Comparison Corrosion Mapping Solutions using Phased Array and Conventional UT Techniques

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Agenda

1. Introduction ✔
2. Conventional UT Mapping Working Flow
3. PA Mapping Working Flow
4. Comparison Chart Benefits and Advantages
Conventional UT
Dual Element Transducer

Pulse – Echo - 2 separate elements preferred to single element

Natural beam reflection of sound

Good Near Surface Resolution
Conventional UT
Dual Element Transducer
Transducers, Transducers everywhere!

Choose your right probe using your criteria of inspection:
- Thickness vs. Frequencies
- Temperature of contact
- Diameter of probe
- High damping for wide bandwidth and narrow peak response
- Lower damping for better sensitivity

PDEI Family

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<tr>
<th>PDEI</th>
<th>f (MHz)</th>
<th>θ (°)</th>
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Dual Element Special Feature

Dual crystal transducers support the Auto-Zero feature that is a quick pulse-echo action that searches out instantly the probe zero. It is more commonly used by high temperature sensing where the probe zero tends to move versus temperature.

Sound path/2 = Probe Zero

Hint: D-series can link the Auto-Zero to a user key
Setup Your Custom Inspection Plan
Specify your Material Thickness

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Review T-Log grid on PC

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B-Chart

Timed Based or Encoded

15 mm (0.59 inch) diameter element

1 to 10 MHz

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PA Corrosion mapping

PA Transducers

- X3 64 Elements
  - Array length: 45 mm
- T5 64 Elements
  - Array length: 60 mm
- WheelProbe 2 64 Elements
  - Array length: 51.1 mm
Focusing, Aperture

8-Active Elements Recommended
WheelProbe

Advantages:

- Constant pressure and even pressure on the surface for repeatable amplitude response.
- Extract Time of flight and Amplitude at the same time because WP is driven by advanced and multitasking software.
- Consistent C-scans for defect evaluation and scanning.
- Very large scanning line and high resolutions mapping.
- Spray a fine layer of water is enough for good coupling Achievable on any type of surface, even on rough corroded surface.
WheelProbe

Advantages:

• Device requires IFT which auto sets probe zero position live
  No wedge delay calibration (only velocity and sensitivity)

• Practically no wear on the tyre, it rolls!

• No lateral slipping

• Integrated encoder
Inspection Steps

1. Load configuration file previously built in UTStudio
2. Calibrate the encoder
3. Select your favorite layout
4. Calibrate the Velocity and Sensitivity
5. Inspect*
6. Save  
   Up to 1.5 GB (no loss of data and resolution – no compression)
   *Save time on acquisition!
   Scan, next index, Set Scan position, scan 2nd strip and so forth - Remotely
Ease of Use + Fast Scanning

No actions required on device during live acquisition

280 mm/s x 44.8 mm = 12 500 mm²/s
= 125 cm²/s

11 in/s x 1.76 in = 19.4 in²/s

Remote Display Using VNC

LED Alarms Recording Status

Range of Scanning: Up to 10 m

Play-Record
Next Index
Set Scan Position

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On-Board Imagery

Direct feedback onsite

Live L-scan
Amplitude readings

Scrolling View
(B-scan)

Merged Views
%
Or
Time of Flight

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Adjust palettes Thresholds

Thickness

Place the relative threshold cursors and choose their colors. E.g.: 70% and above is green.

Min-Max color defined from the part thickness.

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Adjust palettes Thresholds Amplitude

Main Extra Scan Information: Increase detection for small pits.

Line of 0.1 inch diameter Rounded Bottom Hole
Data Collected
Analysis - Annotations

A-scan at beam #11

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Size the Defects

Flat Bottom Hole D=0.375 inch
Area = 0.442 inch²
Area Measured = 0.436 inch²

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Size the Defects
In Amplitude

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Bonding ratio is the percentage of amplitude detected under a certain level

E.g.: Bonding Ratio Reference is 50%
10 A-scans triggered at 40% FSH
10 A-scans at 60% FSH
80 A-scans at 80% FSH

Bonding Measure is then 10%
On Site Example

Provide 100% Coverage
All Devices Rugged
Fast Scanning
Axial Inspect
…And More!

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Create Configuration for Inspection:
- In UTStudio
- or In VEO/PRISMA

Load Configuration File

Load Configuration File from Previous Data (.utadata to .utcfg)

Record Data
- Linear-Scan
- C-Scan
- Merge Scans

Review in UTStudio:
- Color Map
- Color Map Editor
- Annotations
- Notes
- Multiple Working Sheets
- Custom Layouts
- Export to CSV
- PDF Report
- Drag and Drop Views to Word

Directly open in VEO/PRISMA:
- Export to CSV
- Prefixed Layouts
- Share to FTP server
- PDF Report

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<tr>
<th><strong>Conventional Mapping</strong></th>
<th><strong>PA Mapping</strong></th>
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<tbody>
<tr>
<td>Low Cost</td>
<td>High resolution Encoding</td>
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<tr>
<td>Simple Training</td>
<td>Near Surface Resolution</td>
</tr>
<tr>
<td>Easy and Light User Interface</td>
<td>Low Coupling Required (Wheel Probe)</td>
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<tr>
<td>Fast Point Acquisition</td>
<td>No Irrigation Required (Wheel Probe)</td>
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<tr>
<td>Small Equipment</td>
<td>Fast Encoding Performance</td>
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<tr>
<td>Color Palette Application</td>
<td>Focusing</td>
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<td>CSV Exportation</td>
<td>Color Palette Application and Editor</td>
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<td>Traceability</td>
<td>Multi Views</td>
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<tr>
<td>Notes</td>
<td>Advanced PC software</td>
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<td>CSV Exportation from any Views</td>
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<td>Embedded Reviewing</td>
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<td>Further Analysis Possibilities</td>
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<td>Traceability</td>
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<td>Annotations and Notes</td>
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Questions?