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Water Management Solutions

Mike Uthe; 10/01/2020

Our Strategy

- Accelerate development of new products
- Drive manufacturing productivity improvements
- Implement a go-to-market strategy that leverages the scope of all our products and services
- Continue to seek to acquire and invest in businesses and technologies that expand our existing portfolio of businesses or that allow us to enter new markets

Mueller is Uniquely Positioned to Address Utility Pain Points

Brass, Gas, & Repair Products	Condition Assessment & Monitoring	Hydrants & Iron Gate Valves	Metrology	Specialty Valves
				

Aging Infrastructure • Water Scarcity • Water Loss • Technology Changes

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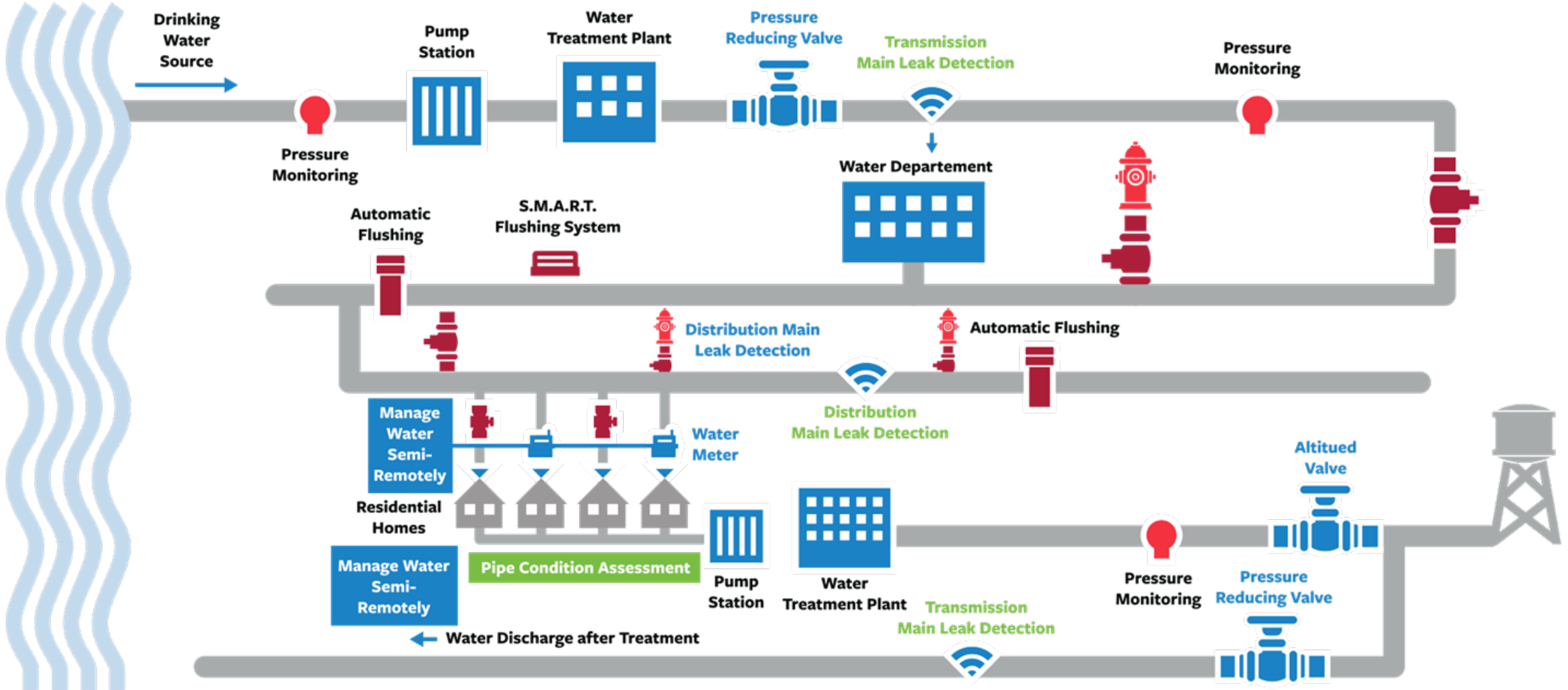
Our Vision: Reliable delivery of safe, quality drinking water



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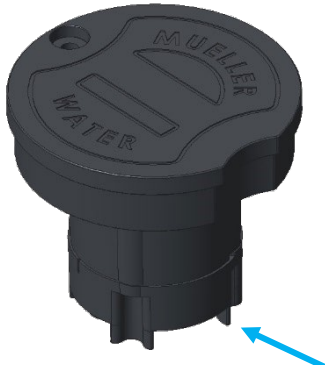
The Total Monitoring Solution…

Hydro-Guard Pressure Monitoring

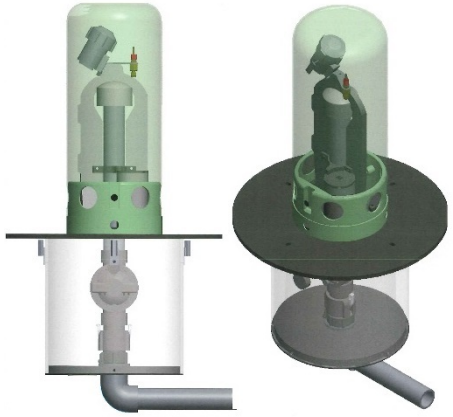


Singer Valve

Echologics

HYMAX

Hydro-Guard Flushing Systems



Core Offerings - Echologics

< 16”

>= 16”

1 Leak Detection Equipment

2 Watermain Leak Detection Services

3 Pipe Condition Assessment Services

4 Pipeline Monitoring Solutions

ePULSE™

ePULSE™

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

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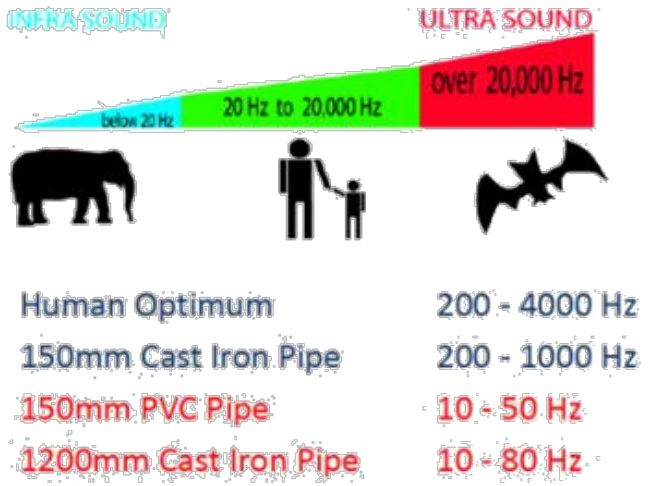
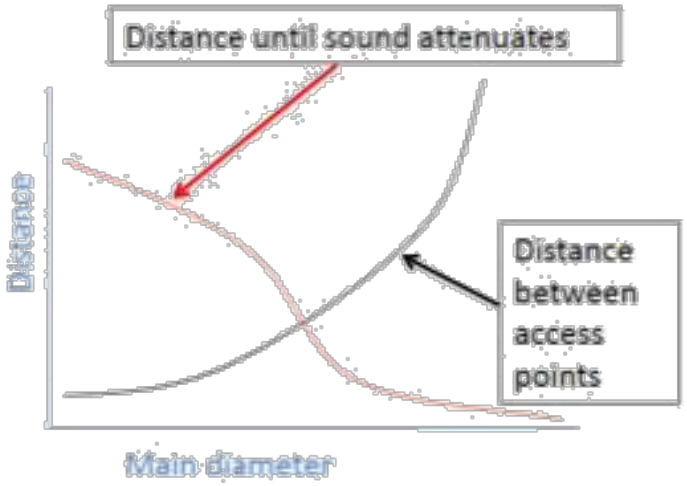
Leak Noise Basics: Size (& Type) of Pipe Matters

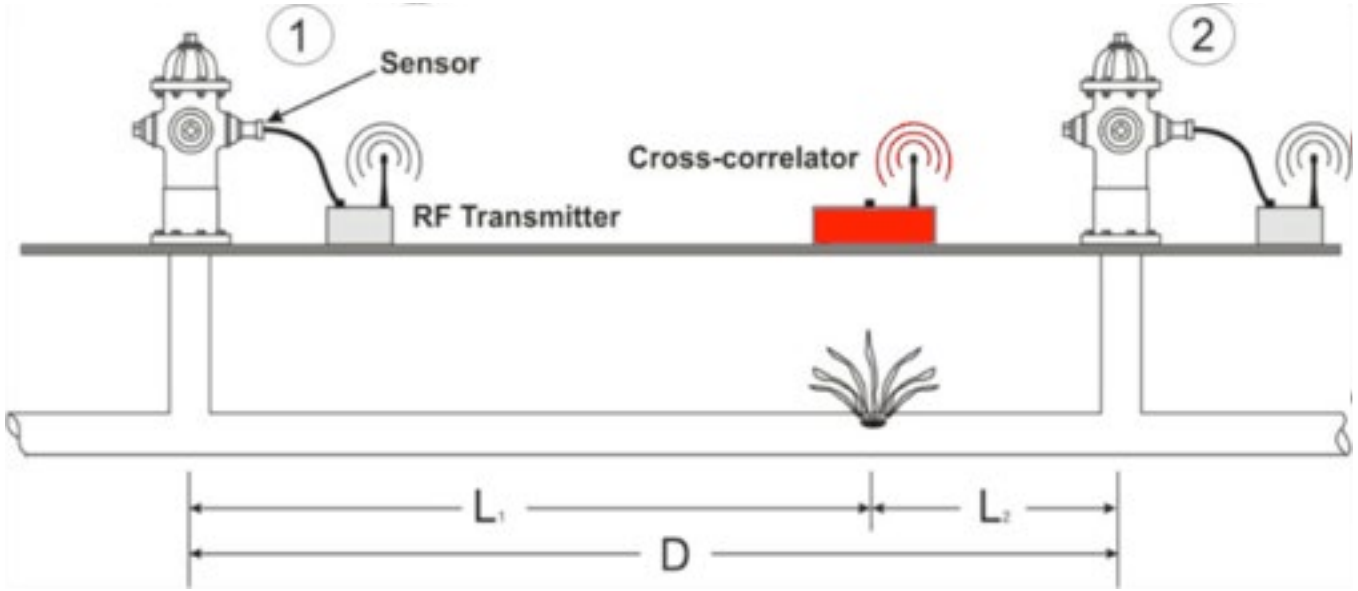
- Small leaks vibrate at higher frequencies; large leaks at lower frequencies
- Larger pipe will not carry sound as far as smaller pipe made of same material
- Leaks from metal pipe generate more noise that travels farther than leaks from cement or plastic pipes
- Transitions in pipe materials (with clamps and couplings) muffle leak noise

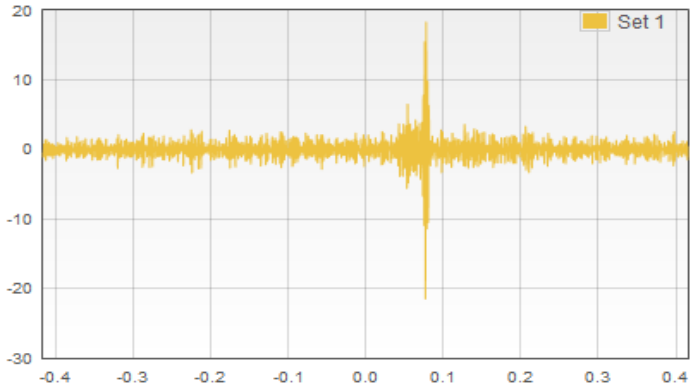




Acoustic Leak Correlation Analysis

1. Bracket the leak with two sensors
2. The leak sound propagates in both directions
3. Vibration travels at known speeds in pipes of specific material and size
4. Correlator measures the time difference to reach each of the sensors, to determine the exact leak location





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Leak Detection Equipment - < 16” – Distribution Mains

Equipment

- Acoustic Correlator: LeakFinderST
- For CI, DI, ST, AC, RCP, PVC, PE, HDPE and more.

http://youtu.be/Q6rd_i5KY1k

“Secret Sauce”

- Human Voice: 125 – 5000 Hz
- Music - Middle C Note: 256 Hz
- Music - A440: 440 Hz
- Typical 6” Cast Iron Pipe: 200 – 800 Hz
- Typical ¾” copper pipe: 400 – 2000Hz
- Typical 6” PVC Pipe: 5 – 30 Hz

Battle of the Correlators

- American Leak Detection evaluated 8 different correlators
- Echologics placed 1st in 6 of 7 tests
- Only correlator to isolate PVC leaks
  - 2 leaks within 2” accuracy

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Sensor Connection Points

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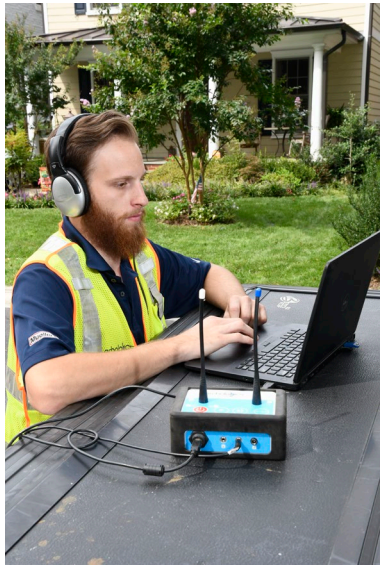
Key Differentiators of Mueller / Echologics vs. Competition

- Mueller / Echologics is the only North American Manufacturer of Correlators
- Only manufacturer to offer a 2-day director approved 1.5 CEU training course with purchase to improve success rate.
- After sales support – Echologics has a leak monitoring centre to offer review of saved correlation files.
- Robustness of unit in cold weather! Trust me, operators are more fragile than equipment!
- Spare Parts inventory in Toronto – loaner kits available for little to no downtime!
- Backed by the Mueller name and reputation.



LeakFinder-ST Demo

Listen for leaks using LeakTuner®

- Automatic and manual scan of 6 band filters
- Graphical display of 10 signals
- Color display with auto-backlight
- Rechargeable with power management system
- 8-10 hours of battery life at full charge

Two people can listen at the same time

Ergonomic X-strap

Ergonomic hand-switch with adjustable cable

Wind noise reducer

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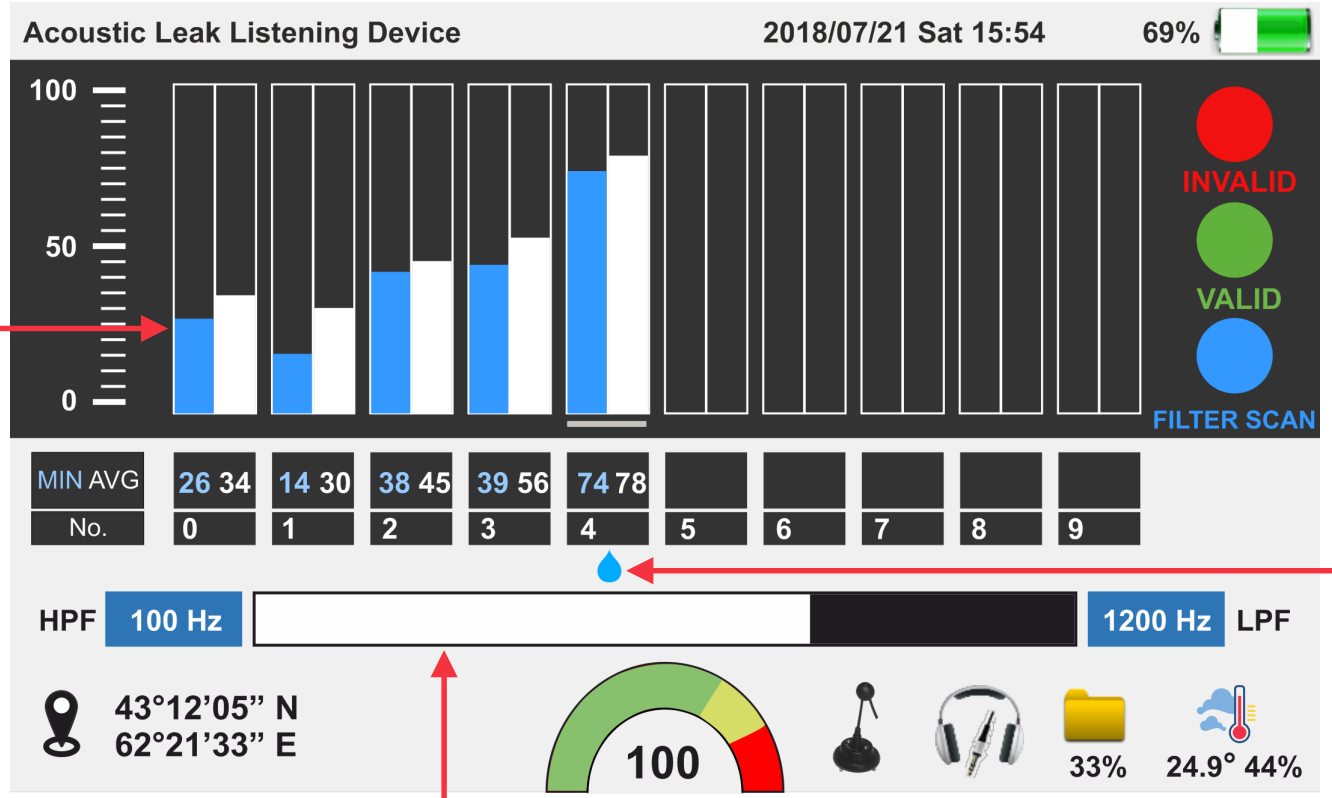
LeakTuner® display – a helping hand in your leak survey



Min. & ave. signals in bar graph (or line graph)

Min. & ave. signals in numbers

Signal validation

Operator's mark

GPS location

Selected filter

Volume safety warning

Status information

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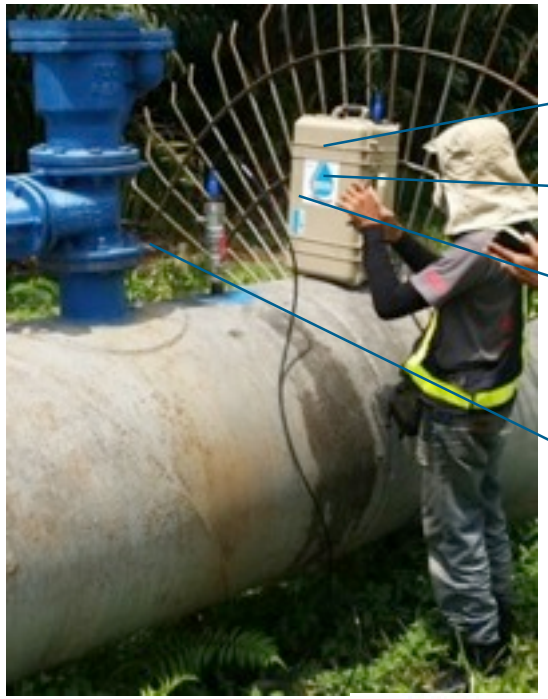
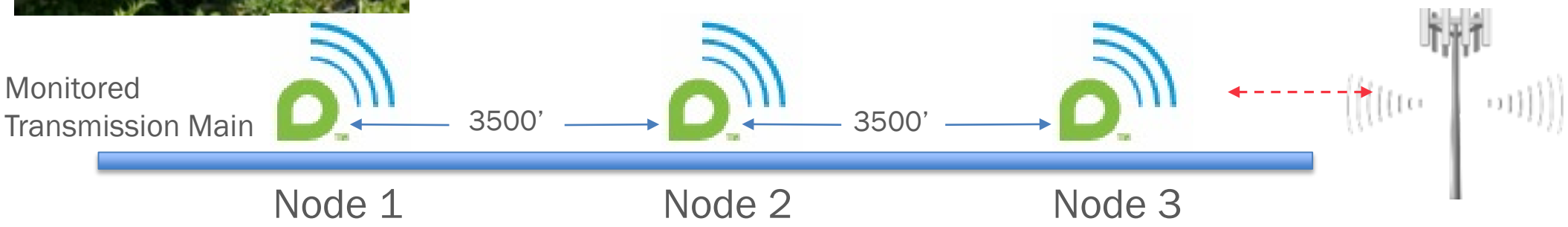
EchoShore-M: Leak Detection for Transmission Mains



- Antenna
- Power Source
- Processor & Comm. Hardware
- Hydrophone



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EchoShore-M - Operation

Rapid Deployment

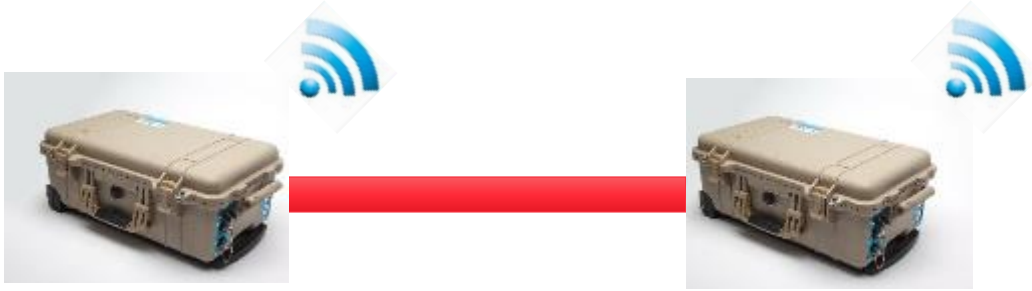
- One pack of nodes can monitor while another pack is re-deployed
- Survey an area for hours, days or weeks
- Allows for rapid survey of long distances

Remote Analysis

- Data collection separated from data analysis
- Automated peak selection
- Web-based reporting interface
- Intermittent noise sources identified and dismissed

Programmable Data Capture

- Programming in the field or remotely
- Time-synced acoustic data capture
- Upload to central server for archiving
- Results passed for local or remote analyst



Increased leak detection capability with decreased cost

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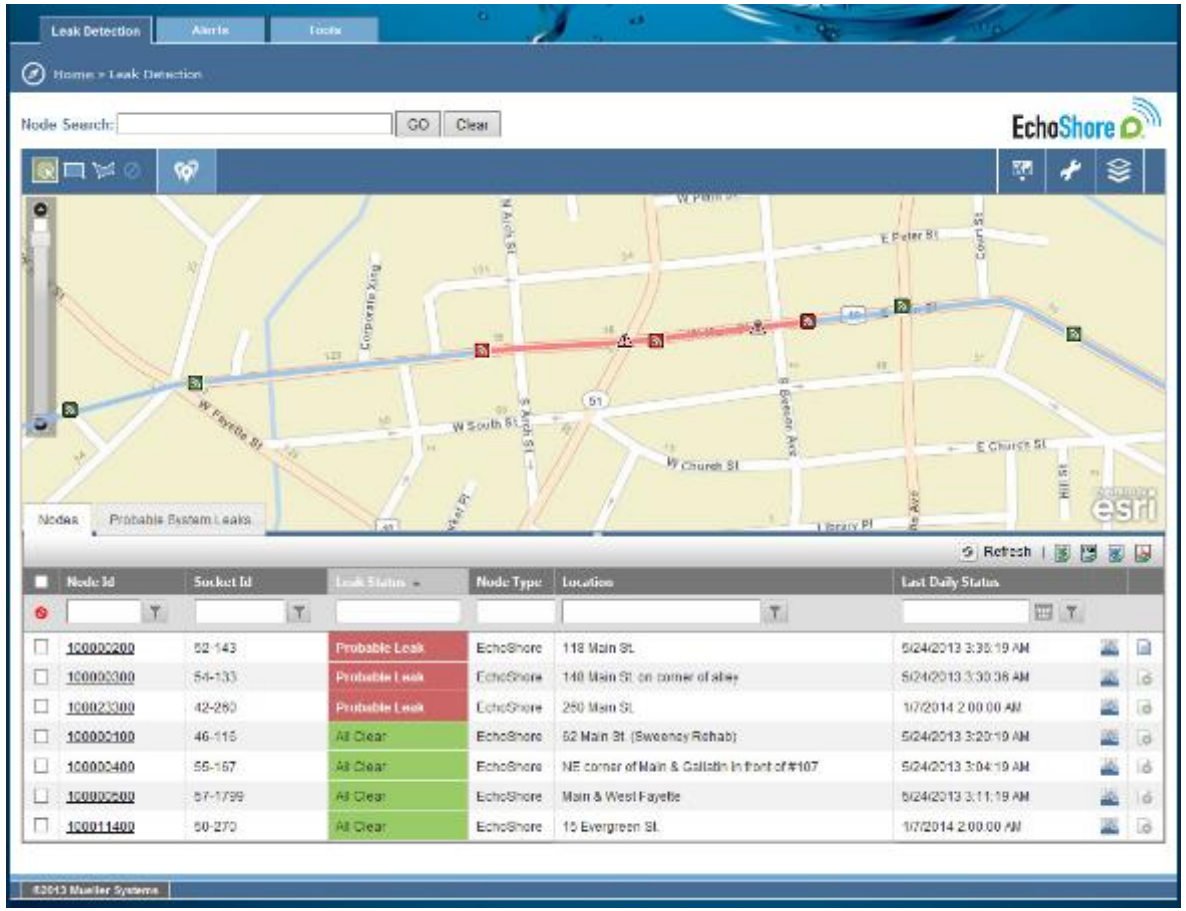
EchoShore-M - User Interface

EchoShore system easily integrates with customer infrastructure:

- Web-based application
- ESRI map display
- Full communication with nodes
- Filtering and correlation analysis tools



Echologics' Condition Assessment Toolbox

"Prioritizing Main Replacement and Avoiding Failures"

Prioritizing Pipeline Renewal Based on Condition

Pipeline 1	Pipeline 2
Installed 1860	Installed 1860
Brown sandy soil	Brown sandy soil
Moderate soil corrosivity	Moderate soil corrosivity
6” Cast Iron Pipe	6” Cast Iron Pipe

31% Thickness Loss

1% Thickness Loss

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Why Perform Condition Assessment Inspections

Condition Assessment is the collection of pipe data to determine:

- What's occurring in the system today?
- What's the probability of a failure?
- What's the best solution to prevent a failure?
- How much time do I have to implement the solution?

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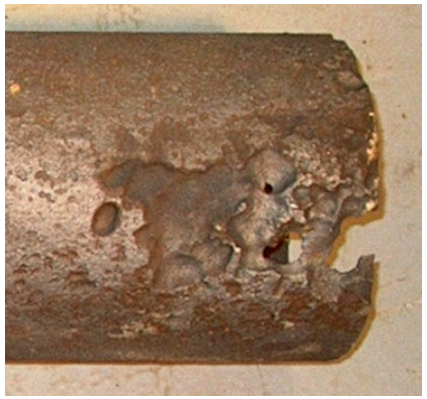
The Problem of Pipe Replacement & Failure

- **All pipe will degrade and fail over time but at varying rates**
  - Consequences = water loss and catastrophic breaks
- **Pipe is hidden underground**
  - No visual way to determine good versus bad pipe
- **Reliance on pipe failure history and age can be ineffective**
  - 60% to 70% of mains being replaced are still in good condition
- **Replacing and rehabilitating pipe is expensive**
  - Pipe replacement costs of $1,000,000 or more per mile
- **Because of price and selection error, wrong pipes are targeted**
  - Increasing water loss and likelihood of catastrophic breaks



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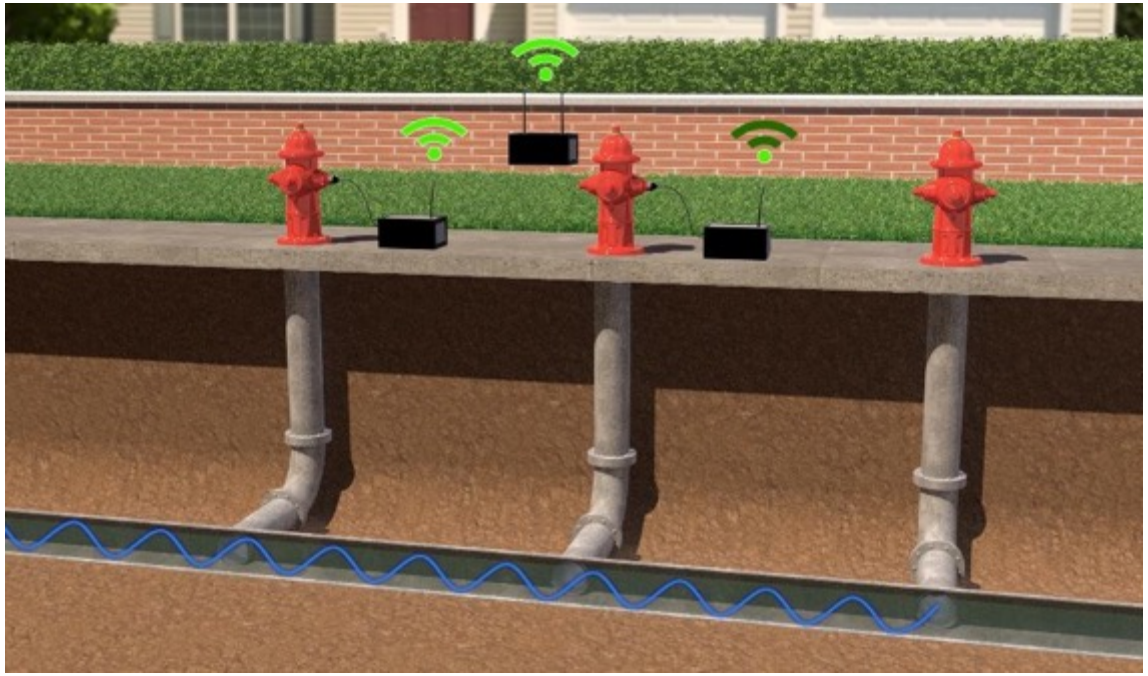
ePulse Condition Assessment

- Helps utilities make better renewal decisions for older water mains
- Only non-disruptive technology:
  No impact on water network or roadways
- #1 position for small diameter condition assessment globally
- Used for:
  - Baseline understanding of water main condition
  - Replacement and rehabilitation planning
  - Rate case justification
  - Due diligence support for water system acquisitions
  - Strategic deployment of intrusive (Internal NDT) condition assessment technologies
  - Reduction in the number of water main breaks experienced by a city



ePulse Condition Assessment

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ePulse: Technical Qualification

1. The Right Pipes

Pipe Material	Pipe Diameter
Metal & Concrete	Up to 24”
Cast Iron & Concrete	Up to 90”

2. Maps
3. Access to outside of pipe (every 700’)

   NOTE: May require potholing
4. Known Pipe Material & Diameter
5. Pressurized, Buried Pipes

Often GIS maps is all you need to develop an ePulse proposal

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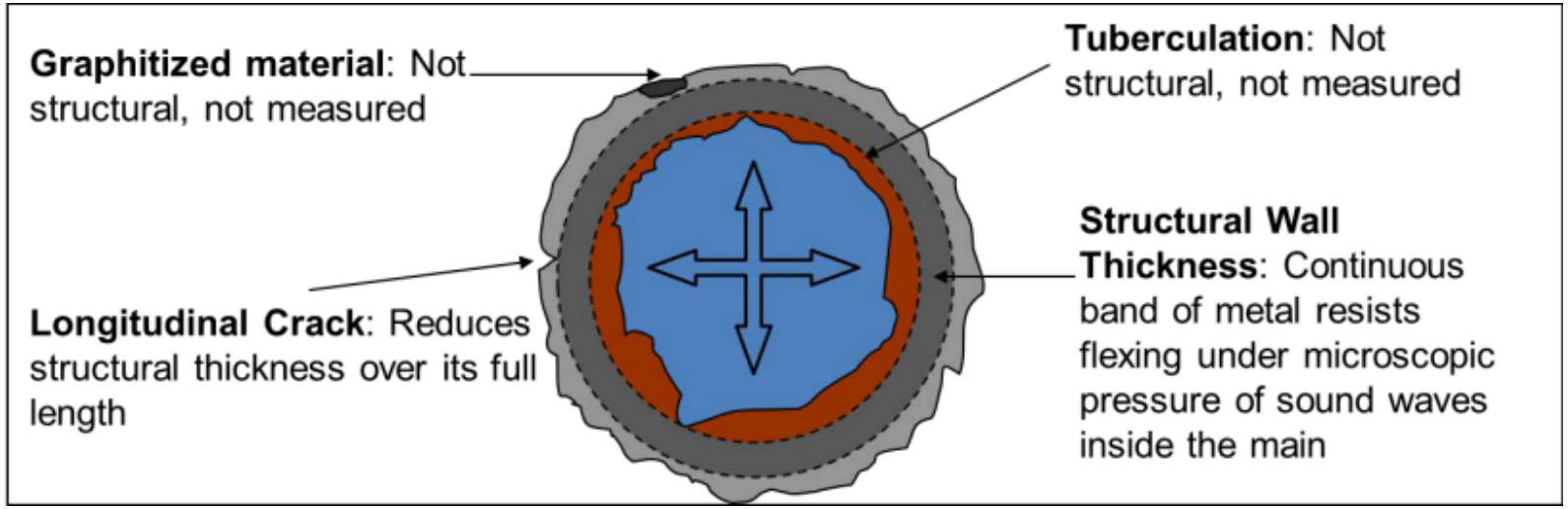
ePulse – Acoustic Pipe Wall Condition Assessment

The ePulse Measures the average minimum remaining pipe wall thickness over a length of pipe between two sensors



Added Value: Detect Leaks while measuring average minimum remaining pipe wall thickness

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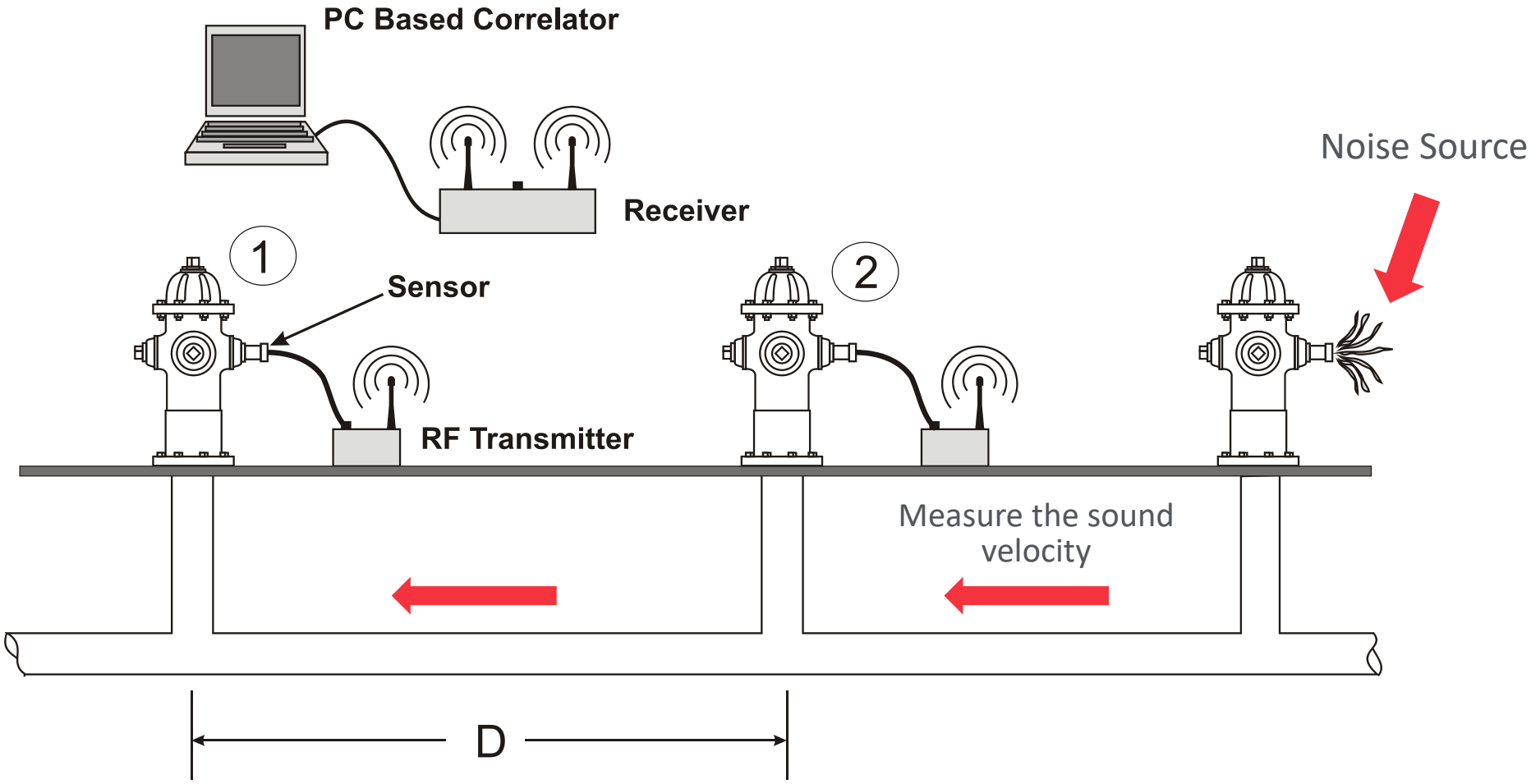
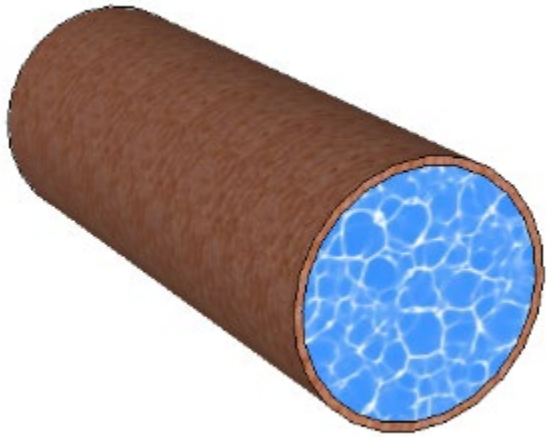
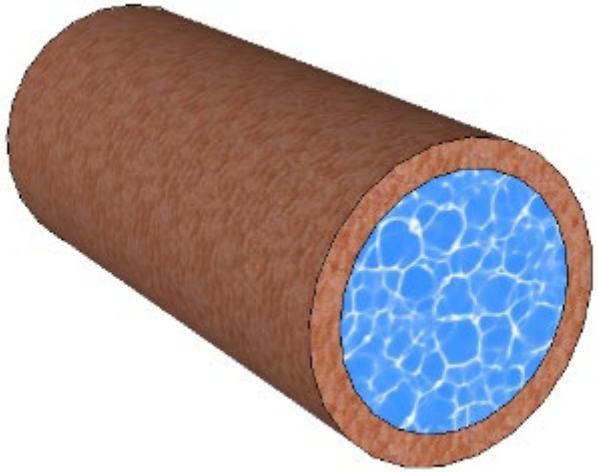
ePulse – How it works (for distribution mains)....



