Acoustic-Based Condition Assessment Offers Cost-Effective and Efficient Pipe Inspection

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BUSINESS AGENDA: UCT Conference 2022

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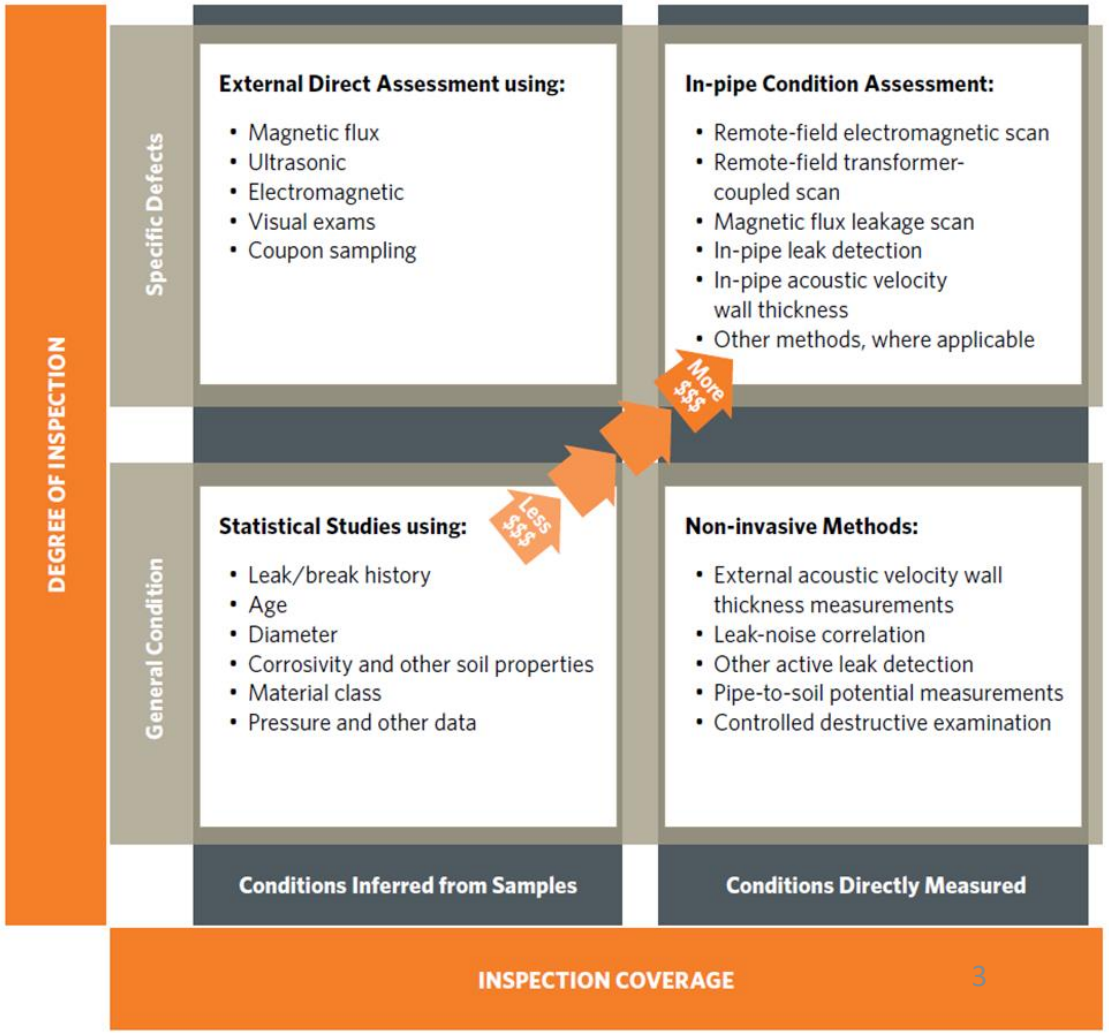
Pipe Condition Assessment Methods

Assessment methods:

- External Direct Assessment
- Statistical Studies
- In-Pipe Assessment
- Non-Invasive Methods



Why Acoustic Based Condition Assessment?

