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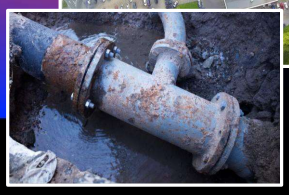

Benchmarking Leak Detection In the Digital Age

A comparative analysis of leak detection methods

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Today's Speaker

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Agenda

1. Benchmarking Report Introduction
2. Cost Effective Approach to Water Loss Reduction
3. Exploring Leak Detection Methods
4. Qualitative Analysis of Leak Detection Technologies
5. Q & A

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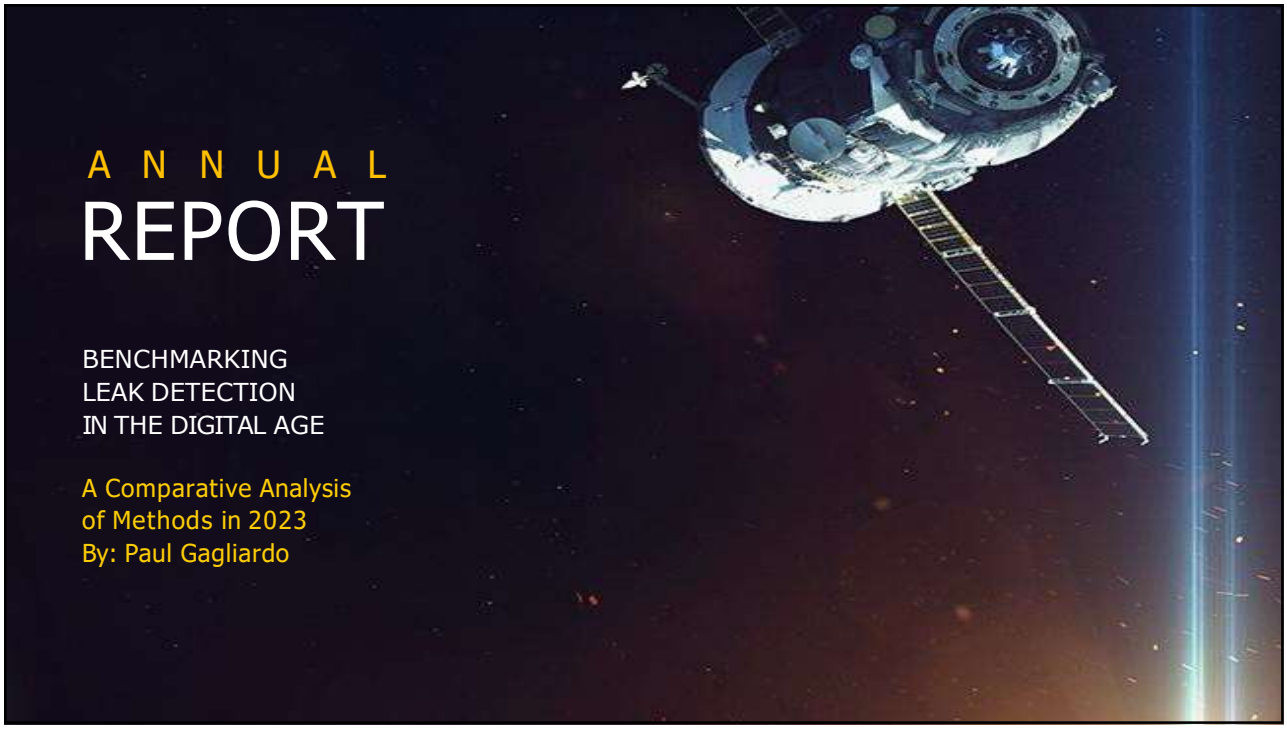

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Introduction

- Water scarcity is a global concern.
- Proactive leak detection programs are essential.
- Addressing aging infrastructure, rising energy costs, and water affordability.

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Introduction

2018 Utah State University report:

- Break rates increased by 27% in 6 years.
- 14 breaks per 100 miles per year in 2018.
- Cast iron & asbestos cement pipes experienced a 40% increase.

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Introduction

- Energy prices affect water supply costs.
- Baseline tap water costs and cost increases.
- Steady annual water rate increases of 5% in the US.

