Pressure Pipe, Trenchless Condition Assessment and Data Driven Prioritization

A Pro-Active Approach will
Minimize failures and cost

Pressure Pipe, Trenchless Condition Assessment and Data Driven Prioritization

Outline:

- Modeling
- Screening Tools
- Validation Tools
- High Resolution Tools

Modeling

Modeling in gravity sewers has and always will be a widely used engineering tool for operations and maintenance of gravity sewers. As technologies evolve and are deployed, our sewers are getting smarter

Modeling Force Mains is more of a challenge due to several reasons.

- Cycle times of pumps
- Inconsistent flow volume/velocity
- Elevation changes
- ARV operation and maintenance
- Debris levels

Modeling Unknowns

Based on experience and engineering recommendations from modelers.

Modeling Force Mains is a challenge.

Based on the operation of the pipeline and the numerous unknowns that are normally considered for a Hydraulic Model in a Gravity Sewer.

What can we find in modeling a Force Main?

- Is the Force main operating as designed
- Are Pressures/Volume consistent
- Air pockets
- Potential locations for Hydrogen Sulfide deterioration

What can't we find in Modeling a Force Main!

- Exact locations and size of
- Gas Pockets, Leaks, Debris, locations of possible degradation, material changes, corrosion

Based on the modeling consensus if the Force Main is not working as designed utilize a screening tool to validate your model for areas of concern and additional validation.

It is also recommended that when rehabilitating a Pumpstation "look outside the fence" and verify the piping is in a good operational condition.

Screening Tools

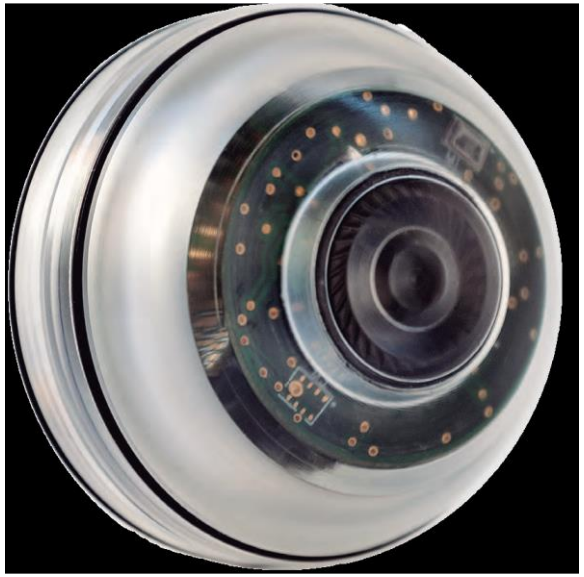
The primary 3 inline screening tools in use provide similar data. Quality and Delivery of Data varies by each provider and cost is a significant factor to consider.

Each device can be inserted in 4” valves at a Pumpstation post pumps and are all typically extracted at a transition manhole or a downstream station with an extraction device. Insertion and extraction in a water line is accomplished at a Hydrant or Accessible valves.

Each manufacturer can provide part of the deliverables below (One delivers all):

- Acoustic- Leaks and Gas pockets
- GPS/GIS
- Locate Deposits, Blockages and Debris
- Bulk Wall Thickness in metallic pipes up to 8”
- Pressure differentials of entire pipeline

Internal Screening Tools



Nautilus

Figure 1

Piper

Figure 2

Smart Ball

Figure 3

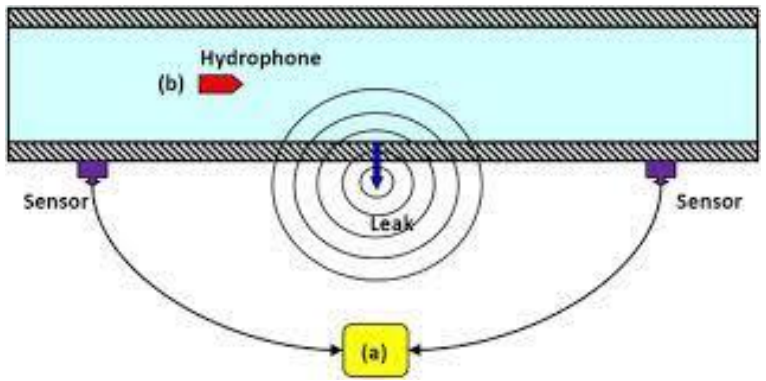
External Screening Tools

Primarily used for leak detection/location and in some cases Condition Assessment in Pipelines.

Tools and Technologies

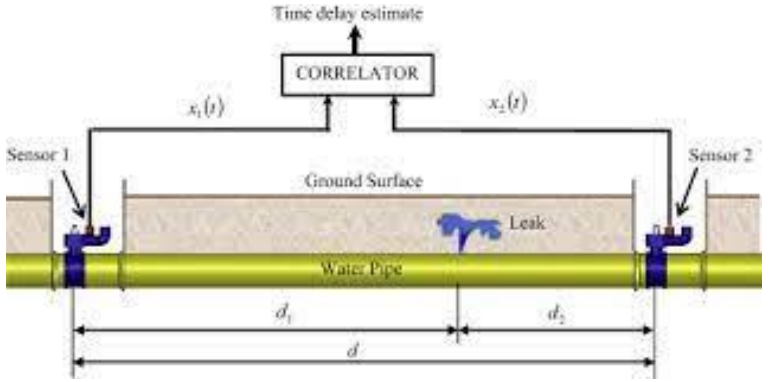
1. Visual
2. Hydrostatic
3. Hydrophones
4. Correlators
5. RF Transmitters/Receivers
6. Ultrasonic
7. Inverse Transient Wave Analysis

