

## Automated Ultrasonic Testing (AUT) of Pipeline Girth Welds

### Description

In automated ultrasonic testing (AUT) of pipeline girth welds a number of separate fixed angle probes or a pair of phased array probes are mounted on a band strapped around the pipe, positioned each side of the weld and driven around the pipe's circumference. As the probes travel around the pipe, ultrasonic data are collected from the weld and the software calculates flaw sizes and positions for display. Very fast circumferential speeds (~100mm/s) are called for, since, to keep pace with construction, it is necessary to complete a weld inspection every 2-4 minutes. AUT is replacing radiography for pipeline girth weld inspections worldwide. The advantages of conventional AUT over radiography are:

- No radiation hazard.
- Better process control of welding through rapid feedback, giving lower reject rates.
- Improved defect evaluation by using Engineering Critical Assessment (ECA) criteria.
- Rapid and reliable data interpretation from specialised output display.

TWI's AUT system is the PipeWIZARD® supplied by Olympus NDT. This has the further advantage over conventional AUT systems that it utilises phased arrays. These offer major advantages over conventional AUT in constant geometry components such as pipeline girth welds.

- Smaller probe pans, reducing the length of pipe coating that has to be cut back.
- One PipeWIZARD can scan pipes ranging in diameter from 2 in. to 56 in.
- The standard PipeWIZARD can scan pipe walls from 6 mm to 50 mm.
- Multiple zones for better detection and vertical sizing.



*TWI's PipeWIZARD crawler mounted on a pipe for laboratory trials*



*PipeWIZARD in the field (courtesy of Olympus NDT)*

- Any weld profile, pipe diameter, or wall thickness can be accommodated by recalling the appropriate previously saved setup files.
- Arrays can be programmed to check the coupling automatically using the back wall echo.



*PipeWIZARD computer screen*

In the PipeWIZARD computer screen shown, the vertical plots are the signals associated with specific zones of the weld (cap, body and root) on the upstream and downstream sides of the weld. Each zone is approximately 2mm deep and is scanned by selecting an appropriate focal law that controls the phasing of the array. The screen display essentially 'opens out' the weld from the root. Flaw lengths are estimated from circumferential position markers and depths from the number of zones affected. The red zones are above a predefined threshold. The central grey area is a Time of Flight Diffraction (TOFD) plot. (See separate sheet for description of TOFD.)

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

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