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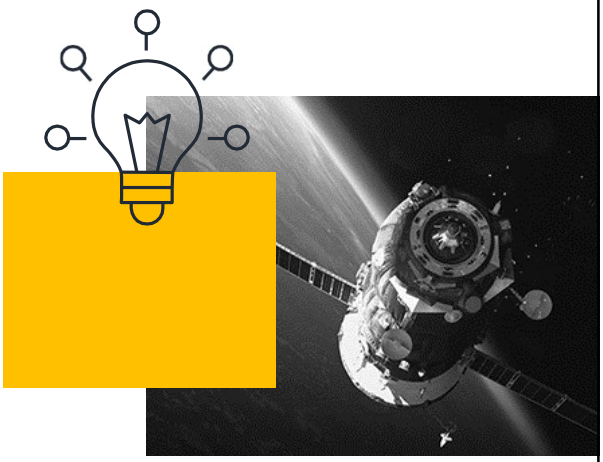
Introduction

- This presentation is a comparative analysis of 2023 leak detection methods.
- Addressing the evolving needs of water management.



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Advancing Water Sustainability Through Loss Reduction

The 2021 City Water Optimization Index Report: "reviewed water systems in 51 cities and found that over half of them experienced non-revenue water levels of at least 25%, with a dozen cities facing non-revenue water (NRW) levels of over 40%."

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The Cost-Effective Approach to Water Loss Reduction

Cost comparison with alternative supply options:

Seawater desalination	Wastewater recycling	Brackish groundwater development	Leak detection cost
$9.00 per 1000 gallons (2.61 EUR per cubic meter)	$5.00 per 1000 gallons (1.45 EUR per cubic meter)	$2.50 per 1000 gallons (0.72 EUR per cubic meter)	$1.30 per 1000 gallons (0.38 EUR per cubic meter)

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The Cost-Effective Approach to Water Loss Reduction

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Unraveling the History of Leak Detection Methods

Overview of historical leak detection methods

1980s District Metered Areas (DMA)

1990s Leak correlators

2000s Fixed-based acoustic sensors

2010s Software-based solutions

2010s SILD technology

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Exploring Leak Detection Techniques: Pros and Cons

Techniques:

- Handheld acoustic correlators
- Correlating Continuous Acoustic Monitors (CCAM) or fixed base acoustic systems
- District Metered Area (DMA)
- Tethered or floating systems
- Software-based condition assessment solutions
- Satellite imagery leak detection (SILD)

Handheld Acoustic Correlators: Pros and Cons

Pros:

- This cost-effective and minimally invasive technique is commonly used in conjunction with other leak detection methods to precisely identify the leak's exact location

Cons:

- Fully manual process heavily relies on the expertise of human operators for successful detection.
- Covering an entire service area in a single year becomes challenging or even impractical for utilities.
- Ensuring proper training for leak detection personnel and obtaining high-quality acoustic devices are critical factors for achieving accurate results.

CCAMs: Pros and Cons

Pros:

- CCAM is a non-invasive approach and can be monitored remotely. The equipment sensitivity and data analytics are improving, which will increase performance

Cons:

- Significant capital cost. Typically, it is focused on monitoring specific areas of the distribution system for long-term observation and is not easily or inexpensively relocated. The installation of permanently fixed leak detection devices requires battery power to operate the sensors and backhaul data to a central processing platform, limiting the productive life of these systems. Additionally, the units have a battery life of 5-6 years, requiring periodic maintenance and replacement.

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DMAs: Pros and Cons

Pros:

- Smaller DMAs tend to be more cost-effective and easier to model, making them a favorable option in certain cases

Cons:

- The implementation of DMA leak detection can be costly, especially if significant modifications are required to isolate an area for accurate input and outlet flow measurements.

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Tethered or Floating Systems: Pros and Cons

Pros:

- These devices can be easily removed via the tether or further downstream using nets or natural exits. Apart from leak detection, these systems are also utilized for condition assessment studies, employing ultrasonic or video tools to collect data.

Cons:

- These systems are invasive and may require a special access point to be constructed for launching and recovery, depending on their size.