How does it work



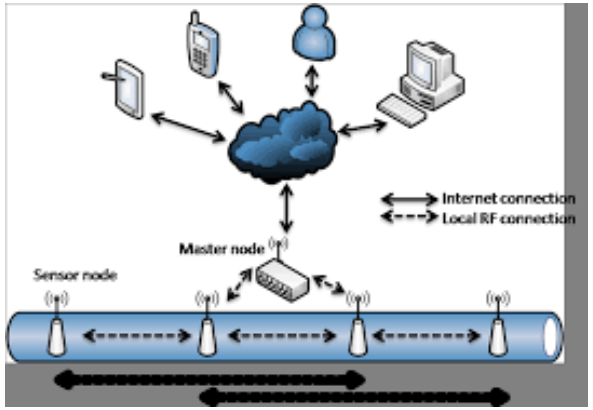
Hydrophones

Figure 4



Correlators

Figure 5



RF Sensors

Figure 6

Validation Tools

Validation Tools can be instrumental in saving cost before or after a screening tool has been used and without the expense of a high-resolution assessment. In many cases this is not a trenchless solution, however the cost savings can justify the use of these tools and the data delivered.

Most used technologies in our industry:

- Visual
- Ultrasonic
- Electro-magnetic
- Eddy Current

Validation Tools

Ultrasonic Thickness Gauge

Figure 7

Eddy Current Testing

Figure 8

Electromagnetic Testing

Figure 9

High Resolution Technologies

These Technologies provide the highest level of detail regarding the overall condition of your pipes. This high-resolution data can be utilized for:

- Pipeline/Asset management
- Rehabilitation prioritization
- Remaining Useful Life (RUL) of your pipes

The most used inline technologies in our industry are:

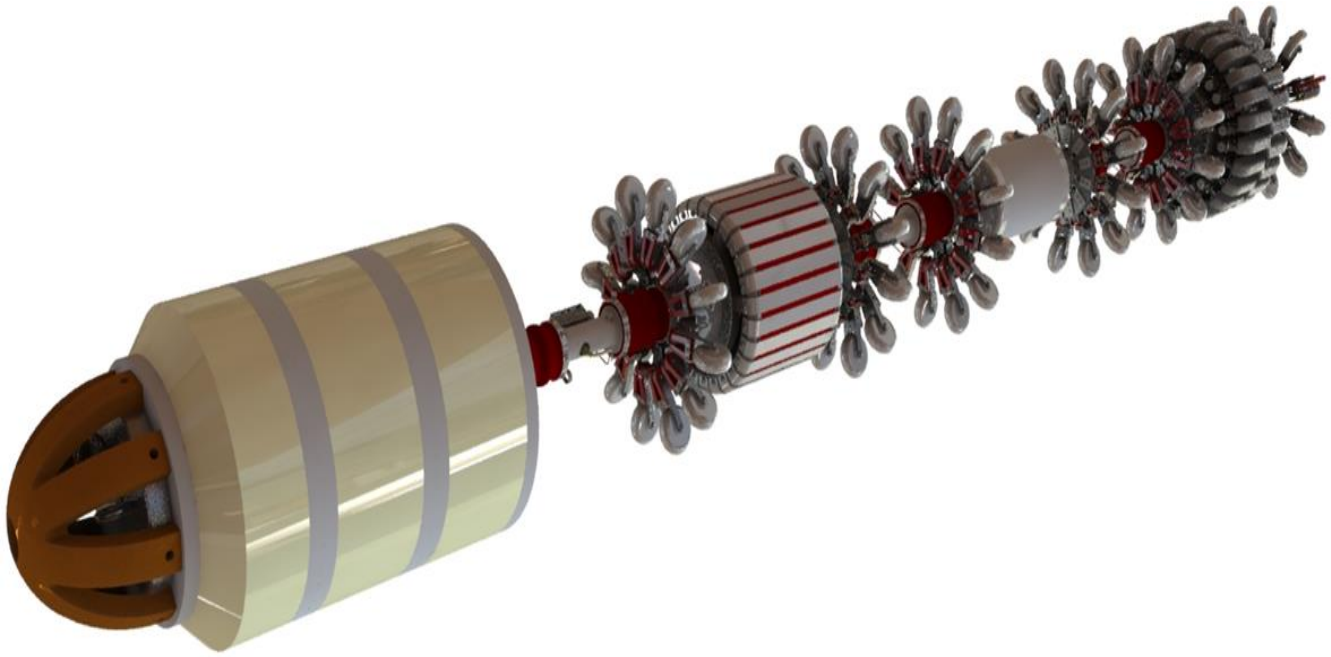
- Ultrasonic (UT)
- Electromagnetic (EM)
- Remote Field Testing (RFT)

These technologies are not created equal, and the quality of deliverables and cost will vary by technology and service provider.

High Resolution Tools

PipeDiver

Figure 10



SeeSnake

Figure 11

High Resolution Deliverables
Show me the Data

All High-Resolution Tools are not created equal.

- Pipe size limitations vary
- Insertion/Extraction methods vary
- Inline valve considerations
- Cost will vary

High Resolution Data is not the same.

- Data Resolution by providers will vary
- Data Resolution by technology will very
- Delivery time of data will vary
- Quality of Data will Vary
- Data will vary by material type and age

Good Decisions Start with the "Right" Data

As technologies and quality data evolves engineers and owners rely on good data to manage their infrastructure.

Analytics are quickly becoming the guide for asset management, operations, maintenance and rehabilitation. This is becoming the path for a **"Smart Utility"** to utilize "Big Data"

Choose your assessment tools based on quality data that can be used for making decisions.

Utilize your staff and your consultants to identify how you will best manage your infrastructure, with the right quality data being the driver for decisions and success.

Questions and Thank You

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