1. Understand what is occurring in the system today
2. Understand remaining life and probability of a failure
3. Effectively prioritize rehab & replacement projects

Condition Driven Approach

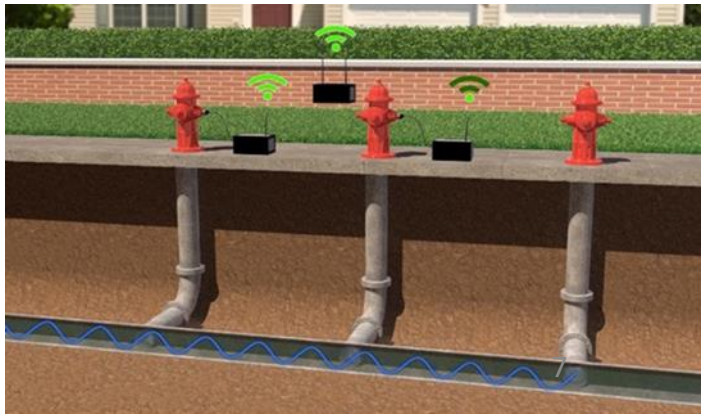
This best practice includes a tiered approach to condition assessment incorporating an asset management desktop model, pipeline inspection, and permanent monitoring (for critical assets). The amount of inspection is driven by the pipeline criticality. This approach mitigates failures risks while optimizing the use of precious capital.

CDAM Approach (Continued)

- *Acoustic Water Pipeline Condition Assessment* provides water utilities with an appropriate path for determining the structural status of an individual pipeline or pipeline system.
- Such condition assessments form a critical piece of an effective Condition-Driven Asset Management Program(CDAM) by **establishing a baseline to understand the present state of a pipeline**.
- By recognizing and understanding the current state, the asset management program then enables the water utility to anticipate future issues and allocate the appropriate measures to be taken to provide for the continuous safe and reliable operation of the system.

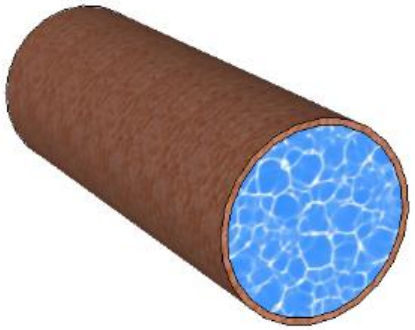
How Does Acoustic Technology Work

- Acoustic sensors are attached to existing contact points, such as fire hydrants, valves or directly in contact with a pipe.
- A sound wave is induced in the pipeline and travels along the pipe. The acoustic sensors capture the time it takes the sound wave to travel between two sensor stations.
- The speed at which the sound wave travels is dictated by the condition of the pipe wall.



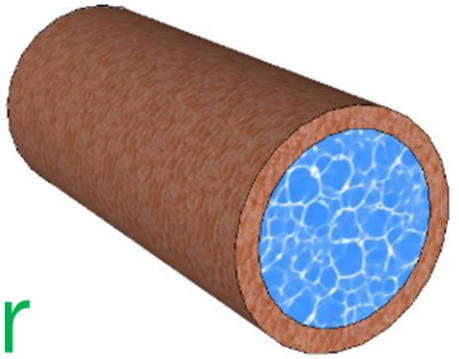
How Does the Technology Work (Continued)

- As the sound wave travels, it pushes water molecules toward each other.
- Because water is incompressible, the molecules push outward on the pipe wall. This places a microscopic flex on the pipe wall — and greater the flex, the weaker the pipe.
- Through this method, acoustic technologies are able to measures the actual strength of the pipe wall which is an ideal measure of actual pipe condition.



