LONG RANGE GUIDED WAVE ULTRASONIC INSPECTION SYSTEM
Who we are

Conventional and Advanced NDT and Inspection Services

Oil and Gas, Refinery, Petrochemical, Heavy Industry, Mining

Over 400 personnel including more than 300 inspectors

Thailand headquarters with International expertise since 1979
Capabilities

- Can be performed at elevated temperatures up to 120°C without taking the pipe out of service
- 100% of the pipeline is inspected (within the diagnostic length of a test)
- Pulse echo type operation provides information on feature position and approximate size
- Focusing capability to evaluate corrosion distribution around pipe circumference
Benefits

• Low cost screening tool with 100% coverage

• Typical test range 60m from ONE single location, with ideal conditions can achieve longer distance.

• Testing of pipes up to 48” diameter

• Proven capability on pipe in service up to 120°C

• Detection of cross sectional wall loss of >3%

• Ideal where conventional testing is impossible or very costly e.g. clamped, insulated, elevated, sleeved or buried pipes.
Target Applications

• Rapid, full coverage screening of pipes
• Especially cost effective in difficult to access locations
  ▪ Sleeved road crossings
  ▪ Corrosion under insulation
  ▪ Wall penetrations
  ▪ Pipe racks
  ▪ Jetty Lines
  ▪ Rope access

• To localise and pin point accurately > 500mm, areas for further investigation by focusing and categorising.
Target Applications

• **Pipe types**
  - Seamless
  - Longitudinally and spiral welded

• **Sleeved road crossings**
  - Ferritic, stainless steels and other metals

• **Coated Pipe**
  - Foam or mineral wool
  - PVC, epoxy, coal tar epoxy
  - Paint
  - Bitumen wrapping

• **Flaws found**
  - External/Internal corrosion or erosion
  - Mechanical damage (depending on severity)
  - Corrosion under insulation (CUI) and buried pipelines
Pre-inspection Set-up

- A ring of transducers is placed around the pipe.
- Usually no surface preparation or coating removal is required.
- No couplant between the transducer and surface is required (due to applied pressure).

![Image of a transducer setup on a pipe]
Process

- Low frequency ultrasound is transmitted penetrating the material with frequencies 20kHz - 100 kHz and received back to the tool location.

- The guided waves used travel varying distances throughout the material, dependent upon raised, buried, submerged or insulated pipe.

- A laptop PC runs dedicated Teletest® data acquisition and analysis software. The flaw detector communicates with the PC via a high-speed data link.

- Teletest® has option to use ‘multi-mode’ technology to assist in characterizing flaws detected.
Process

- Response from anomalies and features are then established and categorized by the received signal and an approximate percentage of wall loss is determined.

- Data Focusing in these areas allows ultrasound energy to be concentrated into a small region of pipe for detailed localized inspection where metal loss is present. Termed “Directionality”

- Further investigation and follow up inspection can then be applied in the areas of interest by other techniques of NDT. Example. Corrosion Mapping (C-Scan)
How It Works

• Guided waves are sent in each direction (Forwards and Backwards)
• Received reflections are then analysed
How It Works

Conventional Ultrasonics  V Guided waves (LRUT)

- Conventional Transducer
- Localised Inspection
- Weld
- Metal loss
- Guided transducers
- Wave
- 100% Inspection
- Weld
- Metal loss
- Guided Wave
- Metal loss
- Flange
How It Works

Position of Collar

Series of Welds

DAC Curves

Iconic representation of identified features

Corrosion is indicated in A-scan view
The symmetric nature of a reflection can help classify it.

Received reflections from features can be used prior to focusing to determine the nature and circumferential position of the data collected.

Using different colors in the A-Scan presentation (Black, Blue, Red) shows where features can be located around the circumferential position of a pipeline.
The symmetric nature of a reflection can help classify it.

A typical weld is completely symmetric and shows up as only a **Black** curve.

A typical corrosion patch at the 3-9 O'clock position is non-symmetric and is identified by the presence of a **Red** curve.

A typical corrosion patch at the 12-6 O'clock position is non-symmetric and is identified by the presence of a **Blue** curve.
The symmetric nature of a reflection can help classify it.

Example: Predominately Blue in colour the A-scan received signal indicates an echo of a 90º bend weld in horizontal to vertical axis when the collar is set at 12 O' clock position.
With the ability of the soft wear, Data focusing gives us the advantage to determine (Along with A-scan interpretation) directionality and severity of an anomaly for each individual location. Dependent upon initial category rating

Area of isolated Cross Sectional Wall Loss (Higher Priority)

Area of scattered Cross Sectional Wall Loss (Moderate Priority)

Area of General Cross Sectional wall loss, likely general corrosion (Low Priority)
Concluding Categorization of Anomaly

Once A-Scan data is analyzed and additionally using results from the focused directionality data we can further categorize anomalies using the following chart.

<table>
<thead>
<tr>
<th>Category A-Scan Amplitude</th>
<th>Directionality Rating</th>
<th>Score (Final)</th>
<th>Follow up priority</th>
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</table>
Typical example of corrosion
Factors affecting results: Bitumen Wrapping

Strong attenuation is caused by bitumen wrapping increasing signal to noise ratio making this interpretation reach threshold limit.

Exposed side shows little attenuation and low noise.
How Can We Help?

Contact

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