



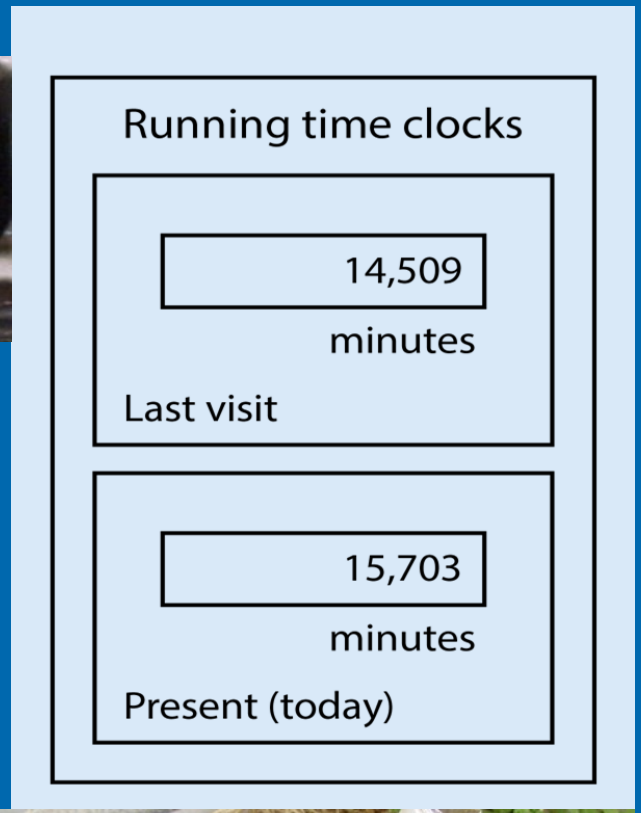


Proactive maintenance – troubleshooting examples

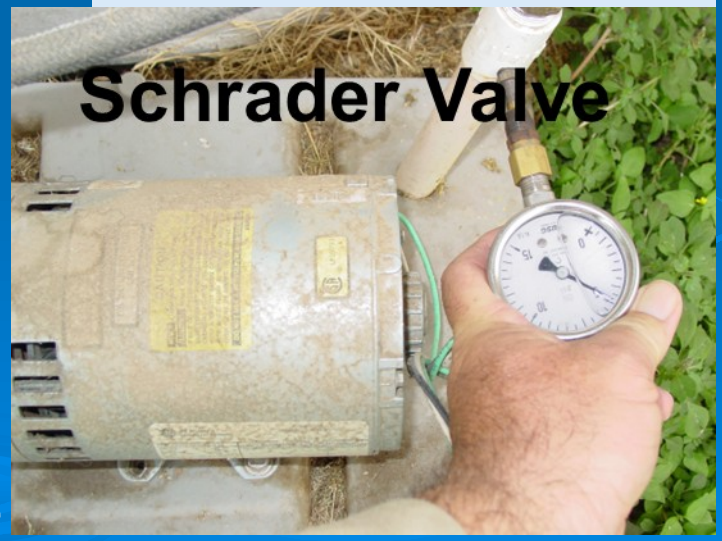
- Pump screens plugged, resulting in excess pump wear and decreased service life expectancy
  - Hydraulic overload washes solids through system due to leaking lids and risers
  - Seals risers, replaces lid, and offers an “effluent screen” to assist in retaining solids in septic tank
- Filter plugging resulting in long pump run times
  - Identifies solids in dosing tank as issue causing plugged filters
  - Identifies if solids carryover is hydraulic or organic overloading or microbial inhibition