Wave propagation velocity (v) = D/ΔT, where ΔT is time delay between signals 1 and 2

ePulse – Acoustic Wave Speed Principle





Slower

Faster

- This pressure wave causes pipe wall to “flex” on a microscopic level
- Thicker (“stiffer”) pipe walls more resistant to “breathing”, causing this wave to travel faster
- Measuring this phenomenon allows calculation of remaining average wall thickness

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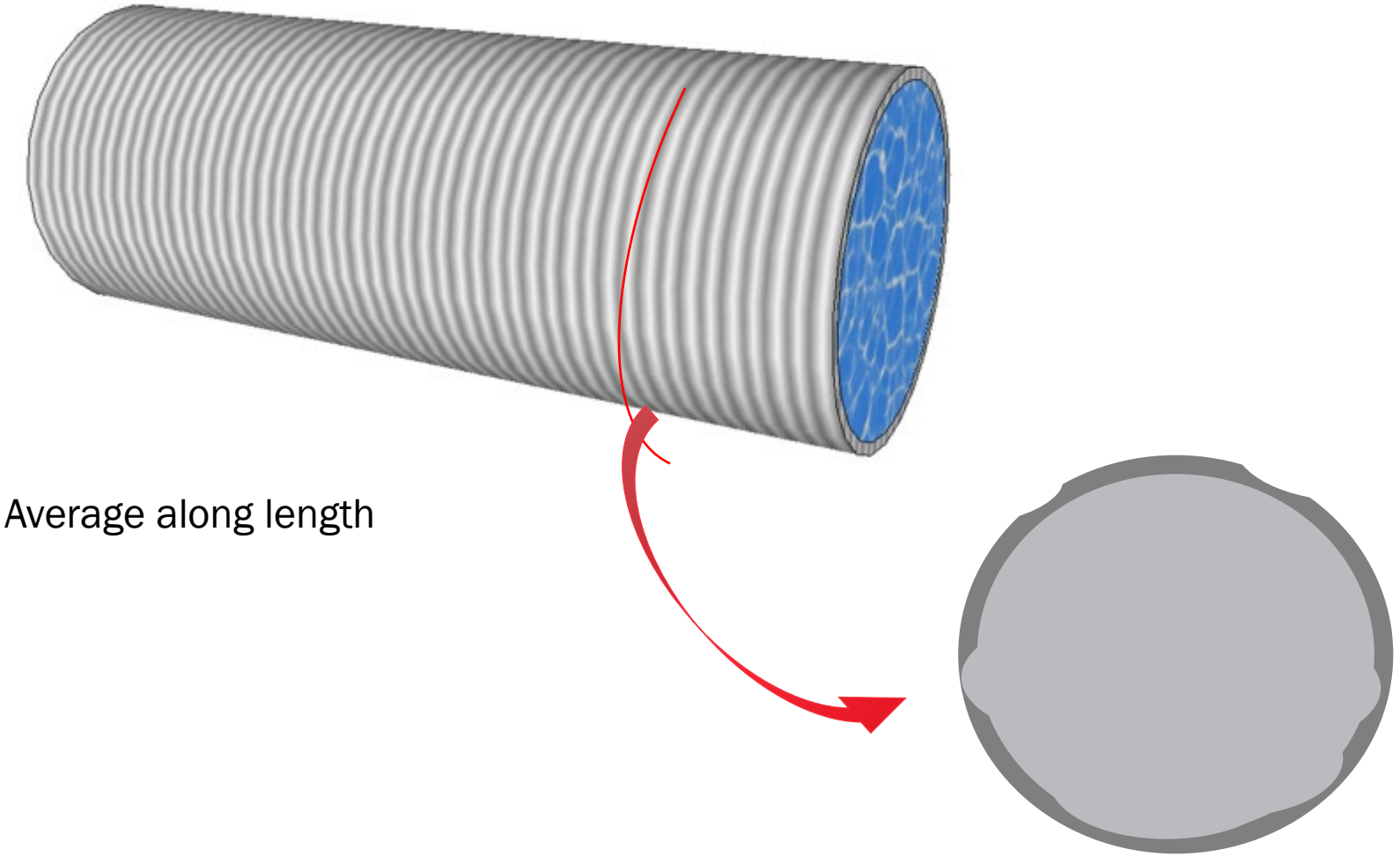
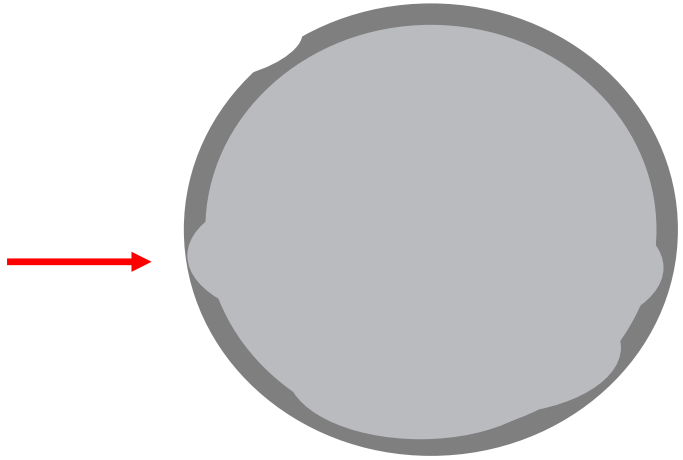
ePulse Measured Thickness

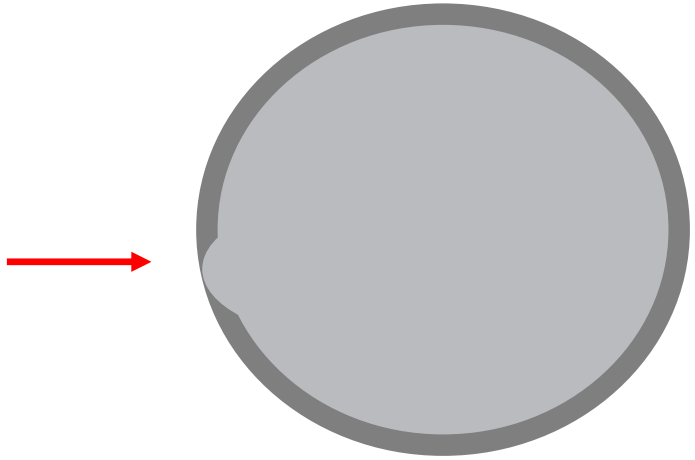


Average along length

Minimum Around Each Circumference

Measure Minimum Around the Circumference





Minimum Wall Thickness	**0.13**
Average Wall Thickness	0.18

Minimum Wall Thickness	**0.13**
Average Wall Thickness	0.27

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ePulse – Typical Field Setup for distribution mains

How Does ePulse Work? In The Field

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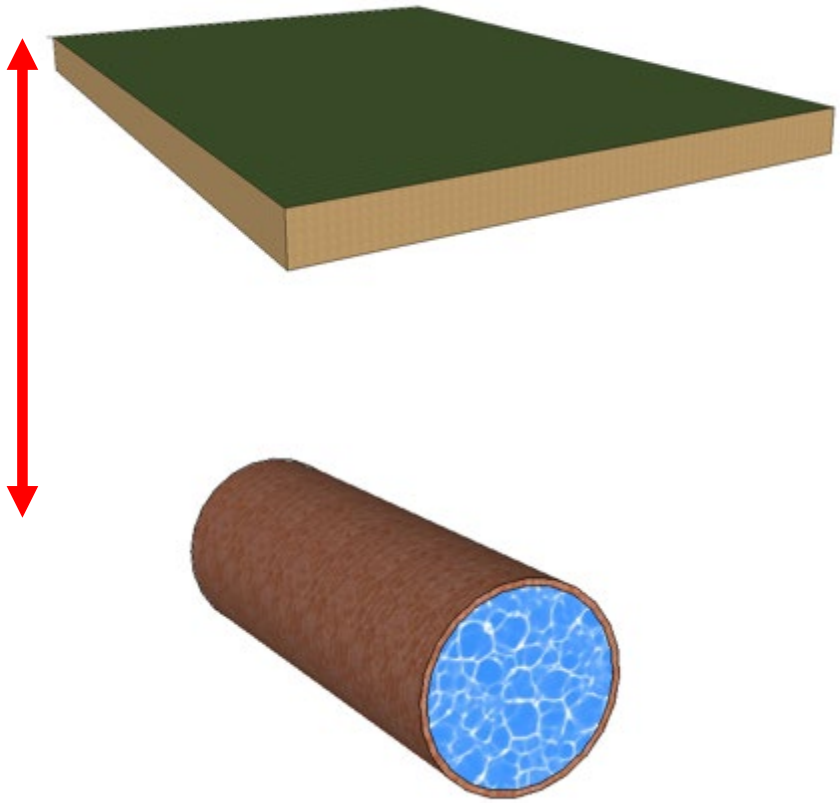
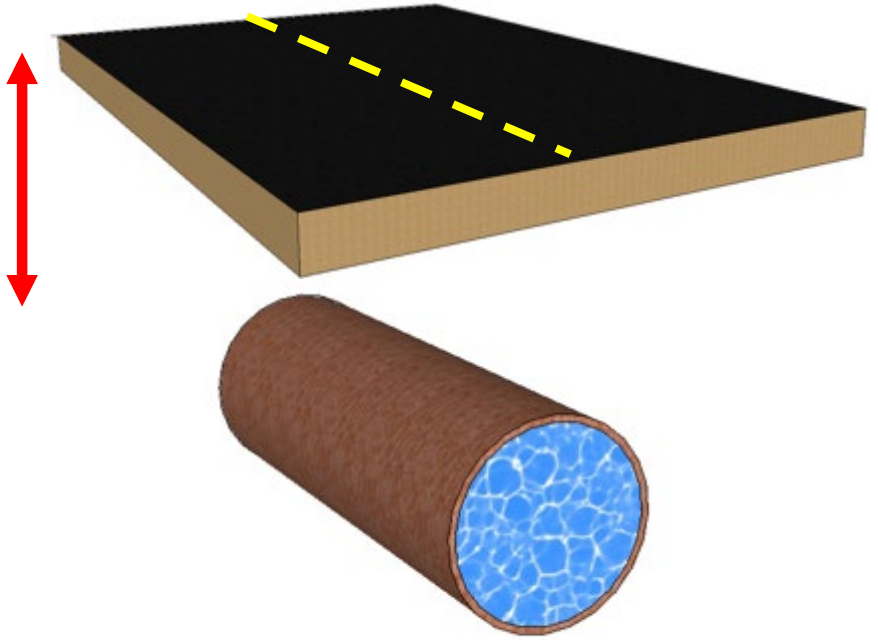
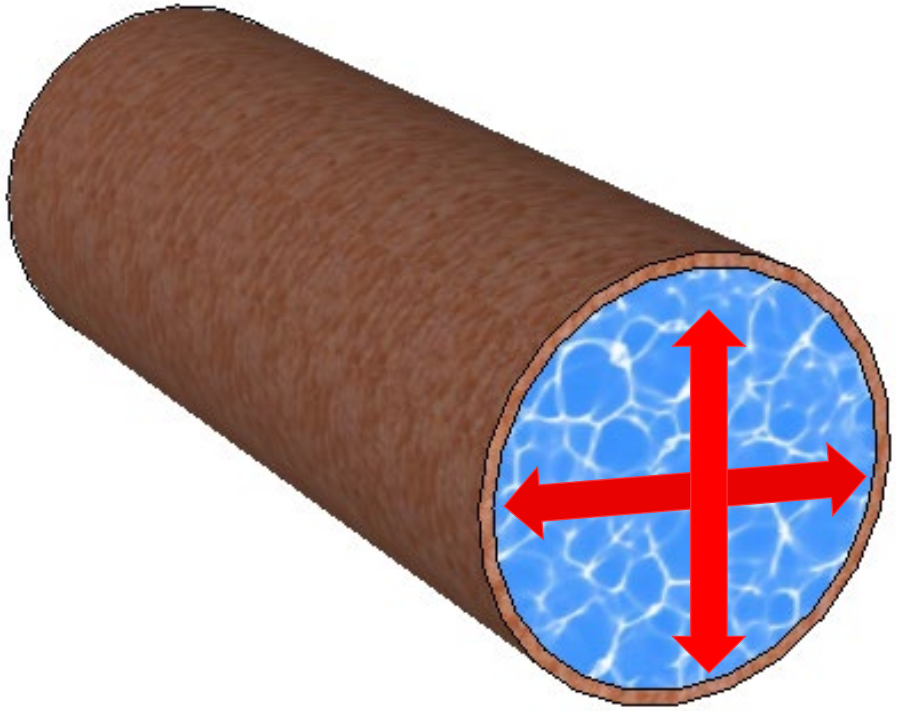
Loading Factor: Traffic & Soil





Loading Factor: Operating Pressure



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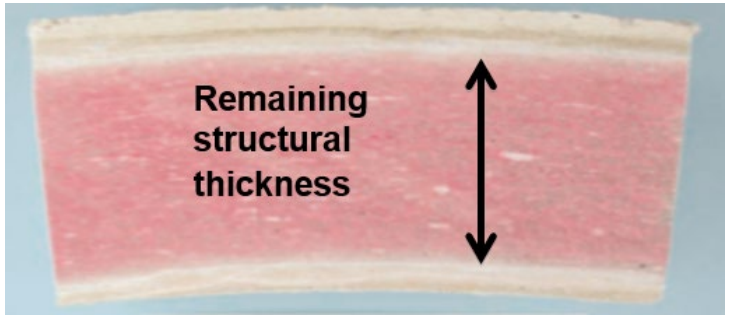
ePulse Survey Results

ePulse Data

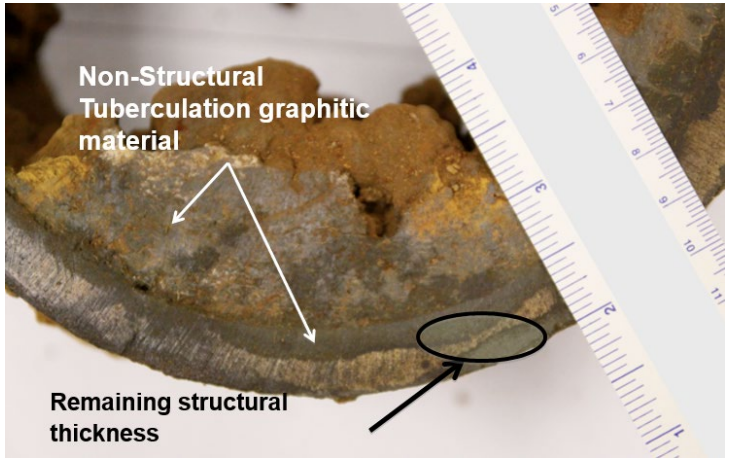
- → Remaining Structural Wall Thickness
- → % Loss from Original Thickness
- → Qualitative Pipe Grade
- → Presence and Location of Any Leaks

Section	Diameter (In)	Length (Ft)	Material	Pressure Class	Nominal Thickness	Measured Thickness	Loss
Unit	In	Ft	-	-	In	In	%
1	16	546	DI	350	0.38	0.31	20%
2	16	251	DI	350	0.38	0.23	40%
3	16	252	DI	350	0.38	0.34	11%
4	16	428	DI	350	0.38	0.35	7%
5	16	427	DI	350	0.38	0.37	4%
6	16	516	DI	350	0.38	0.41	0%
		513	DI	350	0.38	0.32	17%
							0%

Pipe Samples



Asbestos Cement



Ferrous

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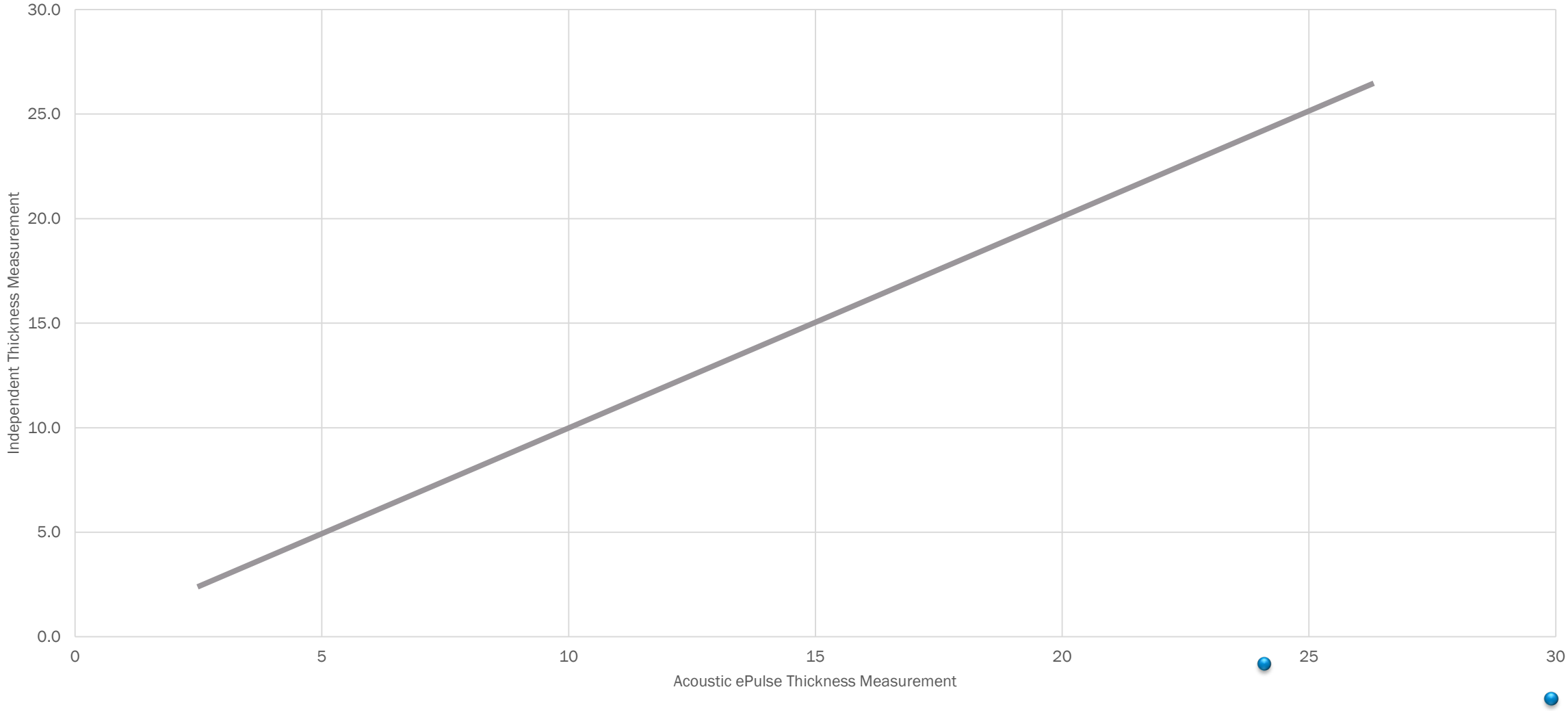
124 Validated Measurements



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ePulse – Typical Results

Leak

Applications

- Pipe Types: CI, DI, AC, BWP
- Segment Distances:
  - Minimum = 150 lf
  - Maximum =750 lf
  - Preferred = 500 lf

Segment	Street	Distance (ft)	Pipe Material	Internal Diameter (in)	Nominal Thickness (in)	Remaining Thickness (in)	Change from Nominal %
1	West Vine St.	413	Asbestos Cement	6	0.66	0.31	53%
2	West Vine St.	338	Asbestos Cement	6	0.66	0.43	35%
3	West Vine St.	323	Asbestos Cement	6	0.66	0.41	38%
4	Cottage St.	381	Ductile Iron	8	0.33	0.28	15%
5	Cottage St.	425	Ductile Iron	8	0.33	0.30	9%

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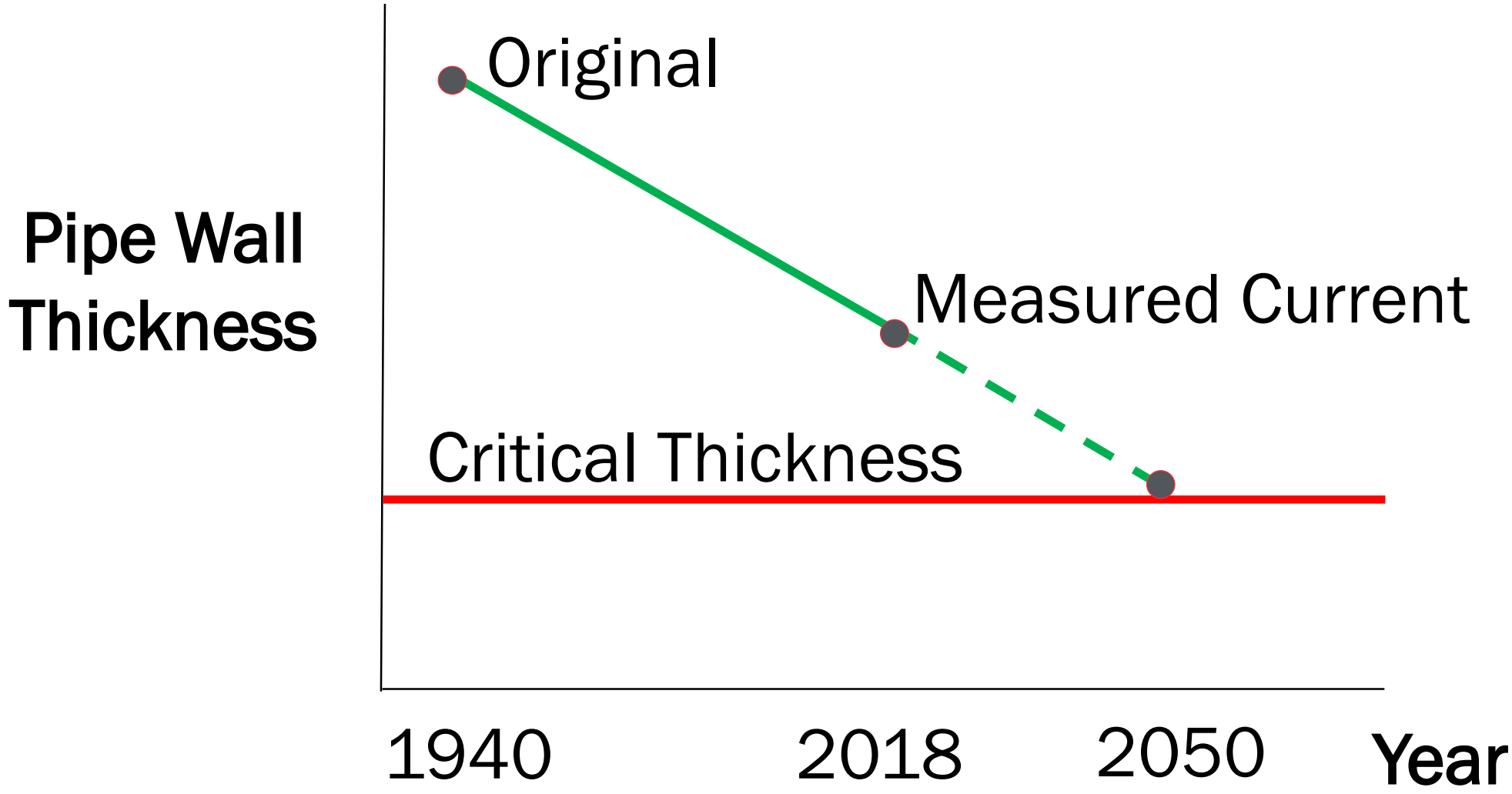
Remaining Service Life Calculation



Remaining Service Life Calculation with ePulse

Pipe Segment	Street Name	Length	Nominal Thickness$_1$	ePulse® Measured Thickness	Pressure	Temp	Installation Year	% Change from Nominal	Remaining Service Life (years)	Predicted Breakage Rate	Probability of Failure Per Segment Length
#		(m)	(mm)	(mm)	(PSI)	(^{0}C)				(brks/km/yr)	(this year)
1	Hennebury Pl	185.9	10.9	9.1	85	11	1940	-17%	50+	0.01	<1%
2	McNeil St	152.4	10.9	4.4	70	11.3	1940	-60%	Exceeded RSL	1.02	3%
3	Howley Ave	175.9	11.7	10.2	70	11.3	1940	-13%	50+	0.00	<1%
4	Summer St	132.6	10.9	3.1	70	11.3	1940	-72%	Exceeded RSL	1.71	4%
5	Merrymeeting Rd	168.2	14.7	9.9	85	11.6	1940	-33%	Exceeded RSL	0.16	1%
6	Merrymeeting Rd	133.8	14.7	11.0	85	11.6	1940	-25%	20 to 29	0.05	<1%
7	Merrymeeting Rd	149.7	14.7	10.9	85	11.6	1940	-26%	20 to 29	0.05	<1%
8	Winchester St	114.3	10.9	8.2	85	11.6	1940	-25%	30 to 39	0.04	<1%
9	Monchy St	152.7	10.9	7.8	75	11.6	1940	-28%	10 to 19	0.07	<1%
10	Monchy St	99.4	10.9	8.5	75	11.3	1940	-22%	40 to 49	0.02	<1%
11	Hamel St	147.8	10.9	3.4	95	11.3	1940	-69%	Exceeded RSL	4.21	39%

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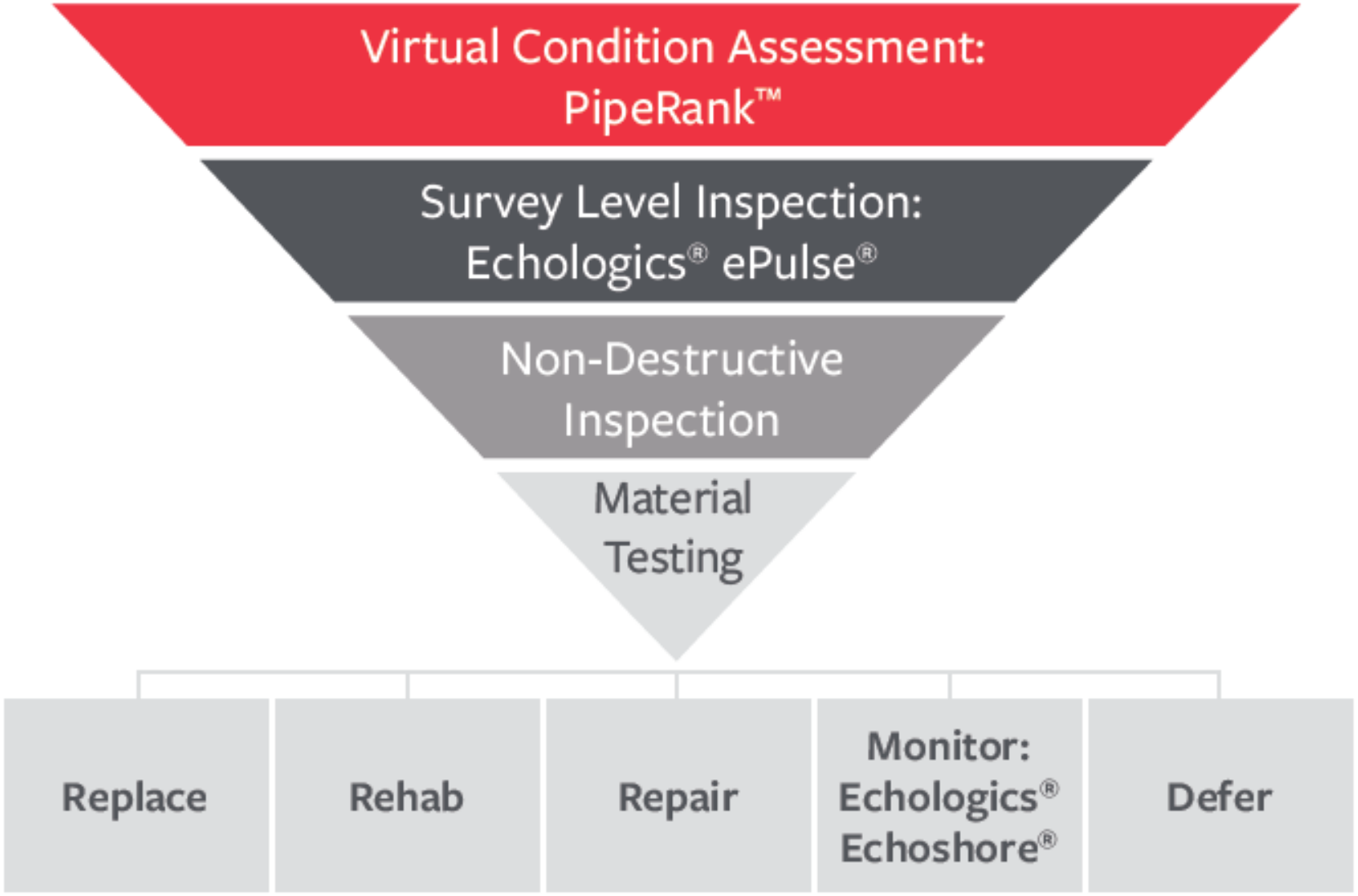
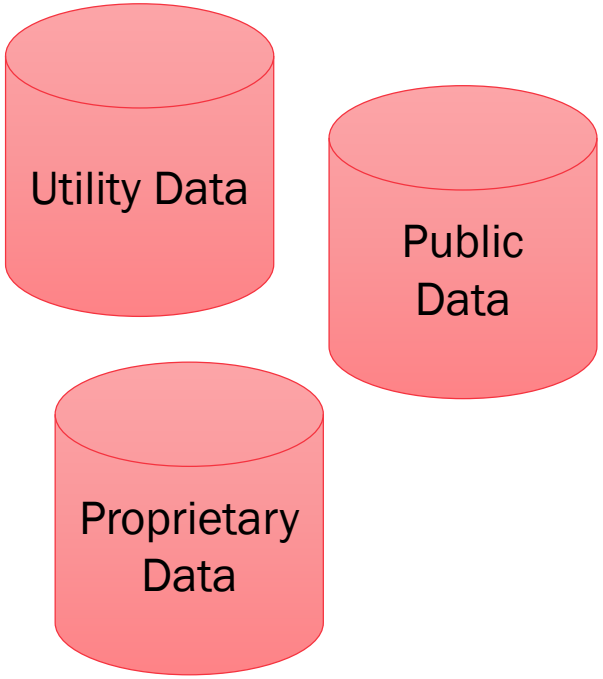
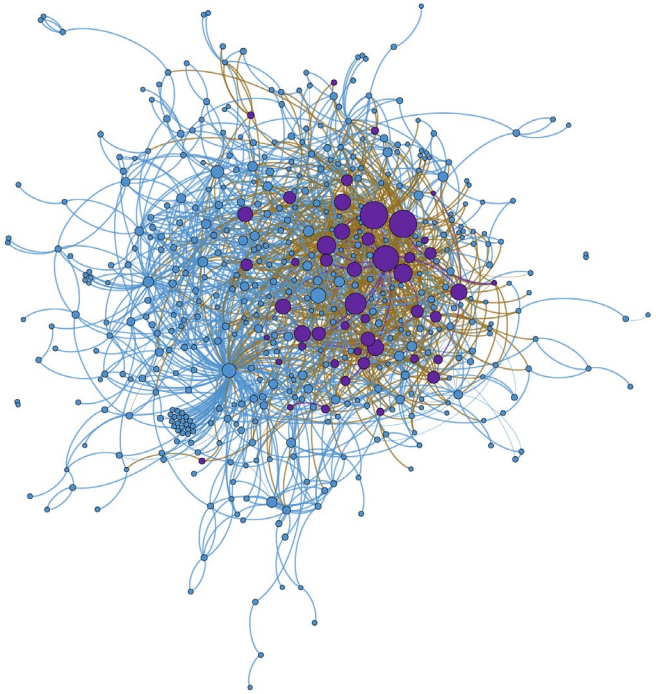
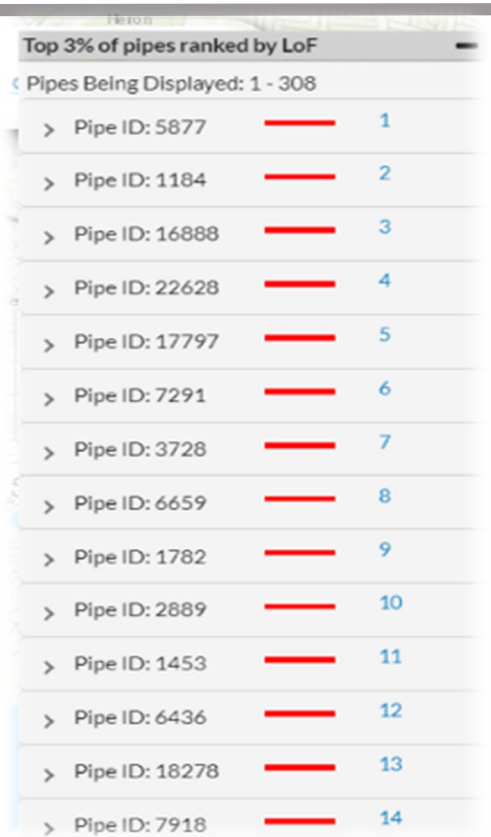
Progressive condition assessment enhances capital investment



How Does PipeRank generate results?







Data collection and clean up → PipeRank finds patterns and relationships → Asset Analysis

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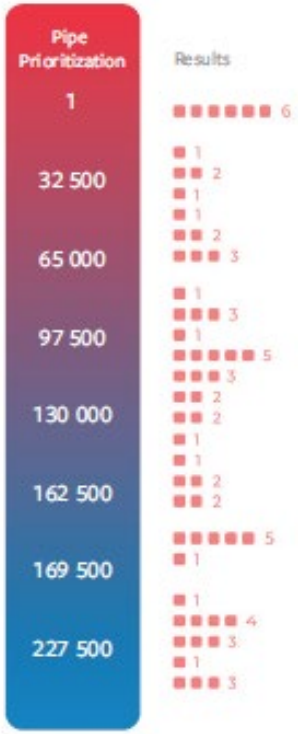
Case Study: PipeRank Accurately Predicted Failures

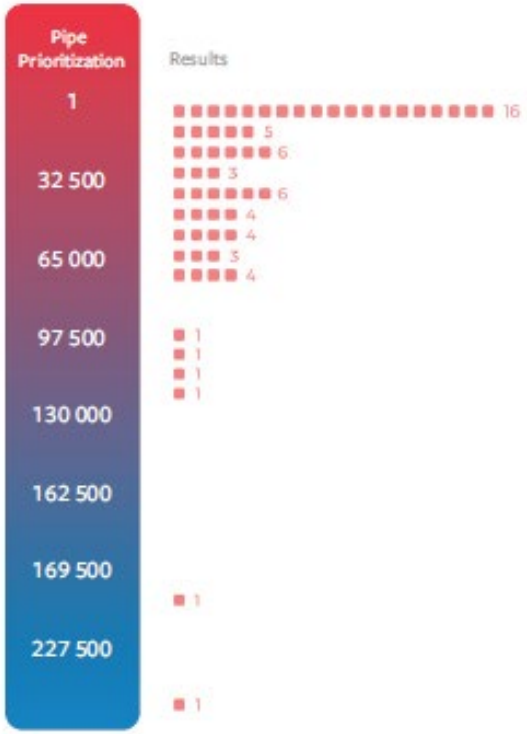
Prior Breaks

16% of failures
in top 5%



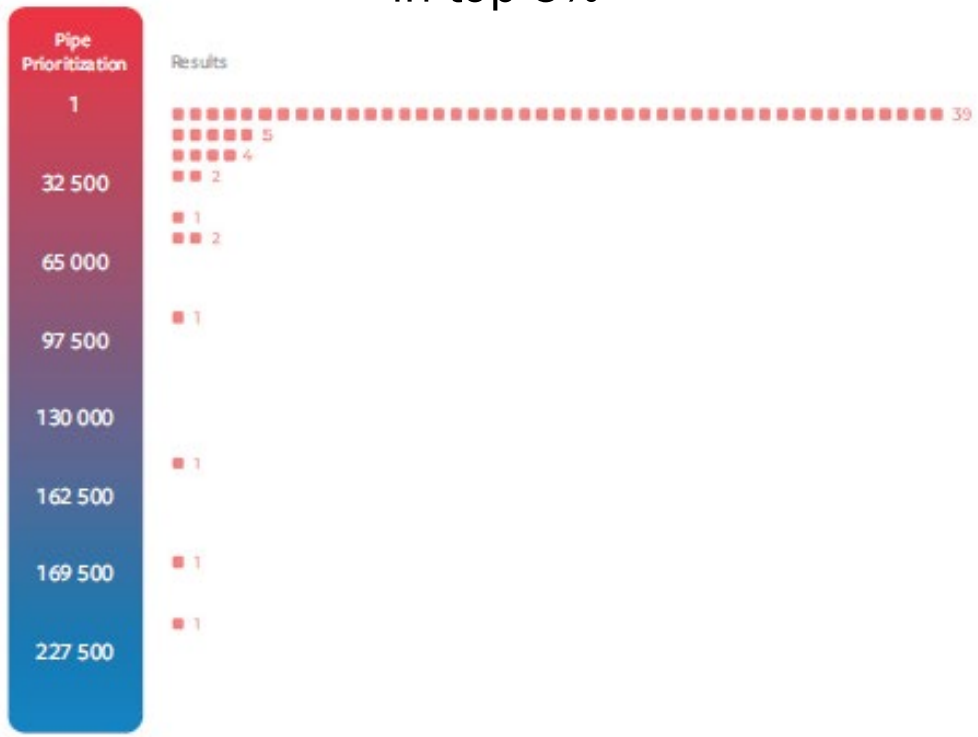
Age

44% of failures
in top 5%



PipeRank

77% of failures
in top 5%



LOF Ranking Vs Actual Failures in 2018

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Pipeline Monitoring Solutions

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Pipeline Monitoring – What are we looking for?

