Replacement of Conventional NDT with Advance NDT Methods for Oil and Gas

By

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Asset Integrity Goal

– To ensure that the entire infrastructure remains safe, effective for the operating life
– Minimizing risky and costly activities such as confined space entry, removal of insulation to perform inspection
– Need to understand that remaining life can change over the course of asset life due to
  • Economic conditions
  • Operating conditions
  • Damage mechanism rates
  • Risk
Safety

- Ensure the equipment is safe to operate, maintain and inspect
- Reduce the number of confined space entries
- Removal of insulation can expose workers to environmental hazards
## Damage Mechanisms and Inspection Techniques

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Guided Wave Testing (GWT)

- Long range ultrasonic technique for screening piping and pipelines
- Test range up to 300 feet from a single collar location
- Elevated temperatures without taking the piping out of service
- 100% of the pipe is inspected
- Rapid, full coverage screening

- Difficult to access locations
  - Inaccessible piping
  - Corrosion under insulation
  - Wall penetrations
  - Pipe racks
  - Soil to air interfaces
  - Corrosion under supports
  - Underground piping
  - Road crossings
  - ILI verifications

Follow up with NDE and ultrasonics
• Permanently installed Guided Wave collars are used for precise monitoring with detection of less than one percent cross sectional change.
  – New algorithms can detect even the slightest change and compensate for environmental changes.
  – Online data basing and review is available.
  – These tools have service life expectancy of >10 years.

• PEC probes can also be permanently mounted for occasional monitoring for critical areas.
Tank and Vessel Hydrogen Damage Inspection

- Simple angle beam Pitch-Catch technique
- Bulk wave at 35°
- Distance between probes up to 24”
- Multiple skips
- Looking for amplitude drops due to inclusions
Inclusions in the parent material will dissipate sound.
Amplitude of sound reaching the Receiver will decrease.
By gating the received signal, a simple line scan will show indications as drops in amplitude.
Indications can be further sized using conventional ultrasonic testing.
EMAT Boiler Inspection

- Individual Tube thickness graph
- Elevation Thickness Graph
- Overall multiple tube display
- Recently replaced tube

Individual Tube thickness graph

Elevation Thickness Graph

Overall multiple tube display

Recently replaced tube
High Temperature Thickness Monitoring

• EMAT Ultrasonic is an ideal method for thickness measurements on conductive materials. The advantages include:

  • Dry, non-contact ultrasound generation permits inspection of very hot (up to 1800F) and very cold material. Lack of couplant requirements also provides extremely reliable and repeatable inspections with micrometer accuracy.

  • Imperviousness to surface conditions. The material can be coated, rough or dirty thus eliminating the need for surface preparations.

  • Inspections of difficult materials such as cast steel, cast iron, austenitic stainless steels, coated and painted surfaces.
EMAT - Piping & Equipment

- Crevice Corrosion Pipe Support Interface
- Crevice Corrosion on Horizontal Vessel’s Saddle Support Interface
- Soil to Air Inspection
- Rapid Screening of large linear feet of piping systems
- High Temperature Thickness Monitoring above 1000F
Corrosion Under Insulation (CUI)

- Corrosion Under Insulation (CUI) detection solution
  - Guided Wave Ultrasonic Inspection (GW)
  - Real-Time Radiography Inspection (RTR)
  - Digital Radiography Profile (DR)
  - Pulsed Eddy Current (PEC)
  - Rope Access
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