QUEST
Professional Center

PROFESSIONAL TRAINING COURSE

Course No. 1295

Phased Array Ultrasonic Testing (PAUT) Training Course

CORROSION, INSPECTION & NDT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION
5 Days

DELIVERY
Classroom

Course Overview

The Phased Array Ultrasonic Testing (PAUT) Training Course is a specialized professional program designed to develop the technical knowledge and practical skills required to understand, configure, perform, and evaluate phased array ultrasonic examinations. PAUT is an advanced ultrasonic non-destructive testing technique that uses multiple individually controlled elements within an array probe to generate and steer ultrasonic beams. This capability enables inspectors to examine complex components, achieve broad inspection coverage, and produce detailed inspection data for evaluating welds and other critical structures.

Phased Array Ultrasonic Testing is widely applied in the inspection of pipelines, pressure vessels, storage tanks, structural components, industrial equipment, power generation facilities, petrochemical installations, manufacturing operations, and major construction and maintenance projects. The ability to electronically steer and focus ultrasonic beams provides inspection flexibility that can be particularly valuable when conventional ultrasonic testing configurations are insufficient for complex geometries or demanding inspection requirements.

This course provides a comprehensive understanding of PAUT principles, including ultrasonic wave behavior, phased array technology, probe configuration, beam steering, focusing, focal laws, scanning techniques, calibration, sensitivity settings, data acquisition, image interpretation, and defect evaluation. Participants will also examine the practical factors that influence inspection performance, including material properties, component geometry, weld configuration, probe selection, couplant conditions, scanning coverage, equipment settings, and data quality.

The Phased Array Ultrasonic Testing (PAUT) Training Course combines theoretical learning with practical exercises, inspection scenarios, data interpretation, and case studies. Participants will learn how to plan a PAUT examination, select appropriate inspection configurations, verify system performance, acquire reliable inspection data, interpret phased array images, identify relevant indications, and document examination results. The course supports organizations seeking to strengthen advanced non-destructive testing capabilities, improve inspection reliability, and support quality assurance and asset integrity programs.

Objectives

- Analyze the fundamental principles of ultrasonic testing and phased array technology within the course context.
- Evaluate PAUT applications according to material type, component geometry, weld configuration, thickness, and inspection objectives.
- Apply principles of probe selection, element configuration, beam steering, focusing, and focal law development.
- Develop appropriate PAUT inspection configurations for defined weld and component geometries.
- Perform equipment setup, calibration, sensitivity verification, and system checks before examination activities.
- Assess scanning coverage and determine whether the selected configuration provides adequate examination of the required inspection volume.
- Analyze phased array data and images to identify relevant indications and potential discontinuities.
- Evaluate common weld indications and distinguish relevant defects from geometric or non-relevant responses.
- Interpret examination results in accordance with approved procedures and applicable acceptance requirements.
- Improve inspection documentation by recording examination parameters, findings, limitations, and evaluation results.
- Strengthen quality control through systematic verification of equipment performance, data quality, and inspection coverage.
- Design a practical PAUT examination plan that integrates inspection objectives, equipment configuration, scanning strategy, data acquisition, and reporting.

Who Should Attend

This course is designed for non-destructive testing inspectors, ultrasonic testing technicians, PAUT technicians, weld inspectors, inspection engineers, quality control inspectors, QA/QC professionals, welding engineers, materials engineers, mechanical engineers, asset integrity engineers, and technical specialists involved in advanced ultrasonic inspection.

The program is particularly relevant to professionals working in pipeline inspection, pressure vessel inspection, storage tank inspection, industrial fabrication, power generation, petrochemical facilities, manufacturing, construction, maintenance, and in-service inspection. It is also suitable for technical supervisors and inspection personnel responsible for selecting ultrasonic inspection methods, preparing examination procedures, reviewing inspection data, and evaluating weld quality.