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Software: Pros and Cons

Pros:

- The software's predictive capabilities enable utilities to proactively address potential issues and optimize their maintenance strategies for system resilience. Not only does it require less capital investment, but it can identify the sections of pipe with the highest likelihood of failure. Additionally, it is less intrusive as it uses readily available information about the system and its environment

Cons:

- Most systems do not have a complete data set for their pipe network. Missing data must be interpolated to complete the analysis. It is difficult to prove analysis efficacy due to long-term prediction horizon.

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SILD: Pros and Cons

Pros:

- The technology works completely remotely and can survey large amounts of land area and pipeline length in a single satellite pass. It can detect likely leak locations and minimize the area that a field crew must physically inspect thereby increasing productivity, efficiency and rate of leaks pinpointed. The technology increases value proposition by identifying more leak locations than other technologies

Cons:

- There are a limited number of satellites that observe Earth using SAR. Field leak crews are still required to pinpoint leaks, and the efficiency of leak detection depends on the proficiency of these field crews

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Comparing Leak Detection Methods: Unassisted BOTG Vs. SILD-Guided Approach

Traditional unassisted boots-on-the-ground (BOTG) leak detection efforts involve inspecting pipelines from one end to the other at random as assigned by the utility.

Vs.

The SILD solution surveys many miles of pipeline with a single scan. Leveraging proprietary algorithms and a GIS-based map, the technology pinpoints likely leak locations, focusing on the 5-10% of the total surveyed area that necessitates proactive attention.

Subsequently, field crews are deployed to these pinpointed areas for physical inspection.

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Comparing Leak Detection Methods: Unassisted BOTG Vs. SILD-Guided Approach

Leak Detection Program Performance Metrics		
	Traditional Unassisted BOTG	**SILD-Guided**
Number of Projects	2147	880
Number of Leaks Found	18,784	87,324
Leaks Found per Crew Day	1.3	5.5
Leaks Found per Mile Physically Inspected	0.3	3.4
Miles Inspected per Crew Day	3.9	1.5
Listening Points per Mile Accessed	35	135
Percent Non-Surfacing Leaks	90%	80%
Average Leak Size	3.2 gpm	4.5 gpm
Cost per leak Found	$1250	$700

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Evaluating Alternative Leak Detection Methods

Study comparing SILD & CCAM technologies.

Results:
SILD detected and pinpointed 117 leaks, while CCAM identified 20 leaks.

Study comparing DMAs & SILD technology.

Results:
Leak per crew day increased by 700%, demonstrating SILD's efficiency.

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Qualitative Analysis of Leak Detection Technologies


Capital Cost


Operations Cost


Performance


Testing Frequency


Flexibility


Invasiveness


Weather Impacts


Turnaround Time


Complexity


Return on Investment

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Qualitative Analysis of Leak Detection Technologies

Comparing Leak Detection Technologies: Performance, Flexibility & ROI						
	Software-Based Condition Assessment	Floating	DMA	TBOTG	CCAM	Satellite Imagery Leak Detection
Performance	Low	Medium	Medium	Low	Medium	High
Flexibility	High	Low	Medium	Medium	Low	High
ROI	Low	Low	Medium	Low	Medium	High

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Qualitative Analysis of Leak Detection Technologies

Comparing Leak Detection Technologies: Costs, Efficiency and Impact						
	Software-Based Condition Assessment	Floating	DMA	TBOTG	CCAM	Satellite Imagery Leak Detection
Capital Cost	Low	Medium	Medium	Low	High	Low
Operations Cost	Medium	Medium	Low	Medium	Low	Medium
Testing Frequency	Low	High	High	High	High	Low
Invasiveness	Low	High	Medium	Low	Low	Low
Turnaround Time	Medium	Low	Low	Medium	Medium	Low
Weather Impact	Low	High	Low	Medium	Low	Low
Complexity	High	High	Medium	Low	Medium	Low

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Satellite Leak Detection: A Smart Investment for Water Utilities

Financial advantages make SILD a smart and cost-effective choice for water utilities aiming to enhance their leak detection strategies and improve their bottom line.

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The Impact of SILD Technology

- **Helps utilities recover** lost water supply by detecting real water losses for necessary repairs.
- **Proficiency in identifying** high-density leak areas, leading to more effective leak detection.
- **Guides the deployment** of other leak-detection methods.

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Thank You

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