Proactive maintenance: recording operational data



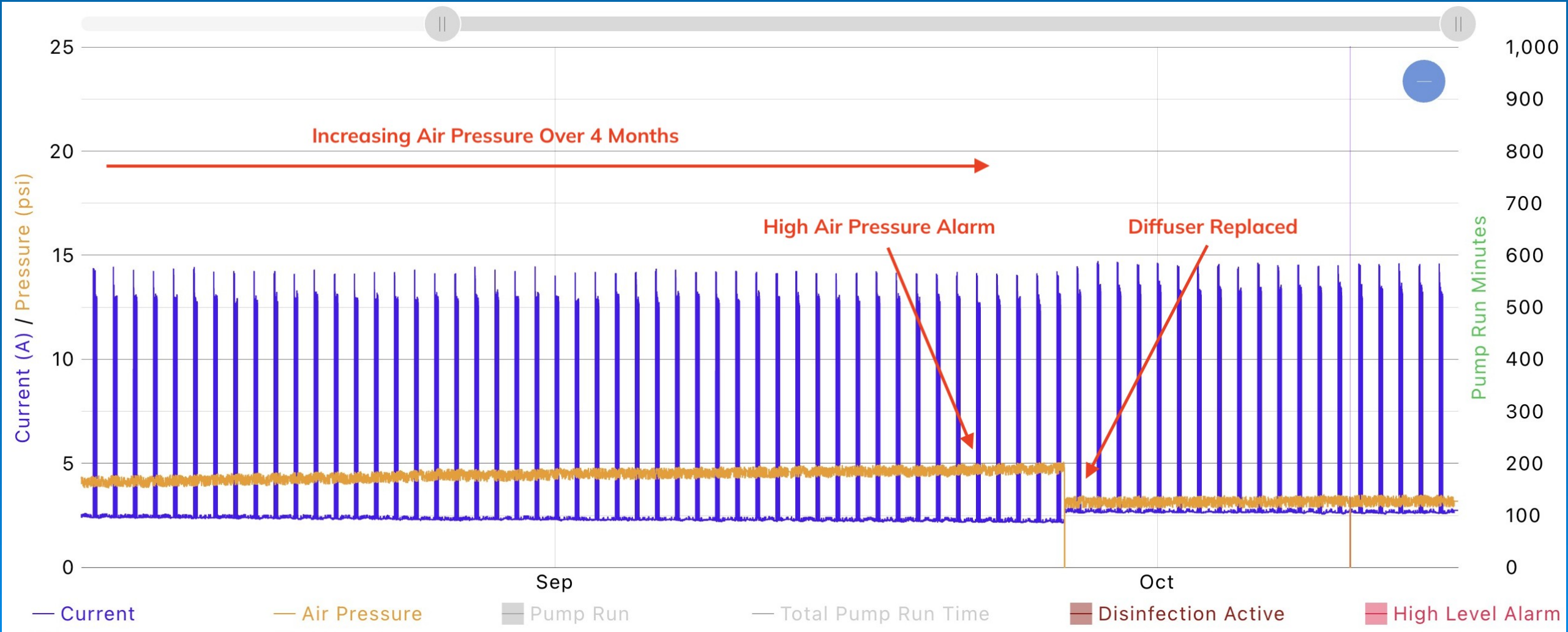


- System operational data
  - Air pressure, pump run time, pump doses
- Tracking data with time
  - Are data values changing? Increasing or decreasing operation
- Evaluating for changes or deviations
- Outside “normal” expected range
- Extreme changes in values: pump run time
- Unexplained decreases in values: cycles per day
- Manual approach to condition-based maintenance



Plugged air diffuser

- Service providers record data
- Service provider uses software to plot data to identify changes in process parameters



Checking system performance – comparing to design values



Using Cycle Counters (CC): dosing frequency, cycles per day

- What data is needed and recorded?
  - Number of days between readings (only when in operation)
  - Design daily dose frequency
  - Elapsed number of cycles = Total number of cycles (NC)
- Design value: Days x design dose frequency = Max cycles
- Compare max cycles to actual number of cycles NC
- Design example: 5 cycles per day
  - What if actual is 2 cycles per day? 40% of capacity, OK
  - What if actual is 4 cycles per day? 80% of capacity, Potential problem

Checking pump performance

Pump operation data is critical to tracking changes in system performance

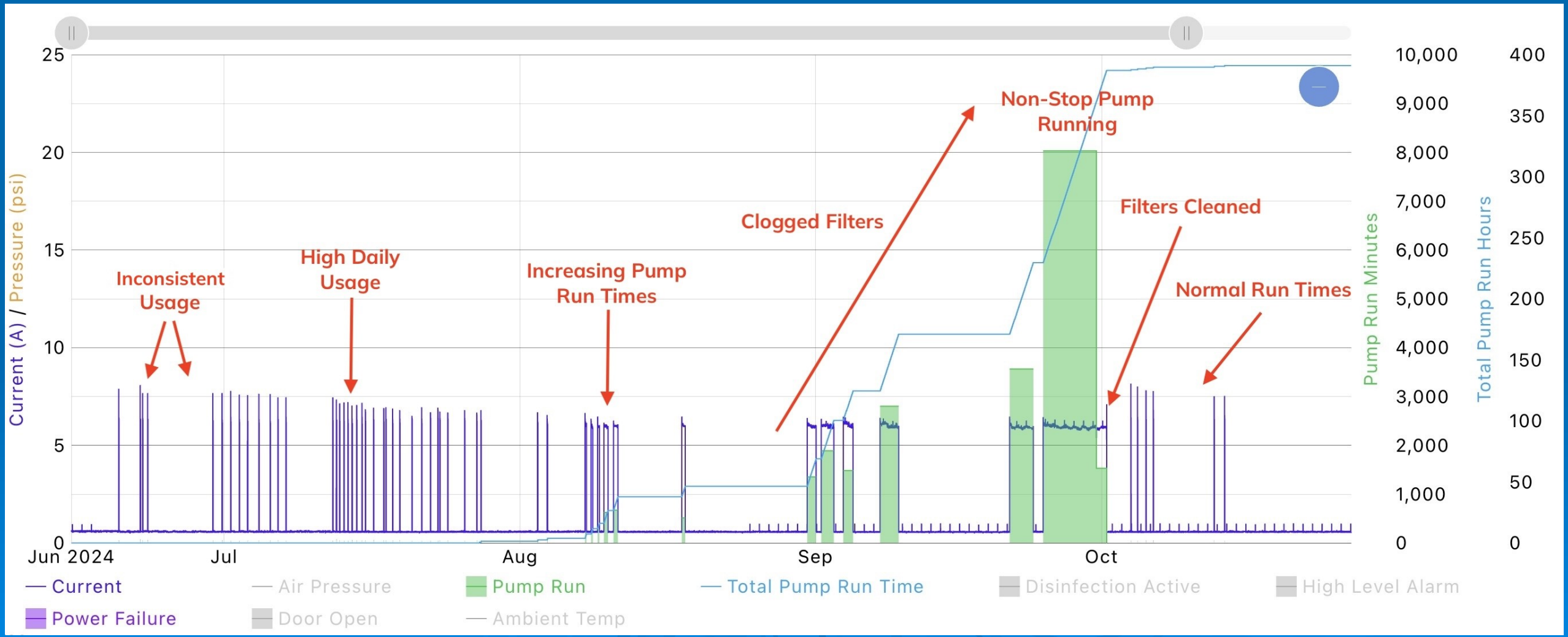
- Cycles per day:
  - Number of cycles / elapsed days = cycles/day
- Run time per cycle:
  - Elapsed time (min) / # of cycles = runtime (min) /cycle