Know when this starts.

To avoid having this happen!

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Calculating Value of Improved Leak Management

- **Savings**
  - ✓ Increased repair efficiency
  - ✓ Reduced leak damage (liability)
  - ✓ Reduced leak detection costs
  - ✓ Extend pipeline asset life
- **Added Value**
  - ✓ Deferred capital investments in plants/pump stations
  - ✓ Value of regulatory support/compliance
  - ✓ Value of increased customer service

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Non-Monetary Benefits

Environmental

Chlorine Pollution of Rivers Kills Fish

- California Regional Water Quality Control Board

Social

Water Main Break Floods Terminal, delays flights at New York's JFK

- New York Times & Yahoo News

Mueller Fixed Leak Detection Products

ECHOSHORE DX PERMANENT DISTRIBUTION MONITORING

- Utilize existing utility hydrant assets to monitor for leaks
  - Identify leaks early
  - Monitor leak progression
  - Prioritize field crew schedules
  - Significantly reduce pipe repair costs
  - Achieve non-revenue water loss targets
  - Extend pipe asset life

ECHOSHORE TX PERMANENT TRANSMISSION MAIN MONITORING

- Dedicated monitoring of the largest, most critical supply lines without service disruption
  - Bridges and river crossings
  - Major roadways and transport links
  - Mains without redundancy
  - Critical feeder mains
  - Mains with a history of rupture or leakage
  - Industrial supply lines
  - Construction zone monitoring

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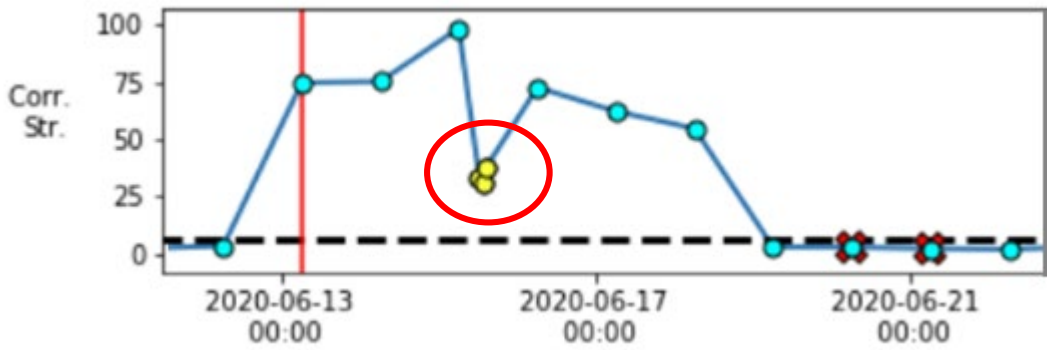
Analyze: Find Leaks & Avoid False Alerts

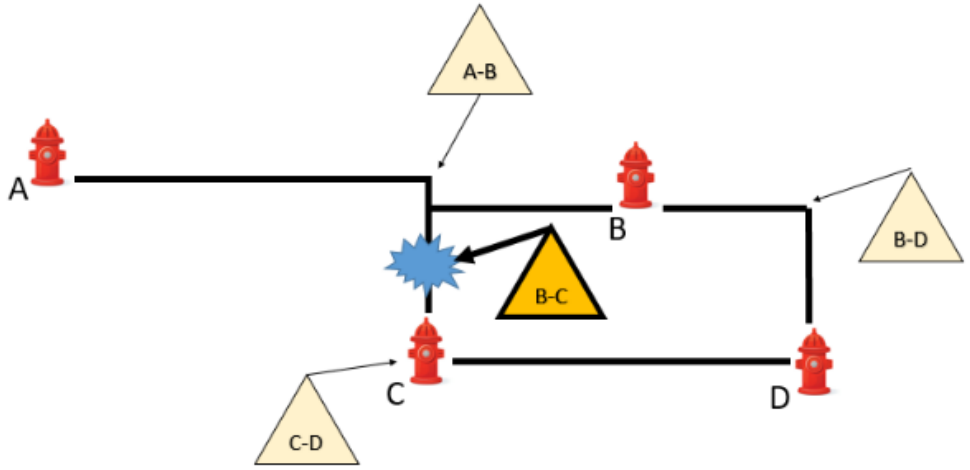
Forced Correlations

- Recordings scheduled outside of standard time



Grouping

- Group of signals reporting from same source



*Both algorithms are automatic and result in a higher likelihood of an alert being a leak

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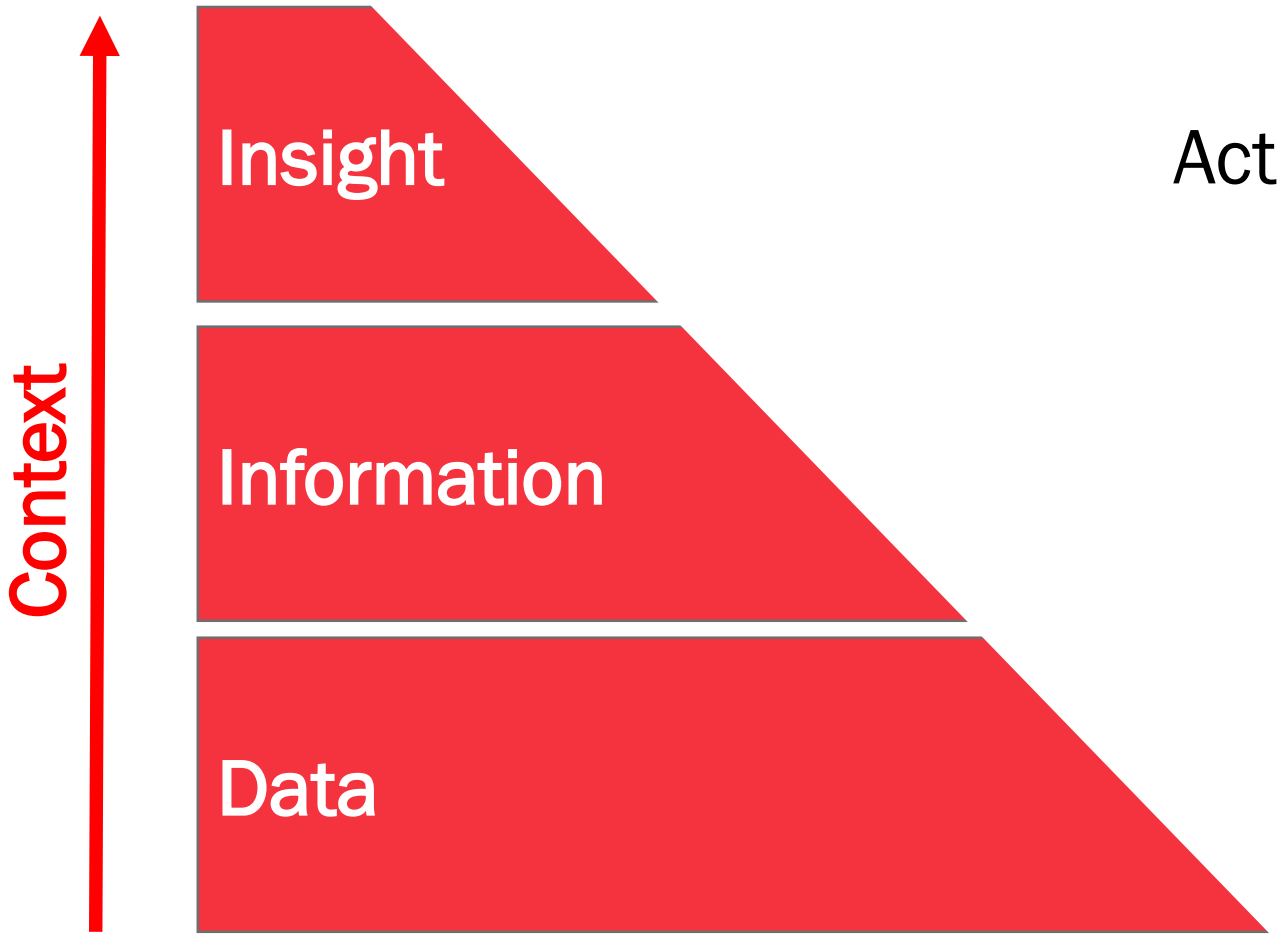
Workforce Efficiency: Getting to Actionable Insights

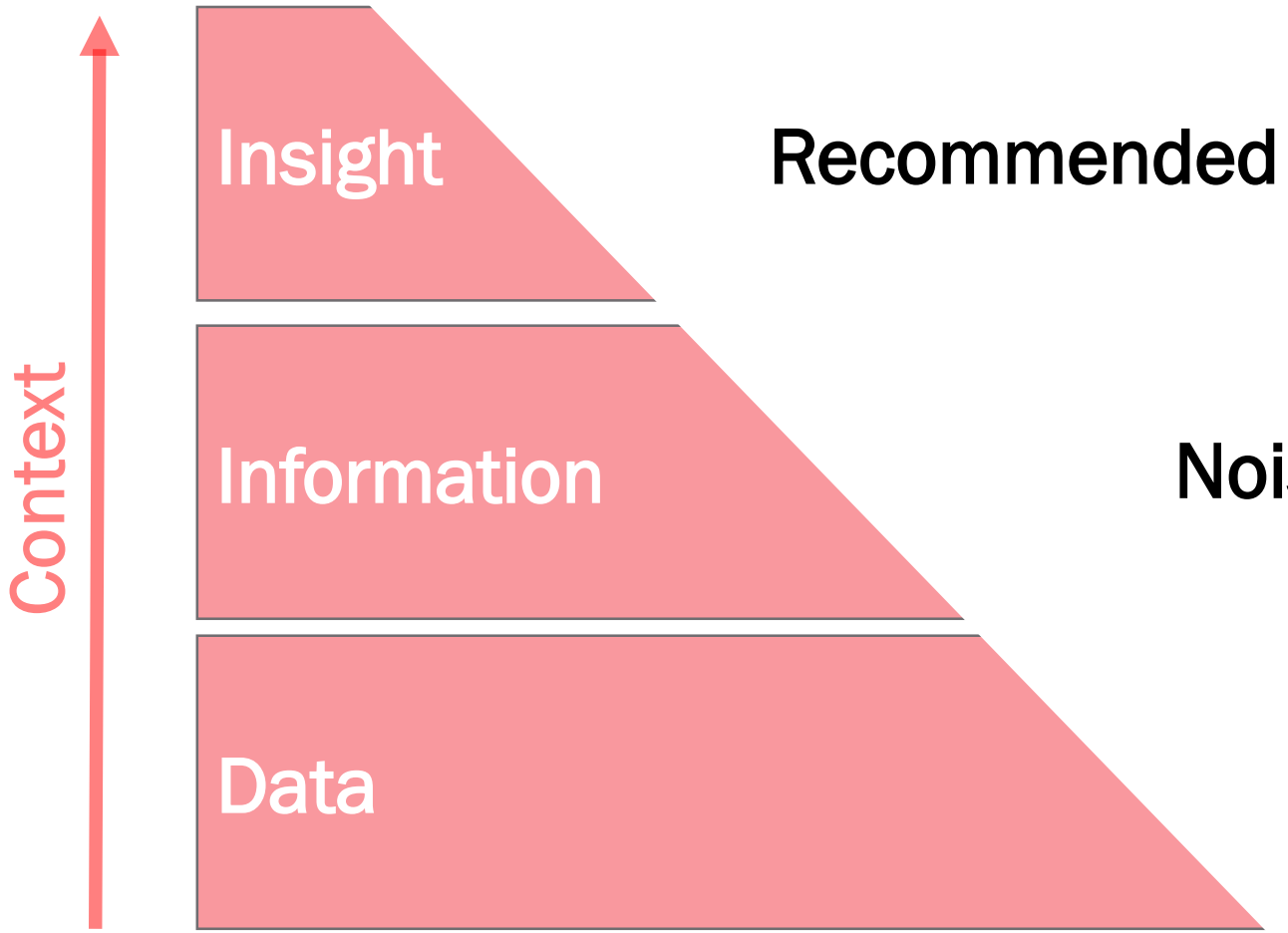


Actionable Data Driven Conclusions

User Friendly Organized Data

Raw numbers

Workforce Efficiency Example: Leak Alerts Drive Quicker Action

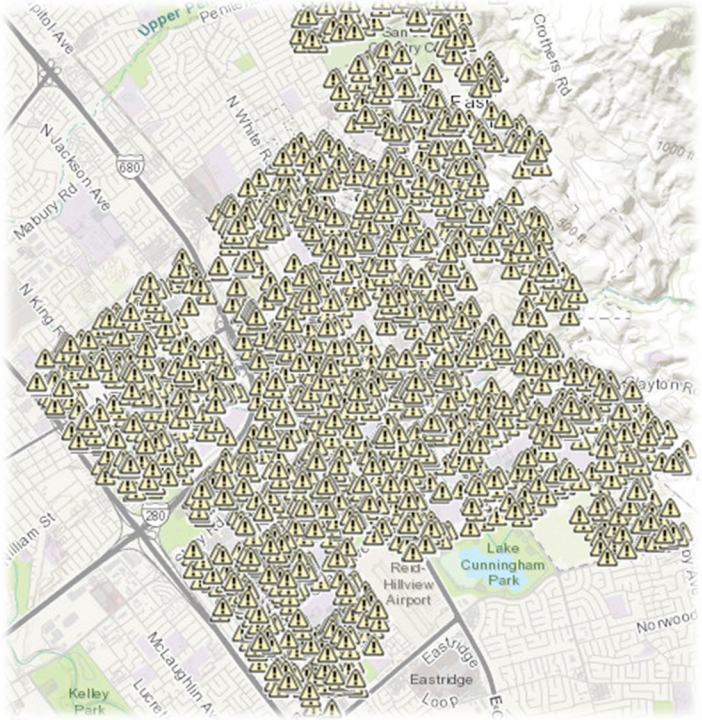


Recommended Locations for Leak Investigation

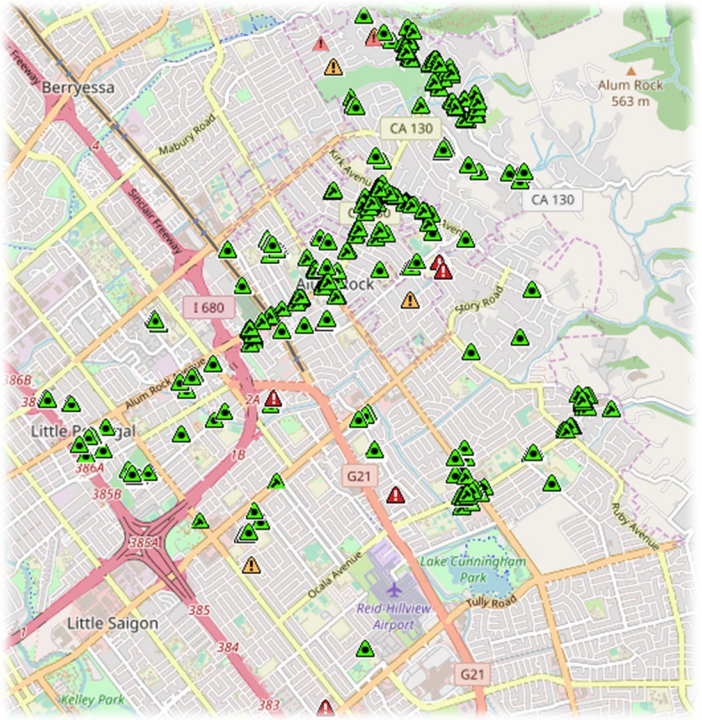
Noise “Heat Map” of Water Network

Sound levels in Water Network

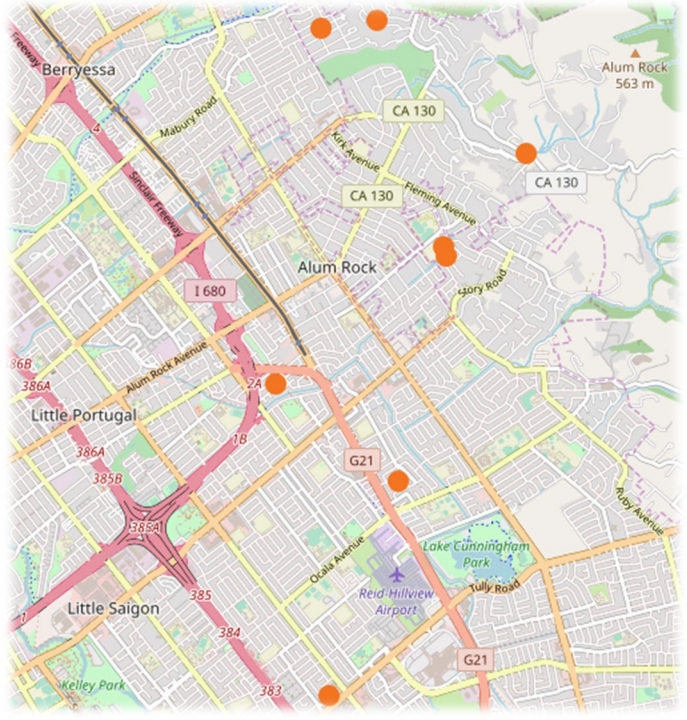
Actionable Information. No Data Overload.



Data
29, 297 Network Noises

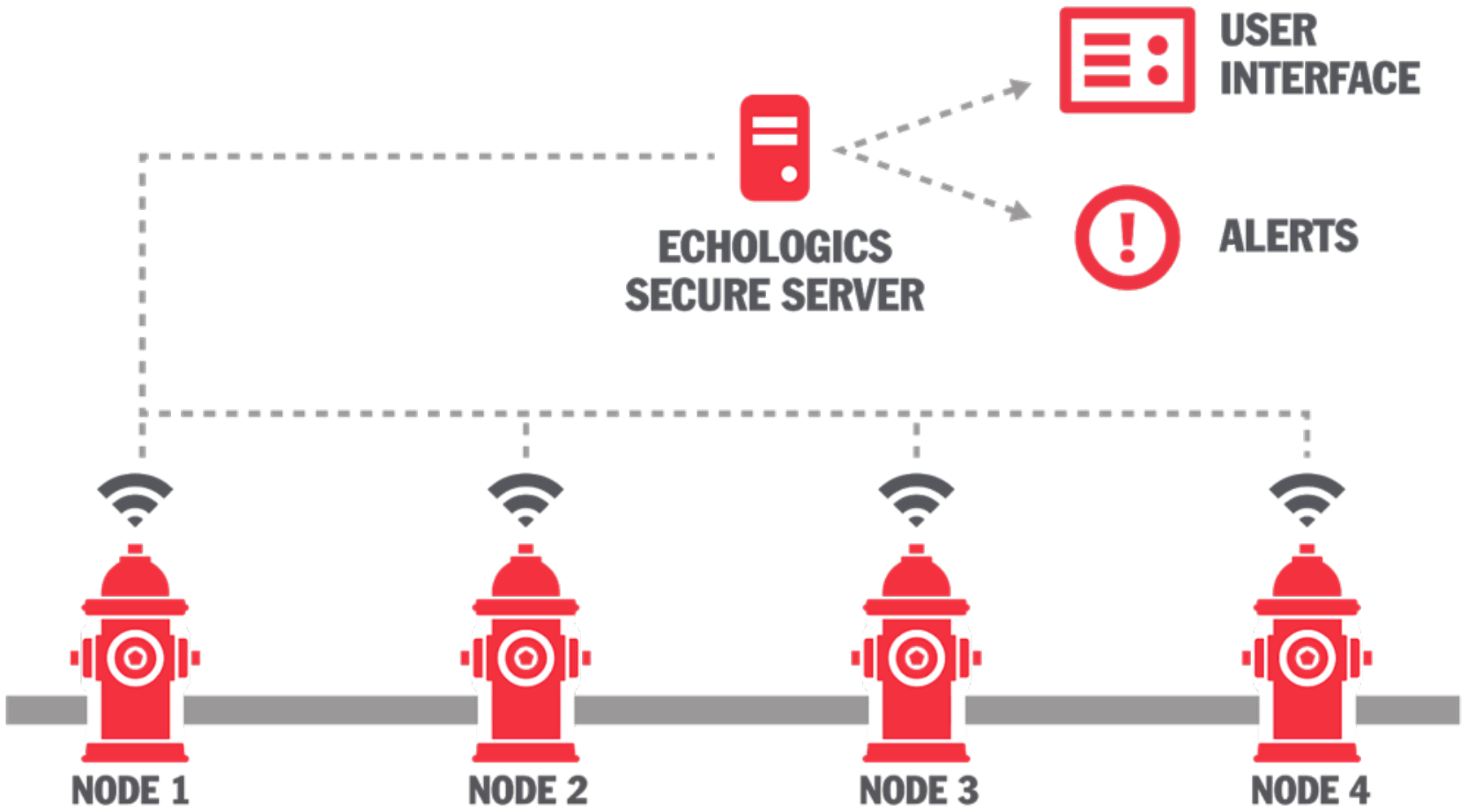


Information
555 Persistent Noises



Insight
8 Investigations Recommended

Detect: Collect Acoustic Data From Water Network



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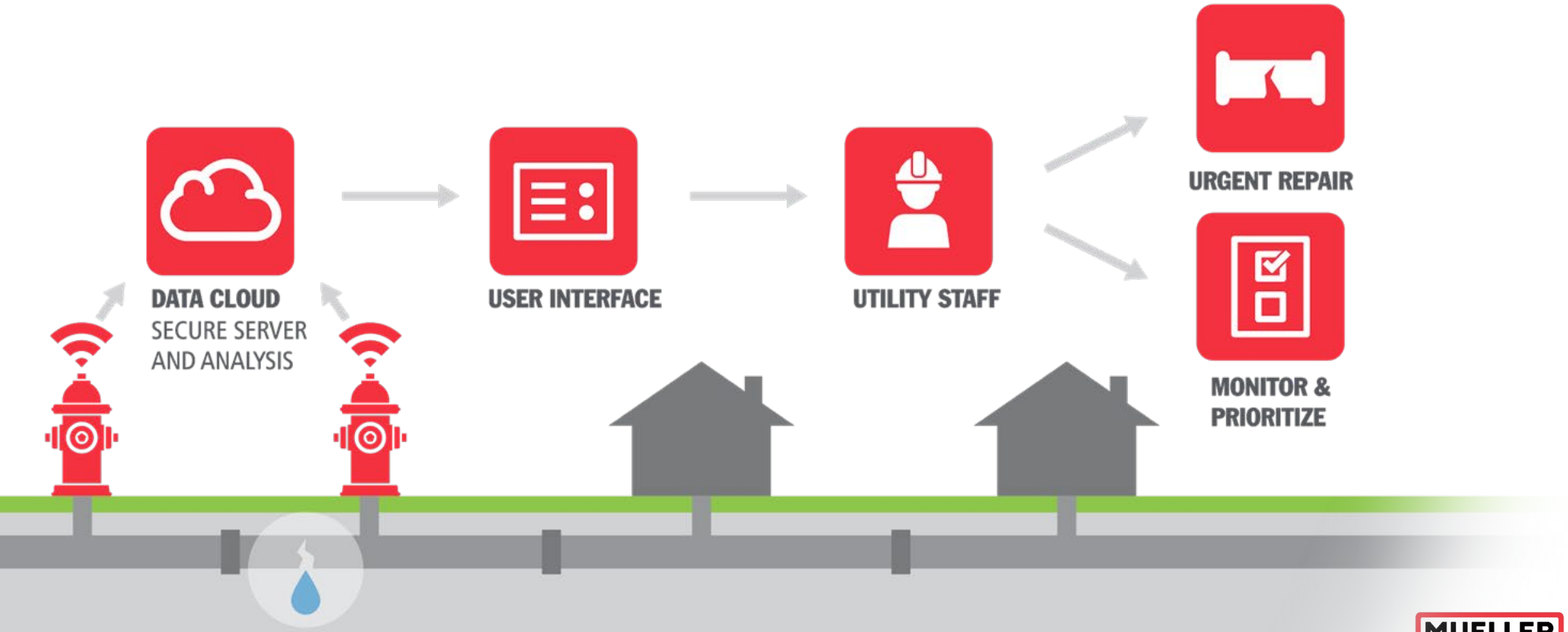
The EchoShore-DX Solution



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EchoShore-DX: System Design Setup

1. The Right Pipes

Pipe Material	Pipe Diameter
Metal	Up to 12”
Asbestos Cement	

2. GIS Maps
3. Cellular Service
4. Pressurized Pipes
5. Fire Hydrants with standard ports

EchoShore-DX configures for most hydrants

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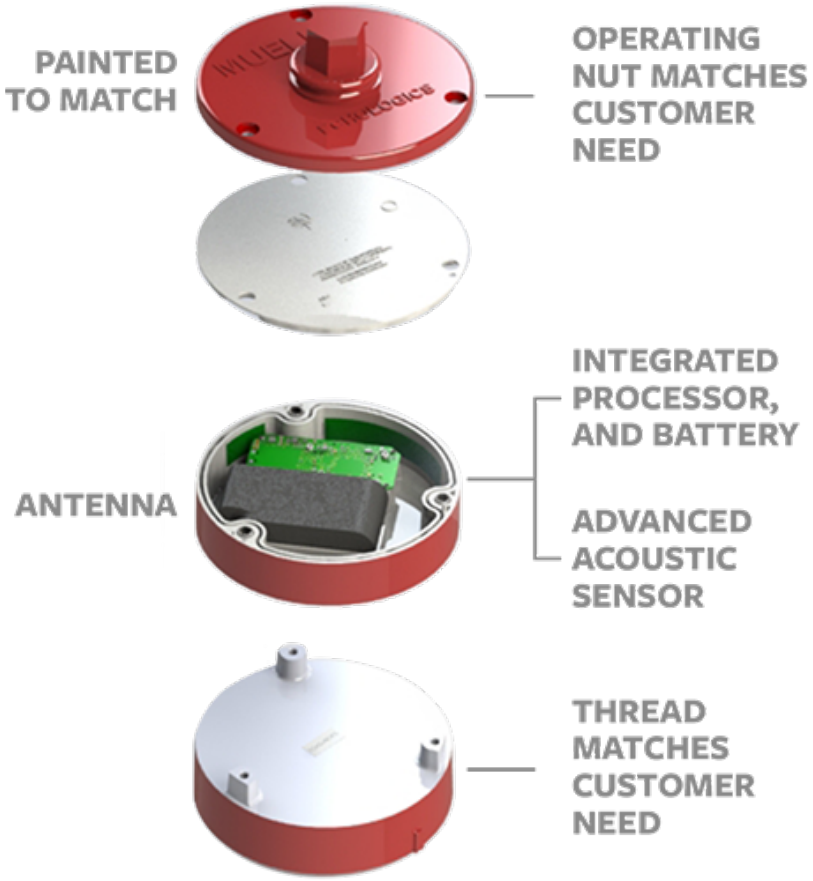
Sensors Hidden in a Fire Hydrant Cap



- 10-year product + battery life
- Hidden in plain sight
- Harmonized design
- Works for both wet and dry barrel hydrants
- Works over 4G LTE-M cellular network

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Integrated Sensors Built and Tested Mueller Tough

Node plastic enclosure is constructed of impact resistant polycarbonate materials

Painted for added UV protection

Tested to the IEC 62262 standard for impact survival

Node withstood torque of 797 ft-lb. Stopped at 797 ft-lb as fire hydrant nozzle failed at that torque

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Rugged 10 Year Product Life

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Faster Leak Alerts

	Monitoring Level		
	Critical	High	Standard
First Time to leak alert	4 hours	24 hours	4 days
Typical time to leak alert	6 – 12 hours	36 – 48 hours	6 – 8 days
Battery Life (years)	1	4	10

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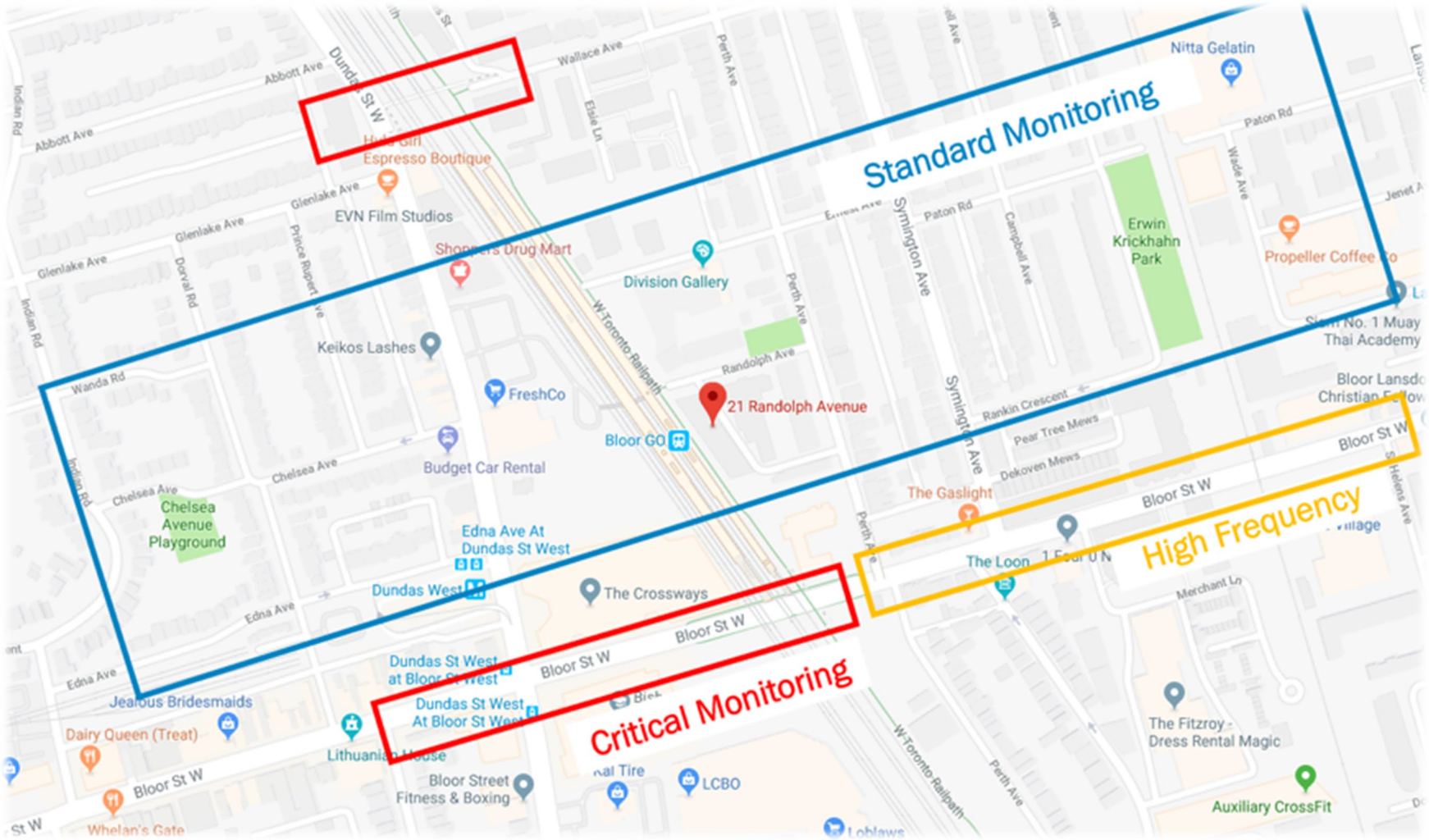
Asset Management: Different Levels of Pipeline Monitoring



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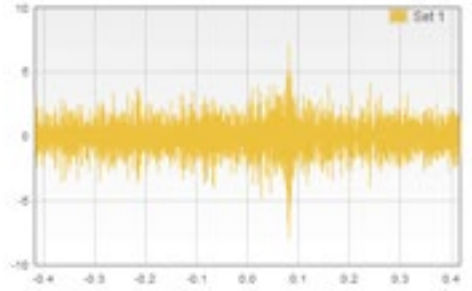
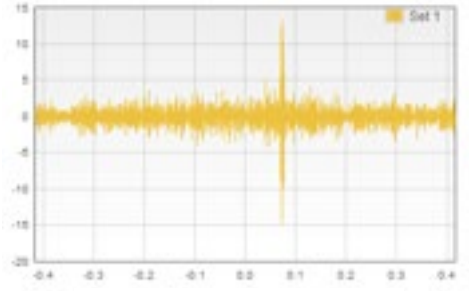
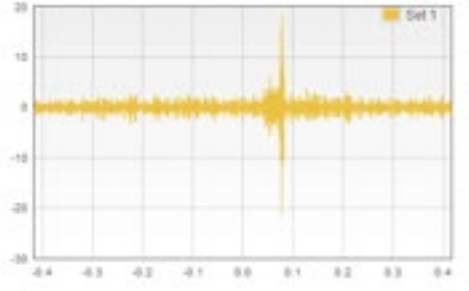
EchoShore-DX: Leak to Failure (Almost)



Origin



+2 weeks



+4 weeks

"...a time bomb defused";

Dave Hughes – American Water

(5 gpm leak paid for the system)

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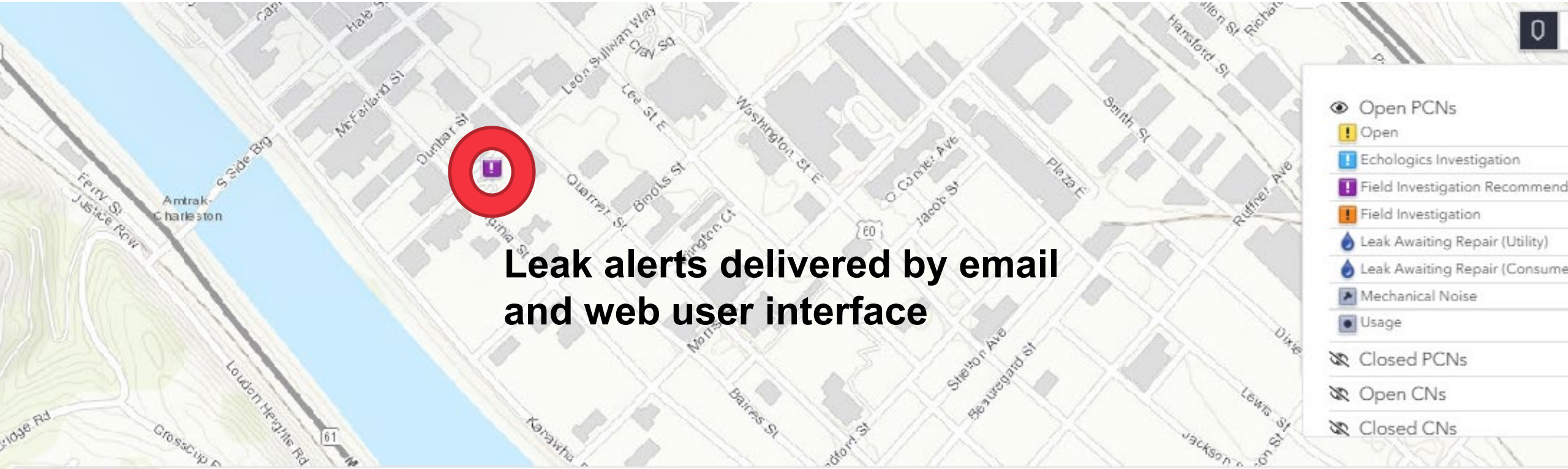
Alert: Actionable Recommendations to Support Operations



Open PCNs | Closed PCNs | Open CNs | Closed CNs | Nodes

PCN ID	Status	Nearby Address	Date Created	Hydrant 1	D1	Hydrant 2	D2	Note
13	Field Investigation Recommended	155 Leon Sullivan Way	10/9/19, 5:31 AM	65	295ft	1088	0ft	

ECHOLOGICS®

a MUELLER brand

EchoShore-TX
Transmission Pipe Fixed Leak Detection

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The Need for Permanent Monitoring of Transmission Mains

Top Risks Identified by Water Utilities

1. Catastrophic Failure of Main
2. Collateral Property Damage
3. Water Loss Management

Not all Transmission Main Segments carry the same level of risk

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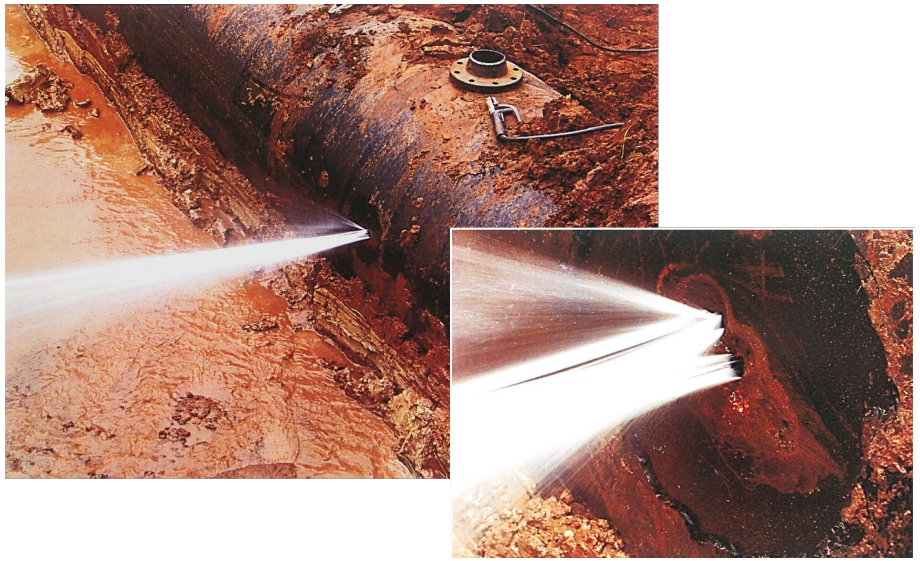
How do Transmission Mains Fail?

