



REAL-TIME CORROSION MONITORING ON 4" CRUDE PIPELINE

Maintaining pipeline integrity in demanding hydrocarbon environments requires more than periodic inspections. It demands continuous, reliable insight into asset health. To enhance corrosion monitoring on a critical crude oil pipeline, a major Middle East operator partnered with Sensor Networks, Inc. (an Eddyfi Technologies company) to deploy microPIMS® wireless ultrasonic sensors, enabling real-time wall-thickness trending and proactive integrity management.

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THE CHALLENGE

The client needed a more proactive and reliable way to monitor corrosion on a critical crude oil pipeline, as traditional manual UT inspections provided limited visibility and required frequent, high-risk field interventions.

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THE SOLUTION

microPIMS wireless ultrasonic sensors were installed to provide autonomous, real-time wall-thickness monitoring with secure data transmission to an on-premise server.

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THE BENEFITS

microPIMS delivered continuous, high-resolution corrosion visibility, successfully detecting early localized wall loss while reducing the need for manual inspections and field mobilization.

The Challenge

A Major Client from the Middle East manages a critical 4-inch crude oil pipeline (Line P-0226, ASTM A106 Grade B) that operates under demanding hydrocarbon service conditions. The traditional integrity inspection method primarily involves manual UT and scheduled field surveys, which provide only minimal information on pipe wall health, leaving operators vulnerable to undetected corrosion that may accelerate between inspections. The Client sought a more proactive monitoring capability that could identify and differentiate false alarms from genuine wall loss and eliminate safety risks associated with frequent field inspections.

The facility environment was large, and sensors needed to reliably transmit data across long distances (800–850 meters) from the installation site to the field office, where an on-premises server hosts the data. The system had to operate autonomously, withstand temperature variations, and deliver continuous trending without interfering with operations. The challenge was to deploy a monitoring solution that provides accuracy, reduces reliance on manual UT inspections, and provides actionable intelligence for the corrosion management team while proving its reliability in real pipeline conditions.

The Solution

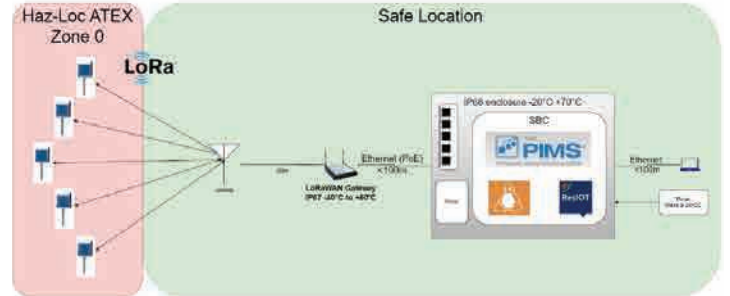
The client deployed the microPIMS Ultrasonic Wireless Sensors from Sensor Networks, leveraging LoRaWAN long-range, low-power technology. Three UHT sensors were permanently installed on the crude pipeline to capture temperature-compensated thickness measurements three times per day. Each microPIMS sensor integrates a piezoelectric ultrasonic probe, LoRa radio module, and dual D-cell battery pack housed in a robust enclosure designed for long-term field operation.

A LoRaWAN gateway and high-mounted antenna were installed on the field office, achieving strong signal performance despite an 850-meter transmission distance. The gateway routed data into an on-premise server containing the webPIMS software, enabling engineers to access real-time wall-thickness trends, corrosion rates, signal health, remaining life estimates, and sensor diagnostics directly through a laptop connection.

The Benefits

The microPIMS system delivered high-resolution, real-time corrosion visibility that greatly enhanced the client's pipeline integrity program. One sensor detected a genuine localized corrosion event, capturing approximately 0.04 mm of wall loss and providing early warning before the thickness approached critical limits. The other two sensors showed stable thickness despite temporary rate spikes, confirming that the corrosion was localized rather than system-wide. The Client didn't have to erect scaffolding for their periodic inspection, and the on-prem server provided data complying with their IT Security protocol. This system greatly improved the efficiency and processes required for the corrosion engineers to monitor the CML points.

During the 90-day trial (August–November 2025), microPIMS successfully collected continuous wall-thickness measurements and automatically generated warnings when pipe thickness dipped below predefined thresholds. The solution demonstrated reliable remote data transmission, device stability, and clear visualization of thickness changes across the monitoring period.



Overall pipeline integrity remained within safe operating margins, with the minimum measured thickness (3.75 mm) staying 29% above the critical threshold (2.90 mm). The ability to monitor continuously eliminated guesswork between manual inspections and reduced the need for frequent field mobilization, especially in hazardous areas.

The trial validated microPIMS as a reliable, accurate, and scalable monitoring solution suitable for broader deployment across the owners' assets. With proven ability to detect early-stage corrosion, provide automated trending, and integrate seamlessly with existing facility infrastructure, microPIMS enhances asset safety, reduces operational risk, and brings modern digital integrity management directly into pipeline operations.