Demand dosing systems – checking performance

- What does the runtime per cycle represent?
  - How long the pump must run to distribute the dose volume.
- Why is this value important?
  - Increasing value indicates maintenance needed
  - Clogged distribution system
  - Engine example: “Oil light is flashing on the dashboard.”

Clogged filters – long pump run time

- Service provider records & evaluates data
- Graphs provide a means for visual evaluation of actions in the system



Time dosing systems – checking performance

- What does the cycles per day represent?
  - How many cycles are required to distribute the effluent volume – pump run time restricted to “ON” setting
- Why is this value important?
- What does an increasing value indicate?
  - Clogged distribution system
  - Engine example: “Oil light is flashing on the dashboard”

Time dosing systems – value of high-water alarms

- Why do you have a high-water alarm?
- Pump run time limited to “ON” setting
  - Increased water usage by source
  - Water infiltration to tanks
  - Decreased pumping system flow rate
- Maintenance required
  - Restore pumping system flow rate
  - Restore water tightness to system
- Timer overrides deactivate early warning system!!!

Proactive maintenance: condition-based predictive maintenance

- Using automated process monitoring to determine component operational status and predict maintenance actions
- Analyze component operation data to predict future component malfunction
- Compare current operational values to previous values
- Identify data trends indicating the need for maintenance
- Identify operating parameters outside of normal ranges
- Identify data anomalies indicating deviations from normal operation
- Parameter examples: water volume, air pressure, pump run times, dosing events, alarm conditions

Telemetry

- Remote communication of system status
- Auto-dialing feature to send information to recipient
  - Often limited to notification of a high-water alarm conditions
- SCADA systems
  - Allows remote access to control panel for data access and parameter adjustment
  - Typically limited to commercial applications
  - Another step toward telematics