Quality managers, inspection managers, asset integrity managers, project managers, engineering consultants, and technical decision-makers can also benefit from the program by developing a stronger understanding of PAUT capabilities, inspection limitations, data quality requirements, and the role of advanced ultrasonic testing within broader quality assurance and asset integrity strategies.

Learning Outcomes

- Explain the operating principles and technical foundations of Phased Array Ultrasonic Testing.
- Distinguish PAUT from conventional ultrasonic testing techniques and identify appropriate applications for each.
- Identify suitable phased array probes, wedges, frequencies, and configurations for defined inspection applications.
- Explain beam steering, electronic scanning, focusing, and focal law principles.
- Configure PAUT equipment according to defined examination requirements and approved procedures.
- Perform appropriate calibration and verify system sensitivity and performance before inspection.
- Establish suitable scanning paths and evaluate required examination coverage.
- Acquire and record PAUT inspection data in a systematic and traceable manner.
- Interpret common phased array inspection displays and identify relevant indications.
- Evaluate weld discontinuities and distinguish relevant indications from geometric responses.
- Assess data quality and identify factors that can compromise inspection reliability.
- Prepare professional PAUT examination records and reports containing inspection parameters, findings, and evaluation results.

Course Outline

DAY 01

Fundamentals of Ultrasonic Testing and Phased Array Technology

- Principles of ultrasonic testing and ultrasonic wave propagation
- Wave modes, reflection, refraction, attenuation, and acoustic impedance
- Introduction to phased array ultrasonic technology
- Phased array probes, elements, wedges, and equipment components
- Electronic beam steering, scanning, and focusing principles
- Applications, advantages, limitations, and inspection considerations

> **PRACTICAL APPLICATION**
> Review an industrial inspection scenario and determine the suitability of PAUT for the specified application

DAY 02

PAUT Configuration, Probes, and Focal Laws

- Phased array probe selection and element configuration
- Probe frequency and aperture considerations
- Wedge selection and probe positioning
- Beam angle, steering range, and focusing requirements
- Focal laws and their relationship to beam formation
- Inspection coverage and examination volume definition

> **PRACTICAL APPLICATION**
> Develop a PAUT configuration and focal law strategy for a representative weld geometry

DAY 03

Equipment Setup, Calibration, and Examination

- PAUT equipment setup and system configuration
- Calibration principles and reference standards
- Sensitivity, gain, range, and system verification
- Verification of probe and wedge performance
- Scanning techniques and probe movement
- Couplant control, surface condition, and examination environment

PRACTICAL APPLICATION

Configure a PAUT system, perform calibration checks, and execute a simulated weld examination

DAY 04

PAUT Data Acquisition, Imaging, and Defect Evaluation

- PAUT data acquisition and recording requirements
- Understanding phased array imaging and examination displays
- Analysis of A-scan, sectorial, linear, and other relevant data presentations
- Identification of weld discontinuities and relevant indications
- Evaluation of cracks, lack of fusion, incomplete penetration, porosity, slag inclusions, and other weld indications
- Differentiating relevant indications from geometric and non-relevant responses

PRACTICAL APPLICATION

Analyze representative PAUT datasets and evaluate the location and characteristics of identified indications

DAY 05

Advanced Evaluation, Reporting, and Quality Assurance

- Review and validation of PAUT examination data
- Evaluation of inspection coverage and data quality
- Application of acceptance criteria and examination procedures
- Managing indications requiring further investigation, repair, or complementary testing
- PAUT reporting, documentation, traceability, and data management
- Integration of PAUT with other non-destructive testing methods and asset integrity programs

FINAL WORKSHOP

Develop a complete Phased Array Ultrasonic Testing examination plan covering inspection objectives, component and weld geometry, probe selection, equipment configuration, focal laws, calibration, scanning strategy, data acquisition, image interpretation, defect evaluation, acceptance requirements, documentation, and final reporting.

Register or Request More Information

Course page: https://quest-training.com/courses/phased-array-ultrasonic-testing-paut-training-course
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