

Course No. 1279

Ultrasonic Testing (UT) Training Course

CORROSION, INSPECTION & NDT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Ultrasonic Testing (UT) Training Course provides a comprehensive and practical foundation in ultrasonic inspection principles, techniques, equipment, data interpretation, and industrial applications. The course is designed to develop the technical capabilities required to use ultrasonic testing for detecting, locating, and evaluating internal and surface-related discontinuities in industrial materials and components. It also addresses ultrasonic thickness measurement and the use of ultrasonic inspection data to support asset integrity, quality assurance, maintenance, and reliability decisions.

Ultrasonic Testing is one of the most important non-destructive testing methods used for examining welds, plates, pipes, forgings, pressure equipment, structural components, and other critical assets. Unlike methods that primarily identify surface conditions, ultrasonic testing can provide valuable information about internal discontinuities and material thickness. A structured understanding of ultrasonic principles enables inspection professionals to select suitable techniques, configure inspection equipment appropriately, evaluate indications, and recognize factors that can influence examination reliability.

The course covers the fundamentals of sound propagation, wave behavior, transducers, probes, couplants, calibration, sensitivity, scanning techniques, and signal interpretation. Participants will explore straight-beam and angle-beam ultrasonic testing, ultrasonic thickness measurement, weld inspection, flaw detection, and the practical interpretation of ultrasonic indications. Particular attention is given to inspection variables such as material properties, geometry, surface condition, probe selection, calibration, accessibility, and inspection technique.

The program also connects ultrasonic testing with broader inspection and asset integrity requirements. Participants will learn how to plan ultrasonic examinations, select appropriate inspection techniques, evaluate results, document findings, and communicate technical conclusions effectively. By strengthening practical ultrasonic testing knowledge, the course supports more consistent inspection practices, improved quality control, informed maintenance decisions, and effective management of industrial asset condition.

Objectives

- Analyze the fundamental principles of ultrasonic testing and explain how ultrasonic waves interact with different materials during the course.
- Identify the characteristics of longitudinal, shear, surface, and other relevant ultrasonic wave modes and determine their practical inspection applications.
- Evaluate ultrasonic testing equipment, transducers, probes, couplants, calibration procedures, and accessories according to inspection requirements.
- Apply appropriate ultrasonic testing principles for detecting and evaluating internal discontinuities in industrial components.
- Assess the suitability of straight-beam and angle-beam techniques for different inspection applications, including weld examination and material assessment.
- Apply ultrasonic thickness measurement principles to evaluate material condition and support corrosion and deterioration monitoring.
- Interpret ultrasonic signals and indications by considering amplitude, location, geometry, material characteristics, and inspection conditions.
- Develop appropriate ultrasonic inspection procedures that define examination areas, scanning approaches, equipment requirements, and reporting considerations.
- Evaluate factors affecting ultrasonic inspection accuracy and reliability, including calibration, surface condition, probe selection, material properties, geometry, and operator technique.
- Strengthen the quality and traceability of ultrasonic inspection records by documenting measurements, indications, equipment settings, and examination results.
- Assess ultrasonic testing findings in relation to inspection objectives, quality requirements, maintenance needs, and asset integrity considerations.
- Develop a practical ultrasonic testing strategy for a selected industrial component, weld, or asset by the end of the course.

Who Should Attend

The Ultrasonic Testing (UT) Training Course is designed for professionals involved in non-destructive testing, inspection, quality assurance, engineering, maintenance, fabrication, welding, and asset integrity. It is particularly suitable for ultrasonic testing inspectors, NDT technicians, inspection engineers, quality engineers, mechanical engineers, materials engineers, welding engineers, metallurgical engineers, corrosion engineers, asset integrity engineers, reliability engineers, and maintenance professionals who require a strong understanding of ultrasonic

inspection principles and applications.

The course is also relevant to inspection supervisors, NDT coordinators, quality managers, inspection managers, maintenance managers, engineering managers, fabrication managers, project engineers, technical authorities, and professionals responsible for inspecting welds, pressure equipment, pipelines, storage tanks, plates, pipes, forgings, and other critical industrial components. It is valuable for professionals who review ultrasonic testing reports or participate in decisions concerning equipment condition, defect evaluation, quality control, and maintenance planning.

Managers, asset integrity professionals, project decision makers, and technical specialists can also benefit from the course by developing a clearer understanding of ultrasonic testing capabilities, limitations, inspection requirements, data interpretation, and reporting. This enables stronger communication between NDT personnel, engineers, quality teams, maintenance departments, and asset integrity functions.

Learning Outcomes

- Explain the fundamental physical principles of ultrasonic testing and sound propagation through industrial materials.
- Distinguish between major ultrasonic wave modes and identify appropriate applications for each.
- Identify and explain the functions of ultrasonic testing equipment, transducers, probes, couplants, calibration blocks, and related accessories.
- Perform the basic steps required to prepare and calibrate ultrasonic testing equipment for an inspection application.
- Select suitable probes and ultrasonic techniques according to material type, component geometry, thickness, and expected discontinuities.
- Apply straight-beam ultrasonic testing principles for material examination and thickness measurement.
- Apply angle-beam ultrasonic testing principles for weld inspection and detection of relevant discontinuities.
- Interpret representative ultrasonic signals and indications while considering signal response, location, geometry, and material characteristics.
- Evaluate ultrasonic thickness measurement results to identify material loss and support corrosion monitoring activities.