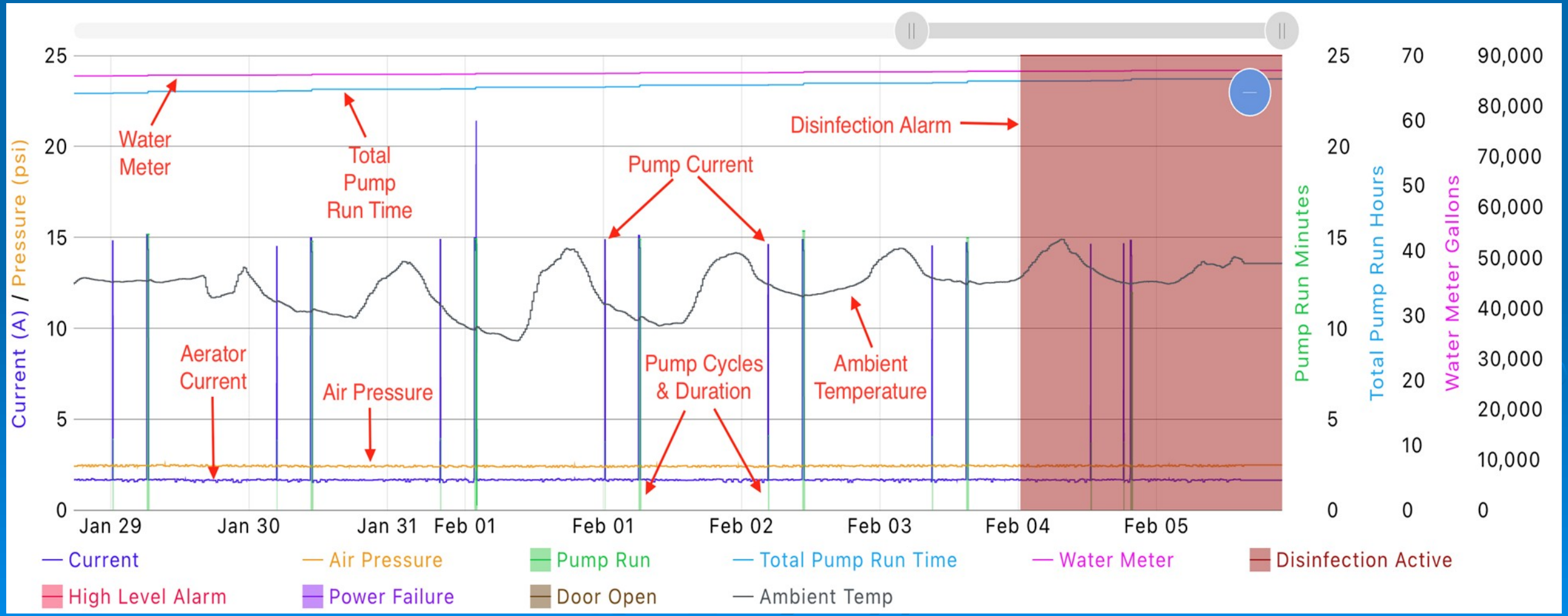


Telematics

- Combines telecommunication with information management (informatics)
- Data stored by receiving entity associated with control system
- Tracks and records system component operational data:
  - Pressure, electrical, run time, dose frequency, etc.
- Analyzes data to identify performance anomalies
  - Pre-defined conditions trigger alarm notification
    - Air pressure out of normal operating range
    - Excessive pump run time
- Alarm notifications are communicated to specified individuals:
  - Owner, service provider, RME, or regulatory community
  - NOTE: Originally developed for fleet ASSET management

Telematics - Example

- Onsite sensor data communicated to data collection center
- Service provider can plot data to identify data trends

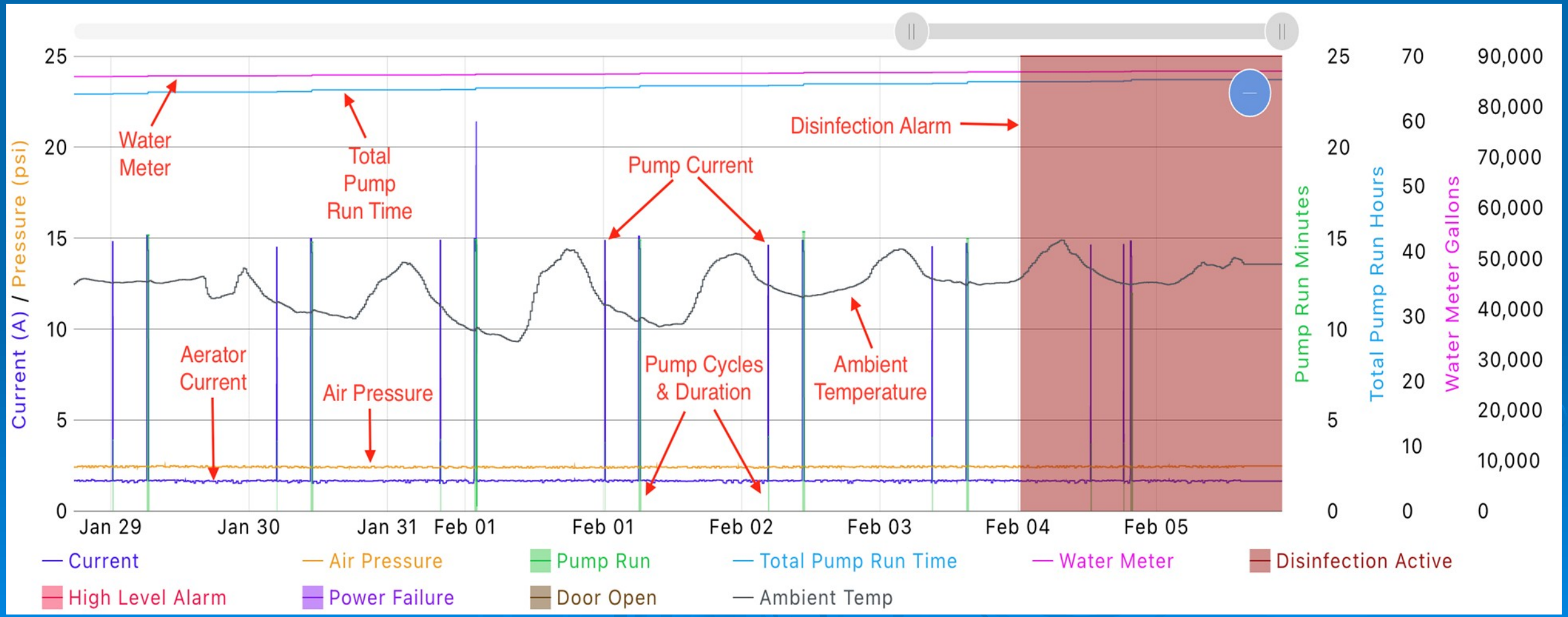


Proactive maintenance: condition-based predictive with telematics

- Combine telecommunication with recording of system data
- Data stored by receiving entity associated with control system
- Track system component operating parameters
  - Pressure, electrical, run time, dose frequency, etc.
- Record component operation data for evaluation
- Alarm conditions are communicated to identified individuals: owner, service provider, responsible management entity, and/or regulatory community