- Joint Failure
  - *Ground Movement*
  - *Poor Installation*
  - *Cracked Bells*
- Pipe Wall Corrosion
  - CIP/ DIP - Pit & General Corrosion
  - PCCP – Wire Breaks / Cylinder Corrosion
- Pressure spikes that can lead to pipe integrity issues over time.
- Transients can cause sudden damage
- Damage from 3rd parties



EchoShore®-TX: High Risk Asset Management

With EchoShore®-TX utilities:

- can know when leaks *start*
- can monitor leak *growth*
- avoid catastrophic failure

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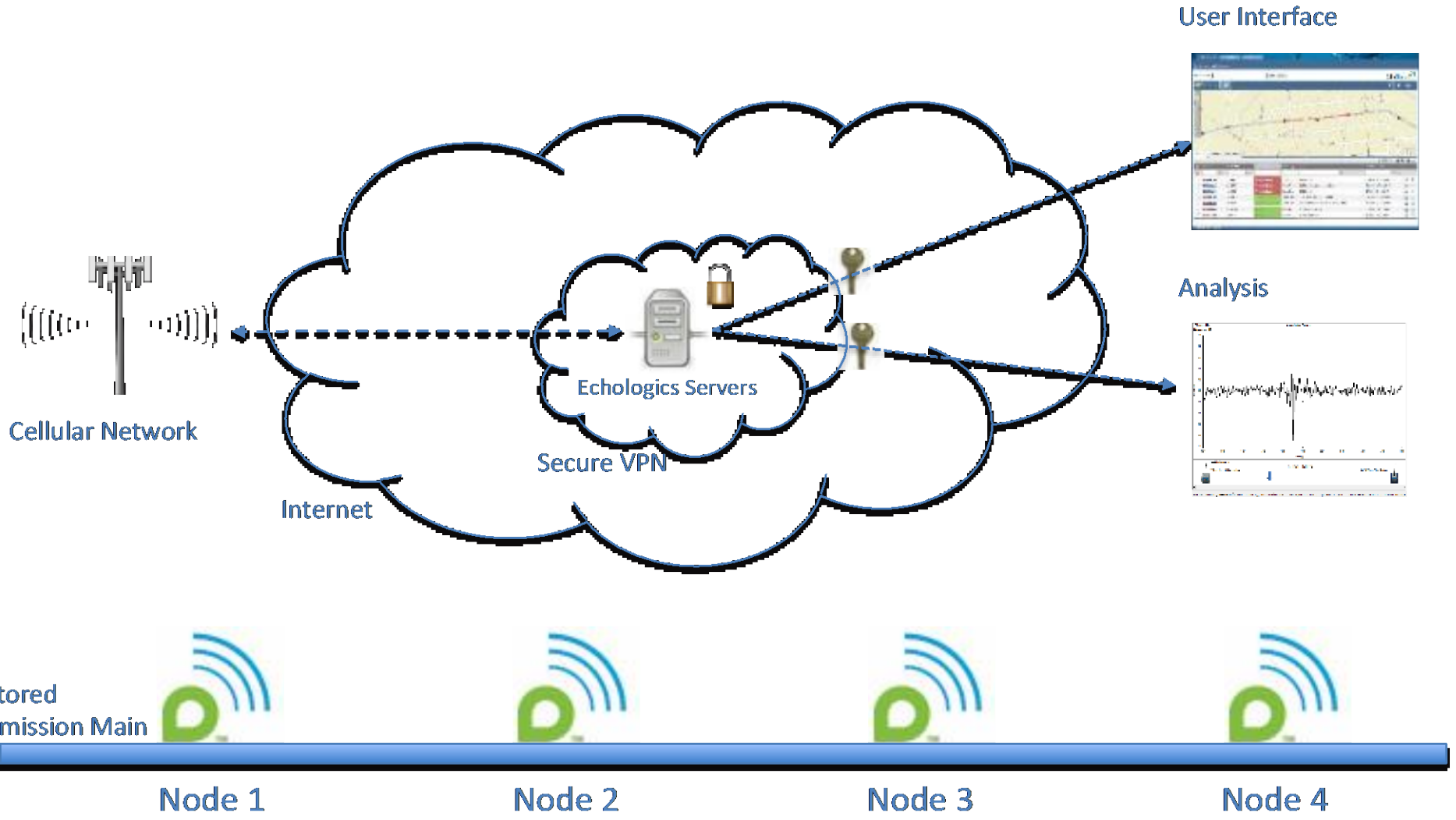
Transmission Main Monitoring: Connectivity



Flexible Installation Options

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EchoShore-TX System Overview

~ Half Mile

~ Half Mile

Transmission Pipe

Node 1

Node 2

Node 3

EchoShore-TX: Technical Qualification

1. **Pressurized Connections or Willing to Tap – Any Diameter**

Pipe Material	Typical Sensor Spacing for 5 gpm leak
Metal & Concrete	2,500 feet
Plastic	600 feet

2. **GIS Or Hard Copy Maps**
3. **Pressurized Pipes**
4. **Cellular Service**

EchoShore-TX In Action

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EchoShore-TX Development Initiatives

BETTER HARDWARE

1. Increase Reliability
2. Improve Battery Life

MORE INSIGHTS

1. Add Pressure Transient Monitoring
2. Clarify standard add-ons

Ruggedized EchoShore-TX enclosure

EchoShore-TX is an Expandable Monitoring Solution

Core functionality is Acoustic Leak Detection

Upgrades include:

- Water hammer detection
- Transient Monitoring
- Tamper detection, and other acoustic anomalies

Pressure/Flow

Temperature

Chlorine

Other Customer Requirement

4-20 mA Signal

Opportunity to expand from advanced leak detection to customized pipeline monitoring

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HYDRO-GUARD®

a MUELLER brand

Automated Flushing

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Why Not Rely on a Hydrant to Flush a Water Line?

- Impossible to correct conditions and maintain quality control
  - Crews cannot attend to a hydrant enough to solve a significant water quality condition by use of a hydrant

- Inefficient
  - Crews often over flush from a hydrant
  - Results in higher volumes than necessary being used and lost revenue
  - Wastes crew time and impacts the bottom line…costs associated with crew time

- Damage to hydrant
  - Overuse, or misuse, of hydrant can lead to damage to nozzles and other components of the hydrant

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Water Quality

- Imagine driving down the road at less than 1-1/2 miles per hour. That's about the rate that water moves through underground pipes.
- This slow movement causes sediment like rust and mineral particles to build up over time and accumulate along the pipe's bottom.
- Water stagnates in a water line, much like water in a lake where there is little movement

"Water, unlike wine, does not improve with age".

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Water Quality

- Rapid water pressure changes, such as water main breaks and the use of fire hydrants, can stir up the sediment and dislodge deposits lining the pipe, resulting in "dirty water" appearance.

- Periodically flushing water pipes removes the sediment and biofilm buildup, maintains the city's infrastructure and assures consistent good quality water.

Water Quality

Conditions that typically justify use of an advanced flushing solution are…

- Service to customers located a distance from treatment facility (Extended Travel Times)
- Water lines sized for fire demand
- Dead-end lines (Low Demand)
- Low water demand in lines sized for future growth
- Seasonal demands
- Water conservation initiatives

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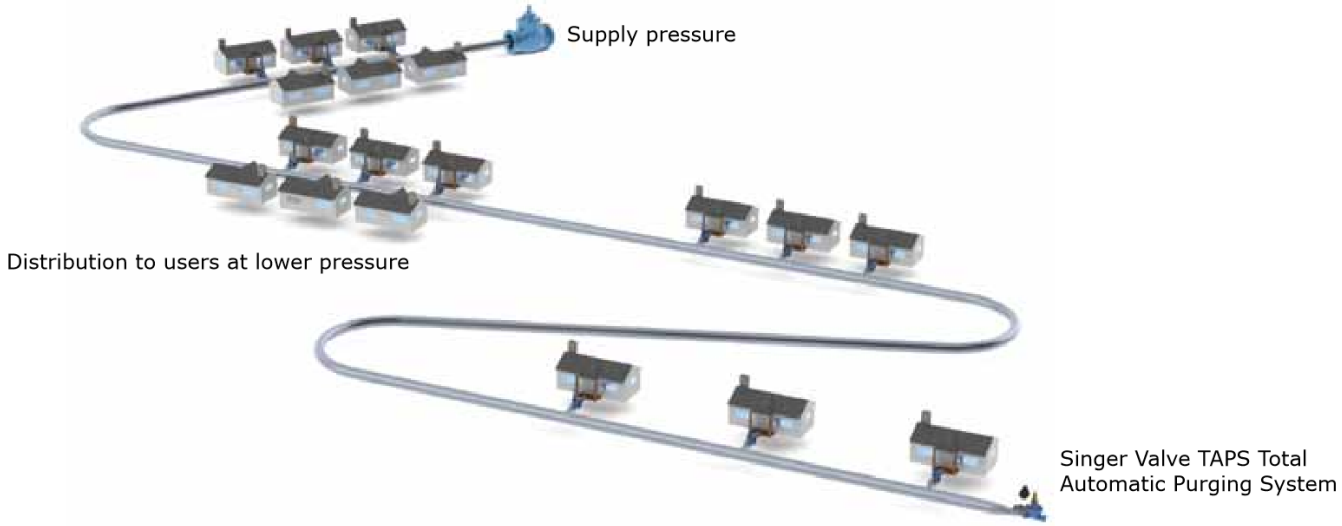
Water Quality

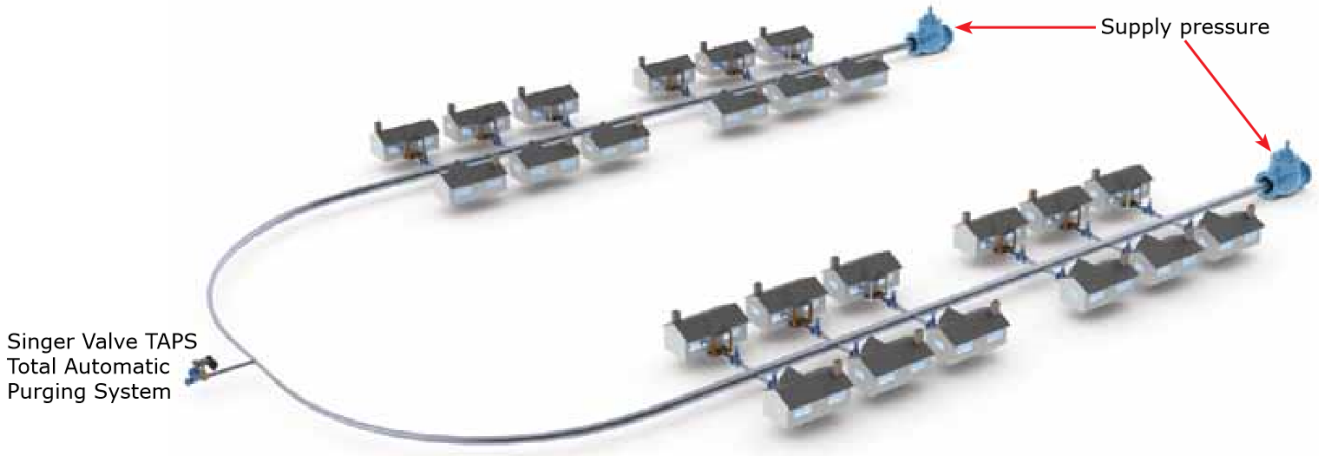
Typical Application 1

Distribution systems that run through rural areas and that have long piping runs, low demand or dead end lines



Loop Systems

Looped systems where there is no usage between users, resulting in a potentially stagnant area in the distribution system



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Water Quality

Naegleria Fowleri

What To Do When the “Brain Eating Amoeba” Shows Up in Your Water System. *St. Bernard Parish—A Case Study*

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Publications

St. Bernard Parish Implements a New and More Efficient System for Flushing Water Mains

Automatic flushing units help save labor, improve water quality and prevent growth of pathogens in a Louisiana parish water distribution system

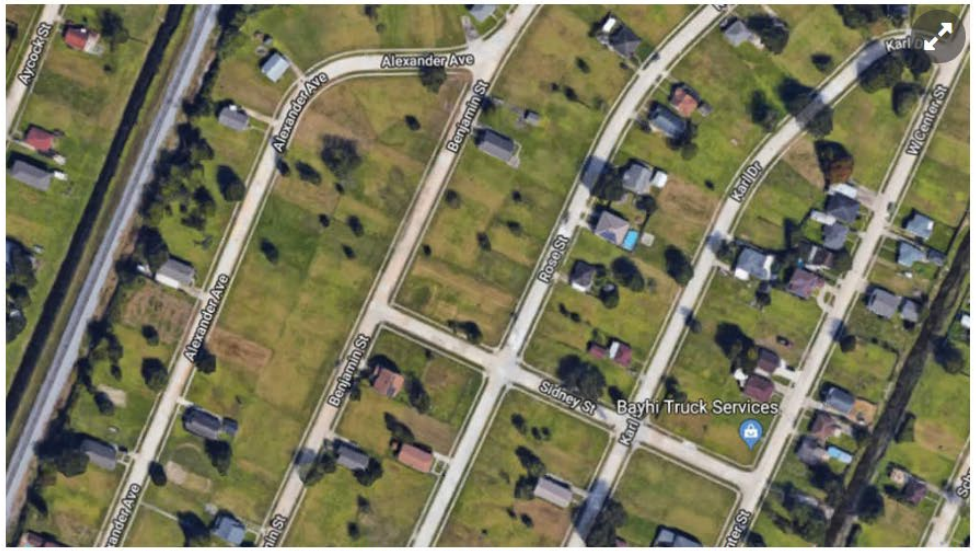
Appeared in print as *"Flushing on Autopilot"*

By **Mark Magda**

August 2019

How We Do It - Water

Order Reprints



St. Bernard Parish, Louisiana, lost significant population as a result of Hurricane Katrina. This aerial photo shows the spotty residential redevelopment.

In 2005, Hurricane Katrina caused devastation to St. Bernard Parish, southeast of New Orleans, and cut its population from 67,000 to 45,000. With spotty redevelopment and more water capacity than is needed for today's residents, the parish has paid close attention to maintaining drinking water quality.

The Louisiana Department of Health and Hospitals notified the water department that there had been two deaths (one in 2011, another in 2013) related to *Naegleria fowleri,* colloquially known as the brain-eating amoeba in the parish. This free-living, bacteria-eating amoeba is found in warm, unchlorinated freshwater such as ponds, lakes, rivers and hot springs. If contracted by humans, it can cause a deadly infection in the brain. (In the first case, the amoeba was found at a residence and not in the distribution system.)

TOP – Treatment Plant Operator

Modern Pumping Today

Municipal Sewer & Water

Monitoring + Flush Management

S.M.A.R.T. Flushing Systems

DFW Airport

O'Hare Airport

Port of Prince Rupert (BC)

Tarrant County College

Oakridge National Laboratory

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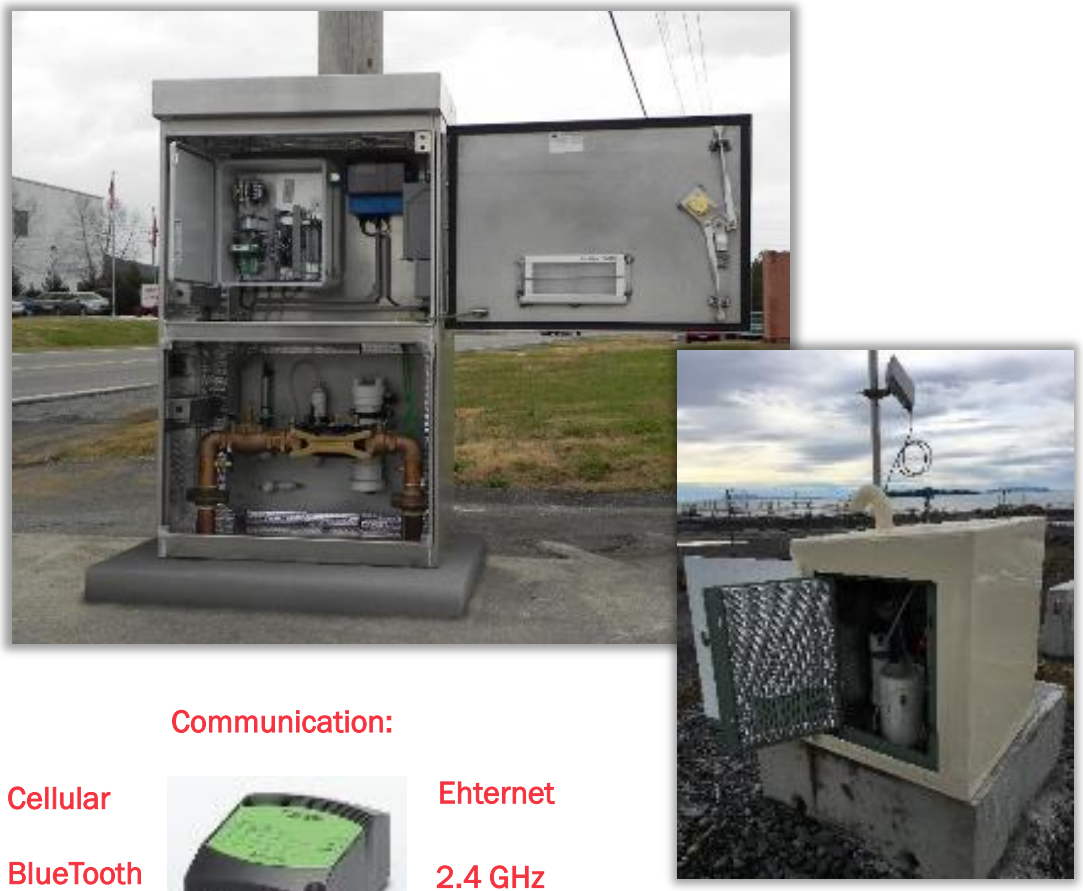
S.M.A.R.T. Flushing Systems

- Capable of monitoring a wide range of water quality conditions
  - Chlorine (Free or Total)
  - Temperature
  - pH
  - Turbidity
  - Flow
  - Pressure
  - Total Organic Compounds
- Automatically initiates a flush event to mitigate poor water quality conditions
- Allows for two way communication
- SCADA compatible
- Capable of sending event notifications
- Ideal for remote locations or trouble points in a distribution system



Communication:

Cellular

BlueTooth

Ehternet

2.4 GHz

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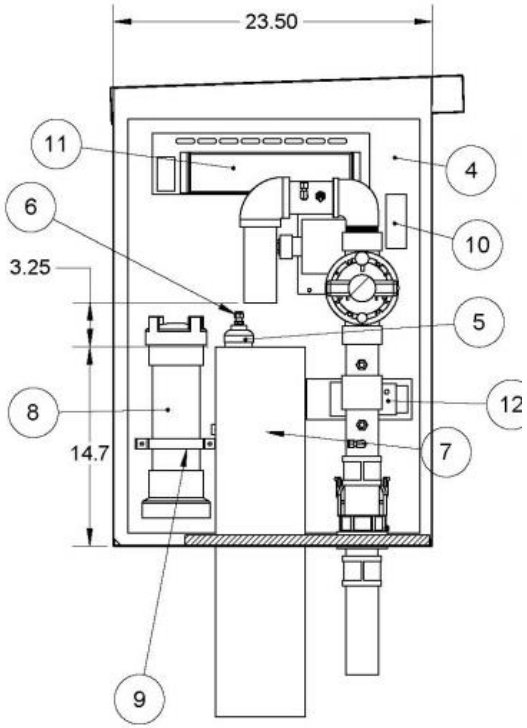
SMART Flushing



SMART

- 10-Flush Events
- Duration: 1 min. to 24 hours / event
- Programming interface remains in flushing system
- Monitors water quality 24/7
- MAX runtime management
- MIN off-time management
- Flexible communication platform

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SMART Flushing

NEMA 3R rated enclosure with lighting

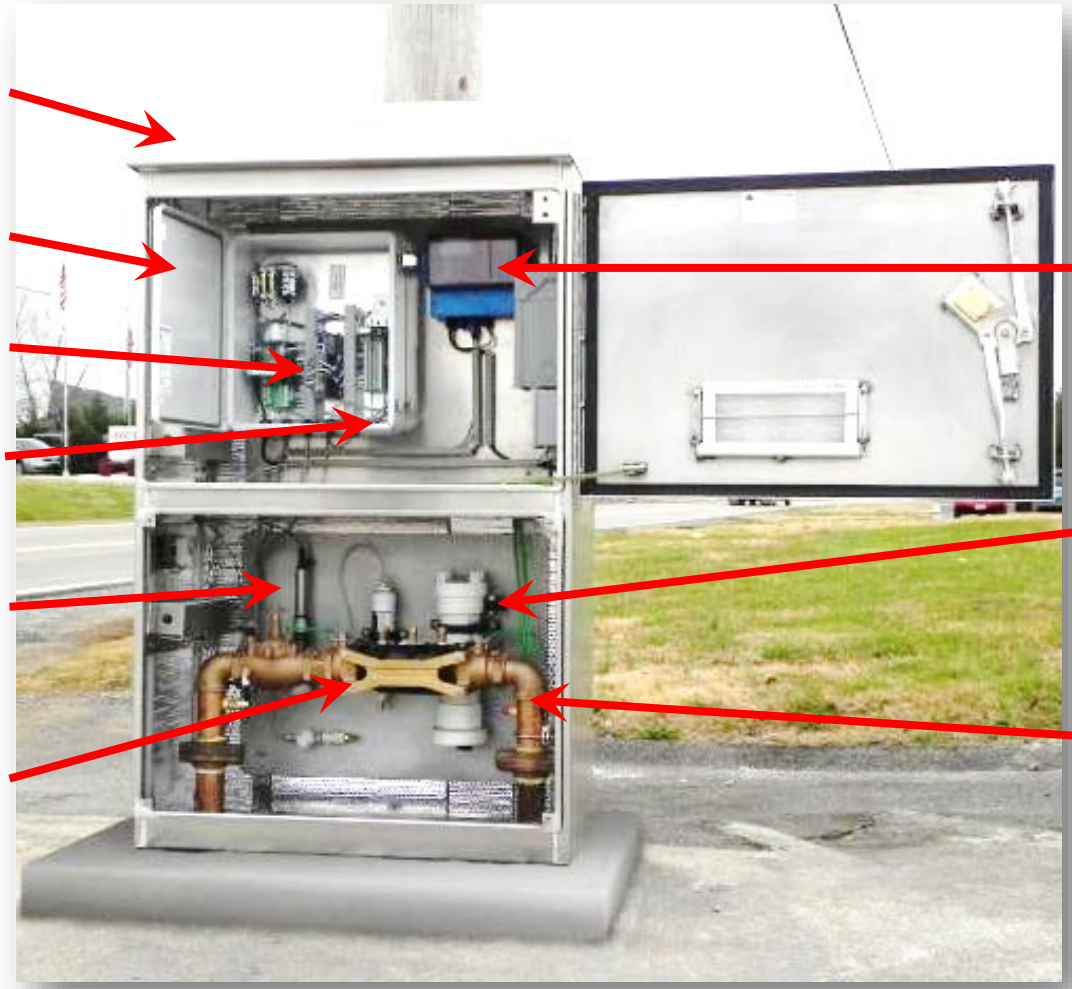
Secondary protective enclosure

S.M.A.R.T. management electronics

Heaters for cold weather protection

Chlorine probe for constant water quality monitoring

Double Check Valve for protection against possible cross connections



Chlorine Analyzer

Directed Discharge Device with 2” Brass Control valve and flushing assembly

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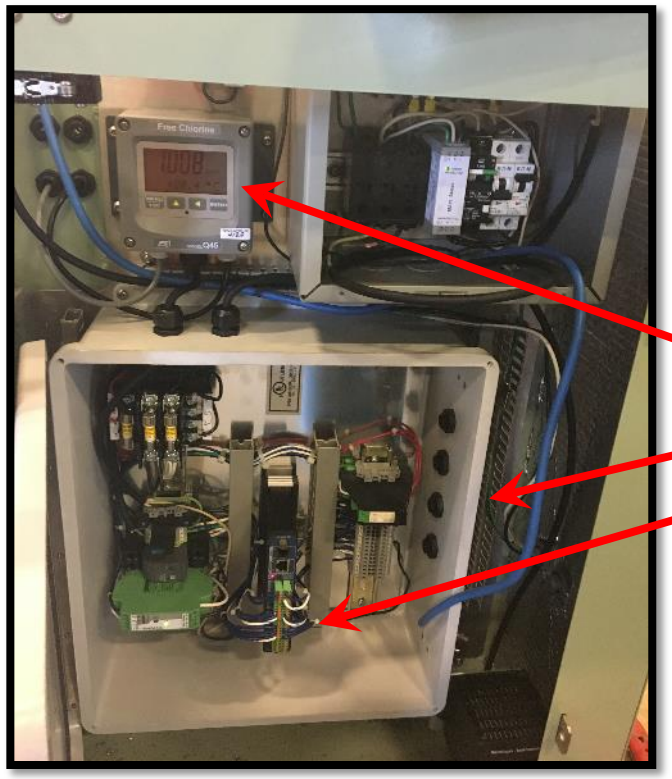
SMART Flushing

33” tall external enclosure with heaters, cooling fan and lighting



ATI Chlorine Analyzer

Secondary protective enclosure

SMART PLC

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Return on Investment

Hydro-Guard® Automatic and Programmable Flushing Systems

		Cost		
Manual Flushing	Manual Flushings per month per site (fire hydrant)	4		
	Duration (minutes per flushing)	45		
	Water outflow per month (gallons)	162,000	900	gpm @ 75 psi
	Total Cost of Flushed Water (monthly) per site	$97	0.0006	per gallon
	Total Cost of Flushed Water (annual) per site	$1,166		
	Estimated Cost Labor/Transportation (annual)per site	$5,400	$75.00	per hour @ 1.5 hours per site
versus	COST OF FLUSHING PER SITE (annually)	$6,566		
Flusing with Hydro-Guard®	Flushing with Hydro-Guard® per month per site	16		
	Duration (minutes per flushing)	12		
	Water outflow per month (gallons)	28,800	150	gpm @ 75 psi
	Total Cost for Flushing (monthly)	$17.28	0.0006	per gallon
	COST OF FLUSHING PER SITE (annually)	$207		
	Water savings (gallons) ▶▶▶▶▶▶▶▶▶▶▶▶	133,200	<< Monthly Savings	
Improved Water Quality	TOTAL ANNUAL SAVINGS PER SITE ▶▶	$6,359		
	Cost of Hydro-Guard® Flushing System (average list price. Price will vary based on model purchased)	$2,384		
	NET GAIN FIRST YEAR (per site total savings less cost of unit)	$3,975	◀ ESTIMATED COST SAVINGS	

See MuellerCompany.com for client case studies on effectiveness of Automatic Flushing!

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S.M.A.R.T System 2.0 – Flushing System

- Operations
- Alarms
- Timer Flush
- Config
- Monitor
- Daily Trend
- Monthly Trend
- Comms
- Clock
- Login

For technical support call: 1-866-642-7500

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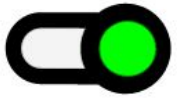
Operations

Manual Flush

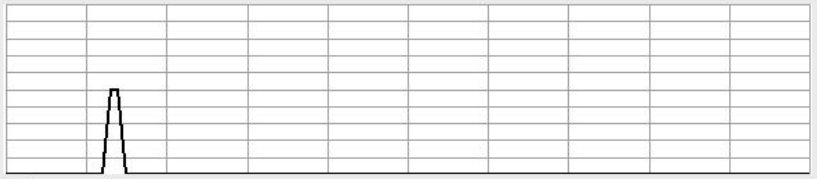
Man | Auto



Flush Solenoid

Current Date and Time: 2017-04-25 14:06:30

Flush Solenoid Trend



Flush Solenoid

Time Flushing Progam(s)

Program	Enabled	Active
Program #1	✓	
Program #2	✓	
Program #3	✓	
Program #4	✓	
Program #5	✓	
Program #6	✓	
Program #7	✓	
Program #8	✓	
Program #9	✓	
Program #10	✓	

Sensor Flush Elapsed Time

0 Minutes

Hardware Flush Elapsed Time

0 Minutes

Flushing Off Elapsed Time

0

Flow Meter Totalizer (Gallons)

0

Flow Rate (GPM)

0

Electrolyte Monitor Elapsed Days

24

Membrane Monitor Elapsed Days

24

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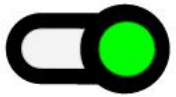
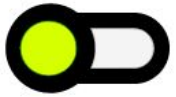
Operations

Manual Flush



Man | Auto



Flush Solenoid

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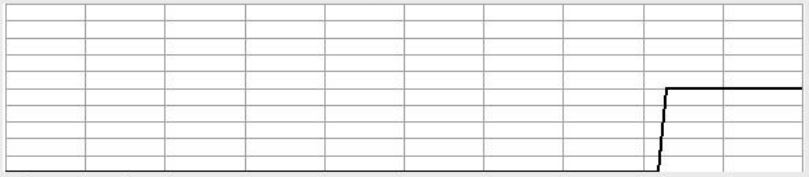
Flush Solenoid Trend



2:06:06 PM	2:06:26 PM	2:06:46 PM	2:07:06 PM	2:07:26 PM	2:07:46 PM
04/25/2017	04/25/2017	04/25/2017	04/25/2017	04/25/2017	04/25/2017

Manual | Zoom Out | << scroll | < scroll | scroll > | scroll >> | Zoom In

Flush Solenoid

Time Flushing Progam(s)

Program	Enabled	Active
Program #1	✓	
Program #2	✓	
Program #3	✓	
Program #4	✓	
Program #5	✓	
Program #6	✓	
Program #7	✓	
Program #8	✓	
Program #9	✓	
Program #10	✓	

Sensor Flush Elapsed Time

0 Minutes

Hardware Flush Elapsed Time

0 Minutes

Flushing Off Elapsed Time

0

Flow Meter Totalizer (Gallons)

0

Flow Rate (GPM)

0

Electrolyte Monitor Elapsed Days

24

Membrane Monitor Elapsed Days

24

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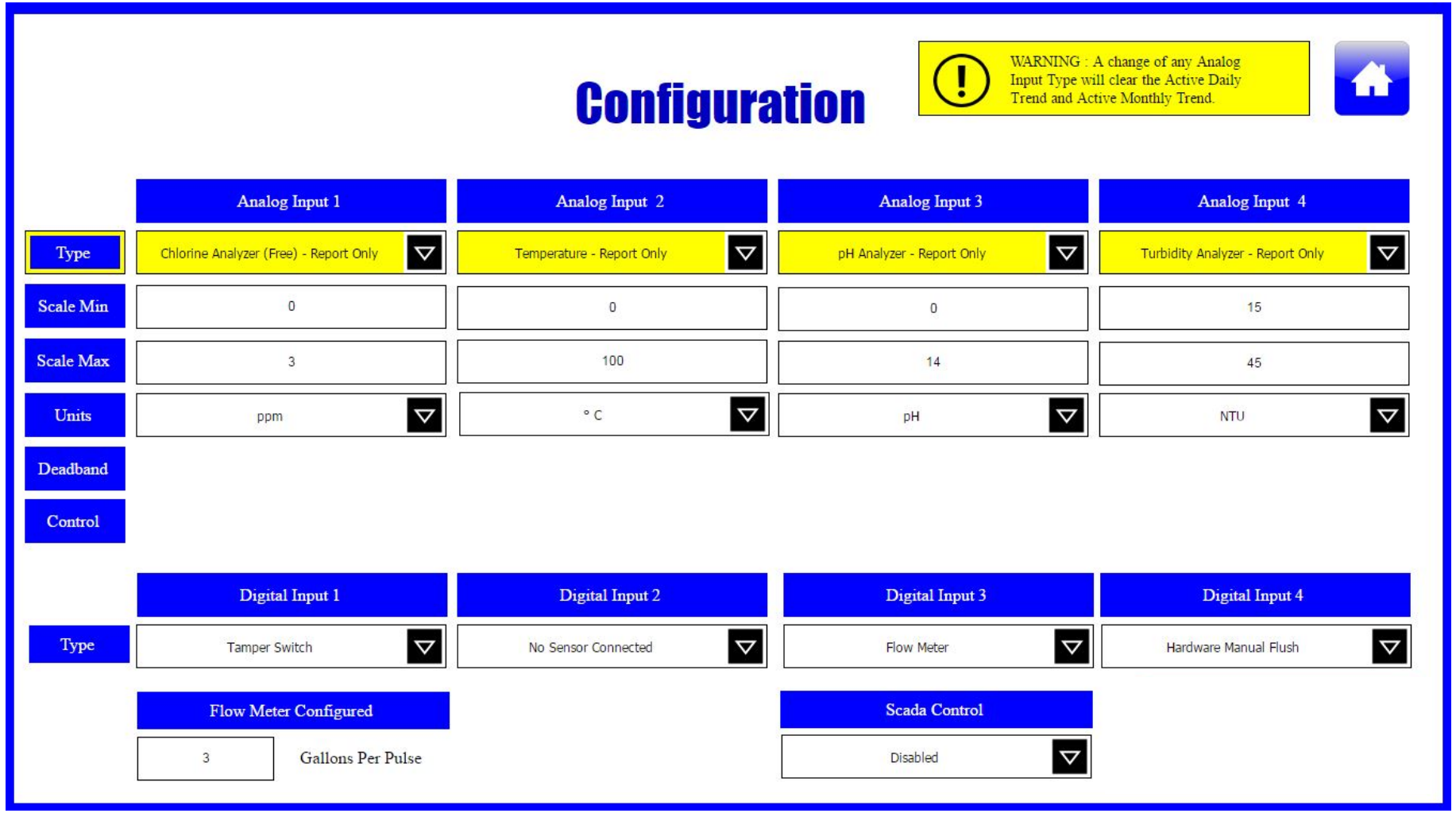
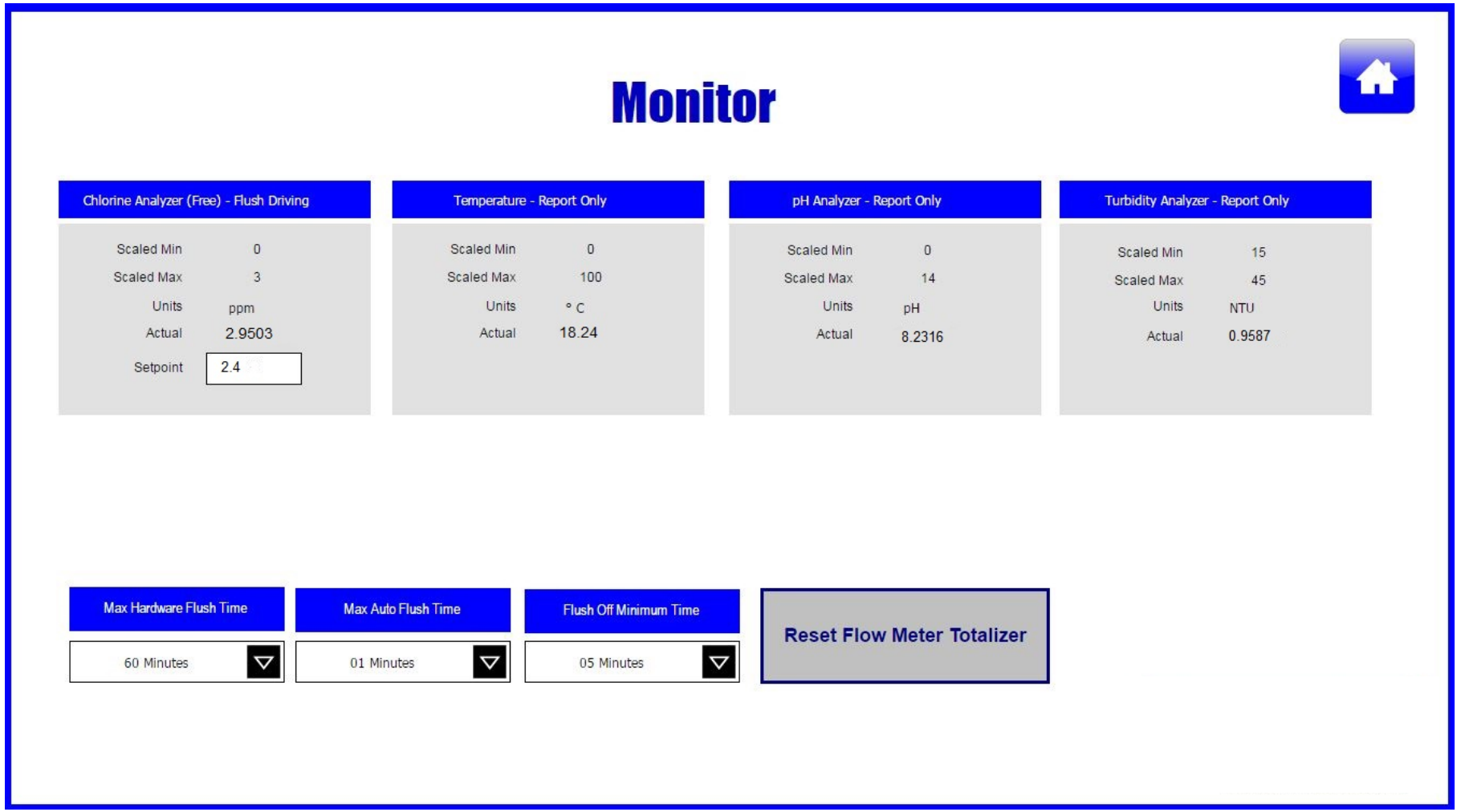