- Identify factors that may reduce ultrasonic inspection reliability and recommend appropriate controls or corrective measures.
- Prepare professional ultrasonic inspection records and reports containing relevant measurements, indications, examination conditions, and conclusions.
- Develop an ultrasonic testing inspection plan for a selected industrial component or asset based on inspection objectives and potential defect mechanisms.

Course Outline

DAY 01

Fundamentals of Ultrasonic Testing and Wave Propagation

- Introduction to ultrasonic testing and its role in non-destructive inspection.
- Basic principles of sound, frequency, wavelength, velocity, and acoustic impedance.
- Propagation of ultrasonic waves through different materials.
- Longitudinal, shear, surface, and other relevant ultrasonic wave modes.
- Reflection, refraction, transmission, attenuation, scattering, and mode conversion.
- Relationship between material properties and ultrasonic wave behavior.
- Principles of ultrasonic flaw detection and thickness measurement.
- Types of discontinuities detectable using ultrasonic testing.
- Advantages, limitations, and practical applications of ultrasonic testing.
- Introduction to ultrasonic inspection procedures and examination planning.

PRACTICAL APPLICATION

Analyze different industrial components and identify suitable ultrasonic testing applications based on material and potential defect types.

DAY 02

Ultrasonic Testing Equipment, Probes, and Calibration

- Overview of ultrasonic flaw detectors and thickness measurement equipment.
- Types and characteristics of ultrasonic transducers and probes.
- Straight-beam and angle-beam probes and their applications.

DAY 02 — CONTINUED

- Probe frequency, size, beam characteristics, and selection considerations.
- Couplants and their role in effective ultrasonic transmission.
- Calibration blocks and reference standards.
- Basic equipment calibration and verification principles.
- Establishing sensitivity, range, zero position, and appropriate instrument settings.
- Factors affecting calibration accuracy and inspection reliability.
- Surface preparation, probe positioning, scanning patterns, and examination conditions.

PRACTICAL APPLICATION

Select appropriate equipment and probes and establish basic inspection settings for representative components.

DAY 03

Ultrasonic Thickness Measurement and Flaw Detection

- Principles and applications of ultrasonic thickness measurement.
- Measuring material thickness and identifying material loss.
- Ultrasonic thickness measurement for corrosion and deterioration monitoring.
- Establishing measurement locations and inspection grids.
- Data recording, traceability, and comparison with historical measurements.
- Straight-beam ultrasonic testing for internal discontinuity detection.
- Detection of laminations, inclusions, voids, and other internal discontinuities.
- Angle-beam ultrasonic testing principles for weld examination.
- Weld geometry, scanning patterns, and detection of relevant indications.
- Factors affecting detection sensitivity and measurement accuracy.

PRACTICAL APPLICATION

Conduct a structured analysis of ultrasonic thickness and flaw-detection data and identify areas requiring further evaluation.

DAY 04

Ultrasonic Weld Inspection and Indication Evaluation

- Principles of ultrasonic weld inspection.
- Identification of common weld discontinuities and their ultrasonic responses.
- Angle-beam inspection techniques for welded joints.
- Probe positioning, scanning directions, and examination coverage.
- Understanding signal amplitude, location, travel distance, and response characteristics.
- Differentiating relevant indications from geometric or non-relevant responses.
- Evaluation of indication characteristics and reporting requirements.
- Factors affecting weld inspection, including weld geometry, surface condition, material structure, and access.
- Common sources of ultrasonic inspection uncertainty and examination errors.
- Review of representative ultrasonic inspection cases and technical findings.

PRACTICAL APPLICATION

Analyze sample ultrasonic weld inspection results and develop appropriate technical conclusions and follow-up recommendations.

DAY 05

Ultrasonic Inspection Planning, Reporting, and Asset Integrity

- Developing effective ultrasonic testing inspection procedures.
- Selecting ultrasonic techniques based on inspection objectives and potential defect mechanisms.
- Defining inspection locations, examination coverage, scanning approaches, and measurement requirements.
- Establishing appropriate calibration and verification requirements.
- Evaluating ultrasonic indications and determining when additional examination is required.
- Integrating ultrasonic thickness measurements with corrosion and asset condition monitoring.
- Documentation, data traceability, inspection records, and technical reporting.
- Communicating ultrasonic testing findings to engineering, quality, maintenance, and asset integrity teams.

DAY 05 — CONTINUED

- Using ultrasonic inspection results to support maintenance, reliability, and asset integrity decisions.
- Identifying opportunities to improve ultrasonic inspection quality and consistency.
- Developing practical ultrasonic testing programs for critical industrial assets.

FINAL WORKSHOP

Develop a comprehensive ultrasonic testing inspection strategy for a selected industrial component or asset, including inspection objectives, potential discontinuities, equipment and probe selection, calibration requirements, inspection locations, scanning techniques, data recording, indication evaluation, reporting requirements, and recommended follow-up actions.

Register or Request More Information

Course page: <https://quest-training.com/courses/ultrasonic-testing-ut-training-course>

Website: <https://quest-training.com>

Email: info@quest-training.com

Phone: +905016771440