Typical system process monitoring data points

- Service provider can track process operational data to identify conditions requiring maintenance activities

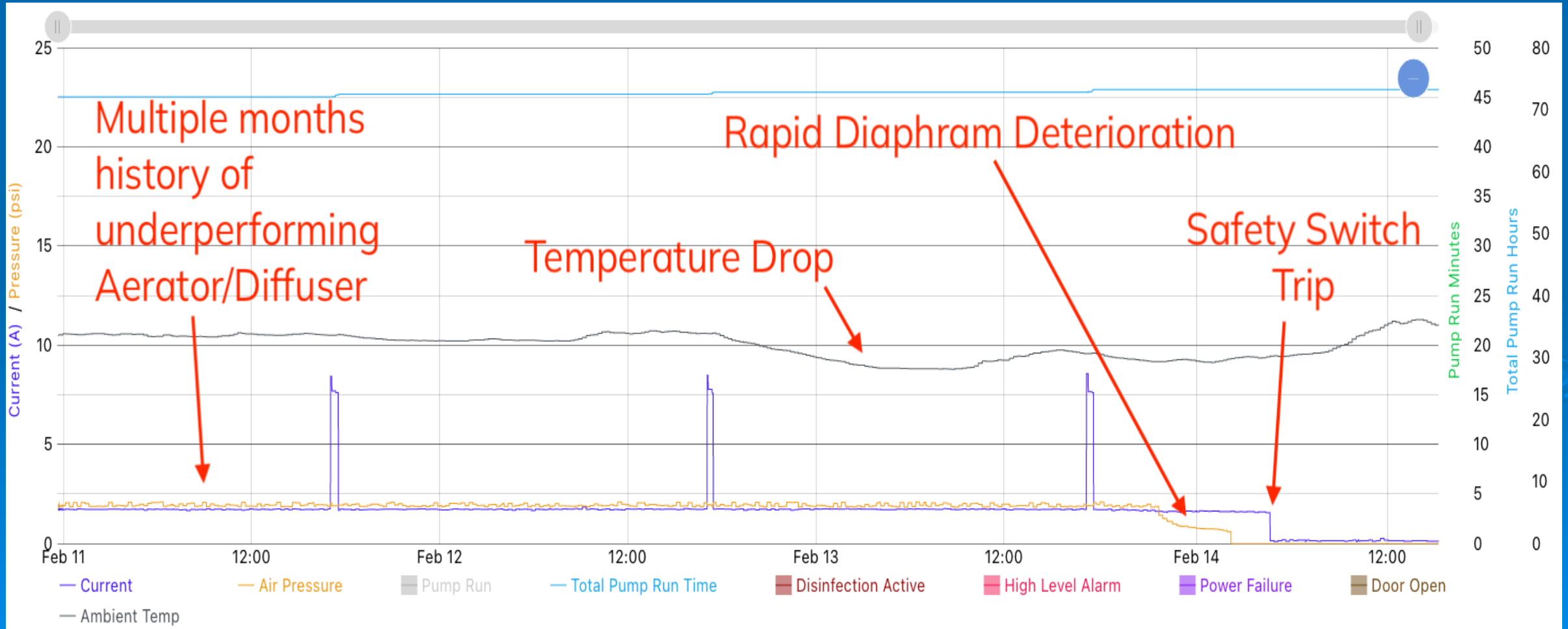


Proactive maintenance: real-time predictive

- Access and continuously analyze system operation data.
- Early warning system regarding component malfunction
- Repair mechanical components before catastrophic system malfunction
  - Replace components before degradation of effluent quality.
- Can reduce risk of public health issues when implementing water reuse systems
- Notifications of deviations from normal operating conditions.
- Notifications can be directed to owner, service provider, responsible management entity, and/or regulatory community
- Functions as an OWTS App