Configuration
WARNING : A change of any Analog Input Type will clear the Active Daily Trend and Active Monthly Trend.
Analog Input 1
Analog Input 2
Analog Input 3
Analog Input 4
Type
Chlorine Analyzer (Free) - Report Only
Temperature - Report Only
pH Analyzer - Report Only
Turbidity Analyzer - Report Only
Scale Min
0
0
0
15
Scale Max
3
100
14
45
Units
ppm
° C
pH
NTU
Deadband
Control
Digital Input 1
Digital Input 2
Digital Input 3
Digital Input 4
Type
Tamper Switch
No Sensor Connected
Flow Meter
Hardware Manual Flush
Flow Meter Configured
3
Gallons Per Pulse
Scada Control
Disabled


Monitor
Chlorine Analyzer (Free) - Flush Driving
Scaled Min 0
Scaled Max 3
Units ppm
Actual 2.9503
Setpoint 2.4
Temperature - Report Only
Scaled Min 0
Scaled Max 100
Units ° C
Actual 18.24
pH Analyzer - Report Only
Scaled Min 0
Scaled Max 14
Units pH
Actual 8.2316
Turbidity Analyzer - Report Only
Scaled Min 15
Scaled Max 45
Units NTU
Actual 0.9587
Max Hardware Flush Time
60 Minutes
Max Auto Flush Time
01 Minutes
Flush Off Minimum Time
05 Minutes
Reset Flow Meter Totalizer

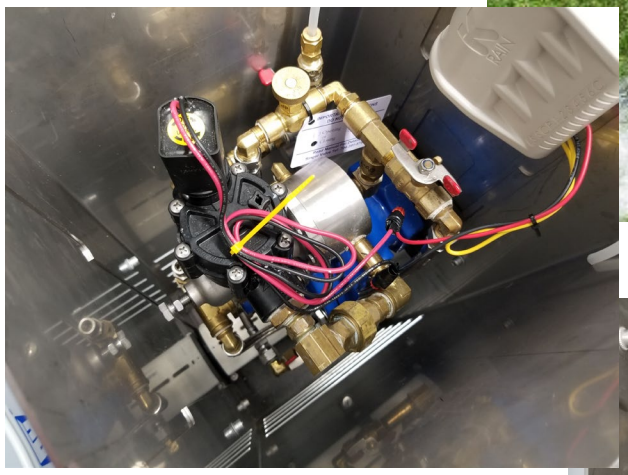
Hydro-Guard® Hydrant Flushing / Portable Model

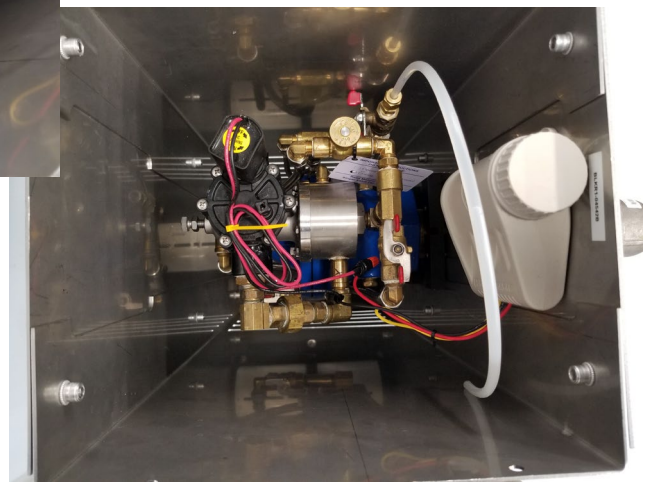
MUELLER

Automated Flushing

HG-6

- **Discharge:**
  - Atmospheric discharge (to ground)
- **Programming:**
  - Built-In
  - Blue Tooth Controller – K-Rain App
- **Height:**
  - 25 inches above ground
    Supports own weight – does not hang
    - Height adjustment of 4” either direction
- **Piping Options:**
  - Low Lead Brass (Standard HG-6)
- **Backflow Prevention:**
  - Air Gap

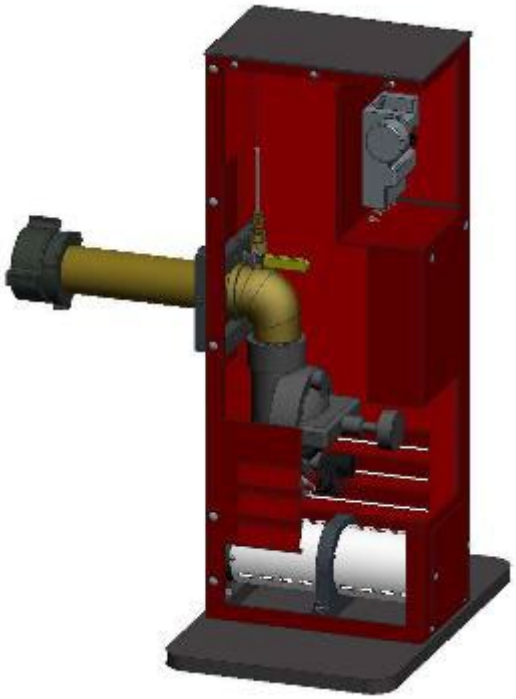


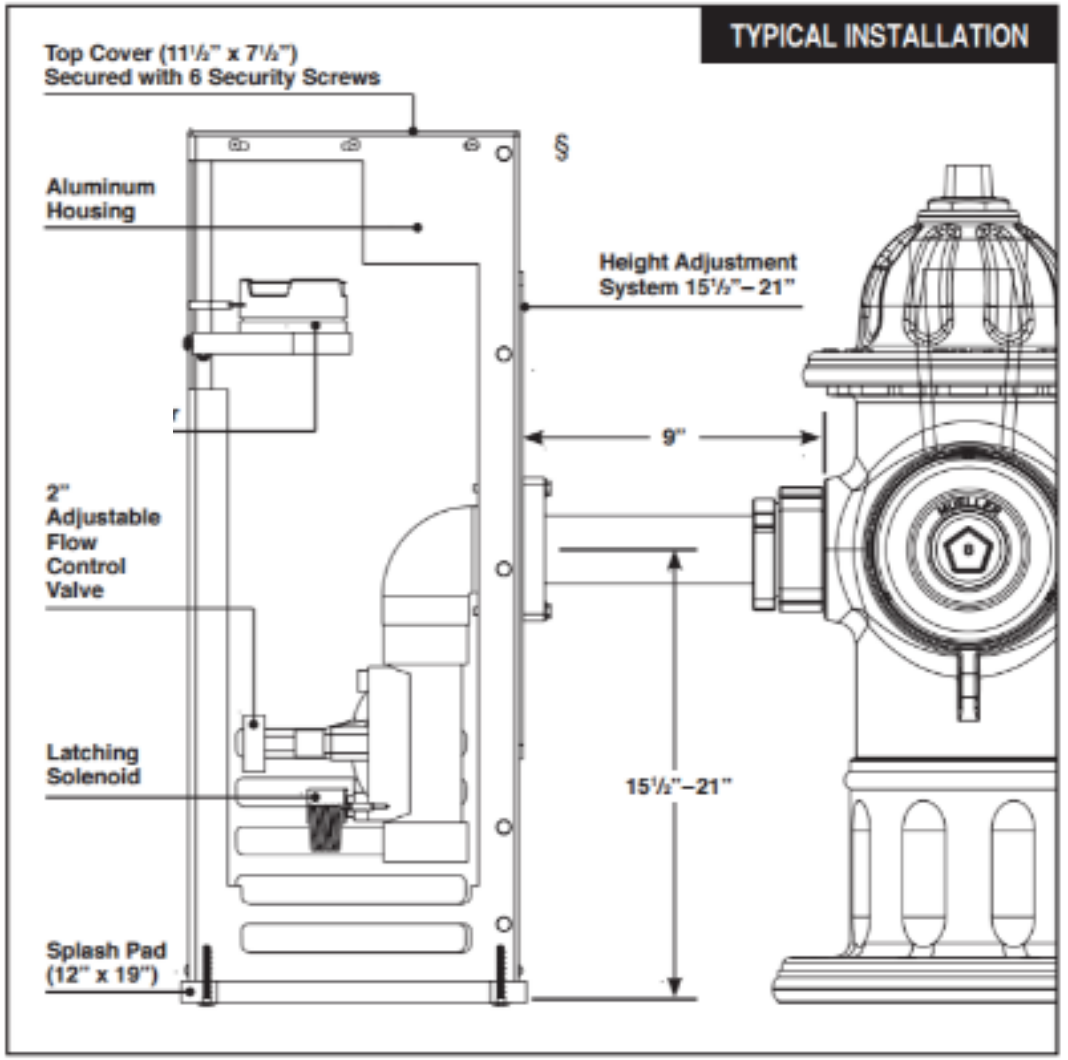


MUELLER

Automated Flushing

HG-6





Singer TAPS Flushing Solutions…the Next Generation

HG-6TAPS

HG -6TAPS (with Singer control valve)

HG -6TAPS

Product Description: Standard product offering
with a Singer Model SC-BT-R
Blue tooth controller
Brass piping

<u>Color OPTIONS:</u>
Red
Yellow
Blue
No Paint

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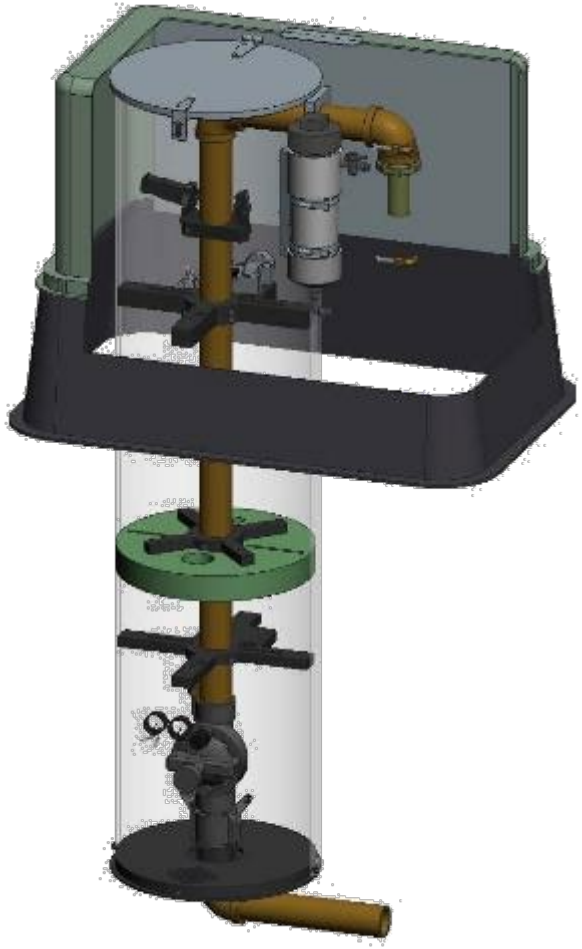
Hydro-Guard® Cold Climate Models



MUELLER

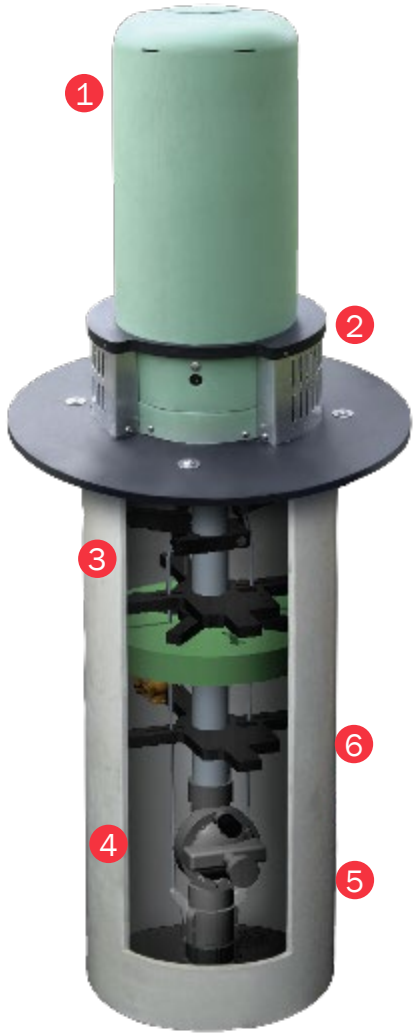
Hydro-Guard® HG-3 Longneck™

- **Discharge:**
  - Atmospheric Discharge (to ground)
- **Programming:**
  - Removable (Requires 545687 handheld)
- **Height:**
  - Above Ground: 25 inches
  - Below Ground: 36” to 108”
- **Piping Options:**
  - Schedule 80 PVC
  - Low Lead Brass
- **Backflow Prevention:**
  - Air Gap

MUELLER

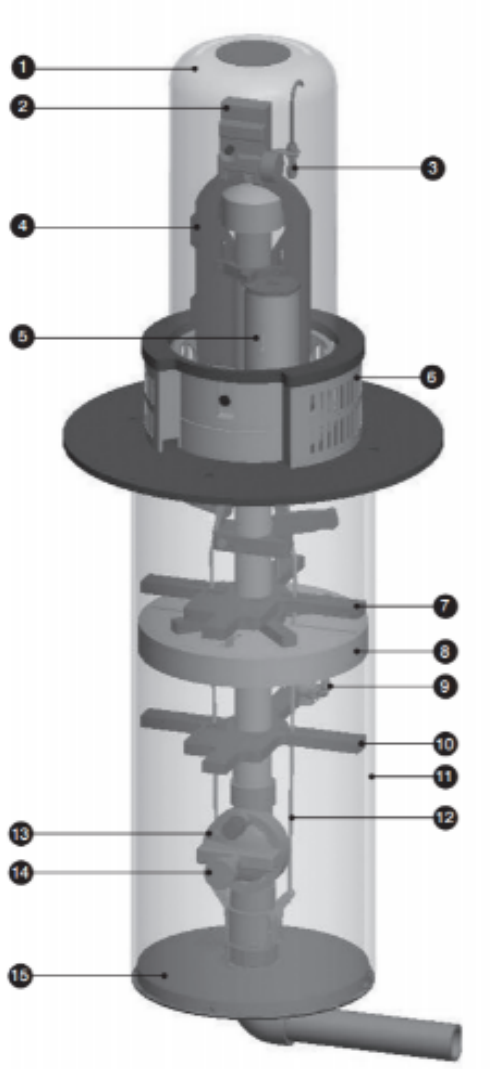
Hydro-Guard® HG-3 Longneck™

1. Lockable HDPE composite lid
2. Stainless diffuser screen with reduces energy of discharging water and prevents pets from nesting inside of device; erosion controlling splash plate
3. Below ground protective sleeve (bury depth of 36” to 108”) with full circumference bottom plate, patented camlock release system and threaded connection for water service line
4. Adjustable 2” control valve, rated to 200 psi (burst pressure tested to 375 psi)
5. Patented camlock release system allow internals to be easily lifted out of protective ground sleeve and cantering stars allow it to be reinserted easily
6. Patented low pressure relief freeze protections allows water to drain from system when flushing stops



MUELLER

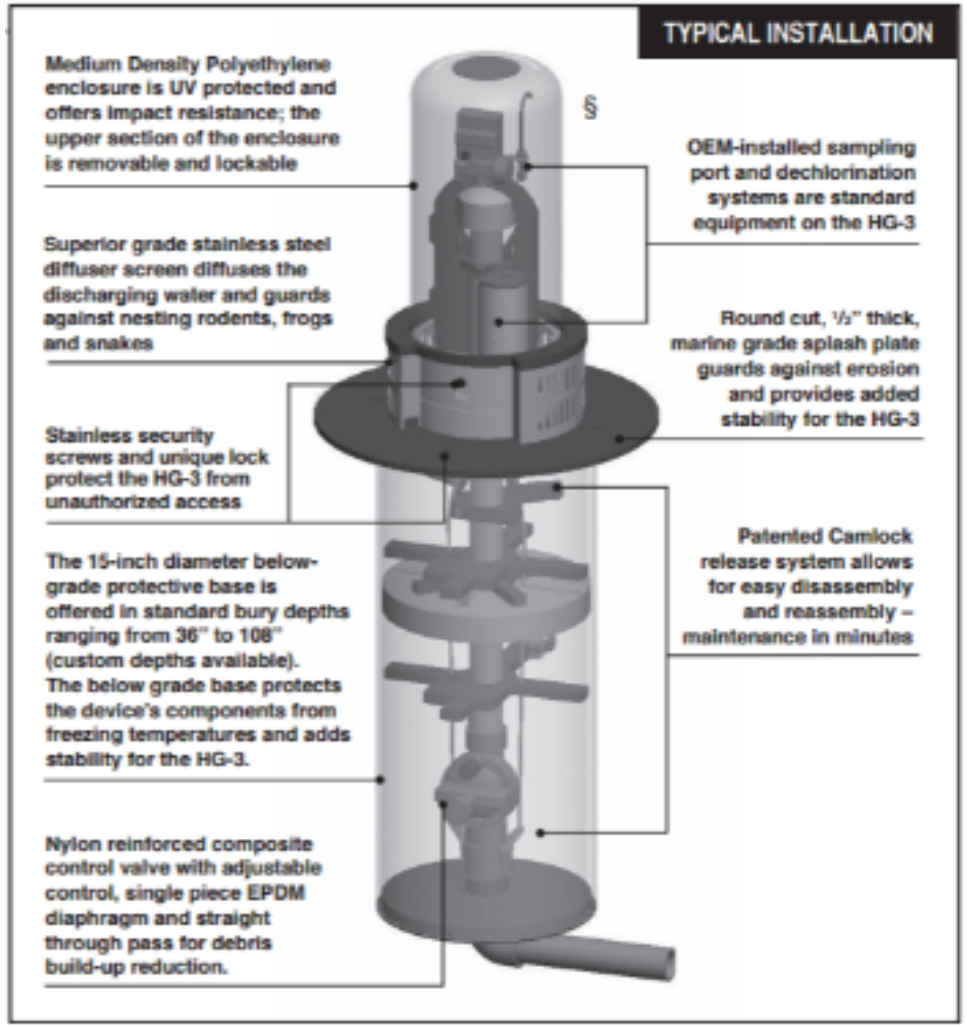
Hydro-Guard® HG-3 Longneck™



REPLACEMENT PARTS

ID	PART #	DESCRIPTION
1	546284	UV Protective Housing
2	HG-S295	TBOS-II Controller Assembly
3	546521	Sample Valve Assembly
4	546329	Riser Assembly
5	546519	Dechlorination System
6	HG-S316	Stainless Steel Housing Bracket
7	545729	Centering Star
8	HG-S126	Insulation Star Sub-Assembly
9	HG-S128	Freeze Protection System Sub-Assembly
10	545729	Centering Star
11	545738	Splash Pad
12	HG-13105	Latching Rods ¼" x 26"
13	HG-S124	Latching Solenoid Sub-Assembly
14	HG-S325	Control Valve Sub-Assembly
15	546330	Bottom Plate Sub-Assembly

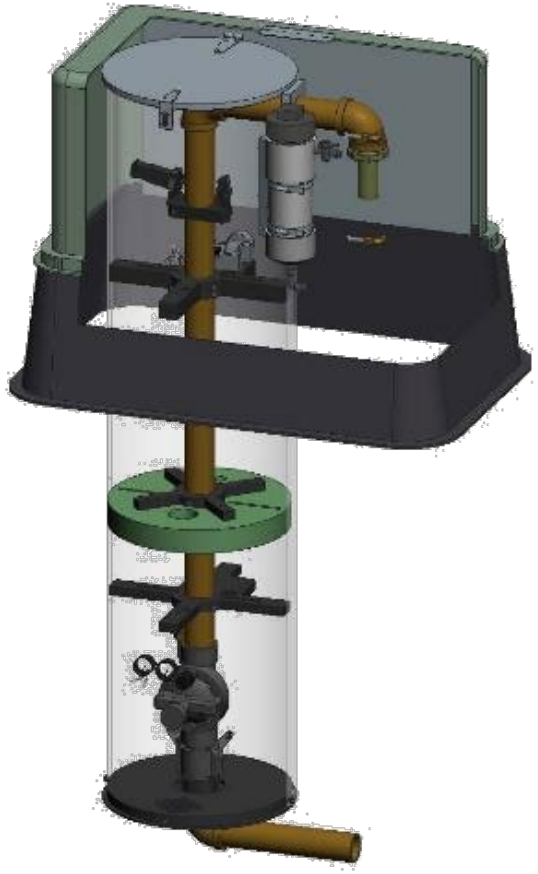
TYPICAL INSTALLATION



MUELLER

Hydro-Guard® HG-4 Longneck™

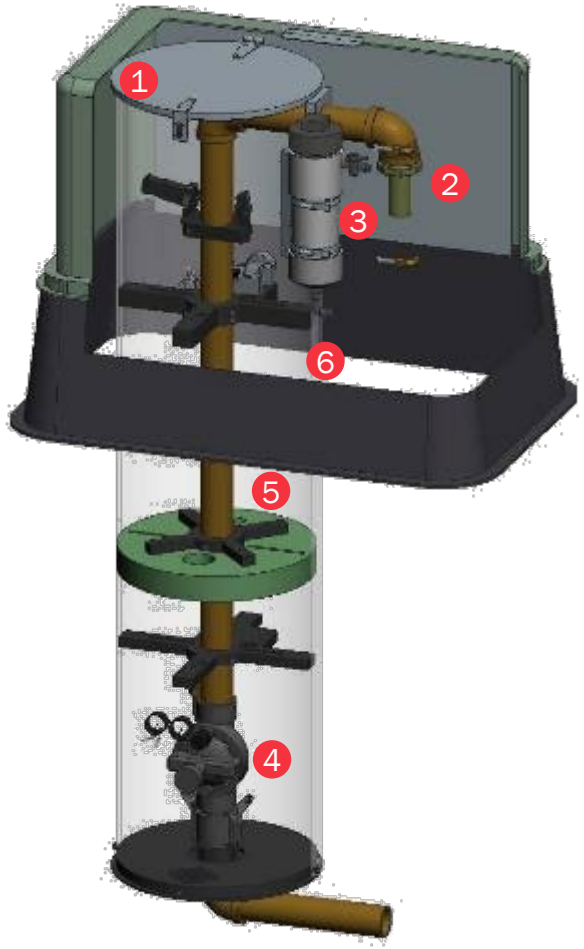
- **Discharge:**
  - Directed Discharge (swale, storm pond or storm sewer)
- **Programming:**
  - Removable (Requires 545687 handheld)
- **Height:**
  - Above Ground: 23”
  - Below Ground: 36” to 108”
- **Piping Options:**
  - Schedule 80 PVC
  - Low Lead Brass
- **Backflow Prevention:**
  - Air Gap



MUELLER

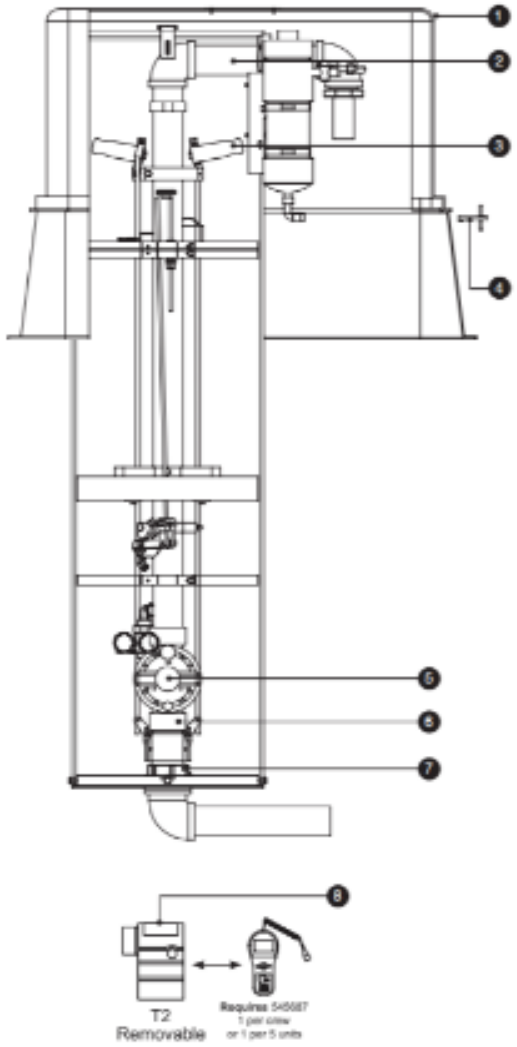
Hydro-Guard® HG-4 Longneck™

1. Lockable HDPE composite lid
2. Lockable protective ground sleeve (bury depth of 36” to 108”)
3. OEM installed sampling and dechlorination system
4. Cantering stars, insulation pad, full circumference bottom plate, patented camlock release system and threaded connection for water service line
5. Patented camlock release system allow internals to be easily lifted out of protective ground sleeve and cantering stars allow it to be reinserted easily
6. Adjustable 2” control valve, rated to 200 psi (burst pressure tested to 375 psi) and patented low pressure relief freeze protections allows water to drain from system when flushing stops



MUELLER

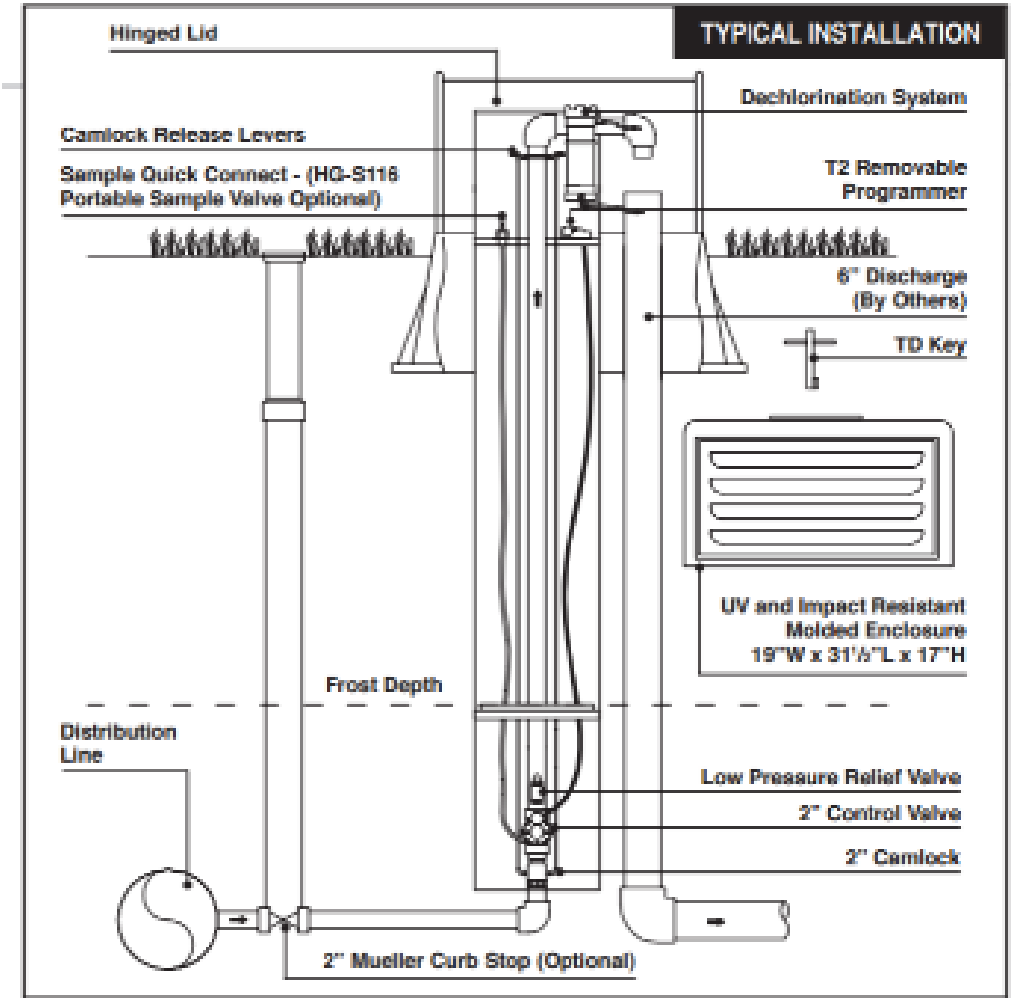
Hydro-Guard® HG-4 Longneck™



ID	PART #	DESCRIPTION
1	HG-2201	UV Protective Housing
2	546553	Dechlorination Sub Assembly
3	HG-S124	Latching Sub Assembly
4	HG-A2006	TD Key
5	HG-123100	Low-Pressure Relief Valve
6	HG-S125	2" Camlock
7	HG-S106	Bottom Plate Sub Assembly
8	545687	Removable Programmable Controller

REPLACEMENT PARTS

HG-S106	HG-4 Bottom Plate Sub Assembly
HG-S124	Latching Sub Assembly
545729	Centering Star
HG-02125	¼" x 1¼" Hex Bolt
HG-S295	TBOS2 Controller Assembly
HG-13176	¼" x ¾" Phil Pan Screw
HG-S128	Relief Valve Sub Assembly
HG-S126	Insulation Star Sub Assembly
546549	HG-4 Top Plate Sub Assembly
HG-2201	DIV 1021-R
HG-21088	HG-4 Name Plate
HG-V129	Silver Thermal Insulation
HG-A2006	TD Key
546372	HG-4 Sample Port
HG-V116	Bulkhead Union Brass
HG-13198	¼ – 20 Threaded Knob
HG-V105	¼ Polyurethane tube
HG-123108	¼" x ¼" NPT Adaptor
546531	HG4 Sample Rod
HG-V105	¼ Polyurethane tube
HG-S325	HG-4 Valve Sub Assembly
546550	HG-4 Outlet Sub Assembly
HG-S117	HG-4 Bottom Plate Connection
546522	HG-4 Below-Grade Housing
546526	HG-4 Latching Rod
HG-S318	HG-4 Latching Solenoid
546535	HG-4 Main Nipple
546553	HG-4 Dechlor Sub Assembly



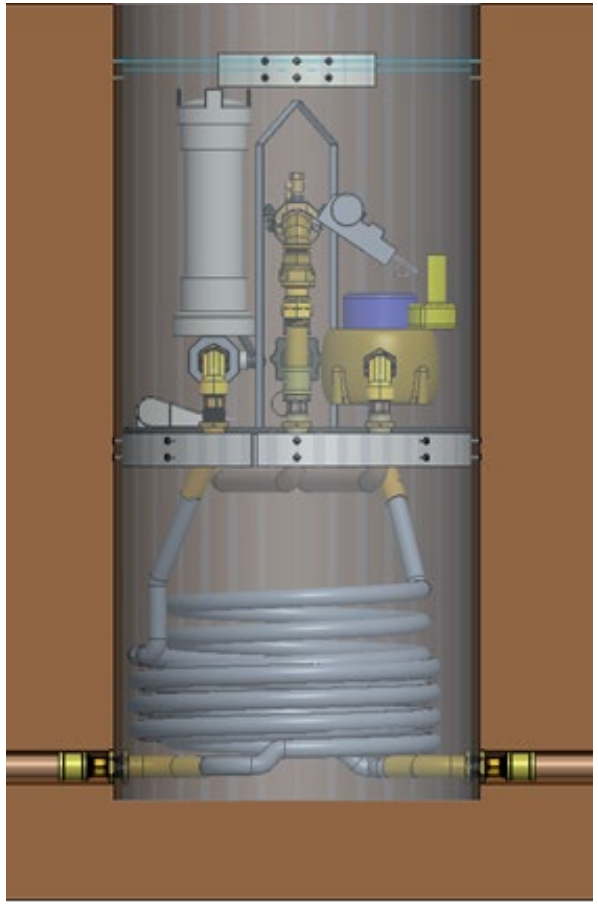
MUELLER

Automated Flushing

HG-8TAPS

Cold Climate

- **Discharge:**
  - Directed discharge (swale, storm pond or storm sewer)
- **Programming:**
  - Blue Tooth Controller K-Rain App
- **Bury Depth:**
  - Above Ground: Cast or Composite Lid
  - Below Ground: 48” to 108”
- **Piping Options:**
  - Low Lead Brass
- **Backflow Prevention:**
  - Double Check



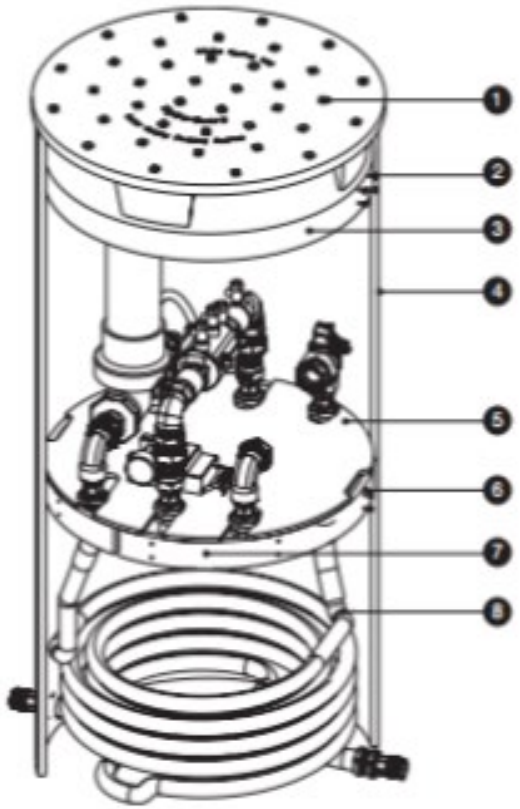
MUELLER

Automated Flushing

HG-8TAPS – Cold Climate

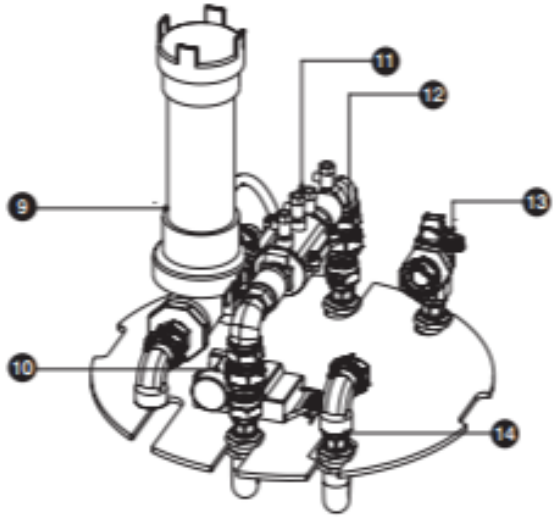
- Cast or composite lid at grade, all other components below grade
- Mueller Thema-Coil Meter Box is the platform this flushing device is built into, allows operator to raise the platform to surface for maintenance and lower for operation; includes lifting strap
- OEM installed sampling and dechlorination system
- Freeze protected by 2” insulation pad and mechanical thermal control valve
- Includes a double check backflow prevention system and a 1” meter yoke that will accommodate a 1” meter or a 1” PRV (by others)
- Adjustable 1” control valve

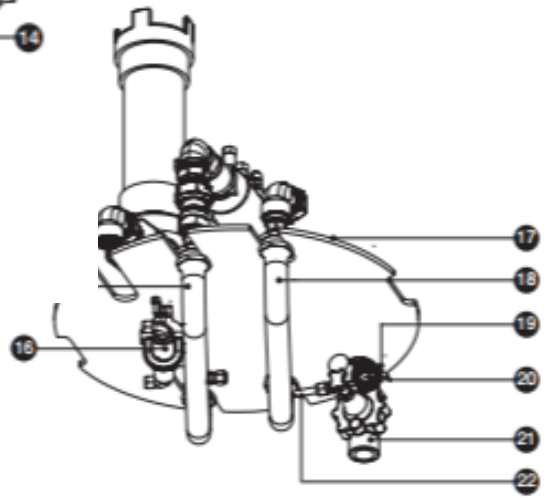
Hydro-Guard® HG-8 Cold Climate



REPLACEMENT PARTS

ID	PART #	DESCRIPTION
1	546787	Composite or Cast Iron Vault Lid
2	546799	HG-8 Plate Rest
3	546785	2" Foam Insulation Pad
4	790015	21" Ø Below-Grade Vault
5	HG-A102L	9-Volt Lithium Battery
6	546779	1" Valve & Meter Replacement Assembly
7	700014	Reinforcing Ring
8	546025	1" Coiled Tubing Assembly
9	HG-A119	320 Inline Dechlorination Assembly
10	HG-FP100	Thermal Control Valve
11	546138-100	1" Backflow Double Check Valve
12	014215 330N	1" Meter Coupling
13	024265 1 330N	1" Ball Angle Meter Valve
14	014210 1 330N	1" Meter Coupling
15	700507 Flow	U-Bar w/ Hole for FP
16	HG-FP100	Thermal Control Valve
17	5461219	Coated Steel Mounting Platform
18	700507	U-Bar
19	546596	Latching Solenoid
20	HG-FP108C	Molded Freeze Adapter / Gasket
21	HG-11010	1" Flow Control Valve
22	HG-V139	¾" Poly Tubing





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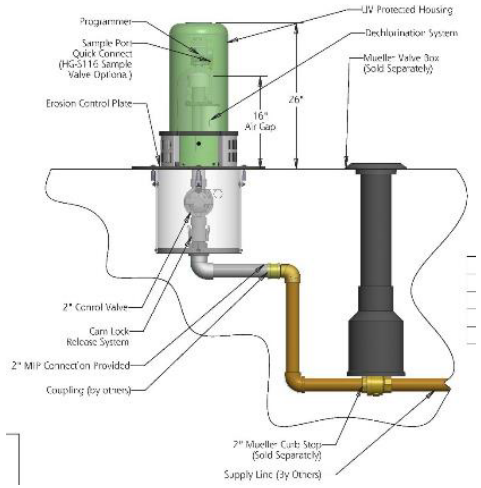
Typical Requirements of Ownership



Installation:

- With a tapping saddle and corporation stop, install a 2-inch tap in the distribution main.
- Install an isolation valve / curb stop and meter if desired.
- Using the 2-inch NPT thread on the inlet side of the Hydro-Guard® product, couple the Hydro-Guard product to the service line.

