NDT Services from TWI

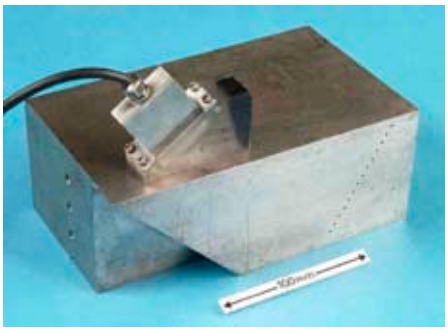
Computerised Pulse Echo Ultrasonic Flaw Detection, Location and Sizing

Description

Phased array ultrasonic systems utilize multi-element probes, which are individually excited under computer control. By exciting each piezo-composite element in a controlled manner a focused beam of ultrasound can be generated. This beam can be steered by use of the software. Linear and sectorial scans are possible, and, in conjunction with probe scanners, 2 and 3 dimensional views can be generated showing the sizes and locations of any flaws detected.

TWI owns a range of phased array systems. They are as follows:

- Laboratory / bench units
    - Olympus NDT's Tomoscan Focus. A 32 channel system.
    - Zetec Tomoscan III. A flexible and powerful system capable of handling up to 128 channels of phased array ultrasound channels
    - Peak NDT's Micropulse 5 PA system. This is an advanced unit developed for the nuclear industry with 128 channels.
- Portable units
    - Olympus NDT's Omniscan MX PA. A robust 16 channel unit. (TWI owns 5 of these systems).
    - Harfang Microtechniques X-32. TWI owns 8 of these units. They are robust and extremely well adapted to site use.



Phased array probe on a calibration block

Harfang flaw detector in use for weld inspection

For non phased array inspections, TWI employs the P-Scan from Force Technology. Utilising both focused and unfocused conventional probes, this is an extremely robust system that is ideally suited to weld flaw detection and sizing. It can be linked to a wide range of mechanised scanners, which manipulate the ultrasonic transducer(s).

Alternatively a single probe with mechanical linkage to record its position and orientation can be manipulated manually, thereby permitting a fully recorded, code compatible, manual UT inspection. The electronic system records the position and orientation of the transducers and uses these data and the ultrasound reflections to simultaneously produce through thickness and plan view projections showing the positions and sizes of any flaws. The latest P-Scan system 4+ owned by TWI has the following capabilities:

- P-scan **weld inspection** producing through thickness and plan view projection images.
- T-scan **corrosion mapping** displays variations in thickness as a coloured plan view of the test piece, allowing detection of isolated corrosion pits, general corrosion thinning and laminations. (Note that both T-scan and C-scan are terms used for scans in which a compression probe transducer is traversed across the surface in a raster pattern to produce plan-view maps showing the positions of embedded flaws or far wall corrosion. The only difference is that T-scan is the term normally used when data is displayed by distance (time of flight), whereas C-scan normally displays amplitude information.)

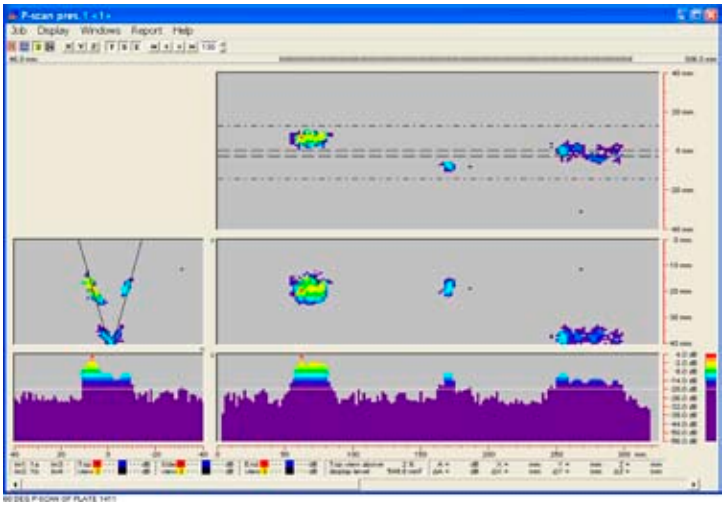
Examples of the displays from these two scan types are given overleaf. The P-Scan system can also be used for TOFD flaw detection and sizing. This is described elsewhere.

TWI has a range of versatile manual and mechanised scanners for use with the P-Scan system.

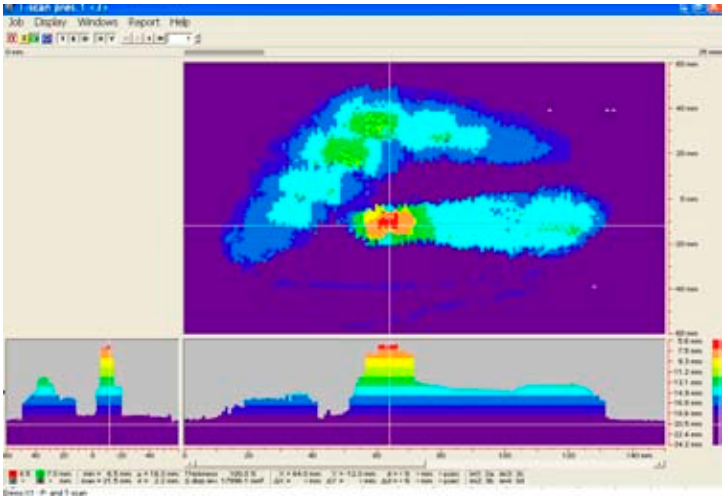
NDT Services from TWI

Selected clients and applications

- Critical phased array flaw sizing on the turret of a FPSO vessel for Petrobras
- Phased array flaw sizing on the Humber and Mardle bridges for the UK Highways Agency
- Phased array boiler inspections for BNFL Magnox
- T-scan corrosion mapping of ship hulls for Ocean Fleets.
- P-scan inspection of welds in gas storage vessels for the British Navy.
- P-scan inspection of girth welds in thick wall Hydrocrackers for Mobil Oil.
- P-scan inspection of seam welds in LPG storage spheres for BP.
- P-scan inspection of offshore platform riser welds for Conoco UK.
- P-scan inspection of offshore riser tie-in “golden” welds for Amoco.
- P-scan inspection for SCC in Ammonia storage tank welds for Norsk Hydro.
- T-scan corrosion mapping of vessels on Ekofisk platform for Phillips Petroleum.



P-Scan display showing weld flaws in plan-view (top), longitudinal (right) and transverse cross-sections (left).



T-Scan corrosion map (top) with longitudinal and transverse section views through areas showing major thinning

For more information on the services offered in this leaflet, contact:

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