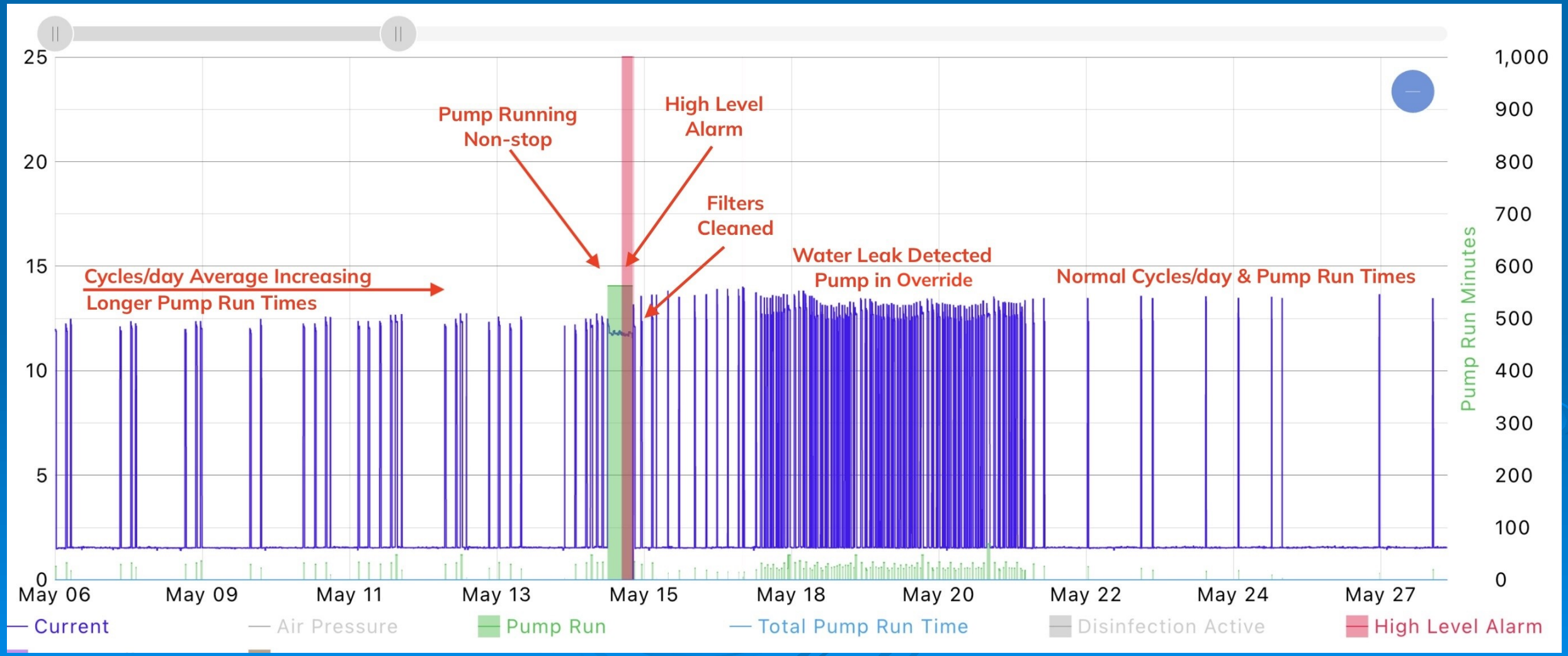
Air compressor malfunction

- Service provider identify under performing components.
- No malfunction – no alarm condition
- Component malfunction – Alarm finally activated
- When would next scheduled maintenance occur?



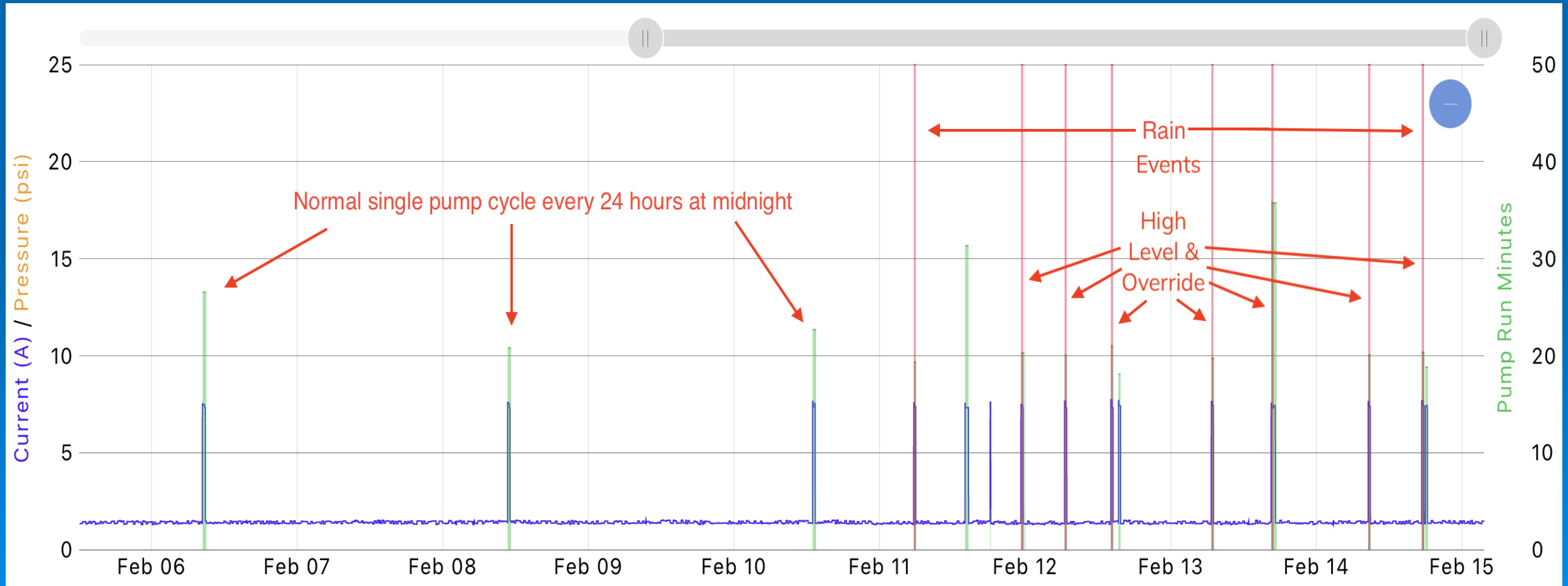
Clogged drip filter and water leak

- Continuous pump run time due to clogged filters
- Water leak - $4,000 water bill
- Flooded soil treatment area



