Advances in Water Pipeline Condition Assessment

ISAWWA Engineering Power Hour
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Presenter: Paul Schumi

Agenda

- Introductions
- Asset Management
- Investigator™
- LDS1000™
- Deliverables
- Potential Applications
Wachs Water Services – Since 1999
Professional Services Firm
200 Strong Work Force
80% Local Operations
750,000 Assets Served
Distribution System Services

Industry Challenges

The U.S. EPA Says:
- “There are 240,000 water main breaks per year in the U.S.”
- “The number of main breaks increases substantially near the end of the system’s service life”
Pipes do not deteriorate at a constant rate

Asset Management

Monitor and maintain assets that are of value to an organization.
Asset Management Basics
(WRF Model)

Inventory Assets → Assess Condition → Determine Residual Life → Determine RRR $ & Timing → Set Target LOS

Assign BRE Rating (Criticality) → Determine Appropriate Maintenance → Determine Appropriate CIP → Fund Your Strategy → Build the AMP
Condition Assessment: Operability

Our Experience Tells Us 750,000

- 40% of all water valves are inoperable
- 12% of all hydrants are inoperable; including inadequate flow
- 11% of all valves are buried or paved over
- 9% of all distribution valves are found in the wrong position; shut and open
- Transmission valves found shut…
External Technology

Analog and Digital Survey

- Ground Microphones
- Loggers
- Correlators
Inspection Companies

- Technologies have come a long way in last 10 years
- Previously, age and break history were only guide to where there were issues
- Destructive Testing only option
  - Coupons, sampling, emergency repairs.
- Gravity Sewer Lines well developed (CCTV).
- Pressurized lines - technologies available, but generally disruptive, unreliable or expensive.

The Opportunity

- Utilities are demanding inspections with minimum disruption
  - Live insertion
- Utilities are demanding cost effective inspections
  - It needs to be financially viable to inspect and repair vs replace
    - 10% of replacement cost
    - Large diameter mains are expensive to inspect
    - What $ per ft price is worth paying for small diameter lines
- Utilities are demanding low risk inspections
  - No lost systems
  - No stuck systems
Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>Investigator</th>
<th>LDS-1000</th>
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<tbody>
<tr>
<td>Pipe Material</td>
<td>Any</td>
<td></td>
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<tr>
<td>Pipe Diameter Range</td>
<td>3” – 12”</td>
<td>16” and Larger</td>
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<td>Insertion Requirement</td>
<td>Fire Hydrant</td>
<td>2 “ Tap or Fitting</td>
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<td>Leak Detection</td>
<td>0.5 gallons/hour</td>
<td></td>
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<tr>
<td>Minimum Flow Velocity</td>
<td>0 fps</td>
<td>1 fps</td>
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<tr>
<td>Direction of Travel</td>
<td>Bi-Directional</td>
<td>With the Flow</td>
</tr>
<tr>
<td>Inspection Distance</td>
<td>Up to 300 ft</td>
<td>Up to 3,000 ft</td>
</tr>
<tr>
<td>Degree of Bends</td>
<td>270°</td>
<td>Depends on Flow</td>
</tr>
<tr>
<td>On-Board Sensors</td>
<td>CCTV and Hydrophone + Sonde</td>
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Specialized Tools

Investigator™
- Non-Invasive Technology
- CCTV Video, Acoustic, w/Sonde
- Highly Accurate

Investigator™ Technology
- Designed for distribution mains (3” – 12” in diameter)
- Non destructive inspection
- No disruption to service
- Single pass acoustic, CCTV video and sonde mapping
- In-line system increases accuracy
The Investigator

- Capable of traveling 100m in each direction (with or without flow)
- Offers simultaneous leak and video inspection
- Needs a 1” access
- Enters system via: air valves, hydrants and pressure tappings

Advantages

- Operator is in control at all times
- Tethered inspection
- Operator has “eyes and ears”
- Ability to stop to look at features
- Less expensive than similar systems
- Every hydrant is an access point
LDS-1000™

