Use of Acoustic Inspection for Prioritizing Renewal and Replacement Projects at Ft. Jackson, South Carolina

George Selembo, PhD, PE, InfoSense, Inc.
Jeffery Johnson, PE, Richard Brady & Associates
Ivan Howitt, PhD, InfoSense, Inc.
Alex Churchill, InfoSense, Inc.

June 12, 2013
PRESENTATION OUTLINE

• Acoustic Inspection Overview
• Project Background and Objectives
• Summary of Results
• Conclusion
PRESENTATION OUTLINE

• Acoustic Inspection Overview
• Project Background and Objectives
• Summary of Results
• Conclusion
SEWER LINE INSPECTION

METHODS

- Manhole Inspection
- Push Camera
- Zoom Camera
- CCTV/Robotic Camera
- Pipe Wall Defect Scanners
- Pipe Profiling / Robotic Multi-Sensor

ACOUSTIC
ACTIVE ACOUSTIC PIPE INSPECTION BACKGROUND

- Patented technology
- Gravity-fed sewer focus
- Developed in Charlotte with CMUD as key partner

- Over 2M feet inspected
- Rapid assessment helps better focus cleaning and CCTV resources
ACOUSTIC INSPECTION TECHNOLOGY

• How Does it Work?

SL-RAT
Sewer Line Rapid Assessment Tool

Blockage
KEY FEATURES OF ACOUSTIC INSPECTION

• No Flow Contact / No Confined Space Entry
• Simple to use – train operators in minutes
• Low Cost – Pennies/foot
• Rapid Onsite Results – Under 3 min./segment
• Portable < 30 lbs
• GIS Integration – GPS Enabled
• Archive Pipe Segment Blockage Assessments
ACOUSTIC INSPECTION APPLICATIONS

• Focus Cleaning Effort – Reduce Cleaning by Over 50% and Enable Condition Based Maintenance

• Eliminate Repeat and Downstream Overflows

• Post Cleaning – Quality Assurance

• Quick Collection System Condition Assessments When Taking Over New Areas
PRESENTATION OUTLINE

• Acoustic Inspection Overview

• Project Background and Objectives

• Summary of Results

• Conclusion
PROJECT BACKGROUND

• Ft. Jackson, SC
  o Established in 1917
  o Trains 50% of the Army’s Basic Combat Training Load
  o 52,000 acres – 1,160 buildings
  o ~20 miles of sanitary sewer lines
  o System was privatized in 2006, currently managed by Palmetto State Utility Services
PROJECT BACKGROUND

- Water and sewer system was privatized in 2007, currently managed by Palmetto State Utility Services (PSUS)
- 50 year own and operate contract
- Specific Area of Study
  - 7,174 feet along I-77
  - 18” – 24” Diameter
  - All inspected with CCTV
PROJECT OBJECTIVES

SL-RAT is primarily used as a prioritization tool for cleaning/camera operations in 6” to 12” sanitary sewer lines

- Evaluate acoustic inspection as a tool for renewal and replacement projects
- Test the acoustic device in larger diameter pipes (18” to 24”)
- Compare acoustic inspection results with CCTV inspection
PRESENTATION OUTLINE

• Acoustic Inspection Overview
• Project Background and Objectives
• Summary of Results
• Conclusion
SUMMARY OF RESULTS

• Performed 32 Acoustic Measurements (9,963 ft) (included several repeat measurements for verification)
SUMMARY OF RESULTS

- Acoustic inspection performed in less than 5 hours
- 26 unique segments inspected (7,900 ft)
SUMMARY OF RESULTS

• Good correlation with CCTV results, particularly when the pipe showed significant structural issues or blockages

Acoustic Score: 3

Acoustic Score: 3
SUMMARY OF RESULTS

• Acoustic scores seemed slightly higher than normal for pipes with minor obstructions or blockages

Acoustic Score: 9
PRESENTATION OUTLINE

• Acoustic Inspection Overview
• Project Background and Objectives
• Summary of Results
• Conclusion
CONCLUSION

• At larger diameters, more surface area available for sound to travel through and around blockages
• Roots, FOG, and other obstructions still reflect and absorb sound
• Acoustic inspection is still viable, but may need to be more conservative on acoustic values at larger pipe diameters
Comparison of open surface area at various pipe diameters
- Assume pipe is ¼ full with flow, obstruction is 18 sq. inches

<table>
<thead>
<tr>
<th>Diameter</th>
<th>6 inches</th>
<th>10 inches</th>
<th>18 inches</th>
<th>24 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total surface area (sq.in)</td>
<td>28.3</td>
<td>78.5</td>
<td>254.5</td>
<td>452.4</td>
</tr>
<tr>
<td>% blocked</td>
<td>89%</td>
<td>48%</td>
<td>32%</td>
<td>29%</td>
</tr>
</tbody>
</table>
CONCLUSION (cont.)

• Inspection is much Cheaper than Cleaning
• Acoustic Inspection is an Effective Method to Make Blockage Assessments
  o Quick
  o Cheap
  o Easy / Safe
• Acoustic Inspection Enables CBM Capability
• Acoustic Inspection Does Not Replace Cleaning or Detailed Inspection
  o Helps Determine how to Effectively Deploy Cleaning and CCTV resources
QUESTIONS?

877-PIPECHK (877-747-3245)
gselembo@infosenseinc.com
www.infosenseinc.com