Maintenance:

- 9-volt Battery – change once per year
- Fill Dechlorination System with 3-inch Ascorbic Acid / Vitamin C tablets; every 84,000 gallons flushed

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HYDRO-GUARD®

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Industrial Flushing Systems

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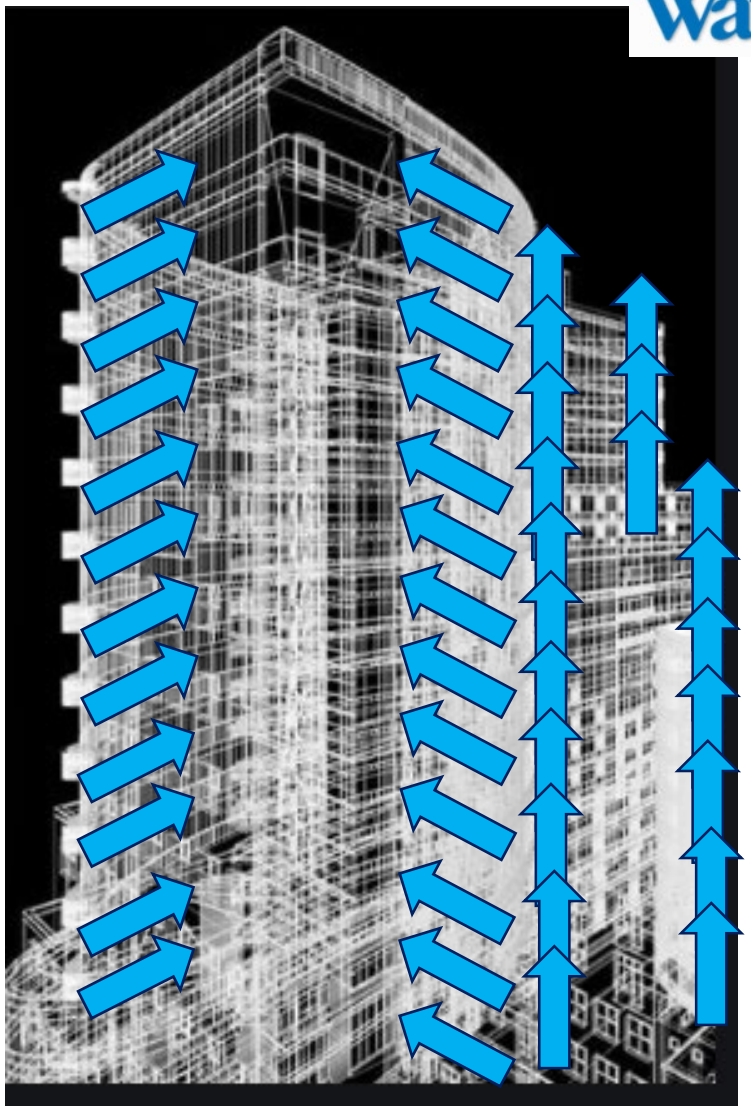
Water Quality in Buildings

- **Water Related Issues in Buildings**
  - Stagnation in water lines
    - Keeping water clean, particularly in schools and manufacturing plants that are experiencing reduced and interrupted water usage during the pandemic.
  - Low Disinfectant Residual
    - Ensure the circulation of chlorine treated water throughout the building.
  - Prevent Leaching of Lead and Formation of Contaminants
    - Water turnover every 30 minutes reduces the risk of leaching of lead.
    - Maintaining proper levels of disinfectant in the line reduces the potential for THM and HAA5 formation.



WaterWorld

It's possible that water left sitting for long periods of time could contain excessive amounts of heavy metals and pathogens concentrated in pipes nationwide, say researchers who have begun a field study on the impact of a pandemic shutdown on buildings.

Apr 14th, 2020
PURDUE UNIVERSITY

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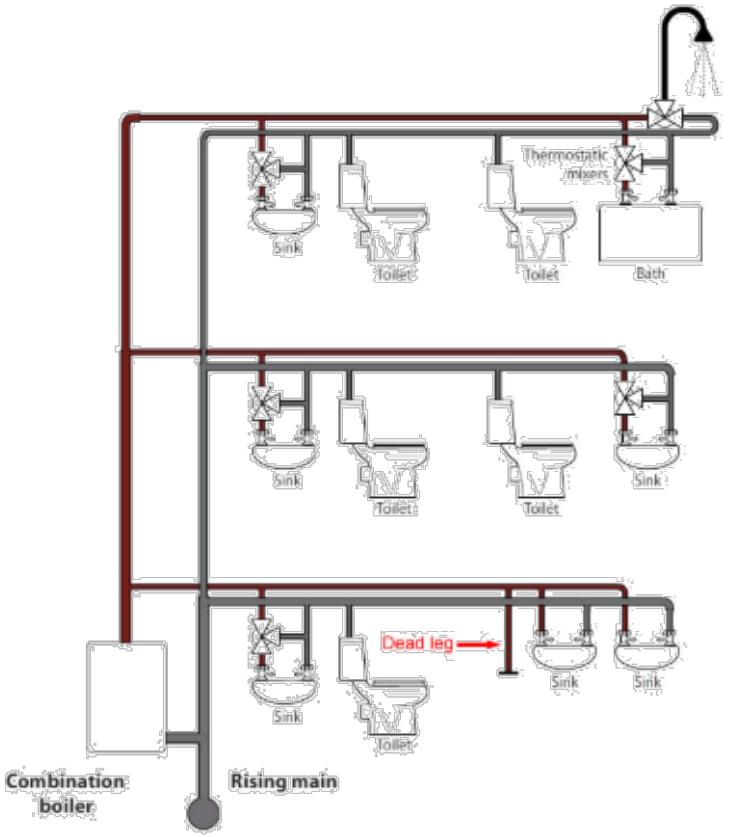
Water Quality in Buildings, Factories, Apartments…

- **Installation points…**
  - **In General:**
    - Every floor may have a dead-end or dead-leg
    - Analysis of water usage will be required to accurately predict where automatic flushing would be benefical
  - **Factories**
    - Eye Wash and Safety Shower stations
    - Drinking Fountains
  - **Hotels**
    - Floors with least occupancy
    - Last rooms on a floor
  - **Apartment Buildings**
    - Floors with least occupancy
    - Any floor where lead fittings may be present



WaterWorld

The team also is tracking a pathogen called Legionella pnuemophila, which is known to cause a bacterial form of pneumonia. Some hospital buildings already have plans in place to flush out stagnant water that could carry this pathogen, but more studies on stagnant water could inform how frequently and how long they should flush.

Apr 14th, 2020
SOURCE: PURDUE UNIVERSITY

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Water Quality in Parks and Recreation sites

- **Installation Points:**
  - Parks and recreation facilities have drinking fountains
- **Health Concerns**
  - Many studies in daycare centers have found that water fountains are common carriers of rotavirus.
  - Researchers have also found that handles on drinking fountains were the most contaminated surfaces in public schools.
  - “The sense today, though, is that “they’re dangerous, they’re not maintained and they’re dirty.”
- **Opportunity**
  - A new fountain costs between $300 and $4,500 to install, depending on plumbing and location.
  - Some cities are slowly bringing back — or at least increasing maintenance of — water fountains.
    - 2013, Los Angeles…comprehensive plan to upgrade and restore public water fountains.
    - 2008, Minneapolis spent $500,000 on 10 new fountains designed by local artists.
    - Washington, the nonprofit group TapIt promotes access to tap water by pushing businesses to provide free water-bottle-refilling stations.
    - Other cities, including New York, Seattle and San Francisco, have taken steps to stop using bottled water in government buildings.

Hydro-Guard® Industrial Flushing System

- **The Hydro-Guard Advantage**
  - The Mueller Hydro-Guard® Industrial Flushing System is ideal for keeping water clean, particularly in schools and manufacturing plants that are experiencing reduced and interrupted water usage during the pandemic.
  - Designed for small line sizes
  - Best suited for applications where water quality conditions, water age, or excessive temperatures require water to be rotated frequently.
  - Ideal solution for school properties, commercial buildings, hospitals, and manufacturing facilities
  - Allows for a reduction operational expenses
    - Uses less water to flush the lines
    - Less staff-hours to maintain
    - Higher degree of consistency in Water Quality
    - Full return on investment within one year.

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Hydro-Guard® Industrial Flushing System

- **Piping**
  - 1” piping
  - No Lead Brass or Schedule 80 PVC
- **Valve:**
  - 1” Composite (Pressure Rating: 15 to 200 psi)
  - ¾” Singer Stainless Steel Valve
- **Programming:**
  - BlueTooth Controller
  - SMART Water Quality Monitoring and Flushing
- **Enclosure:**
  - NEMA -rated composite enclosure
- **Mounting Options:**
  - Wall or Pipe Mount
- **Freeze and/or Scald Protection:**
  - Optional Thermal Control Valves

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Sampling Stations

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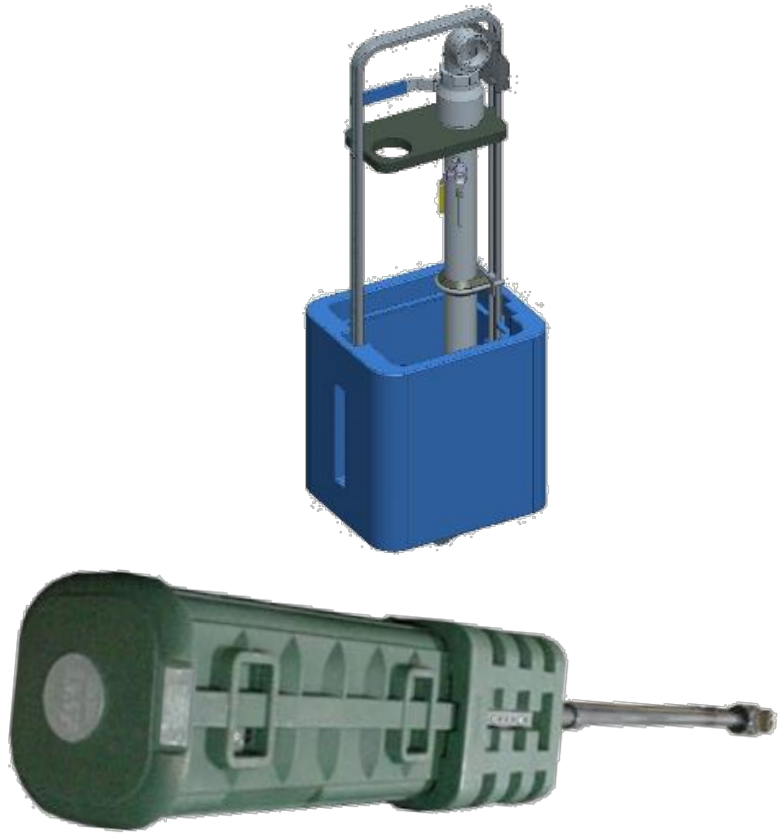
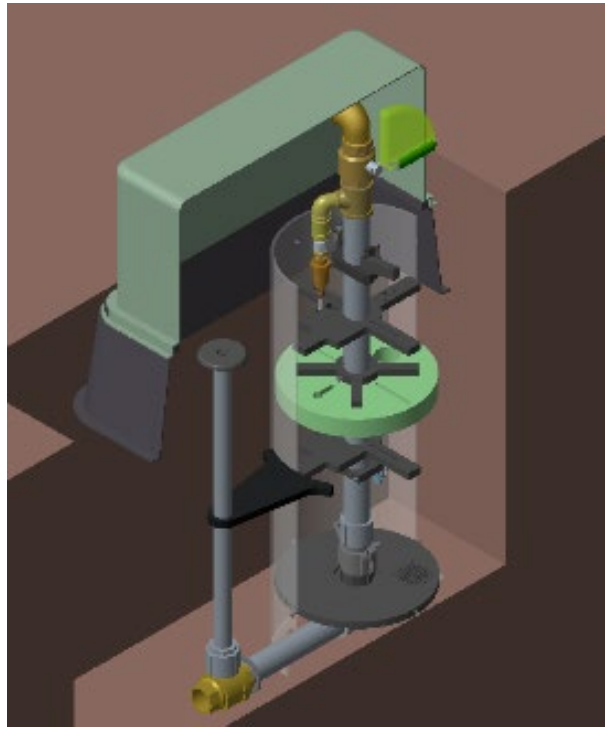
Hydro-Guard® Water Quality Sampling Solutions

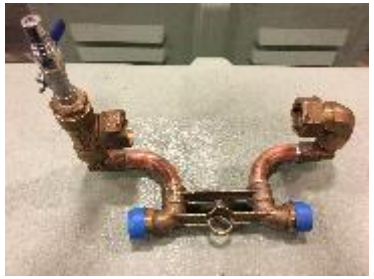
- Retrieve water quality samples from a dedicated sample site
- Easy access to sampling points in a distribution network
- Durable construction
- Reliable samples



Sampling Stations

Hydro-Guard BOSS Sample Stations





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Hydro-Guard® BSS-01

- **Blow Off Valve**
  - 1” Blow Off; Threaded or Unthreaded
- **Bury Depth:**
  - 18” to 72”
- **Piping Options:**
  - Low Lead Brass (Standard)
  - 304L Stainless Steel (Optional)
- **Enclosure Options:**
  - 304L Stainless Steel / Painted
  - HDPE Composite
  - Both styles are lockable cabinets
- **Freeze Protection:**
  - TCV
  - Curb Stop + Drain
  - VAC
  - Curb Stop + VAC

MUELLER

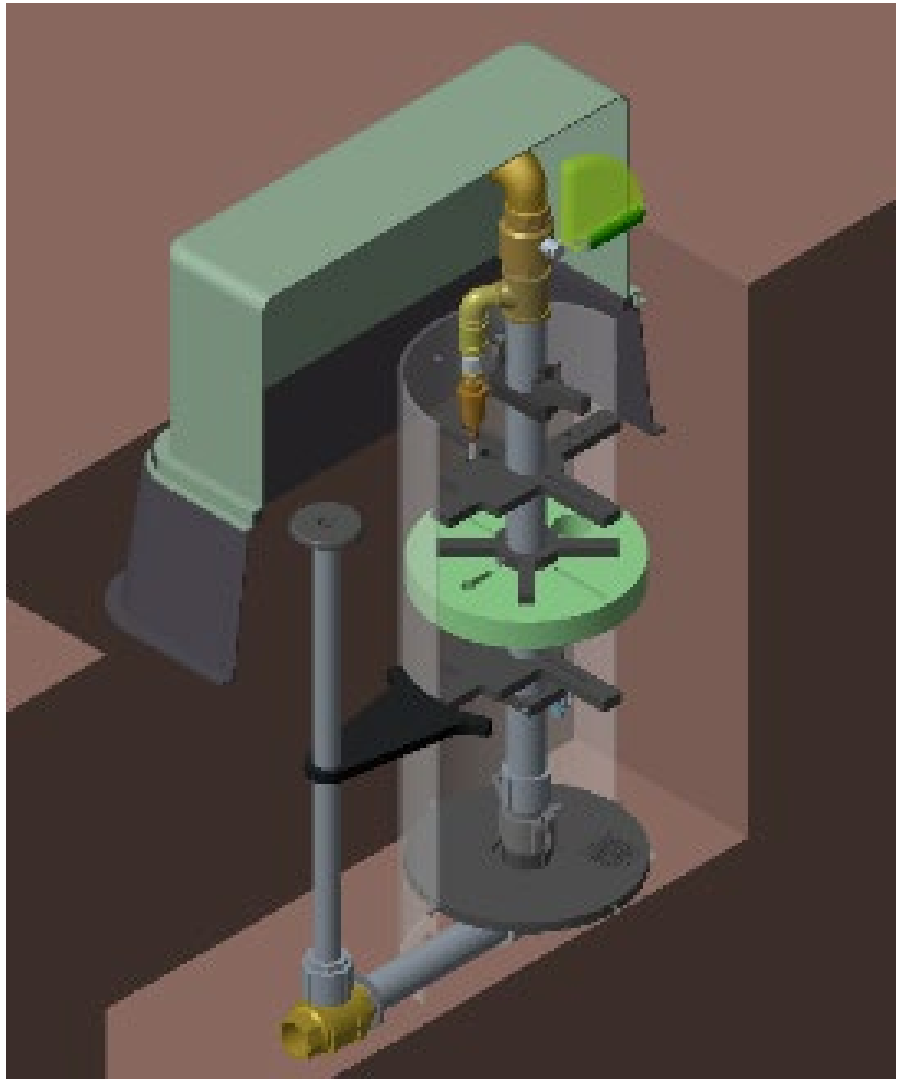
Hydro-Guard® BSS-02

- **Blow Off Valve**
  - 2” Blow Off; Threaded or Unthreaded
- **Bury Depth:**
  - 18” to 72”
- **Piping Options:**
  - Low Lead Brass (Standard)
  - 304L Stainless Steel (Optional)
- **Enclosure Options:**
  - 304L Stainless Steel / Painted
  - HDPE Composite
  - Both styles are lockable cabinets
- **Freeze Protection:**
  - TCV
  - Curb Stop + Drain
  - Curb Stop + VAC

MUELLER

Hydro-Guard® BSS-04

- **Blow Off Valve**
  - 2” Blow Off; Threaded or Unthreaded
  - Atmospheric discharge (to ground)
- **Bury Depth:**
  - 36” to 108”
- **Piping Options:**
  - Low Lead Brass (Standard)
- **Enclosure Options:**
  - HDPE Composite
  - Lockable cabinet



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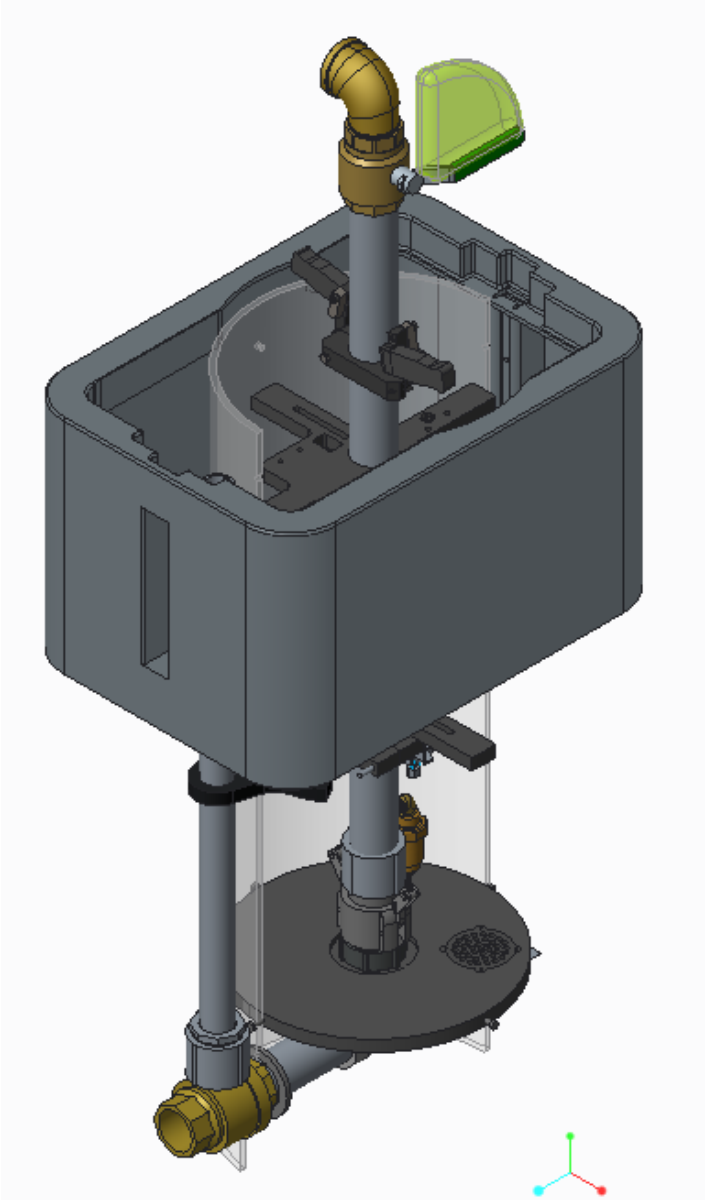
Hydro-Guard® BSS-04 Sample Stations



Enclosure Options

- Metal Enclosure

- Composite Enclosure

Freeze Protection Options

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Pressure Management

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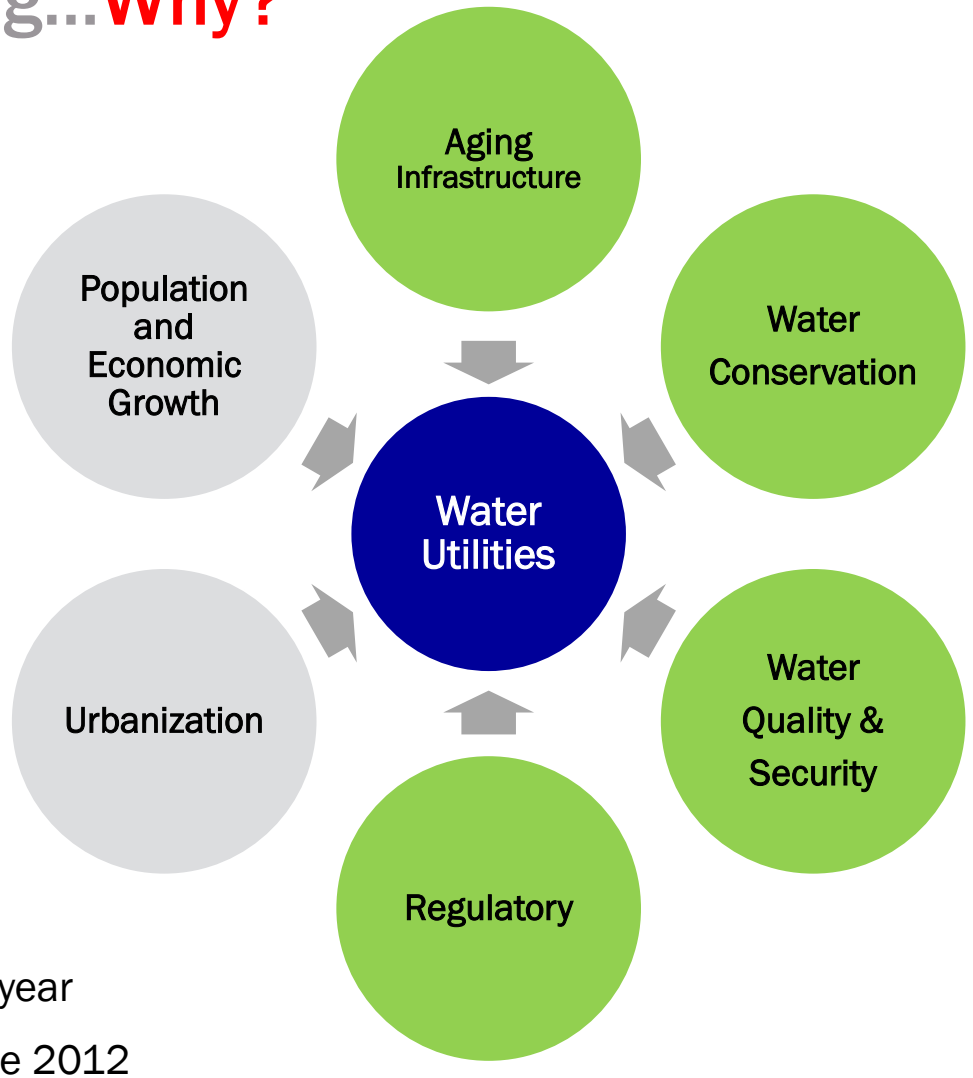
Water Utilities are Facing Many Challenges

Pressure Monitoring...Why?



Non-Revenue Water

- Up to 30% of treated water is lost or unaccounted for in the water system
- Growing number of states requiring water loss audits

Water Conservation

- 240,000 water main breaks per year
- 27% increase in break rates since 2012

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Pressure Monitoring

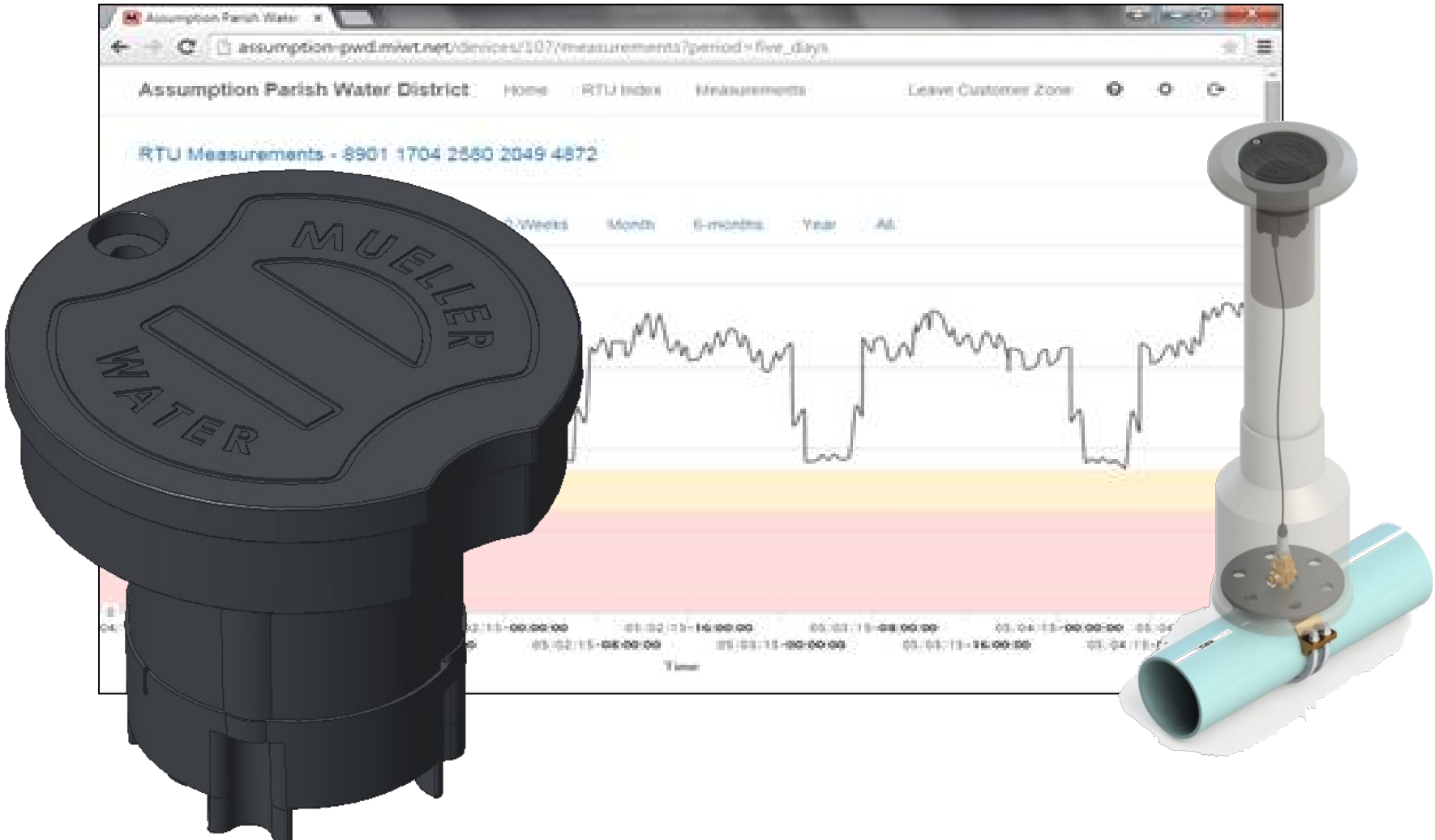
Why monitor pressures throughout the distribution network?

- To prevent damage and interruption in service
- To reduce customer complaints
- To optimize pressure data
- To identify high pressure areas
- To reduce energy costs and improve pump operation efficiency
- To confirm auto flushers have operated properly and stay in compliance with Federal and State regulations for pressure and chlorine residuals

MUELLER

Pressure Monitoring...**How?** When? Where? **What?** Why?

Pressure Monitoring Systems



Pressure Monitoring…**How?** When? Where? **What?** Why?

How can Intelligent Water Technology™ benefit your distribution network?

- Continuous verification of system pressure data anywhere in the distribution network
- Remote data logging and performance analytics
- Near-time condition alerts
- Powered by long-life Lithium battery (~5 years)
- User friendly web interface
- SCADA compatible with OPC Client protocol

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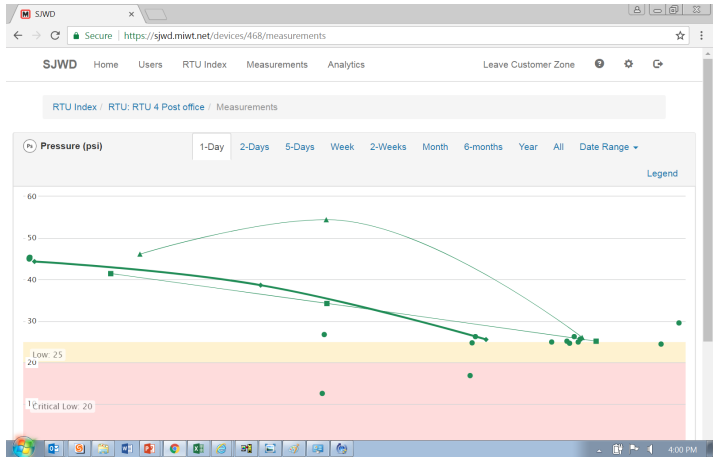
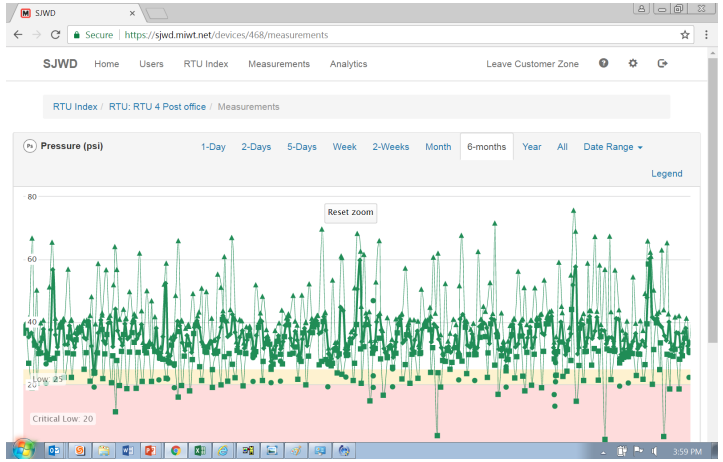
Pressure Monitoring…**How?** When? Where? **What?** Why?

How frequently can Mueller's pressure monitoring system sample pressure?

- Multiple reading options in a "steady state" mode
- In a "transient state" mode the device will sample at rate of 4, 32, or 256 readings per second.
- Observance Mode…Know when pressure differentials are beyond your set points
- Sampling Mode…Raw data for hydraulic modeling



Steady State



Transient State

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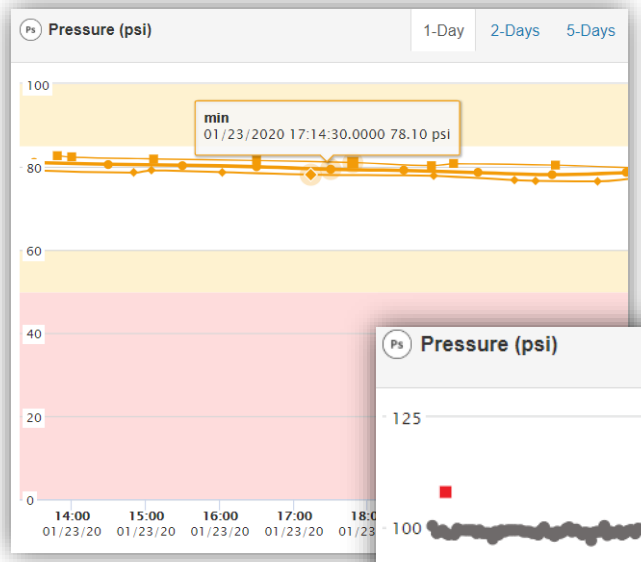
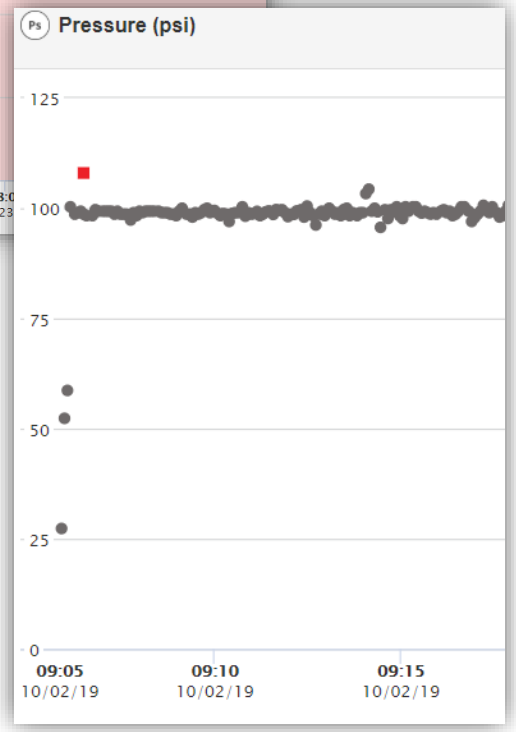
Hydro-Guard Pressure Monitoring System

Pressure Monitoring Methods



< Average / Min. / Max. Mode



Sampling Mode >

- Average / Min. / Max. Mode
  - In the Standard mode of operation for the Hydro-Guard Pressure Monitoring System, Average / Minimum / Maximum pressure monitoring mode, the device shall monitor pressures in 15 second intervals. At the conclusion of every hour, the device will calculate the average, minimum and maximum pressure readings for that hour and log each.
- Sampling Mode
  - In the Sampling mode of operation for the Hydro-Guard Pressure Monitoring System, the device shall record raw data at a frequency of either one reading per 30 seconds or one reading per minute. This feature is beneficial for the creation of a dynamic hydraulic model.
- Transient 256 Mode
  - In the Transient 256 mode of operation for the Hydro-Guard Pressure Monitoring System, the device shall record data at a rate of one reading every 15 seconds unless the device identifies a pressure reading that is at, or exceeds, the operator's pre-determined trigger point for PSI. This trigger point will signal the device to enter into a Transient monitoring mode where it will monitor pressure at a frequency of 256 reading per second. The operator can establish a time frame for which the device will operate in the Transient mode. Once the pre-set time is reached, the device will return to the standard Average / Min. / Max. mode.
- Observance Mode
  - In the Observance mode of operation for the Hydro-Guard Pressure Monitoring System, the device shall monitor the pressure at the installation point and log all data points that meet or exceed the operator's pre-determined trigger point for PSI. When a data point is logged, the data shall be uploaded and a notification generated. Notifications shall be transmitted via SMS text message and/or email to the authorized users on the account.

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Pressure Monitoring…**Where?** When? **What?** Why? How?

Flexible Installation Options:

- In road / Sidewalk / Traffic Rated (when in valve box assembly)
- Water Meter Vault
- AWWA 502/503 Fire Hydrants
- Air Release Valves

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Why Use a Hydrant to Monitor the Water Distribution System?