Slower

Faster



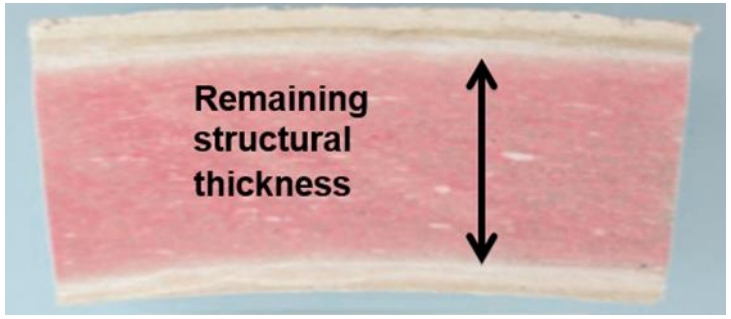
Acoustic Condition Assessment Results

Data

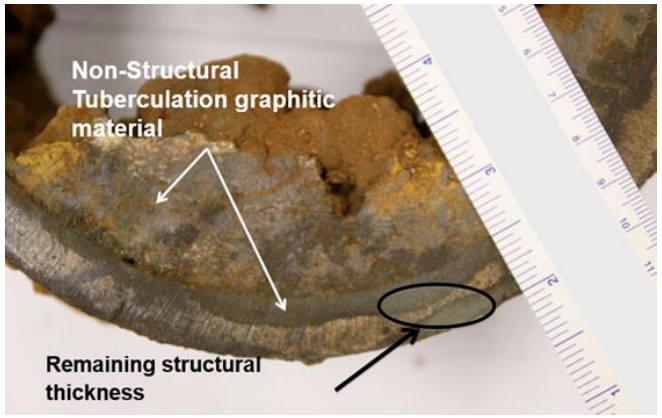
- → Remaining Structural Wall Thickness
- → % Loss from Original Thickness
- → Qualitative Pipe Grade
- → Presence and Location of Any Leaks

