™

WHITE PAPER

PPHM™
Predictive Pipeline Health Management

seismos

The Next Generation of Pipeline Monitoring, Combining Controlled Acoustics and AI for Real-Time Protection

A system providing periodic, direct, non-intrusive detection of pipeline anomalies before they become critical hazards to people, the environment, and the asset itself.

INTRODUCTION

Seismos-PPHM™ is a technological breakthrough in the field of pipeline monitoring. The system uses controlled acoustics to detect anomalies early on, before they escalate into costly hazards for both people and the environment. The system operates by introducing controlled acoustic pulses into the pipeline media which propagate through the pipeline, enabling monitoring across very long distances. The controlled acoustic signals are specifically designed to optimize the signal-to-noise ratio, allowing for unparalleled accuracy in anomaly detection. The system then employs progressive data processing to predict failure points in real-time, enabling operators to take preventative measures and prioritize maintenance resources, ultimately saving millions of dollars.

TECHNOLOGY

One key feature of PPHM™ is its non-intrusive nature, allowing for the seamless integration of the system into existing pipeline operations. This is achieved through the use of an external threaded connection, which connects the system to the pipeline without disrupting flow.

The system utilizes a controlled acoustic emitter to introduce controlled pulses into the pipeline media, which then propagate through the pipeline, enabling monitoring across 20 to 30 miles. It is important to note that these controlled acoustics are not to be confused with random pressure waves, as they are specifically designed and controlled for their frequency, shape, amplitude, and time. This allows for an optimal signal-to-noise ratio, enabling early detection of anomalies with unparalleled accuracy.

OPERATIONS

Seismos-PPHM™ is a flexible - in its applications - technology that offers a variety of modes of operation depending on the specific needs of an application. The system can be utilized in both an ad-hoc and semi-continuous or continuous mode. Ad-hoc applications, for example, may involve the detection and localization of specific anomalies such as corrosion or bends. On the other hand, periodic monitoring applications can involve the semi-continuous tracking of the pipeline for emerging defects that have the potential to escalate from a minor problem to a major threat. This versatility allows operators to tailor the system to their specific needs, making it a highly effective solution for pipeline monitoring, such as:
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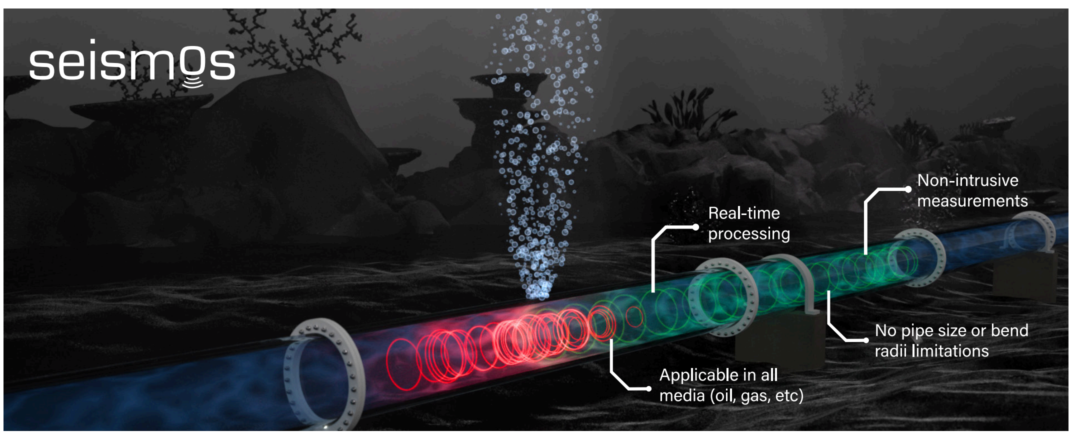
- Predicting leaks through early anomaly detection
- Continuously monitoring for buildup and corrosion
- Optimizing maintenance scheduling (ILIs, pigs, etc)
- Real-time pig tracking



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Contact us:
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Pipelines

seismos

PPHM™ Predictive Pipeline Health Management

Direct, non-intrusive detection of pipeline anomalies before they become critical hazards to people, environment, and the asset

Non-Intrusive	Direct Measurements	Predictive	Widely Applicable
No inline inspection instrumentation	Detecting via active controlled acoustics	Prognostic, not just diagnostic	Unpiggable pipelines included

Applications

» Media

Gas, Water, CO_2, crude oil, aqueous fluids

» Failure detection

Leaks, scale buildups, blockages, geometric deformations, flow restrictions

» Frequency of operation

Periodic or continuous

Benefits

» Critical downside insurance

Detect anomalies at the very early stage to prevent undesirable events

» Maintain asset reliability

Enable operational efficiency by eliminating unexpected breakdowns

» Reduce maintenance costs

Minimize ad-hoc inspections and manage maintenance based on data

» Predictive maintenance

Quantify the risk of failure across all pipeline sections. Allocate maintenance resources/dollars to the sections that require the most attention.

System requirements

» Surface point connection

» Fluid information

» Pipeline schematic

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Overview

Seismos PPHM™ (Predictive Pipeline Health Management) eliminates the need for costly, labor-intensive periodic inspections and invasive solutions by leveraging controlled acoustics and artificial intelligence. Without interrupting operation, PPHM™ monitors for geometric deformations, leaks, scale build-ups, and other irregularities. Progressive data processing enables the prediction of failure points in real time, before they manifest as costly economic or environmental hazards.

How it works

Controlled acoustics are introduced through a surface connection and propagate via the pipeline media. Unlike traditional pressure wave technologies, PPHM™ actively controls the acoustic signals introduced into the system (in shape, amplitude, frequency, and time). This enables much higher resolution in detecting acoustic responses and evaluating the state of the pipeline in the presence of noise.

Features	Seismos	Pressure wave	Fiber	Pigs	ILI	Flow sensor
Non-intrusive	✓	✓	✗	✗	✗	✓
Diagnostic	✓	✓	✓	✓	✓	✗
Predictive	✓	✗	✗	✗	✗	✗
Unpiggable pipes	✓	✓	✓	✗	✗	✓
Quasi/Continuous	✓	✗	✓	✗	✗	✓
Cost	$	$$	$$$	$$$	$$	$

How to use

The PPHM™ system is accessed via an online platform that incorporates advanced analytics to provide a holistic view of what is occurring inside the pipeline asset, as well as alerts for emerging failure modes based on quasi continuous measurements.