Integrating Valve Assessments With Pipeline Inspections

How to Apply a Specific Valve Assessment to a Specific Pipeline Inspection Tool Platform

Brad Gresham, Business Development Manager - South Region
Wachs Water Services, a Xylem brand

Wachs Water Services

Serving Water Utilities since 2000
Division of Pure Technologies 2015
Acquired by Xylem – February 2018
- >100 Full-Time Employees
- ~ 350 clients served
- 164 projects in 2020 (121 Clients)
- Experienced Operations Team
- Dedicated Information Services Team
- Client Support Team
- Experienced Management
The EPA and The Water Research Foundation (study 4369)

• “having an asset management program in place can play a key role in minimizing damage due to infrastructure failure, particularly if the program had a special focus on the valve management program.

• Knowing the exact location of each valve, whether the position of the valve was open or closed and having performed regular operability maintenance of the valves, made it more likely that the utility’s crew could quickly isolate the area of the break, and thereby, minimize the amount of water discharged and damage to surrounding properties.”

Water Research Foundation (study 4451)
Financial Costs - WRF 4451

Defining “High Consequence” Pipe Breaks

Financial - borne directly by utility, other agencies
- Direct cost of event response, emergency repairs
  - Labor, Overtime, Equipment, Materials
  - Police and fire department assistance (e.g., traffic)
  - Alternative water provision
- Direct cost of restoration and claims (post event)
  - Repaving costs (patch, width, full block)
  - Litigation expenses / liability claims
- Water loss, foregone revenue
- Loss of public confidence and trust in the utility

Societal Costs - WRF 4451

Defining “High Consequence” Pipe Breaks

Societal - borne by customers and community:
- Property and other collateral damage
- Impacts on adjacent infrastructure (e.g., power, telecommunication, transportation)
- Transportation disruption (travel time, delays and inconvenience)
- Business losses (commerce and manufacturing)
- Loss of service to essential facilities (e.g., hospitals)
- Inconvenience to residential customers
- Water quality degradation (health risks, advisories)
Environmental Costs – WRF 4451

Defining “High Consequence” Pipe Breaks

Environmental
- Sediment, chlorine, scouring, and related impacts on proximate sensitive receptors
- Fish and aquatic/riparian species and habitat
- Regulatory implications and fines
- Greenhouse gas emissions
- Embedded energy in lost water
- Emergency repair vehicles and equipment
- Traffic detours – longer drive times

Evolution of Asset Management
Convergence of Pipeline Building and Distribution Asset Eras

Reactive → Proactive → Predictive

<2010
- Failure Avoidance
- Foundation for growth
- Era: Bury and Forget It!

2010 - Present
- Adoption of AM
- Receptive to technology
- Era: Extending Useful Life!

2017 - Future
- Move to optimize (TOTEX)
- Using data to inform decisions
- Era: Data & Knowledge!
Finding the “Weak Links”
Not All Old Pipe is Bad Pipe
Not All Old Assets are Bad Assets

1. Find the weak links
2. Repair
3. Manage Distribution System

Regarding Valves and Hydrants, What is Risk?

Risk = Probability of failure times Consequence of failure
Risk: Both Sides of the Equation

Likelihood of Failure
- Condition
- Material
- Service history

Consequence of Failure
- Financial
- Environmental
- Social

Risk

What creates Consequence of Failure

Duration
How long the damage is occurring

Footprint
Over what area is the damage occurring

Damage Rate
What damage is occurring (where and what)
How to Manage Consequence of Failure

Shorten the time
\( (duration) \)

Make the impacted area smaller
\( (footprint) \)

How to Manage the Consequence of Failure

- Better Data
- Asset Information and Operation
What Constitutes **Information** Usability?

- Is it **accurate**?
- Does it have **meaningful** content?
- Do I have **access** to it?

What Constitutes **Asset** Usability?

- Can I **find** it?
- Can I **access** it?
- Can I mechanically **operate** it?
What is a Critical Valve?

- Large Valves that Control Transmission
  - 16” and larger but relative to Municipality size
- The 1st Valve Off the Main – Can’t Isolate Mains w/o Them
- Valves Near Critical Facilities
  - Hospitals & Dialysis
  - Schools & Universities
  - Police & Fire
- Valves that Control Flow Across / Under Crossings
  - Rivers & Streams
  - Highways & Byways
  - Rail
How Can We Prioritize Repair / Replacement?

