QUEST
Professional Center

PROFESSIONAL TRAINING COURSE

Course No. 1278

Non-Destructive Testing (NDT) Methods Training Course

CORROSION, INSPECTION & NDT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION
5 Days

DELIVERY
Classroom

Course Overview

The Non-Destructive Testing (NDT) Methods Training Course provides a comprehensive and practical understanding of the principles, applications, capabilities, and limitations of major non-destructive testing methods used to evaluate the condition and integrity of industrial materials, components, equipment, and structures. The course focuses on how NDT techniques can detect discontinuities, identify material degradation, assess component condition, and provide reliable inspection information without causing damage to the inspected asset.

Non-destructive testing is an essential component of modern inspection, quality assurance, maintenance, reliability, and asset integrity programs. Effective NDT helps organizations identify defects at appropriate stages, support engineering decisions, verify manufacturing and fabrication quality, and monitor the condition of critical assets throughout their operational lifecycle. The course provides participants with a structured understanding of how to select and apply appropriate NDT methods according to material type, component geometry, expected defect characteristics, accessibility, inspection objectives, and operating conditions.

The program covers the principal NDT methods used across industrial applications, including visual testing, ultrasonic testing, radiographic testing, magnetic particle testing, liquid penetrant testing, eddy current testing, and other relevant advanced techniques. Participants will examine the physical principles behind each method, equipment and inspection procedures, defect detection capabilities, practical limitations, interpretation of results, inspection documentation, and factors that influence examination reliability.

The course also emphasizes the integration of NDT results into broader inspection and asset integrity decision-making. Participants will learn how to evaluate inspection requirements, select suitable testing methods, interpret findings, understand the significance of detected indications, and communicate results effectively to engineering, maintenance, quality, reliability, and management teams. This practical approach supports stronger inspection planning, improved quality control, informed maintenance decisions, and more effective management of industrial asset integrity.

Objectives

- Analyze the fundamental principles of non-destructive testing and explain how different NDT methods detect and evaluate material discontinuities during the course.
- Identify common material defects, discontinuities, and degradation mechanisms that can be detected through appropriate non-destructive testing techniques.
- Evaluate the suitability of major NDT methods according to material type, component geometry, defect characteristics, accessibility, and inspection objectives.
- Apply the fundamental principles of visual testing, ultrasonic testing, radiographic testing, magnetic particle testing, liquid penetrant testing, and eddy current testing.
- Assess the capabilities and limitations of different NDT methods when developing inspection strategies for industrial components and equipment.
- Interpret representative NDT indications and inspection results to distinguish relevant conditions from non-relevant or inconclusive indications.
- Develop appropriate NDT inspection plans that define testing methods, inspection locations, coverage requirements, and reporting considerations.
- Evaluate NDT inspection results in relation to quality requirements, equipment condition, manufacturing processes, maintenance activities, and asset integrity objectives.
- Improve the reliability of NDT activities by considering equipment selection, inspection procedures, surface conditions, operator practices, environmental factors, and data quality.
- Strengthen communication between NDT personnel, inspectors, engineers, quality professionals, maintenance teams, and asset integrity specialists through clear technical reporting.
- Apply structured decision-making approaches to select appropriate NDT techniques for different industrial inspection scenarios.
- Develop a practical NDT inspection strategy for a selected industrial asset, component, or fabrication application by the end of the course.

Who Should Attend

The Non-Destructive Testing (NDT) Methods Training Course is designed for professionals involved in inspection, testing, quality control, engineering, maintenance, reliability, fabrication, manufacturing, and asset integrity. It is particularly suitable for NDT inspectors, 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 comprehensive understanding of non-destructive testing methods and their industrial applications.

The course is also relevant to inspection supervisors, quality managers, maintenance managers, engineering managers, asset integrity managers, fabrication managers, project engineers, production engineers, technical authorities, and professionals responsible for verifying the condition and quality of equipment, components, welds, structures, pipelines, pressure equipment, storage tanks, and manufactured products.

Managers, project decision makers, procurement and quality professionals, and technical specialists who evaluate inspection requirements or NDT reports will also benefit from the program. The course provides the knowledge required to understand method selection, inspection limitations, defect detection capabilities, reporting requirements, and the role of NDT results in engineering, maintenance, quality assurance, reliability, and asset integrity decisions.

Learning Outcomes

- Explain the fundamental physical principles behind major non-destructive testing methods and their industrial applications.
- Identify common defects and discontinuities in metals, welds, components, structures, and manufactured products.
- Select appropriate NDT methods based on material properties, component geometry, expected discontinuities, accessibility, and inspection objectives.
- Explain the practical application of visual testing, ultrasonic testing, radiographic testing, magnetic particle testing, liquid penetrant testing, and eddy current testing.
- Compare the advantages, limitations, sensitivity, and practical applications of different NDT techniques.
- Interpret representative NDT indications and distinguish relevant indications from conditions requiring further evaluation.
- Evaluate the suitability of NDT methods for weld inspection, material examination, fabrication quality control, and in-service asset inspection.
- Develop structured NDT inspection plans covering methods, inspection areas, testing requirements, documentation, and reporting.
- Assess factors that can influence NDT reliability, including surface condition, equipment settings,

material properties, environmental conditions, and inspection technique.