- It's already installed and easily accessible.
  - 7 to 10 million hydrants installed in the US
- It belongs to the water utility.
  - No additional footprint or infrastructure is required.
- It can be easily modified to monitor key parameters.
  - Leaks
  - Pressure

MUELLER

Smart Hydrant Options

EchoShore DX Leak Detection

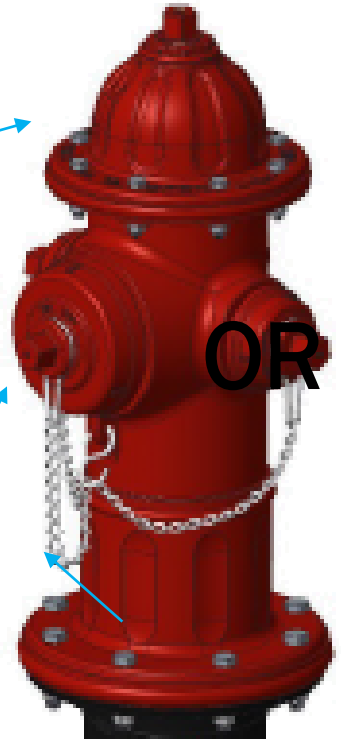
+

Remote Pressure Monitoring (RPM)

=

Smart Hydrant

Pressure Monitoring Hub



EchoShore DX leak detection

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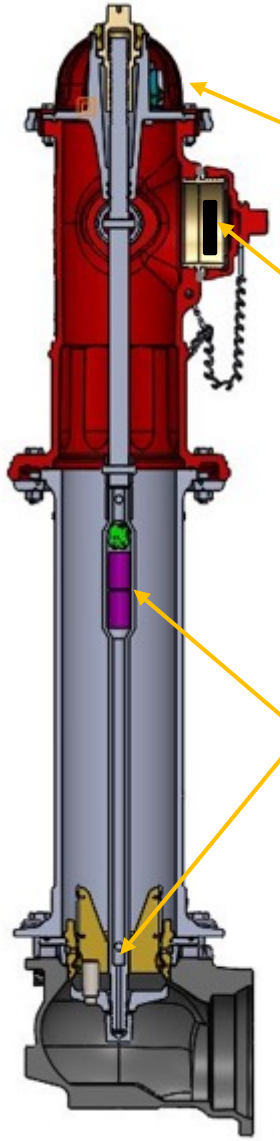
Smart Fire Hydrant



Cellular Hub

Echoshore DX
(leak detection)

Pressure and other sensors integrated into the main valve and lower stem for water system monitoring without charging the hydrant.

Smart Stem

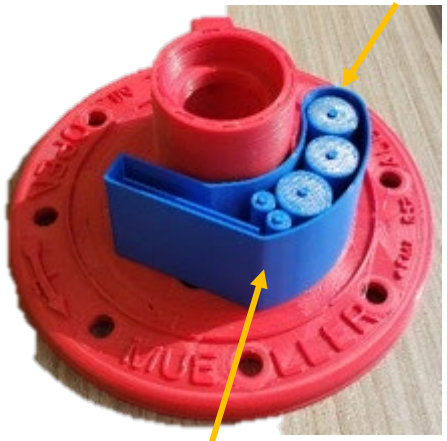
Bluetooth Antenna

Electronics (PCB)

Batteries

Pressure sensor

Cellular Hub Bonnet



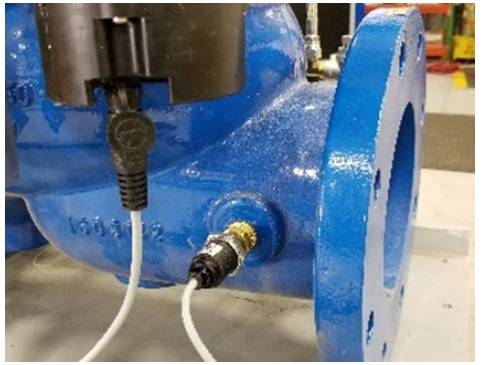
Batteries

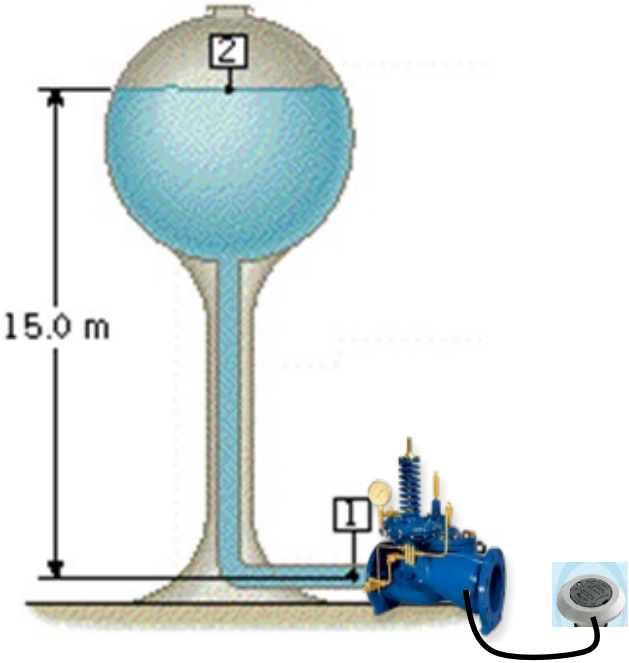
Electronics (PCB)
& Cellular radio

Pressure Monitoring…**Where?** When? **What?** Why? How?

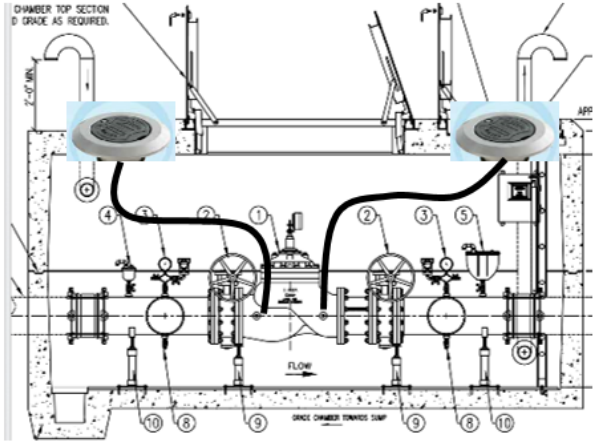
Flexible Installation Options:

- Vault – PRV, etc.
- At the Water Tanks
- Air Release Valves





Cellular pressure transmitter installed on a fire reserve tank fill control valve to monitor fire reserve tank level



Cellular pressure transmitter installed in top cap of a control valve vault monitor upstream & downstream system pressure

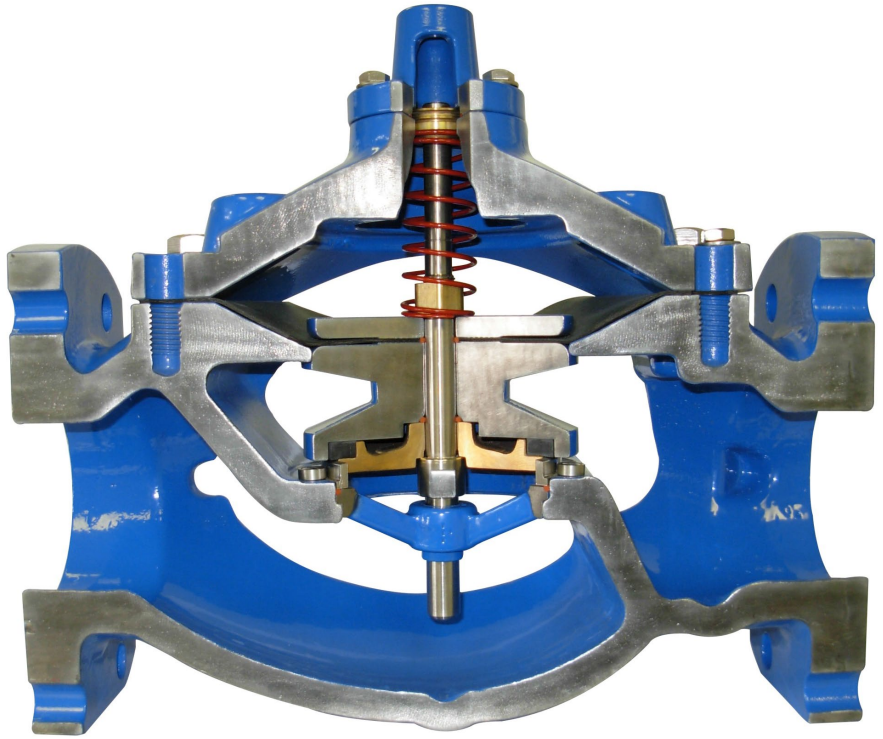
MUELLER

RPM – Remote Pressure Monitoring

- Singer and Hydro-Guard

SINGER™

Pressure Management



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Singer Product Line Overview

- Singer have over 61 years of experience manufacturing pilot operated diaphragm control valves.

Product Line

We break the product into categories. Each category represents a particular type of water control function

- Main Valves: e.g., 106- / 206-PG
- Main Valve Option: e.g., Anti-Cav Trim
- High Performance: e.g., 106- / 206-PR-SM
- Electronic Control: e.g., 106- / 206-SC
- Pressure Reducing: e.g., 10- / 206-PR
- Relief / Sustaining / Surge: 106- / 206-RPS
- Pump Control: e.g., 106- / 206-BPC
- Level Control: e.g., 106- / 206- Two-Way Flow Alt. Valve
- Flow Control: e.g., 106- / 206-RF
- Pilots & Accessories: e.g., 160 Pressure Reducing Pilot

MUELLER

Standard Valve Construction

- Sizes ½” to 48”
- Globe or Angle Style
- 150#, 300#, Threaded NPT, Groove
- 65/45/12 Ductile Iron
- AISI 316 Stainless Steel up to 12” in size

MUELLER

Singer Advantage - Main Valve

Coating:

- Standard Fusion Bonded body
- 8 - 12 Mil (200 - 300 µm) thick
- 2 – coats on bodies
- NSF Approved

Singer Advantage - Main Valve

Fasteners

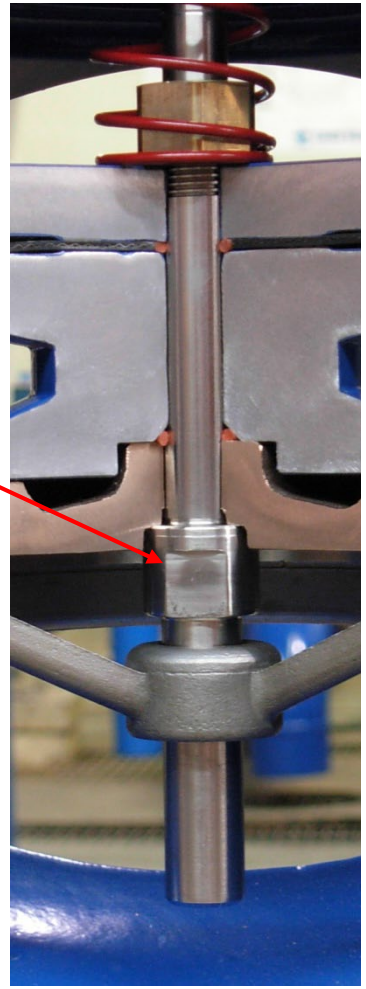
- 18-8SS Bolts
- Washers also supplied
- Protects coating
- No rust – easier to remove years down the road
- Bolts – not studs

MUELLER

Singer Advantage - Main Valve

Stems

- 316 Stainless Steel
- Wrench flats provided – no need to worry about damaging valve stems. 10” (250mm) & below
- Available with Oxy-Nitride coating to increase lubricity. Non- growth protection



MUELLER

Singer Advantage - Main Valve

Stem Caps

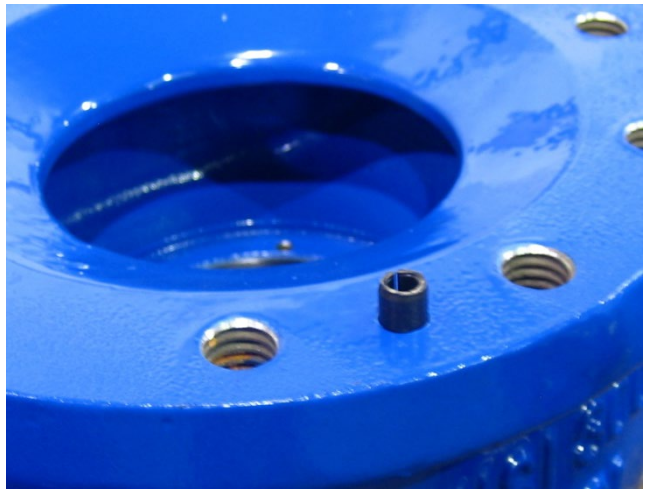
- Removable stem cap to assist in bonnet removal
- Large space around stem eliminates bonnet misalignment and the risk of stem damage

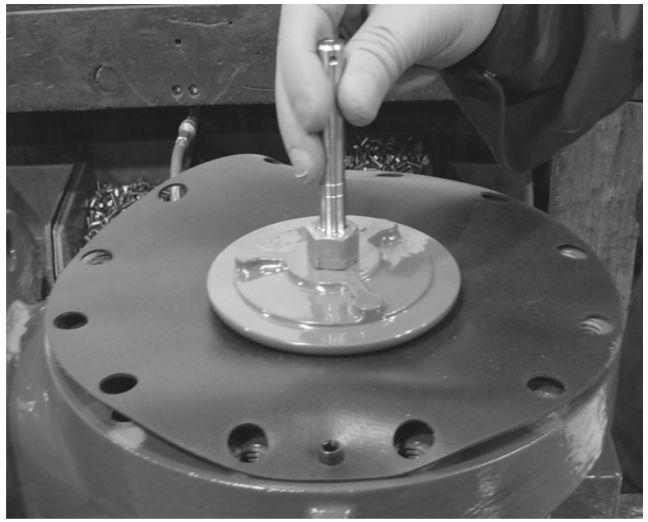
Singer Advantage - Main Valve

Bonnet Alignment:

- Roll pins are utilized to locate the **bonnet** and **diaphragm**

- Why – other option is to utilize a lip design. A lip requires a close tolerance to the body to be effective. Fusion coating the bonnet would require machining after coating to achieve this tolerance, exposing bare metal which will rust over time.





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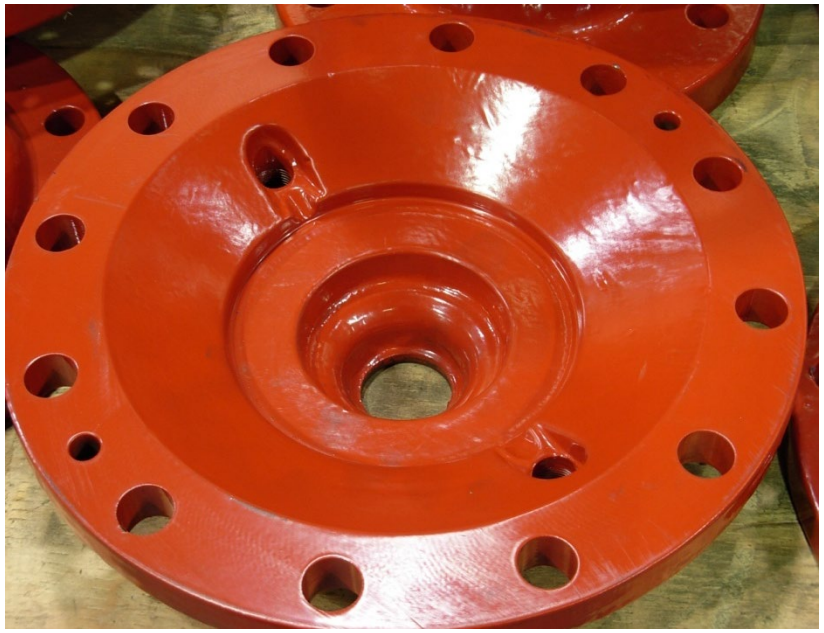
Singer Advantage - Main Valve

No Jacking Screws:

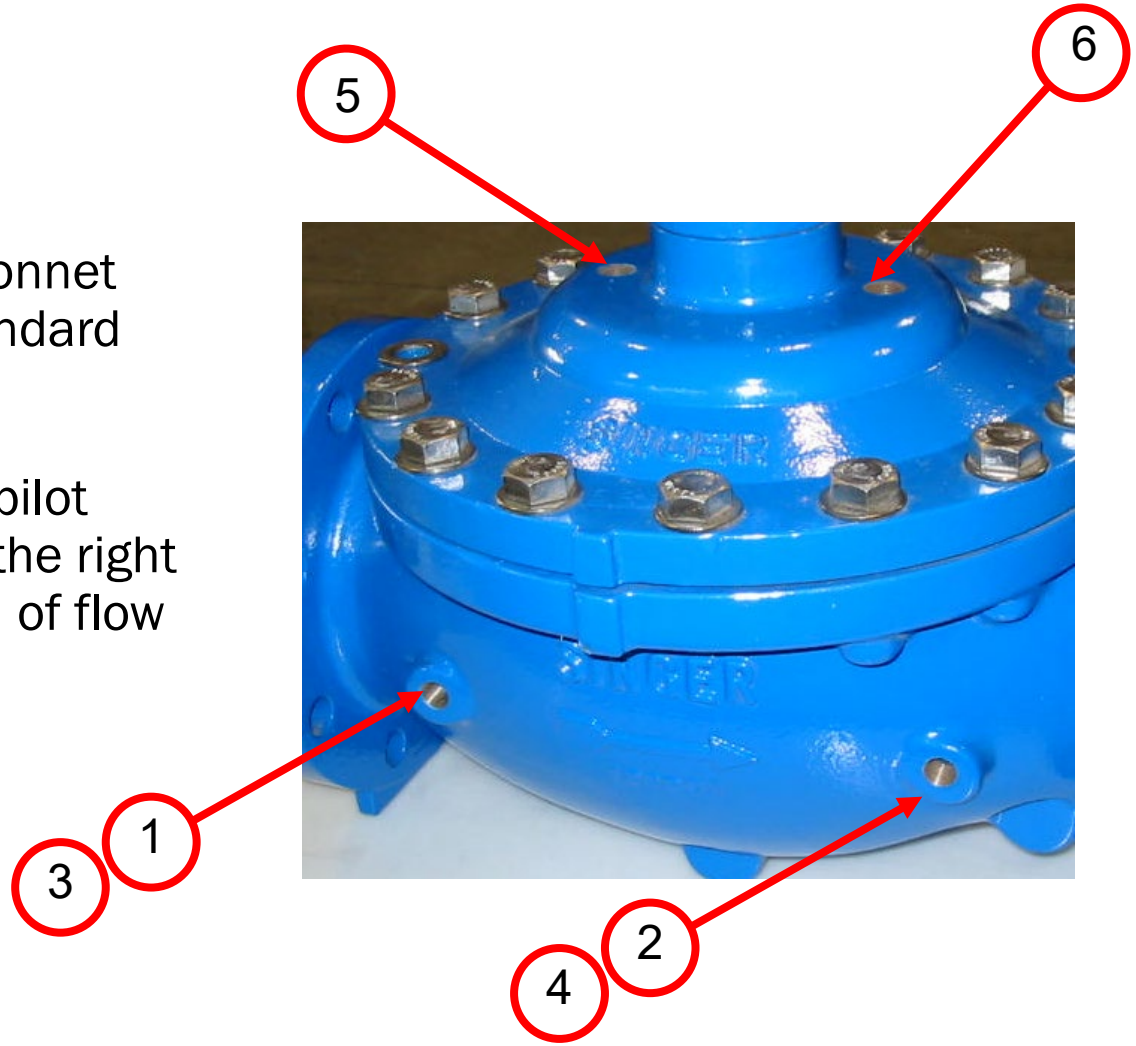
- As the bonnet has no bare exposed metal to rust and bond to the body. It is removed easily without the need for jacking screws or a cold chisel.



Singer Advantage - Main Valve

Body Tapping's:

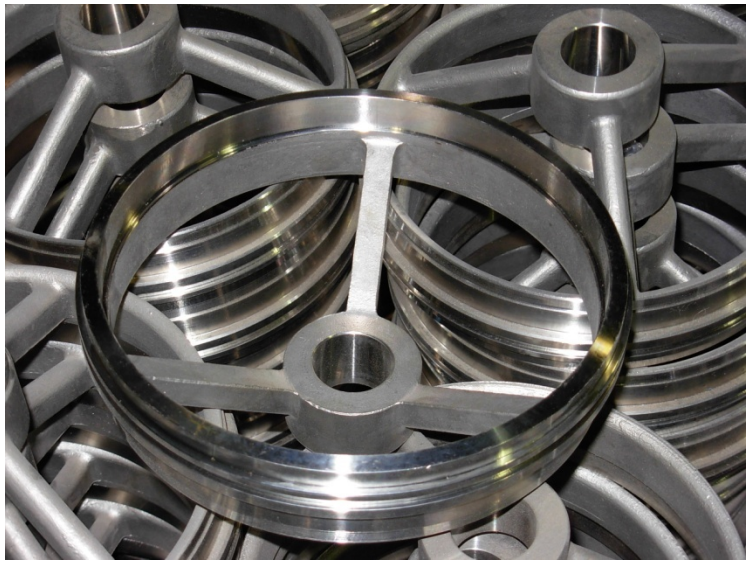
- 4 body tapping's and 2 bonnet tapping's included as standard
- As an industry standard, pilot systems are installed on the right hand side in the direction of flow



Singer Advantage - Main Valve

Seat :

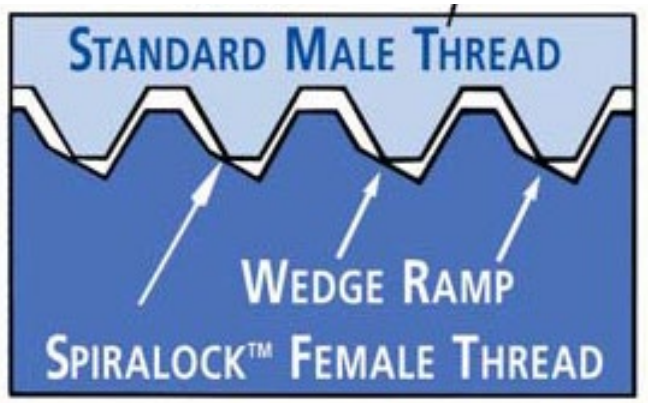
- Seats are 316 Stainless Steel
- Guaranteed for life of valve
- Bottom guide and seat are now one piece on sizes 8” and below



Singer Advantage - Main Valve

Seat Mounting

- Seats are held in place with Stainless Steel screws and washers
- Easily removable with standard slotted screwdriver
- Self locking due to Spiralock® tap design
- Spiralock® is a unique and proprietary preload locking internal (female) thread form that's exceptionally resistant to transverse vibration - the primary cause of thread loosening
- Used on everything from NASA's Saturn probe to artificial knee joints.



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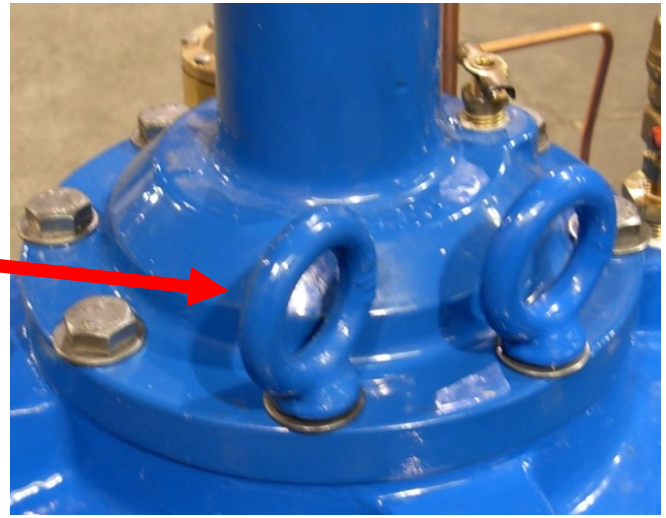
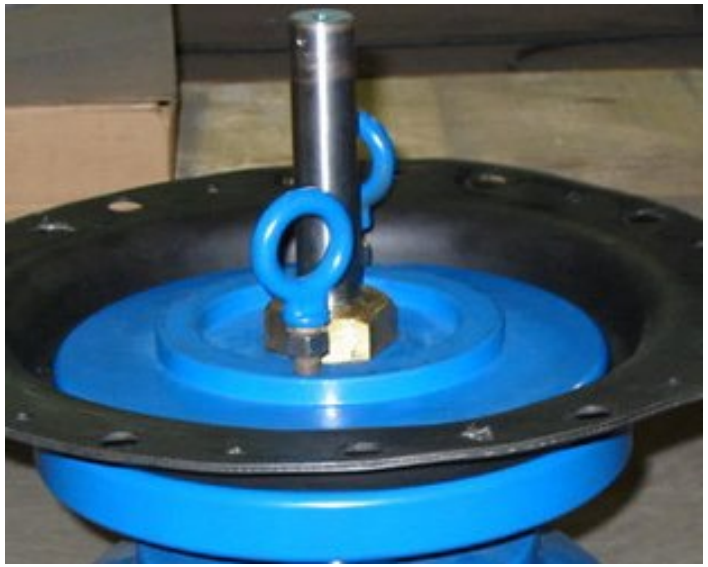
Singer Advantage - Main Valve

Lifting Eye Bolts

- Lifting eye bolts provided to assist in disassembly on larger valves

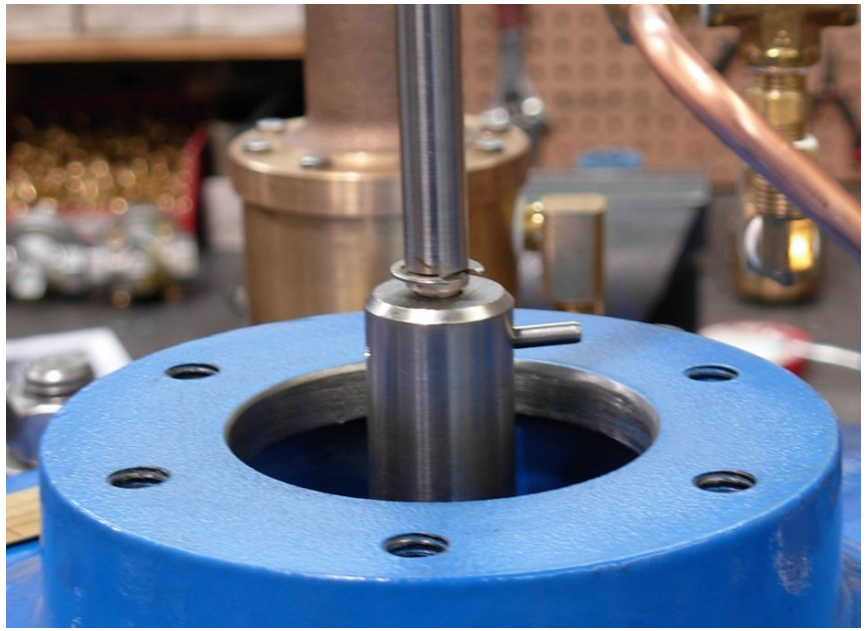




Singer Advantage - Main Valve

Stem Extensions – for Limit Switches/Position Indicators

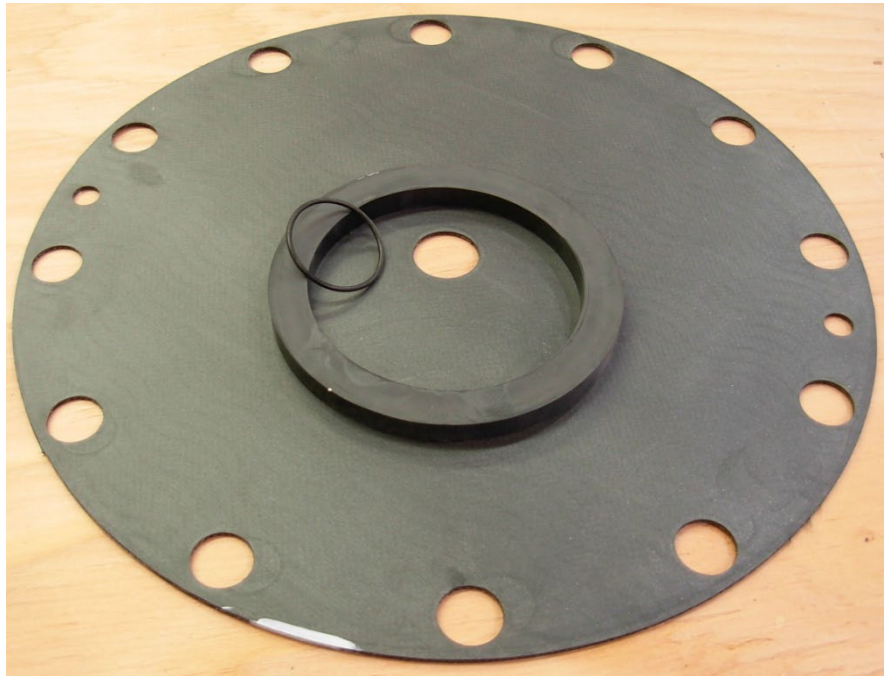
- Stems are held in place with roll pin – not threaded
- More free movement of extension eliminating binding through bushings



Singer Advantage - Main Valve

Elastomers:

- EPDM is standard for most elastomers in the main valve
- Better chlorine handling capability



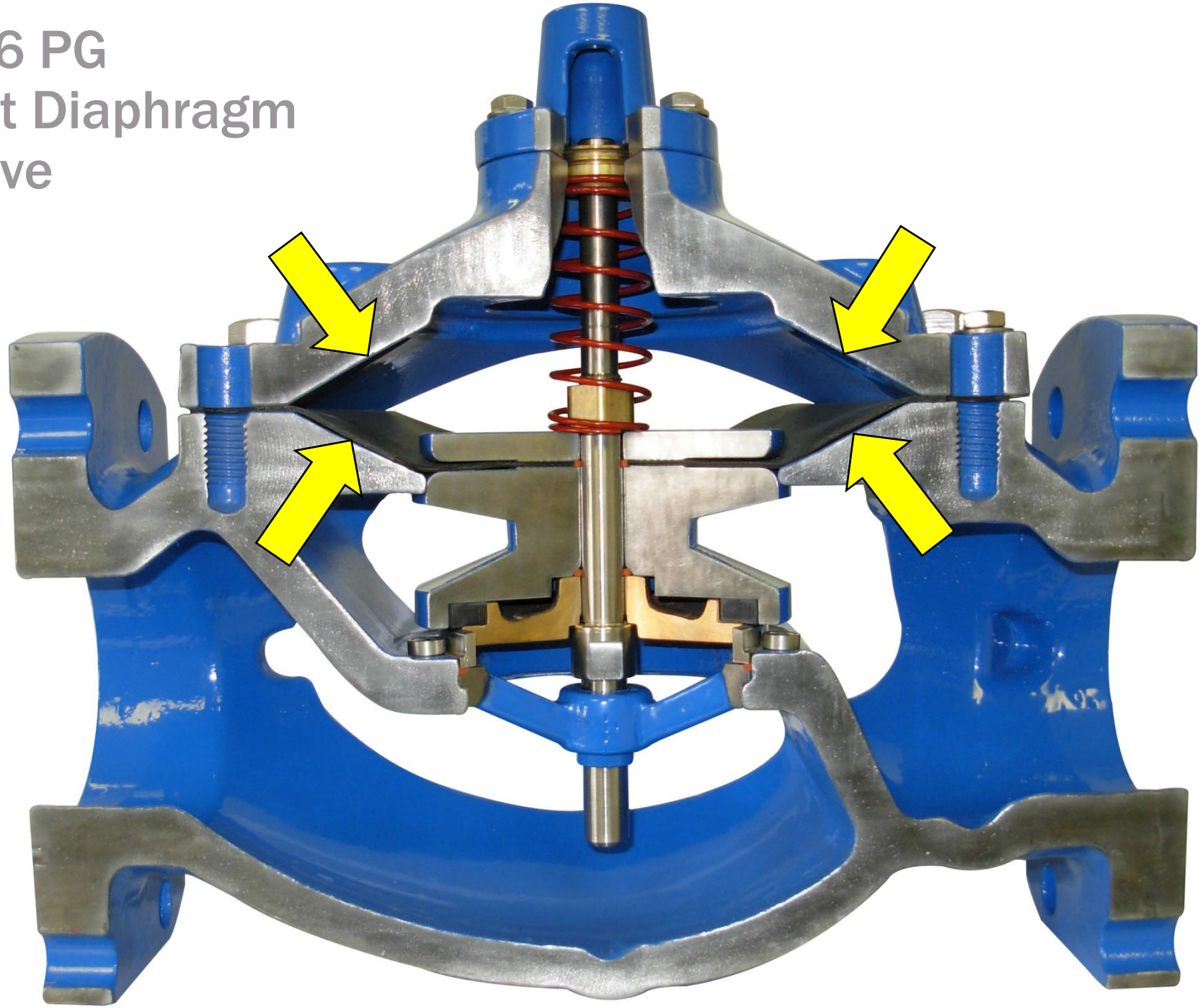
Singer Advantage - Main Valve

Covers:

- 6” and larger, covers are smaller diameter than competitors – lighter, easier to handle

SAFETY!!

106 PG
Flat Diaphragm
Valve



Why it works...

Surface Area:

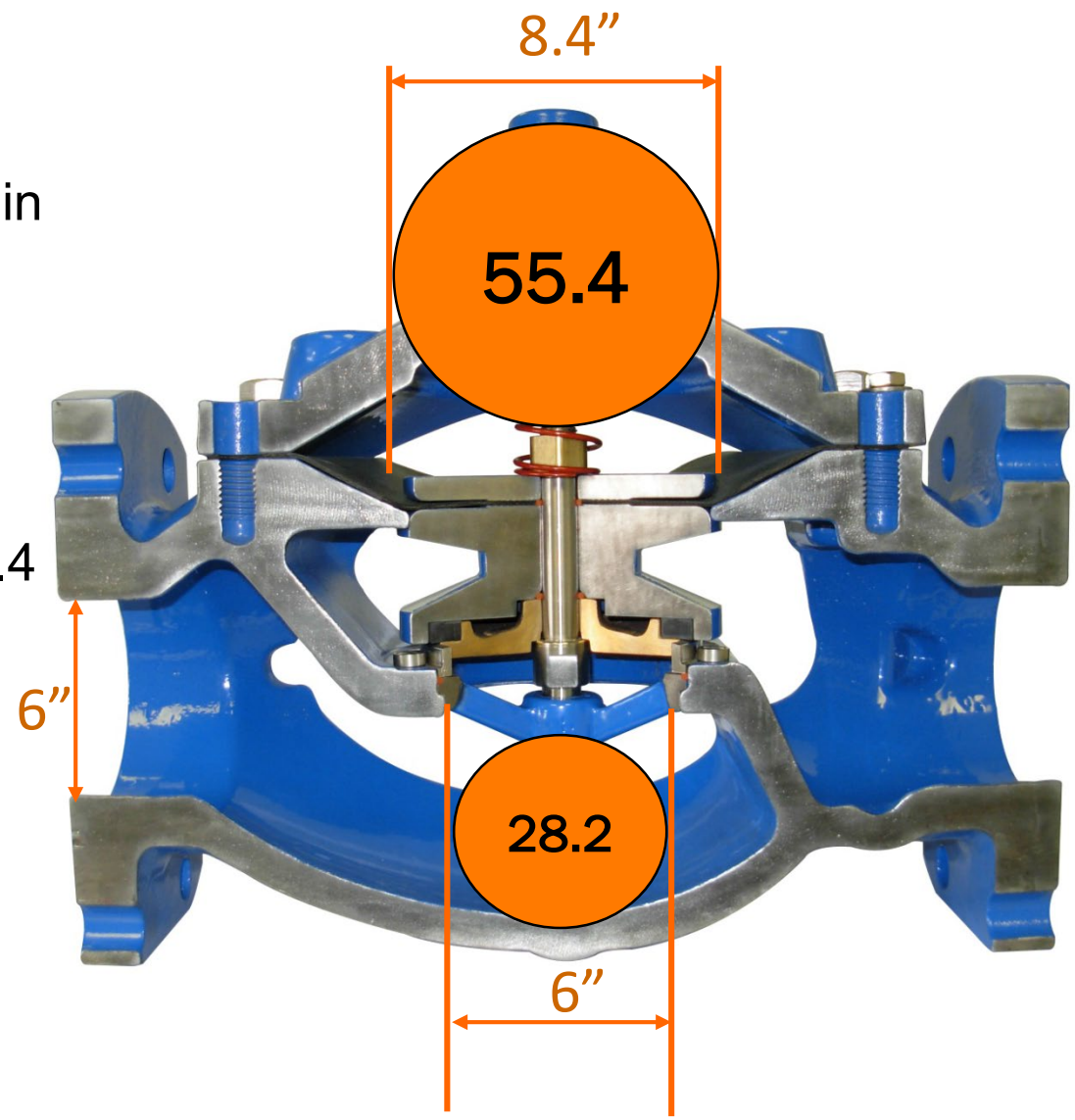
Calculation:
(Surface area) X (PSI) = Force in pounds

Assume 100 psi in line and in bonnet

Area on top of diaphragm is 55.4 sq inch

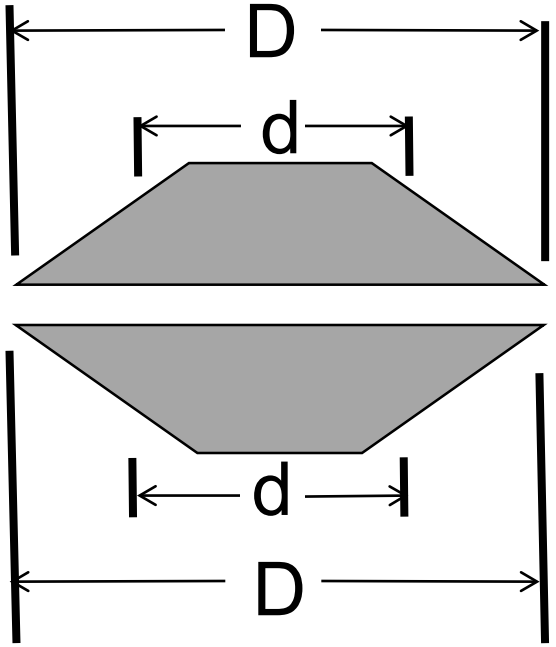
Orifice Area is 28.2 sq. inch.

