

Oil & Gas Pipeline and Coating Inspection

Terahertz NDT for Non-Contact Coating, Corrosion and Polyethylene Pipeline Inspection

Oil & Gas assets rely on **protective coatings, polymer pipelines and welded joints** to maintain integrity under demanding operating and environmental conditions. During manufacturing and service, defects such as **coating-thickness variation, corrosion beneath dielectric coatings, voids, inclusions and incomplete fusion in polyethylene pipe joints** can develop without being clearly visible from the surface.

TeraNIM-OG uses **Terahertz Time-Domain Spectroscopy (THz-TDS)** for non-contact and non-destructive inspection of suitable Oil & Gas materials, enabling evaluation of **protective coating thickness, corrosion indications beneath dielectric coatings and defects in polyethylene/HDPE pipes and fusion joints** without cutting the component or applying liquid couplant.



Why Oil & Gas Pipelines and Coatings Need Non-Contact Inspection?

- Protective coatings can hide corrosion and substrate degradation
- Multilayer coating thickness can vary across pipes, joints and large structures
- PE / HDPE pipelines can contain voids, inclusions and incomplete fusion defects
- Complex pipe geometry and field conditions make repeatable contact inspection difficult
- Single-sided, non-contact inspection is valuable for automated and in-service quality control

Conventional Oil & Gas Inspection Challenges

- **Ultrasonic Testing: Contact-Based Inspection**
- **Radiography / Conventional NDT: Controlled Inspection**
- **Coated & Polymer Pipeline Structures: Inspection Challenge**

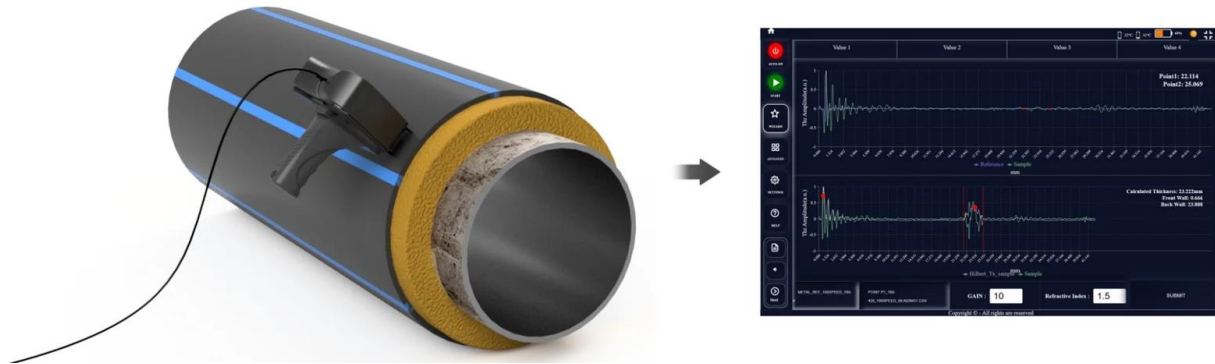
⚠ Hidden corrosion beneath coatings

⚠ Multilayer coating-thickness variation

⚠ Non-metallic PE / HDPE pipelines

⚠ Fusion-joint defects

⚠ Need for non-contact inspection



How Terahertz Technology Works for Oil & Gas Inspection

TeraNIM-OG uses reflected THz signals to inspect protective coatings and suitable PE/HDPE pipeline materials.

For coated metal:

Air → Insulation material → Coating → Metal Interface

The reflected signal can provide information on **coating thickness, interface condition and corrosion indications beneath the coating.**

For PE / HDPE pipelines:

Air → PE / HDPE Surface → Pipe Wall / Fusion Joint

Signal changes can indicate **voids, inclusions, air gaps and incomplete fusion defects.**

TeraNIM Oil & Gas Inspection Workflow

SCAN

Direct a THz pulse onto the coated pipeline or PE / HDPE component and acquire reflected signals using single-side, non-contact access.

DETECT

Identify signal changes associated with coating thickness, corrosion beneath dielectric coatings, pipe-wall variation and internal defects such as voids, inclusions or incomplete fusion in PE / HDPE joints.

ANALYSE & REPORT

Determine coating or wall thickness, defect location and corrosion / fusion-joint indications, generate a 2D inspection map, and provide the Pass / Fail inspection result.

Key Advantages for Oil & Gas Operators & Manufacturers

- **Non-Contact Inspection:** THz measurement can be performed without physical probe contact with the inspected surface.
- **Non-Destructive Testing:** Inspect suitable coatings and polymer pipeline components without cutting or sectioning the asset.
- **Corrosion Under Coating Detection:** THz reflections can provide indications of corrosion beneath suitable dielectric protective coatings.
- **Coating & Defect Mapping:** Scanning multiple locations enables spatial evaluation of coating thickness and internal defect indications.
- **PE / HDPE Pipeline Inspection:** THz technology can evaluate suitable polyethylene pipe material and fusion joints for internal discontinuities such as voids, inclusions and incomplete fusion.
- **Automation Ready:** TeraNIM-OG can be integrated with scanners, robots or automated positioning systems for repeatable inspection.

Oil & Gas Quality Control with TeraNIM™

TeraNIM-OG provides a non-contact and non-destructive approach for inspecting suitable coatings, corrosion-under-coating conditions and polyethylene pipeline structures.

By combining **THz reflection measurement, signal processing and automated scanning**, the system can support **protective coating-thickness measurement, corrosion indication mapping, PE / HDPE pipe inspection, fusion-joint defect detection and digital Oil & Gas quality control.**