Water infiltration during rainfall

- Long pump run times – direct relation to rain events
- Root cause analysis identifies water infiltration as an issue
- Repair to stop leaking risers and tanks
- Owner has confirmation service performed correctly



Monitoring strategies terminology

- Monitoring
  - assessing component or system status relative to specific operational, performance or compliance standards (e.g., process monitoring, qualitative or quantitative monitoring as part of service visit).
- Process monitoring
  - recording data on equipment condition and process parameters using sensors, recording devices, meters, etc. to determine process operational conditions to facilitate identification of deviations from normal operation.

Monitoring strategies terminology (cont.)

- Continuous process monitoring
  - real-time data recording of process information, including equipment condition and process parameters to identify deviations from normal operation; see condition-based maintenance and predictive maintenance.
- Remote continuous process monitoring
  - remote access to and storage of real-time data associated with process information such as equipment condition and process parameters; includes the ability to identify deviations from normal operation and notify interested parties; see maintenance, predictive.

Proactive maintenance: reliability-centered maintenance

- Proactive maintenance strategy focuses on understanding the functions and potential failure modes of equipment to determine the most effective maintenance approach. It prioritizes maintenance efforts on critical components to ensure overall system reliability
- Process monitoring to ensure treatment process reliability
- Prediction of component malfunction and proactive replacement of components before malfunction
- Periodic performance testing to confirm system compliance with performance standards.
- Facilitates adoption of water reclamation and reuse strategies

Proactive maintenance strategy terminology

- Preventative maintenance:
  - proactive maintenance strategy utilizing scheduled, time-based or usage-based approach to conducting activities, e.g., maintenance tasks at predetermined intervals (e.g., every three months or after 500 operating hours).
- Condition-based maintenance
  - proactive maintenance strategy that includes monitoring equipment condition in real-time using sensors and diagnostics; maintenance is triggered based on the actual condition of the asset, rather than a pre-set schedule.

Proactive maintenance strategy terminology (cont.)

- Predictive maintenance
  - proactive maintenance strategy that uses data analysis to anticipate potential equipment malfunction and schedule maintenance proactively to minimize downtime, reduce maintenance costs, and optimize equipment lifespan by addressing issues before they escalate into major breakdowns.
- Reliability-centered maintenance
  - proactive maintenance strategy that focuses on understanding the functions and potential failure modes of equipment to determine the most effective maintenance approach; prioritizes maintenance efforts on critical components to ensure overall system reliability.

Proactive maintenance – philosophy

- Owner's proactive approach:
  - Contacts service provider when alarm is activated
  - Owner expects troubleshooting of system to identify cause of malfunction
  - Views service provider as part of management team for their infrastructure asset
  - Views alarm conditions as valuable to protecting their wastewater infrastructure
- Service provider's proactive approach:
  - Performs routine maintenance on components
  - Evaluates operational data and communicates information to owner
  - Communicates system operational status and future maintenance needs
  - Offers customer a variety of service plans based upon customer needs and proactive maintenance strategies
  - Views customer as a long-term business partner
  - Views regulatory program as supportive to long-term business strategy

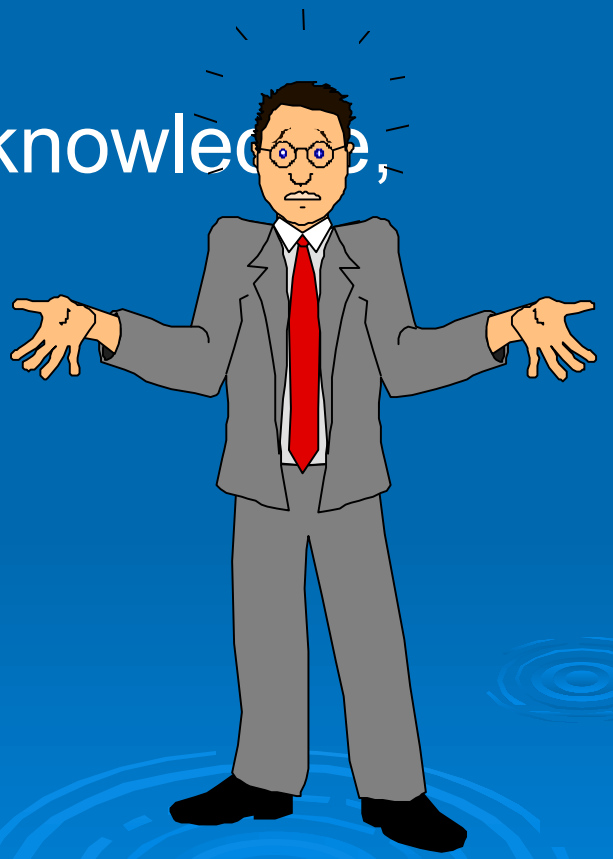
What is the customer's view of your value?