Condition Assessment of Large Diameter Transmission Mains
**LDS-1000™ Technology**

- Designed for transmission mains
- No disruption to service
- Less expensive
- Single pass acoustic, CCTV video and sonde mapping/tracking
- In-line system increases accuracy
- Global projects completed in Canada, UK, Philippines and Australia

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**The LDS-1000**

- Video and leak sensor (38.6mm)
- Needs 2” tap for insertion
- Wide angle optic, fix focus
- 16” and larger Transmission mains
LDS-1000™ Key Components

- Cable & drum
- Disinfection system
- Motorized feed/retrieval
- Advanced sensor head

Insertion tube
Operator control case with acoustic/CCTV video/sonde tracking software

distribution system solutions

LDS-1000™ Access to Pipelines

- 2 inch (ID) tap
- Air valves
- Service fittings
- Pressure taps

distribution system solutions
Protecting Water Quality

Chlorine feed system  Disinfection contact chamber

Transmission Lines (1200mm pic)

- Superior camera technology
- Travels through valves, bends
- Travels in Low or No Flow
- Capable of 1km per insertion
Transmission Lines (600 mm pic)

- Enters System via:
  - Air Valves
  - Gate Valves
  - Sahara Chamber
  - Pressure Tappings
- Ability to Map Pipeline

Deliverables
Simultaneous Video and Acoustic Clear Peak Over Leak Site

PIPELINE ASSESSMENT REPORT

Client: Any Utility - USA Date: 00/00/000 Time: 00:00 Crew: The "A" Team

Condition Rating: 3

Maintenance Rating: 2

Hydraulic Rating: 2
Actual Inspections

- Full data report on inspection process, location and findings
- Tuberculation accumulation grading
- Video and audio provided on CD/DVD
GIS Integration

- Clickable GIS pipeline attributes
- GPS coordinates of insertion points
- Electronic and acoustic MPEG links
- Confirmation of distance inspected from location points

Potential Applications
Condition Assessment

Investigator can identify:
- Closed valves
- Undocumented valves
- Illegal service connections
- Undocumented fittings
- Pipeline material
- Improperly installed liner
- Faulty repairs
- Unknown diameter changes
- Pipe corrosion
- Pipe blockages & flow restrictions
- Damaged pipe joints

- Tuberculation levels
- Damages service connections
- Leaks
- Damaged pipe walls
- Air pockets
- Screw plugs
- Hardwood dowel repairs
- Operability of valves
- Debris accumulation

What else do you want to KNOW about?

In-Line Asset Locating

Closed gate valve

Identification and location (GPS) of undocumented valve
Tuberculation and Flow Restrictions

Early stage of tuberculation build-up at pipe joints and lips

Early stage of tuberculation build-up at pipe joints

Severe flow restrictions due to late stages of tuberculation build up.
Leads to pressure loss.
Joint Inspection

- Corrosion at cast iron pipe joint
- Clean joint verification

Liner Inspection

- Post liner quality inspection and verification.
Validating Leaks with Investigator™

Tap located and confirmed not to be a leak
Change of material confirmed not to be a leak as identified by correlation

Distribution System Confidence to Make the Right Investments

- Eliminates needs for excavations
- Eliminates replacement/lining of pipes that are still in good condition
- Allows for comparison of pipeline degradation over time
- Provides understanding of actual pipe condition
- Maximize aging infrastructure investments
Investigator™ and LDS1000™
Conclusion

- Simplified condition assessment approach
- Proven technology with over 7,000 insertions
- Increased efficiencies through advanced sensor head – acoustic/video/sonde tracking
- Accurate and tangible information with each inspection
- Confidence in infrastructure renewal strategies
- Pressurized pipeline inspection - Seeing is believing!

Thanks!

Questions?

Paul Schumi
pschumi@wachs.ws.com
(630) 485-9870