

Magnetic Particle Testing Fundamentals Training Course

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Overview

Magnetic Particle Testing Fundamentals Training Course is a one-week foundation course for NDT technicians, welding inspectors, quality personnel, maintenance engineers, and asset integrity teams who leave with a Magnetic Particle Examination Pack. Participants connect magnetic theory, material suitability, magnetization direction, equipment, media, surface preparation, field checks, indication formation, interpretation, demagnetization, safety, and reporting. The course turns visible particle patterns into controlled examination evidence. Agile Leaders Training Center presents magnetic particle testing through method discipline and traceable records.

Who Should Attend

- Functions responsible for NDT examination of ferromagnetic components
- Welding inspection teams responsible for surface and near-surface discontinuities
- Quality personnel responsible for procedures, records, and acceptance interfaces
- Maintenance functions responsible for inspecting in-service machinery and structures
- Asset integrity teams responsible for examination planning and technical review

The course assumes participants can follow technical procedures and basic inspection drawings, and it leaves out personnel certification, product-specific acceptance decisions, and live examination authorization.

Departments and Industries

The course supports departments and industries that inspect ferromagnetic materials, welds, and components.

- Fabrication, welding, machining, foundries, and steel production
- Oil, gas, petrochemical, power, and process facilities
- Aerospace, automotive, rail, marine, and heavy equipment
- Quality assurance, NDT, maintenance, and asset integrity
- Inspection services, technical assurance, and repair organizations

Learning Objectives

By the end of this course, participants will be able to:

- Analyze magnetic flux, leakage fields, and discontinuity orientation
- Compare yoke, prod, coil, and central-conductor techniques
- Apply visible, fluorescent, wet, and dry particle methods
- Build equipment, field-strength, media, and lighting checks
- Evaluate relevant, nonrelevant, and false indications
- Use demagnetization, cleaning, reporting, and safety controls

Course Agenda

Day 1: Establish MT Principles and Scope

- Ferromagnetic Material Suitability and Limitation Map
- Magnetic Flux, Poles, and Leakage-Field Diagram
- Discontinuity Orientation and Field-Direction Matrix
- Surface and Near-Surface Detectability Review
- Magnetic Particle Examination Pack Structure

Day 2: Select Magnetization Equipment and Technique

- Yoke, Prod, Coil, Head-Shot, and Central-Conductor Comparison
- Circular and Longitudinal Magnetization Planning Sheet
- Alternating, Direct, and Half-Wave Current Selection Guide
- Continuous and Residual Method Decision Matrix
- Equipment Function, Calibration, and Field-Adequacy Checklist

Day 3: Prepare Surfaces and Apply Detection Media

- Surface Condition, Coating, Cleaning, and Contrast Review
- Dry Powder and Wet Suspension Application Checklist
- Visible and Fluorescent Particle Selection Matrix
- Bath Concentration, Contamination, and Performance Record
- White Light, UV-A, Adaptation, and Viewing Condition Check

Day 4: Interpret Indications and Complete Controls

- Relevant, Nonrelevant, and False Indication Decision Tree
- Crack, Lap, Seam, Inclusion, and Geometry Pattern Reference
- Indication Location, Length, Orientation, and Record Sheet
- Demagnetization, Residual Field, and Post-Cleaning Checklist
- Procedure, Report, Safety, and Acceptance Interface Review

Day 5: Magnetic Particle Examination Practice

- Exercise: Select Field Direction for Simulated Discontinuities
- Exercise: Verify Yoke Function and Viewing Conditions
- Exercise: Apply Visible and Fluorescent Examination Sequences
- Exercise: Classify and Record Simulated Indications
- Capstone Exercise: Complete the Magnetic Particle Examination Pack

Practical Exercises

The course uses suggested activities based on simulated specimens, equipment checks, photographs, particle indications, and controlled records.

- Suggested activity: choose magnetization directions and techniques for component geometry and likely flaws
- Suggested activity: verify equipment, media, surface, and viewing conditions before examination
- Suggested activity: distinguish relevant, nonrelevant, and false particle patterns
- Suggested activity: document demagnetization, post-cleaning, results, limitations, and referral decisions

FAQs

Who suits magnetic particle testing fundamentals training, and what does it assume?

Magnetic particle testing fundamentals training suits NDT, welding inspection, quality, maintenance, and asset integrity functions. It assumes participants can follow technical procedures and basic inspection drawings.

How does magnetic particle testing differ from liquid penetrant testing?

Magnetic particle testing uses magnetization and particle attraction to find surface and some near-surface discontinuities in ferromagnetic materials. Liquid penetrant testing uses capillary action to reveal surface-breaking discontinuities in suitable nonporous materials.

Why must magnetic particle testing use more than one field direction?

Discontinuities are most detectable when they cross magnetic flux. Examinations commonly use different field directions so cracks with different orientations can create detectable leakage fields.

What causes nonrelevant magnetic particle indications?

Nonrelevant indications can arise from geometry changes, keyways, threads, sharp section changes, dissimilar magnetic properties, or residual fields rather than service-significant discontinuities.

When is demagnetization needed after magnetic particle testing?

Demagnetization is considered when residual magnetism could attract debris, interfere with machining, welding, instruments, operation, or later processing, or when the governing procedure requires a residual-field limit.

Conclusion

Participants take back a Magnetic Particle Examination Pack linking material suitability, technique, field direction, equipment checks, media, viewing conditions, indications, demagnetization, and reports. The pack replaces isolated visual judgments with traceable examination evidence. It supports inspection decisions while approved procedures, product standards, acceptance criteria, and qualified authority remain governing.

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