- Knowledgeable, skilled, and able to offer solutions
- Trustworthy resource for information
- Dependable and reliable service
- Responsive to problems – answers the phone!!!
- Fixes system the first time: Capable of troubleshooting system to determine the root cause of problem, no parts changer
- Cleanliness and quality workmanship
- Protects family members and companion animals
- Protective of their assets: increases component service life and reduces life cycle costs



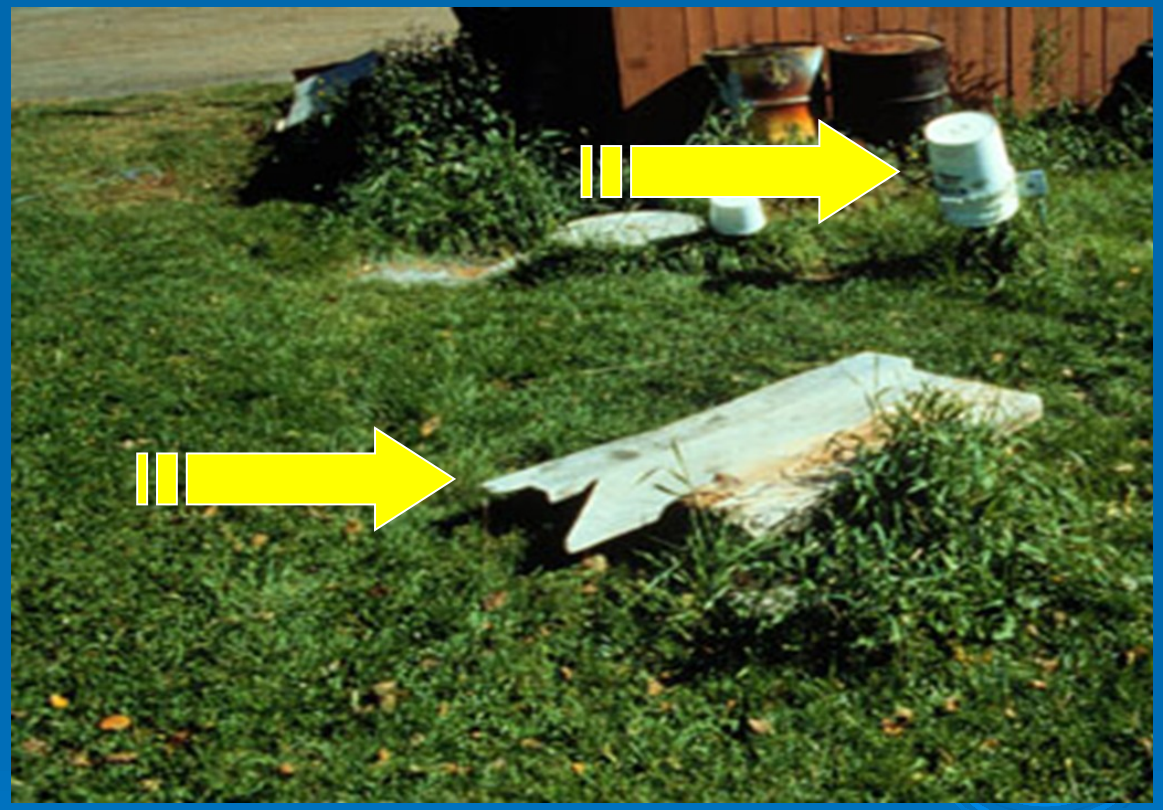
Customer advertising

- **Satisfied** if system works
  - Enjoys the use of their property
  - Positive comments regarding workmanship, knowledge, reliability and dependability
- **Dissatisfied** if system does not work
  - Complaints
    - Permitting Authority
    - State Authority
    - Legal
  - Tells EVERYONE that will listen
- **Inexpensive** if positive, very **expensive** if negative



Protecting your value

- Do not contract with nightmare systems
- Perform a pre-contract audit
- Identify items requiring attention before accepting contract
- Educate owner regarding system status and need for replacement of components
- Return system to operational status before establishing a contract
- If owner not willing to fix system, no contract



Unacceptable and inoperative components need to be replaced: overtime, component replacement and system rehabilitation is required

Summary

- What is the customer's vision and experience?
- What does the customer view as valuable?
- What are possible levels of service
- Reactive maintenance
- Proactive maintenance strategies
- Process monitoring strategies
- What is the customer's view of you as a service provider and your associated value?

References, sources of add'l information

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