Riser Bolt Inspection

Application Solution
Overview

• Inspection Challenge
• Recommended Phased Array Ultrasonic (PA UT) Solution
• Results
• Benefits of Zetec Solution
Riser bolts require regular in-service inspections for crack detection.

Removing bolts is time consuming, so owners look for reliably “in-situ” inspection.

Manual inspection techniques (conventional Ultrasound (UT) or PA UT) are not sufficiently effective:

- Signal interpretation can prove difficult in the presence of multiple geometrical echoes (e.g. threads) and reflections.
- No permanent data recording or position information.
Recommended PA UT Solution

• Encoded phased array UT will improve efficiency and reliability of the inspection:
  – Increased detection capability
  – Improved characterization and sizing of indications, through adequate visualization of inspection data
  – Provides permanent records

• Solution dealing with variety of bolt types:
  – Simple, encoded manually driven scanning tool
  – Standard phased array UT probe driven by a portable phased array unit
  – On-board software tools allowing for efficient and reliable interpretation of inspection data
Inspection Technique

- 1D linear array, 5 MHz, 32 elements
- Azimuthal scan, generating LW beams, focused at the bolt OD surface (“projection” mode)
- Selection of refracted angles through ray-tracing for adequate coverage of the area of interest
- Guided and encoded rotation of the probe to cover the complete circumference of the bolt
Dedicated Manual Scanner

- Encoded rotation, manually driven
- Adjustable radial probe position
- Spring-loaded probe for adequate coupling
- Fits onto a range of hex nuts
Zetec Topaz 32 Instrument

- Fully integrated, portable PA UT unit
- PA UT 32/128PR + 2 UT at 200 V
- 64-bit computer, fast processing
- Rugged, battery operated
- Driven by UltraVision Touch software for setup, recording and full data analysis
- 2GByte data files on-board
- Reporting Feature
Results on Test Bolt

Notch 1
0.75" x 0.25" (L x d)

Notch 2
0.75" x 0.125"

Notch 3
0.75" x 0.375"

Notch 4
0.75" x 0.325"

Notch 5
0.75" x 0.25"

Notch 6
0.75" x 0.125"

Notch 7
0.5" x 0.06"
Results on Test Bolt

Notches 1 and 2, close to the echo from the bolt geometry, are well resolved by using the Linked B-Scan View; detection from A-scan only is challenging.
Results on Test Bolt

Notches 3, 4, 5 and 6, all in the threaded area, and with depths varying from 0.125” to 0.375”, are clearly detected and resolved from the thread signals.
Notch 7, only 0.06” deep, and located in close proximity of the back wall, can be clearly resolved from the geometry.
Results on Test Bolt

3D imaging of phased array UT data in riser bolt CAD model, generated with UltraVision Classic 3D software, facilitates data interpretation by end users.
Benefits of Zetec Solution

- Encoded manual scanning device provides repeatable results and permanent recording

- **TOPAZ**³², a fully integrated portable system:
  - High performance from on-board 64-bit computer
  - On-board UltraVision Touch software provides all required tools from setup through reporting
  - Capability to record large data files (up to 2 GBytes)

- Easy to deploy:
  - Dynamic Merge views for on-line monitoring of inspection data
  - Complete data analysis capability
  - Indication Table & Report Generation

- Files fully compatible with UltraVision Classic 3D software
Thank You!

Learn more at: www.zetec.com