



MsS Guided Wave For CUI

Corrosion Under Insulation (CUI)

Corrosion Under Insulation (CUI) is a critical issue in industries such as petrochemicals, oil and gas, and power generation, where equipment like pipes and tanks are insulated. CUI occurs when moisture is trapped between the insulation and the equipment, creating a corrosive environment that can lead to hidden damage. This corrosion is particularly problematic because it's not visible, often going undetected until significant damage occurs, potentially leading to equipment failure, leaks, downtime, and safety risks. The global cost of corrosion is estimated at \$2.2 trillion annually, with CUI accounting for 40–60% of pipe maintenance costs.

Overview of Guided Wave Testing (GWT)

For CUI inspection, GWT is effective because it can detect corrosion with minimal removal of insulation, reducing both time and cost. The technology uses either full circumferential bands or sectoral probes around the pipe to generate torsional or longitudinal wave modes, which are analyzed for echoes indicating defects.

Application to CUI Inspection

For CUI inspection, MsS guided wave testing is highly effective due to its ability to inspect with minimal removal of insulation. The technology can detect corrosion by analyzing wave reflections, with techniques like Sectional Focusing Inspection (SFI) using sector probes offering high sensitivity for specific areas, such as pipe supports or soil-air interfaces, which are prone to CUI. This is crucial for identifying localized corrosion that could lead to failures, especially in high-temperature environments where thermal cycling exacerbates CUI. The process involves attaching the MsS probe to a test point on the pipe, generating waves, and analyzing the received signals for amplitude changes or echo patterns indicative of wall loss.





MsS Guided Wave For CUI

MsS Guided Wave Testing offers several advantages for CUI inspection:

- Long-range capability: Can inspect up to 300 feet in each direction (depending on condition of piping) with encircling probes, covering extensive pipe lengths from one location.
- Minimal insulation removal: Reduces preparation time and cost, as it doesn't require removing insulation, which is a significant advantage for CUI detection.
- High productivity: Allows rapid screening of large sections of piping or plate.
- Access to difficult areas: Effective for buried pipes, underwater sections, or elevated pipe racks, minimizing safety risks.
- Sensitivity enhancement: SFI (Sectional Focusing Inspection) with sector probes increases defect detection sensitivity, ideal for detecting small CUI areas.

MsS Guided Wave Testing general applications include:

- Inspection of insulated piping in refineries, detecting CUI at pipe supports and soil-air interfaces, preventing potential leaks.
- High-temperature piping inspections, with temperatures up to 500°F, reducing downtime by avoiding insulation removal.
- Buried pipe inspections, identifying CUI at dike crossings, enhancing safety and integrity management.

MsS guided wave testing is an efficient method for detecting CUI on insulated piping systems, offering significant advantages in speed, range, and access, particularly for ferromagnetic materials. MsS proves to be an effective method for preventing costly failures and ensuring safety. Its integration into inspection programs, combined with follow-up techniques, provides a comprehensive approach to managing CUI risks.