

Phased Array Ultrasonic Technology

Ultrasonic phased array testing is a powerful NDT technology and one whose use is growing rapidly, however it can seem complex to a person who has not worked with it.

Ultrasonic phased array systems can potentially be employed in almost any test where conventional ultrasonic flaw detectors have traditionally been used. The flaw image obtained with multiple angles and beams gives a more accurate flaw characterization than conventional ultrasonic inspection. Phased array UT is now used for inspecting fabricated piping and pressure vessel welds. For piping inspection, it is used in lieu of radiography or manual ultrasonic inspection. Weld inspection and crack detection are the most important applications, and these tests are done across a wide range of industries including aerospace, power generation, petrochemical, metal billet and tubular goods suppliers, pipeline construction and maintenance, structural metals, and general manufacturing. Phased arrays can also be effectively used to profile remaining wall thickness in corrosion assessment applications.

The benefits of phased array technology over conventional UT come from its ability to use multiple elements to steer, focus and scan beams with a single transducer assembly. Beam steering, commonly referred to as sectorial scanning, can be used for mapping components at appropriate angles. This can greatly simplify the inspection of components with complex geometry. The small footprint of the transducer and the ability to sweep the beam without moving the probe also aids inspection of such components in situations where there is limited access for mechanical scanning. Sectorial scanning is also typically used for weld inspection. The ability to test welds with multiple angles from a single probe greatly increases the probability of detection of anomalies. Electronic focusing permits optimizing the beam shape and size at the expected defect location, as well as further optimizing probability of detection. The ability to focus at multiple depths also improves the ability for sizing critical defects for volumetric inspections. Focusing can significantly improve signal-to-noise ratio in challenging applications, and electronic scanning across many groups of elements allows for C-Scan images to be produced very rapidly.



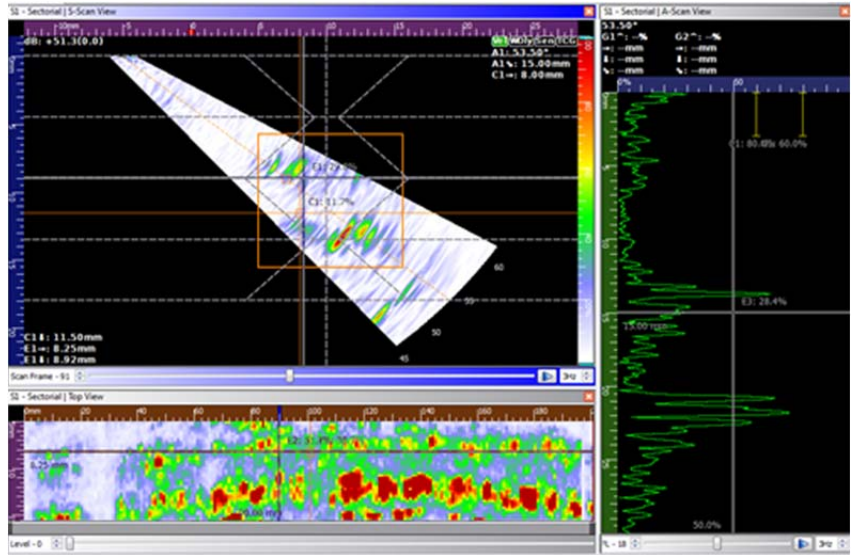
Advantages of Ultrasonic Phased Array Testing

- Comprehensive data collection with auditable, repeatable results.
- Digital records eliminate materials waste and the need for extra storage space.
- High-speed inspection using single-axis scans instead of conventional raster scan.
- Adaptable to complex configurations complex parts including thick components.
- Automated scanning processes ensure reliability and accuracy.
- Increased sensitivity to the detection of planar defects (as compared to radiography)
- Provides capability to size the depth (vertical component) of a defect.
- Better detection in austenitic materials and dissimilar metal (DM) welds
- Real-time data acquisition increases production times and reduces component downtime
- Does not require work stoppage as needed when performing radiography
- No hazards in signal transmission or instrument transportation as found with radiography.
- PA-AUT permits the use of Engineering Critical Assessment, which typically allows larger defects. (Overall, combined process control and ECA should produce lower reject rates.)
- Typical PAUT crews require fewer personnel than that of a radiography crew

- Reduced the cycle time between when a weld is complete and the disposition of the weld's acceptance
- PAUT technology is rapidly advancing every day, creating even more options for performance and accuracy.

Industry Acceptance

Ultrasonic phased array testing is becoming widely accepted throughout most all industries. Quickly following is the acceptance from governing bodies for Codes and Regulations. Currently most all major regulatory agencies provide acceptance to using Ultrasonic Phased Array techniques. Some which provide acceptance to using the method in lieu of radiography. These agencies include ASME, API, NRC, etc. AWS is currently developing specifications that allow the use of PAUT in lieu of the required manual UT techniques. Several high profile projects are under the supervision of AWS representatives where PAUT is being used in lieu of both radiography and manual UT inspection methods.



Disadvantages of PAUT

The potential disadvantages of phased array inspections are the somewhat higher costs for the instrumentation however these costs are frequently offset by their greater flexibility and a reduction in the time required performing a given inspection.

The higher costs of operator training are often considered a disadvantage but the quality of the technician after such training is priceless and therefore an overall advantage to the customer. As our industry places more and more emphasis on the technologies of Ultrasonic Phased Array testing we are seeing better resources come available for training and education for both the technicians and the customers.

The Tricen Advantage

Tricen's UT inspection program was developed on the foundation of advancing technology. Every day we strive to develop new techniques and applications that increase performance and reliability while focusing on reducing the costs of inspections. Targeted areas of cost reduction include component downtime, customer required resources, and project impact.

We work directly with our customers to develop an inspection plan that complies with Code and Regulatory requirements, accommodates schedule demands and project resources, and provides accurate and comprehensive data. We offer a wide range of PAUT techniques including encoded scans, automated scanning, manual scanning, production welds, weld overlay examinations, dissimilar weld examinations, and corrosion mapping and assessments.

Industries Tricen is currently serving include:

Power generation (including nuclear) • Petro-chemical • Construction (vessels and piping) • Commercial Building services