- Run Repeated Isolation Traces (simulated Main Breaks)
- What Valves have the BIGGEST Impact
  - Reduce Footprint of Affected Area
  - Reduce Duration of Main Break before Isolation
- Rehab / Replace Highest Impact First

Why Not Just Replace Them All?

*It's Expensive!!*
- DC Water - $300K / Large Valve Replacement
- Louisville Water - $500K (26’ deep)
- Grand Rapids – 5 Large Valves / 3 Vaults - $600K
- Cost of the Valve
- Cost of the Contractor
- Cost of Disruption

*A Municipality Can Often Repair at a Fraction of the Cost of Replacement!*
Valve Assessments Can Be Grouped by Their Purpose and Integrated

**Valve Assessment Types**
- Level I Valve Assessment
- Level II Valve Assessment
- Level III Valve Assessment

Pipeline Inspections Can Be Grouped by Their Purpose and Integrated

**Pipeline Inspection Types**
- Leak Detection of Pipe and Appurtenances
- Visual/Sounding Wall Inspections
- Electromagnetic Wall Inspections
Valve Assessments Types and Purpose

**Level I Valve Assessment**
- Turn Counts
- Torque Required
- GPS Coordinates
- Name Plate Data
- Structure Type
- Surface Type

**Level II Valve Assessment**
*It's all about gear performance and gear condition!*
- Butterfly Valve Actuators
- Gate Valve Gearboxes
- Includes Level I Assessment

**Level III Valve Assessment**
- Disc and Gate Condition
- Disc and Gate Position
- Seat Rings, Gaskets, Seals
- Very Large Valves
- Includes Level I & II Assessments

Pipeline Inspections Tools and Purpose

**SmartBall Leak & Air Pocket Detection**

**Sahara Leak & Air Pocket Detection**

**PipeWalker EM**

**Visual and Sounding**

**Robotics**

**PipeDiver**
When, Where, How and Why to Integrate Valve Assessments With Pipeline Inspections

SmartBall Leak & Air Pocket Detection

Level I Valve Assessment

Sahara Leak & Air Pocket Detection

Level I Valve Assessment
When, Where, How and Why to Integrate Valve Assessments With Pipeline Inspections

Level I Valve Assessment  PipeDiver EM Inspection  Level II Valve Assessment

When, Where, How and Why to Integrate Valve Assessments With Pipeline Inspections

Level I Valve Assessment  Robotics Technology
When, Where, How and Why to Integrate Valve Assessments With Pipeline Inspections

Visual & Sounding
- Hollows
- Joints
- Spalling
- Cracking
- Leaks
- Rust

Level II Valve Assessment
- Focus is Gearbox
- Worm Gear Type
- Traveling Nut Type
- Scotch Yoke Type

Level III Valve Assessment
- Inside the Pipe
- Disc/Gate
- Internal Stops

When, Where, How and Why to Integrate Valve Assessments With Pipeline Inspections

Level III Valve Assessment
- Disc/Gate
- Internal Stops

Human-PipeWalker EM Inspection
Most pipe in the ground is in good condition and does not need to be replaced!

Why replace your large and critical valves when your can assess and rehab for 1/10 the cost?

---

**Additional Benefits to the Municipality**

- Know Where Everything Is
- Know What Works & What Doesn’t
- Better Water Quality
- Higher Water Pressure
- Lower Pumping Costs, Extended Pump Life (hidden cost)
- Reduced Number of Main Breaks
- Maintain a Low Profile / Stay out of the News!
- Prioritize Maintenance & Capital Spending
Where Should You Begin?

• Don’t be Afraid to Outsource
  • Transmission & Distribution System Specialists
  • Dedicated, Focused
  • Proper Training, Procedures, Experience
• Make it Modular
  • Perform over Time
  • Logical & Systematic Progression
• Combine Services – Maximize each Asset Visit

Integrated Approach

Valve Testing, Hydrant Testing, Leak Sounding, GPS Mapping, Data Documentation, Linkage with Business Systems
Critical Valves – the Backbone of Your System

**Successful Program**
- Intentional Selection of Personnel
- Fit for Purpose Equipment
- Comprehensive Classroom Training
- Extensive Practical Field Training
- Documented Processes & Procedures
- Monitoring, Oversight & Ownership

AWWA (M-44) Recommends Annual Inspection of Large & Critical Valves

Assets Need to Work

What’s the Status of Your System?
Questions?

Brad Gresham
Wachs Water Services, Xylem Inc.
South Region Business Development Manager
brad.gresham@xylem.com
678.340.6850