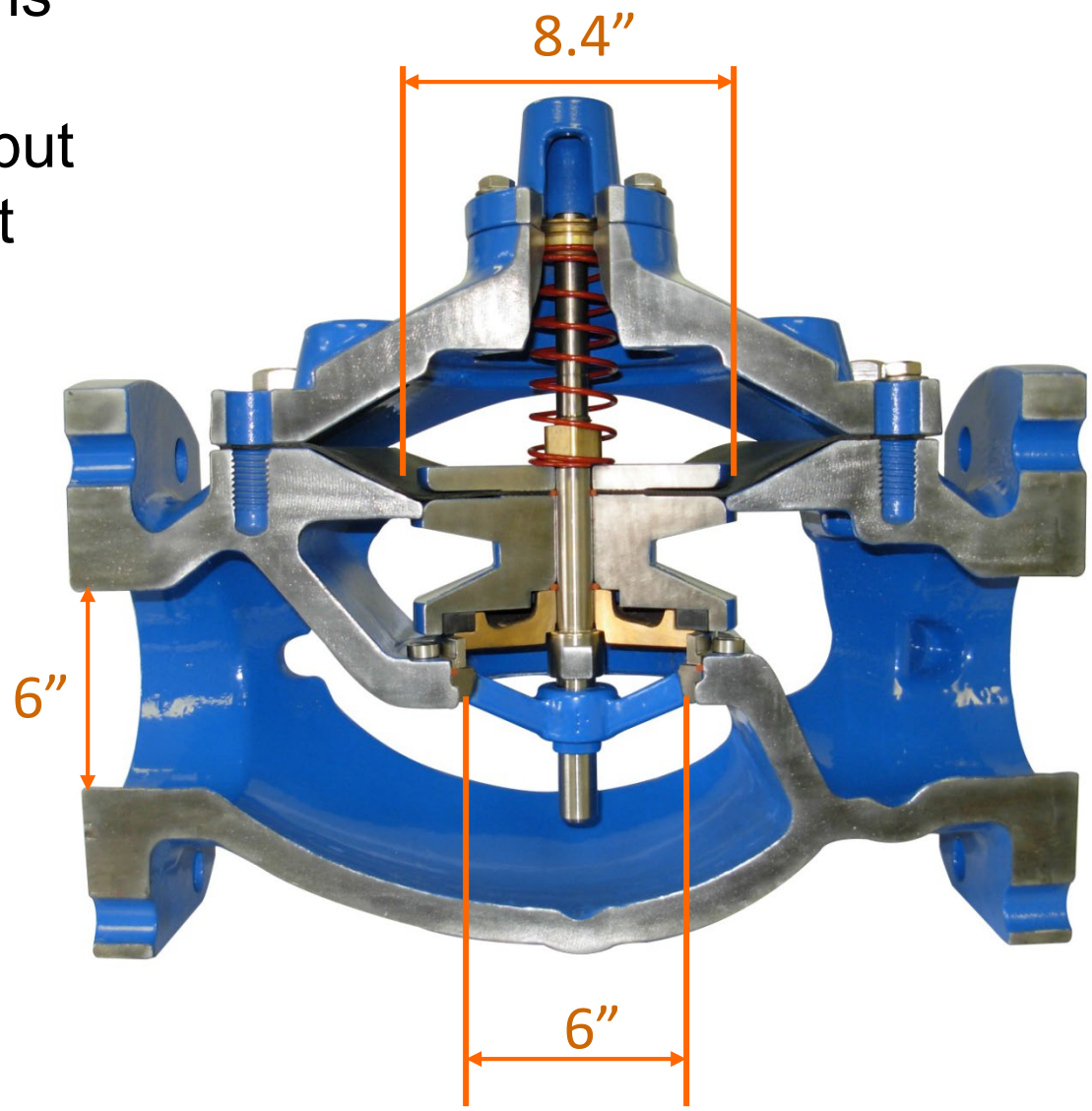
Closing Force =
100 x 55.4 = 5,540 lbs
Opening Force =
100 x 28.2 = 2,820 lbs



Valve Operation

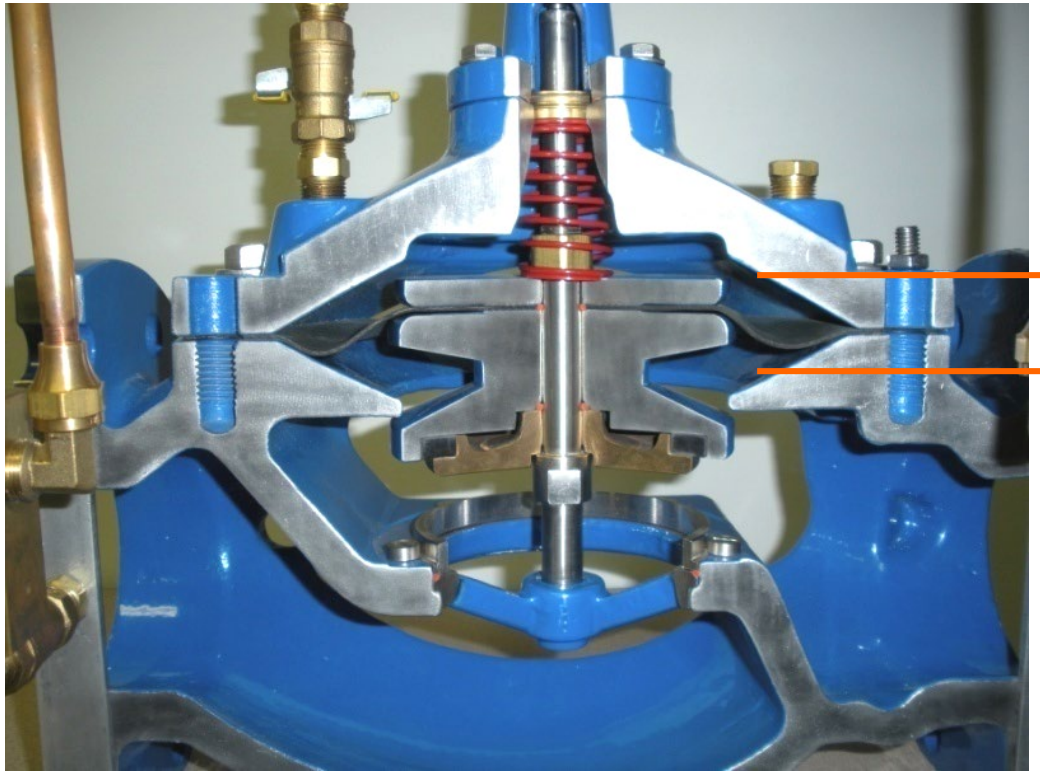
- As the main valve opens the surface area of the diaphragm increases, but the opening is constant
- As the surface area increases so does the available closing force.





Large Flat Diaphragm Valves

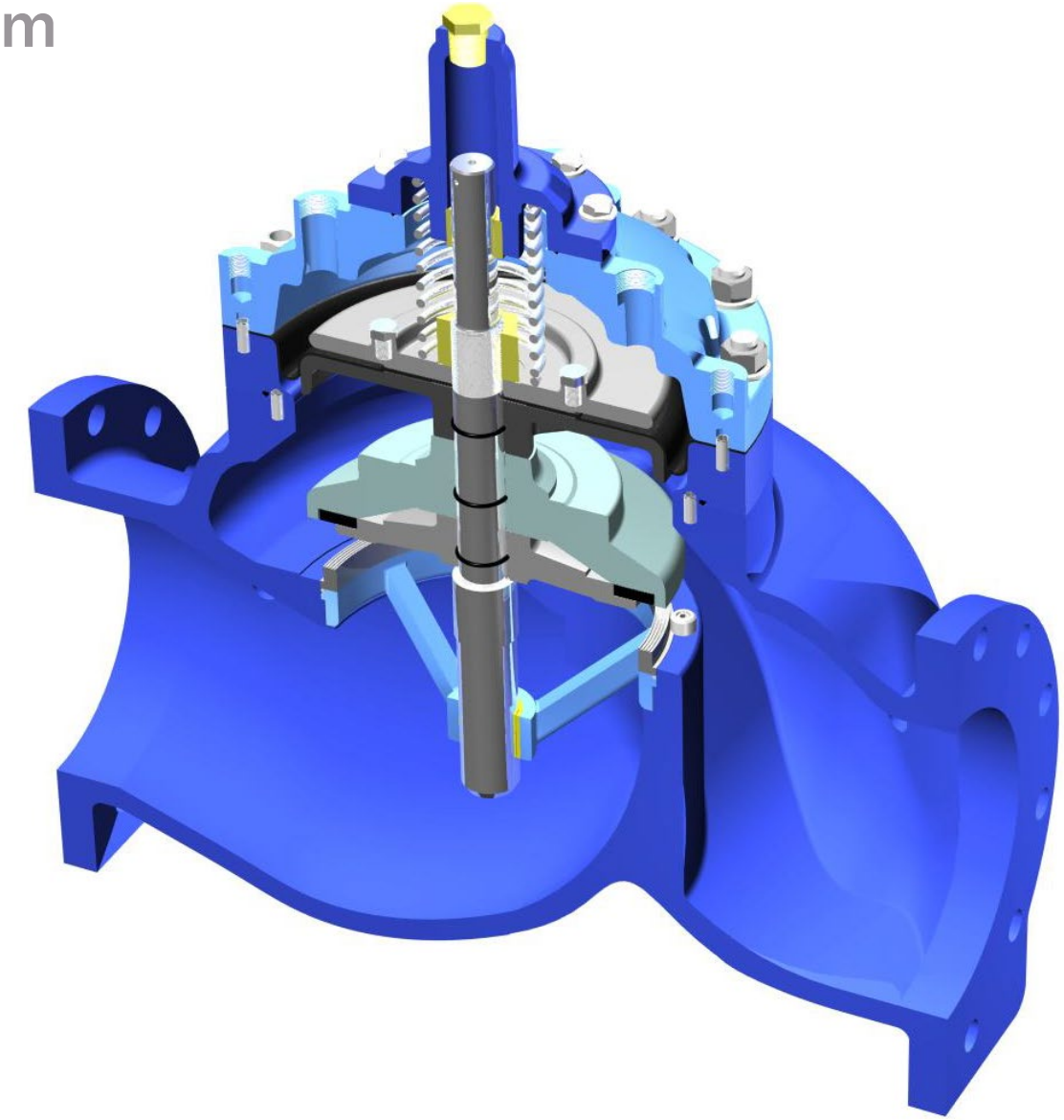
Hydraulic control becomes difficult In larger size valves over 6” that have flat diaphragms.



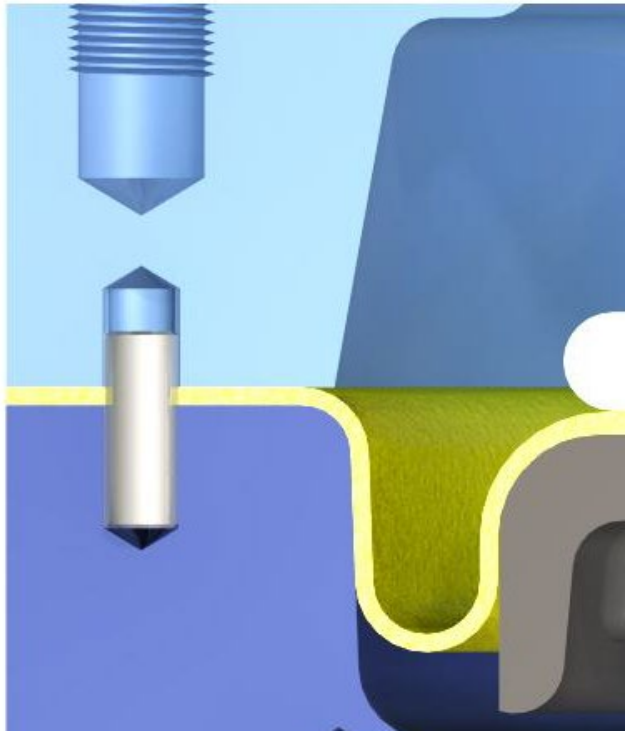
Best level of control when the valve is 20%-80% open

106 PG-SRD
Single Rolling Diaphragm

Optimal pressure and flow control using the SRD Single Rolling Diaphragm



106 PG-SRD
Single Rolling Diaphragm

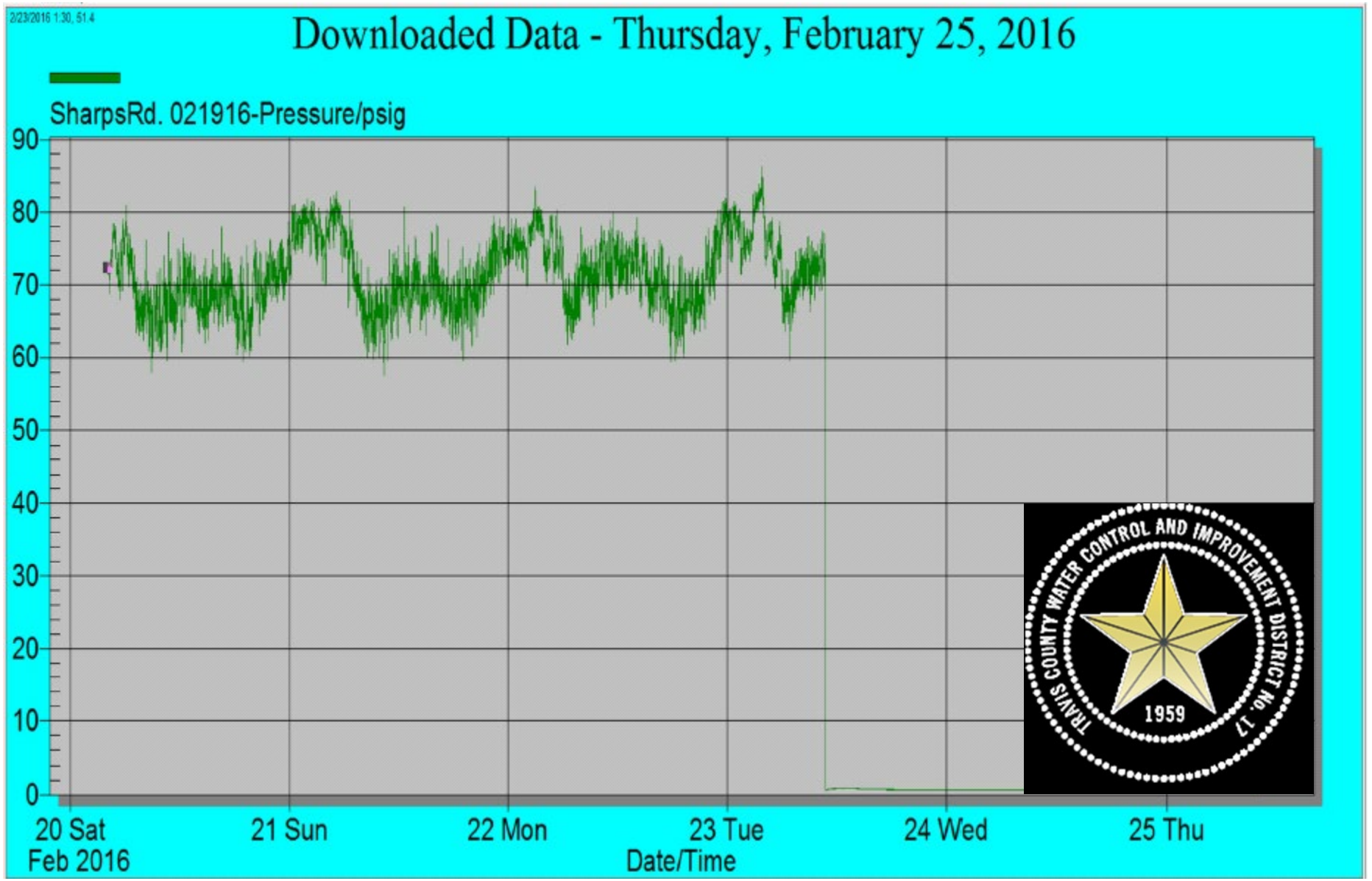


- Diaphragm is exposed to control pressure over the entire stroke of the valve.

- There is no loss of diaphragm surface area as in flat diaphragm valves.

- Maximizes the effective area for optimal control. “No hunting”.

- Provides for low flow and high flow stability.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90
80
70
60
50
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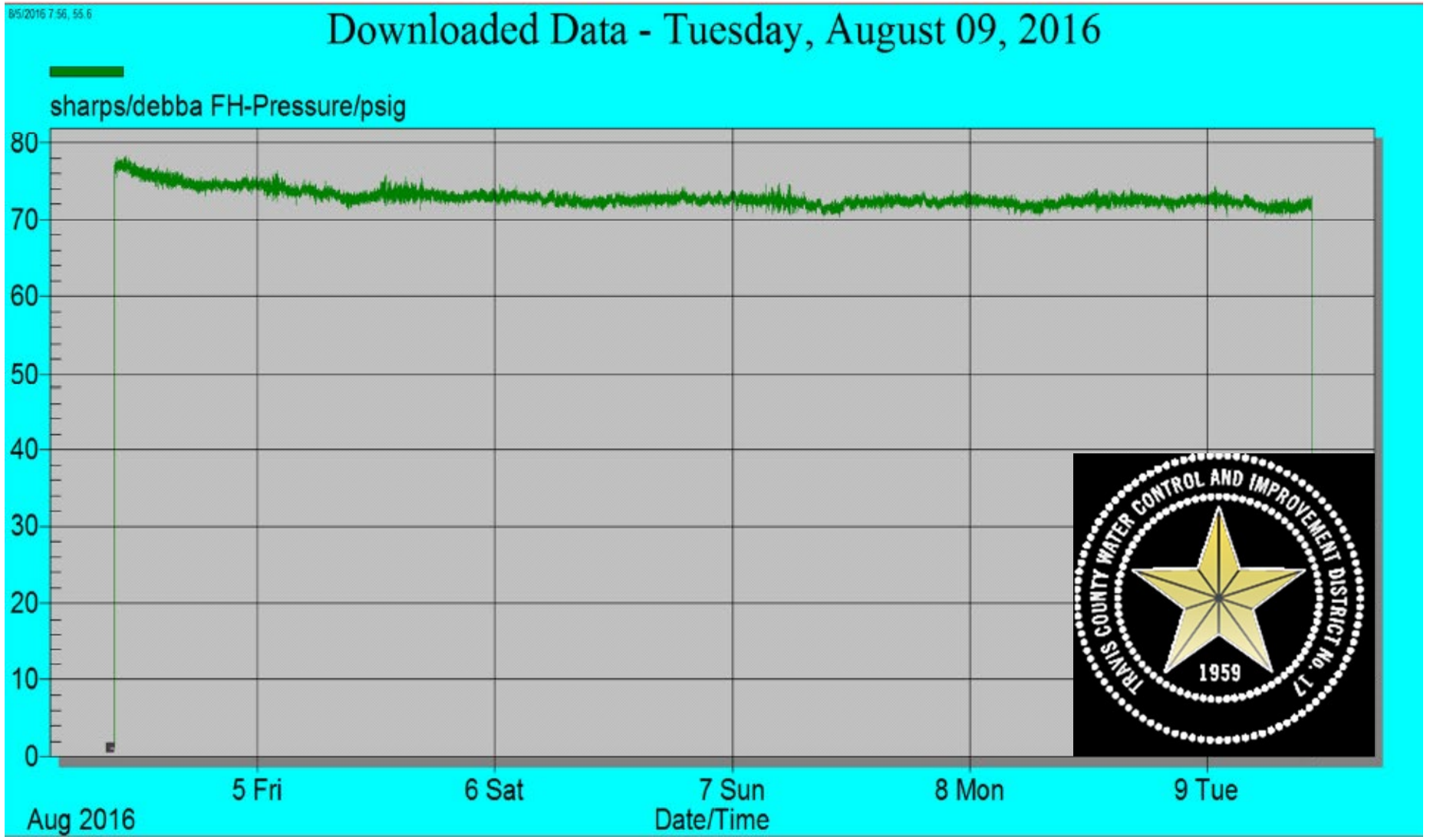
24 Wed
25 Thu
Date/Time
TRAVIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT No. 17
1959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sharps/debba FH-Pressure/psig
80
70
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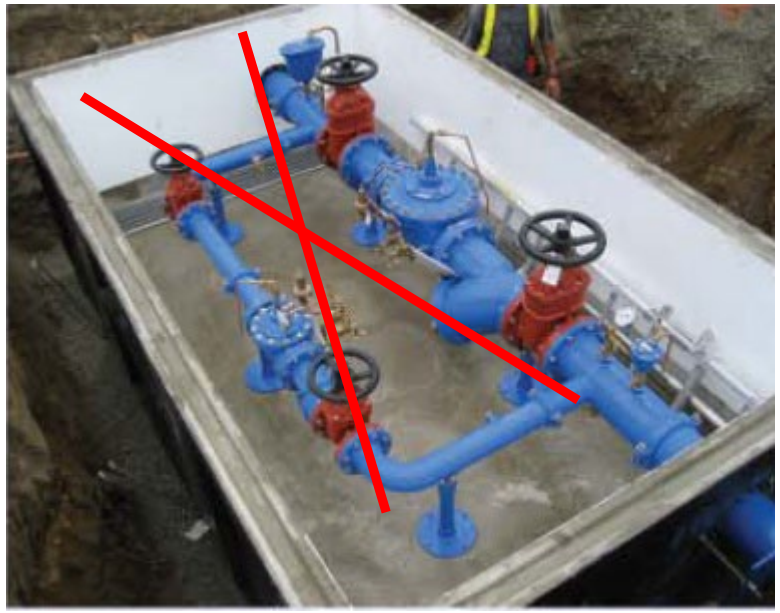
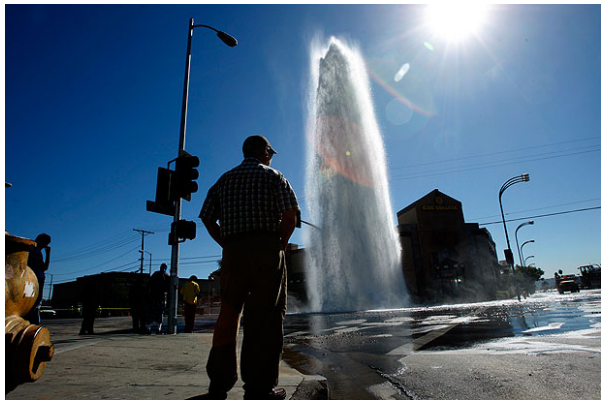
TRAVIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT No. 17
1959

106 PG-SRD
Single Rolling Diaphragm



- Low flow stability – without the need for external bypass for low flow
- Save space and construction cost.
- 3 – 4900 GPM on a 10” valve.
- Lowest flow capability in the Industry.
- Available in 6” and larger valve sizes.

What happens when a pressure reducing valve *fails*?



You get exactly what you do not want, HIGH PRESSURE DOWNSTREAM that can lead to:

- Pipe breaks
- Damaged pipes within the distribution network
- Water loss
- Consequential associated damages
- Interruption of service

Pressure Reducing Valve with integral back up

- Application is for areas of critical service where loss of control is not an option
- Built in protection for diaphragm, pilot failure or plugged strainer
- Includes downstream surge protection
- Optional limit switch to signal back up system
- Provides overpressure protection to supply system

Pressure Management

SINGER VALVE
Result-Based Solutions. Globally.™

PRSM

Surge Pilot set to
55psi / 3.74 bar

Pressure Reducing Pilot set to
50psi / 3.45 bar

Pipe Inlet Pressure

80 psi
5.52 bar

Pipe Outlet Pressure

50 psi
3.45 bar

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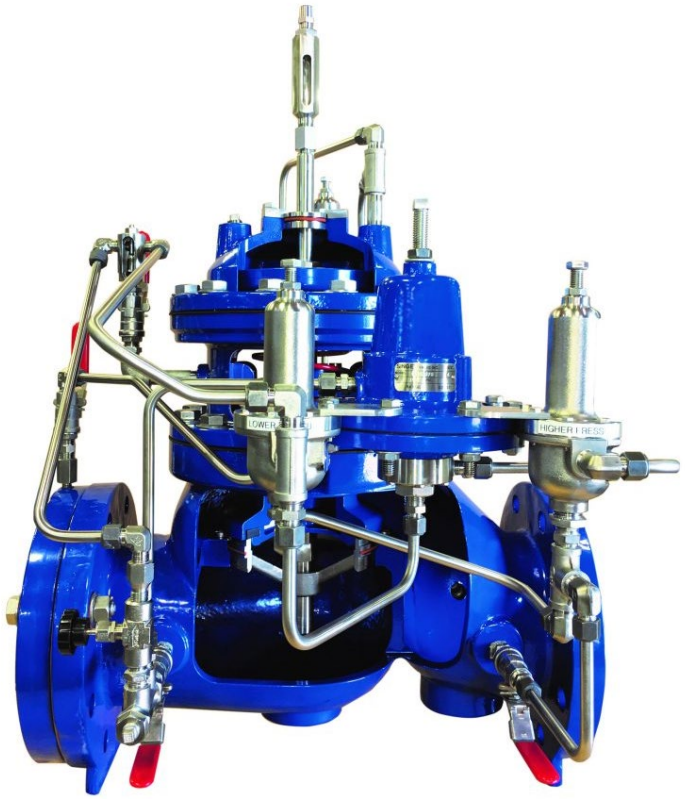
Pressure Management – Two-Step Pressure w/Redundancy

2 Step Valve with Integral Redundant Control

Singer 106- PGM-2PR-630-SM Pressure Management Valve with Integral Backup.

Designed for applications where failure is not an option, this valve hydraulically manages pressure around the clock to reduce water loss, save money and prevent unwanted pressure spikes that contribute to premature pipe failure.



Hydraulic Flow Based Pressure Management

MUELLER

PRV – Motor Driven Pilot Interfacing with Scada (4 – 20 mA)

– remote pressure control

- 24 VDC (AC Option available) and in submersible
- Pressure and flow transmitters can be used in each DMA to relay real time data to SCADA
- Motor device interfaces with adjustment on pilot
- Power failure results in constant pressure at last setting
- Continuous adjustments of flow based on changing pressures – Flow Modulation

MUELLER

Pilot Operated Control Valve
Flow Metering Measurement Options

- Flow Metering is possible as an option on any pilot operated control valve
- Straight runs of pipe not required (eliminates the need for a meter and separate meter pit). 3 pipe lengths upstream of the control valve is required
- Flow metering can be added to pressure reducing, sustaining, altitude, pump control or any other control valve model
- Accurately measures flow, senses reverse flow and empty pipe

MUELLER

Flow Metering Valves

- Proven Insertion Magnetic Flow Meter Technology
- 2% Accuracy of READING not full scale
- NIST Traceable – Fully Lab Tested
- Flow rate accuracy from .3ft/sec to 32 ft/sec
- Self cleaning – Maintenance free
- Available in sizes 3”- 48” for any Control Valve Model

Converter

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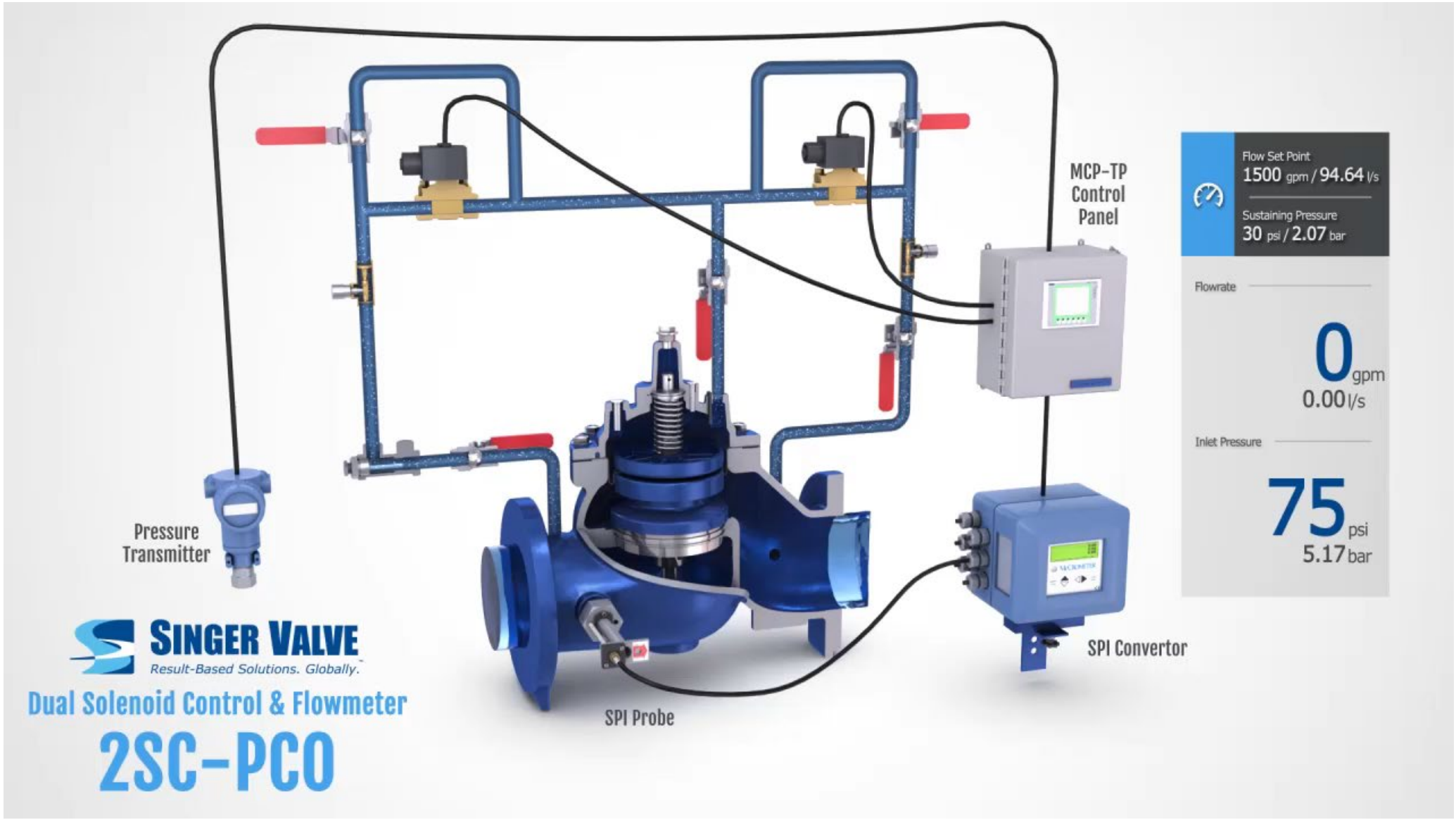
2SC-PCO



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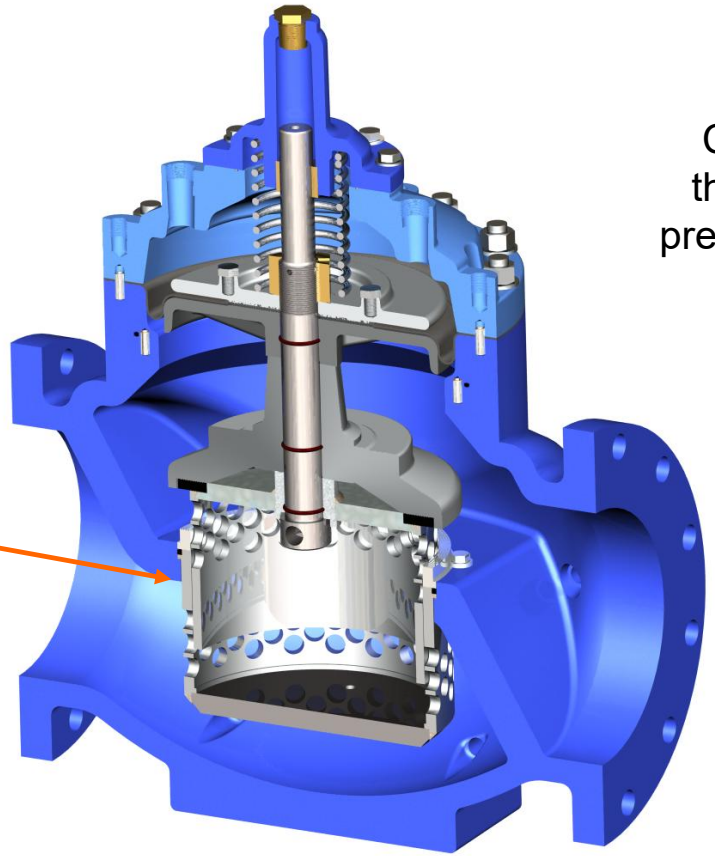
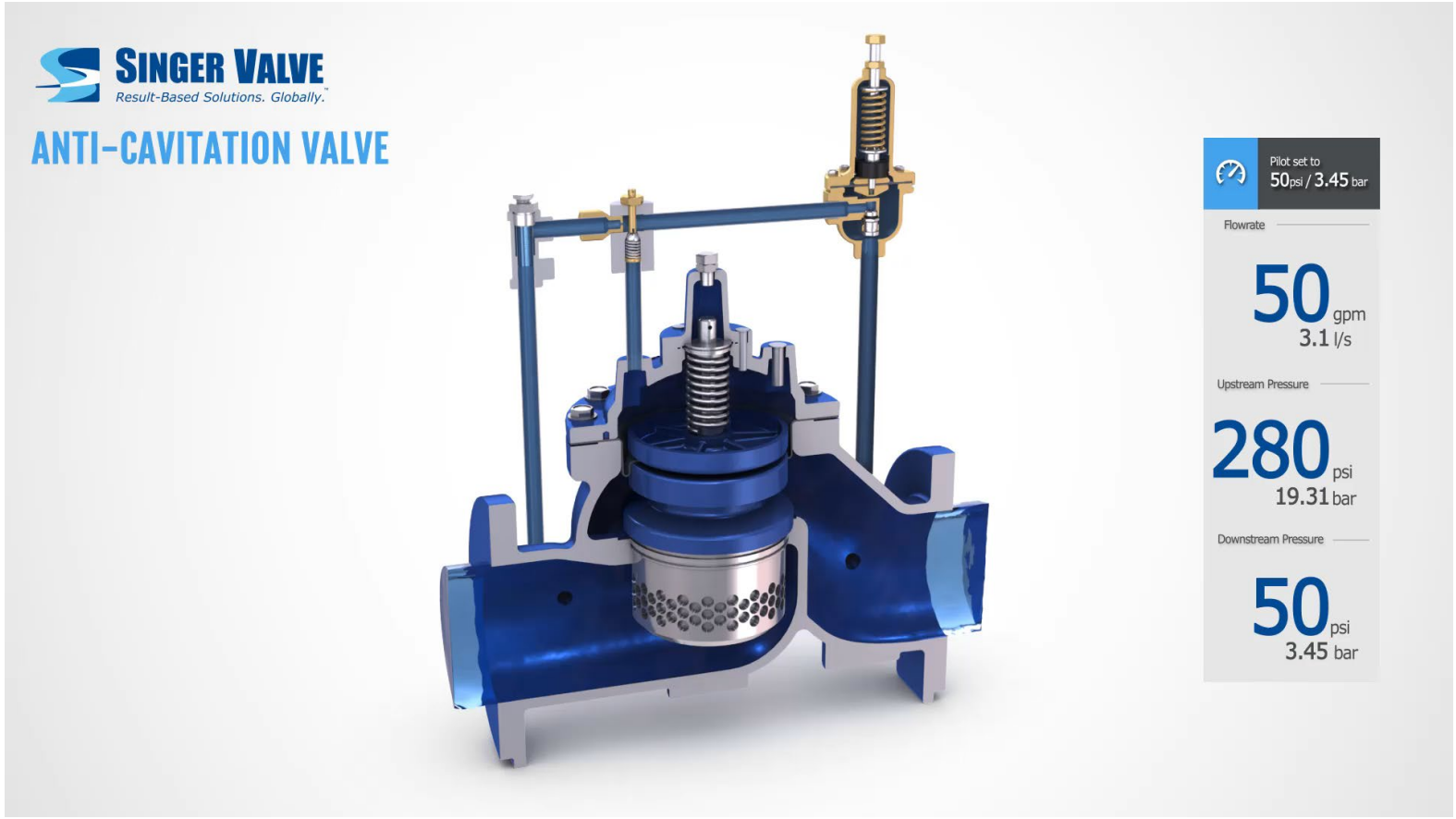
Cavitation Control



Double sliding cages

Cavitation will occur when there is greater than a 65% pressure drop across the valve

Model 106 PR-AC Anti-Cavitation Valve



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Renewable Energy!

KEY BENEFITS

An end-to-end solution that accurately controls pressure, reduces operating costs and creates a new source of revenue by producing electricity that can be used onsite or sold to electric utilities (net metering and wheeling).

Low cost source of energy

- High utilization/capacity factor;
- Space efficient;
- Easy installation;
- Low maintenance costs.

Low operating risk

- Uses proven components.

Long operating life (>30 years).

In-PRV PRODUCT

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Thank you for your interest and time.