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%
							9%

Pipe Samples

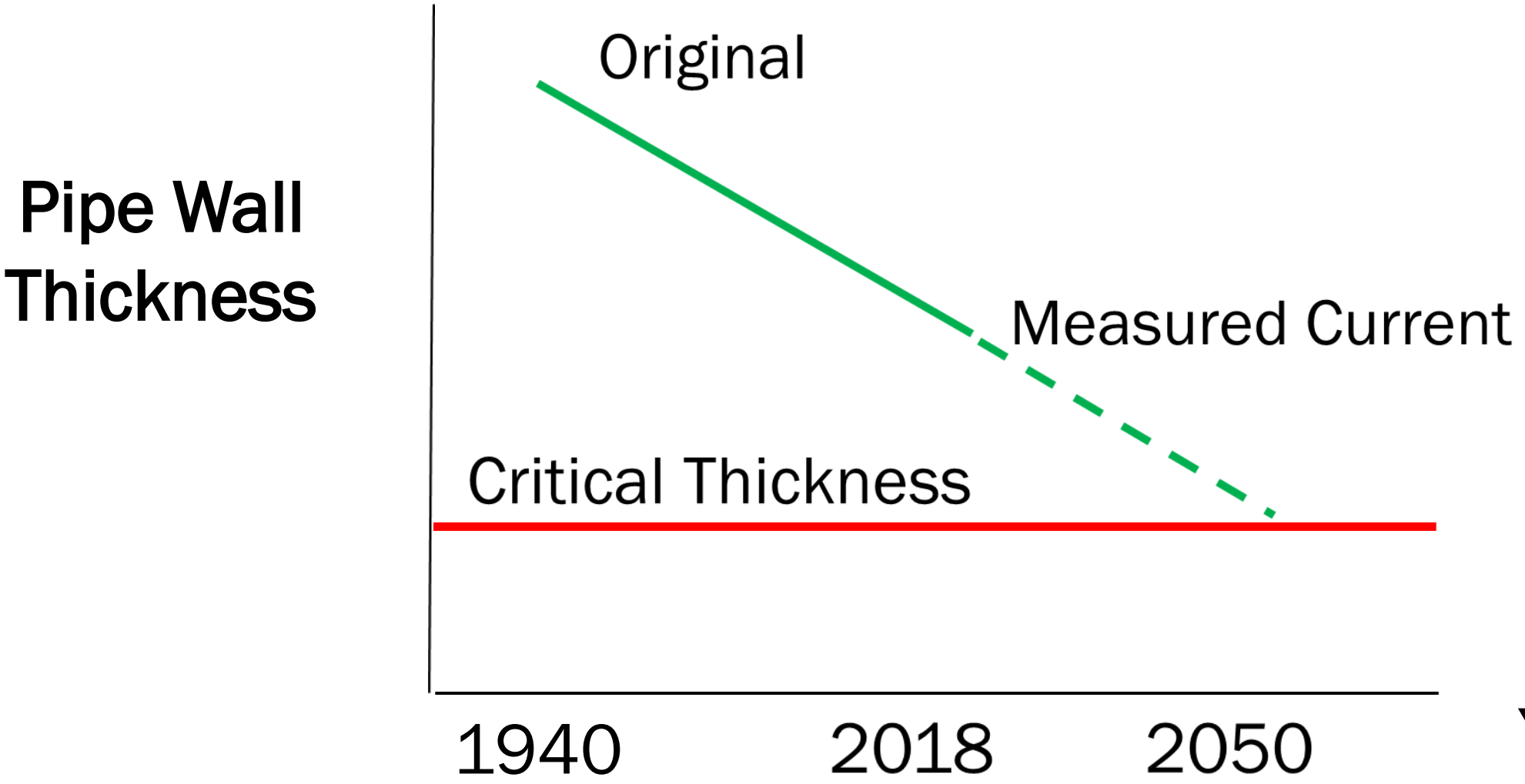


Asbestos Cement



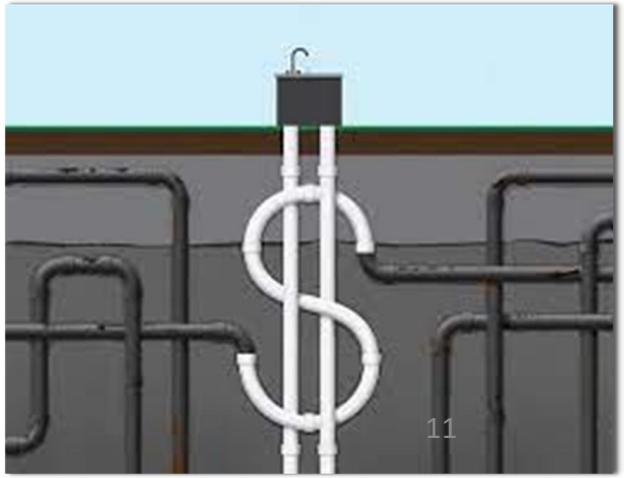
Ferrous

Remaining Service Life Calculation



Key Benefits

- Utilities are realizing a real return on assessment costs by simultaneously determining the structural integrity of pipe segments and accurately pinpointing leaks, all without breaking ground or disrupting service.
- With assessment costs of 2.0% to 3.0% of pipe replacement, acoustic condition assessment is being used for rate case justification, litigation questions, replacement and rehabilitation decisions, and due diligence support for water system acquisitions.



Key Benefits (Continued)

1. Is a valuable tool to confirm pipe replacement recommendations based primarily on assumptions and computer models. This non-invasive technology uses acoustic signals and advanced computer algorithms to measure the average minimum remaining wall thickness of pipe, thus providing accurate structural information to optimize pipe repair and replacement programs and improve capital spending.

2. Assist municipalities/utilities in optimizing the use of their annual pipe renewal budget to execute the most cost-effective corrective action for all substandard pipe. Return on investment is realized by investing in the right locations with the right technology to increase the pipe renewal ratio

Questions