- Review NDT reports and communicate inspection findings effectively to engineering, maintenance, quality, and asset integrity teams.
- Integrate NDT results into inspection, maintenance, reliability, and asset integrity decision-making processes.
- Prepare a practical NDT inspection strategy for a selected industrial component or asset based on identified inspection objectives and potential defect mechanisms.

Course Outline

DAY 01

Fundamentals of Non-Destructive Testing and Inspection Principles

- Introduction to non-destructive testing and its role in industrial inspection.
- Principles of material discontinuities, defects, imperfections, and degradation.
- Relationship between material properties and NDT method selection.
- Overview of major NDT methods and their industrial applications.
- Inspection objectives in manufacturing, fabrication, commissioning, maintenance, and asset integrity.
- Basic principles of inspection planning and examination coverage.
- Factors affecting NDT reliability, sensitivity, and inspection quality.
- Understanding indications, defects, acceptance requirements, and technical evaluation.
- Introduction to NDT documentation, traceability, and reporting.

> **PRACTICAL APPLICATION**
>
> Analyze an industrial component and identify appropriate NDT methods for potential defect mechanisms.

DAY 02

Visual Testing, Liquid Penetrant Testing, and Magnetic Particle Testing

- Principles and applications of visual testing.
- Direct and indirect visual examination techniques.
- Surface condition assessment and identification of visible discontinuities.
- Lighting, access, surface preparation, and inspection limitations.
- Principles of liquid penetrant testing.
- Penetrant materials, application procedures, removal, development, and interpretation.
- Advantages and limitations of liquid penetrant testing for surface-breaking defects.
- Principles of magnetic particle testing.
- Magnetic fields, magnetization techniques, particles, and indication formation.
- Applications of magnetic particle testing for ferromagnetic materials.
- Identification and interpretation of surface and near-surface indications.

> **PRACTICAL APPLICATION**
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> Compare visual, liquid penetrant, and magnetic particle testing for selected industrial inspection scenarios.

DAY 03

Ultrasonic Testing and Thickness Examination

- Fundamentals of ultrasonic testing and sound propagation through materials.
- Ultrasonic equipment, probes, couplants, calibration, and basic inspection procedures.
- Straight-beam and angle-beam ultrasonic testing principles.
- Detection and evaluation of internal discontinuities.
- Ultrasonic thickness measurement and corrosion assessment.
- Inspection of welds, plates, pipes, forgings, and other industrial components.
- Factors affecting ultrasonic inspection accuracy and reliability.
- Signal interpretation and evaluation of representative indications.
- Data recording, measurement traceability, and inspection reporting.

DAY 03 — CONTINUED

- Applications of ultrasonic testing in manufacturing, fabrication, maintenance, and asset integrity.

PRACTICAL APPLICATION

Analyze ultrasonic thickness and flaw-detection data and determine appropriate inspection conclusions.

DAY 04

Radiographic Testing, Eddy Current Testing, and Advanced Applications

- Fundamentals of radiographic testing and image formation.
- Applications of radiographic testing for welds, castings, components, and fabricated assemblies.
- Radiographic image quality and interpretation principles.
- Capabilities and limitations of radiographic testing.
- Fundamentals of eddy current testing and electromagnetic induction.
- Applications of eddy current testing for conductive materials and surface or near-surface discontinuities.
- Detection of cracks, material variations, thickness changes, and other relevant conditions.
- Comparing eddy current testing with other NDT methods.
- Overview of advanced NDT applications and technology-assisted inspection.
- Method selection for complex components and challenging inspection environments.

PRACTICAL APPLICATION

Develop an NDT method-selection strategy for components requiring multiple inspection techniques.

DAY 05

NDT Inspection Planning, Result Interpretation, and Asset Integrity

- Developing effective NDT inspection plans based on inspection objectives and defect mechanisms.
- Selecting NDT methods according to material, geometry, accessibility, and expected discontinuities.
- Defining inspection locations, coverage, frequency, and examination requirements.
- Interpreting NDT findings and determining when additional examination is required.
- Evaluating NDT results within quality assurance and asset integrity programs.
- Integration of NDT findings with maintenance, reliability, corrosion management, and inspection programs.
- NDT reporting, documentation, traceability, and communication of technical findings.
- Identifying sources of inspection uncertainty and improving examination reliability.
- Using NDT results to support condition assessment and maintenance decision-making.
- Developing practical inspection strategies for critical industrial assets.
- Continuous improvement of NDT programs, inspection processes, and technical reporting.

FINAL WORKSHOP

Develop a comprehensive NDT inspection strategy for a selected industrial asset, including inspection objectives, potential defect mechanisms, method selection, inspection locations, testing requirements, result interpretation, reporting requirements, and recommended follow-up actions.

Register or Request More Information

Course page: https://quest-training.com/courses/non-destructive-testing-ndt-methods-training-course
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