

Magnetic Particle Testing

Level I and II
Training Course Outline

SCOPE

This course covers the principles of Magnetic Particle Testing and prepares a candidate to

- Select equipment to conduct test
- Setup test equipment
- Steps to conduct test
- Familiarize with codes and standards
- Interpret results with respect to applicable codes and standards
- Understand limitation of the test method
- Write test reports.

TRAINING

Training material is presented in modules that are followed by quizzes

PERSONNEL CERTIFICATION

ASNT SNT-TC-1A

NAS 410

Training, experience and examination requirements

Training Requirements

- Recommended Course Outline
- Training Hours
- Practicals

Quizzes and examinations

MODULE 1: MANUFACTURING DISCONTINUITIES

- Types of Discontinuities: Inherent, Processing and Service
- Casting Discontinuities: Hot Tear, Cold Shut, Porosity, Shrinkage
- Primary Processing Discontinuities including discontinuities in Rolling, Forging, Drawing, Extruding
- Secondary Processing Discontinuities including discontinuities in Grinding, Heat Treating, Machining, Welding, Plating
- Service Discontinuities:- Erosion, Wear, Fatigue, Corrosion, Creep

MODULE 2: THEORY OF MAGNETISM

- Magnetic field, Lines of force, Flux density
- Permeability, Reluctance, Retentivity, Residual Magnetism and Coercive Force
- Diamagnetic, Paramagnetic and Ferromagnetic materials
- Leakage flux
- Fleming's Right Hand and Left Hand Rule
- Magnetic Fields: Circular, Longitudinal

- Hysteresis Curve

MODULE 3: METHODS OF MAGNETIZATION

- Faraday's Law: Electromagnetism
- Types of current AC, DC, HWDC
- Circular field: Head Shot (Direct Contact), Prods and Central Conductor Techniques, Offset Central Conductor
- Advantages and disadvantages of circular field
- Longitudinal field: Coils and Yoke
- Advantages and disadvantages of Longitudinal Field
- AC and DC Field Distribution in a Magnetic and a Nonmagnetic Conductor
- Demagnetization

MODULE 4: EQUIPMENT

- Equipment consideration
- Wet Horizontal, Mobile and Portable Equipments
- Fluorescent testing, Black Light
- Light meter
- Accessories

MODULE 5: MEDIUMS AND THEIR PREPARATION

- Dry and Wet method
- Particles: Dry and Wet
- Properties of particles
- Visibility of particles
- Methods of Application
- Contamination of Magnetic Particles
- Settling Test Procedure
- Concentration for Wet suspensions as per ASME Sec V Article 7
- Bath Maintenance

MODULE 6: APPLICATIONS

- Residual and Continuous Method
- Magnetic Particle Inspection of Solid Cylindrical Parts, Gears, Multiple diameter Articles, Discs, Hollow Cylindrical Articles
- Selection of proper method of magnetization
- Verification of magnetic fields
- Checking the adequacy of field using the Pie gauge, shims
- Fluorescent Inspection
 - Black Light Warm Up Time
 - Minimum intensity and light meter
 - Visual Adaptation
- Visual Inspection
 - Minimum light intensity and light meter
- Magnetic Rubber Inspection

MODULE 7: TYPES OF INDICATIONS

- Interpretation including Relevant, False, Non-relevant indications

MODULE 8: CODES AND STANDARDS (Specific Training)

- MT Inspection Procedures

Codes

- ASME Section V Article 7: Magnetic Particle Examination
- ASME Section VIII (Accept/Reject Criteria)

Standards

- ASTM E-709: Standard Guide for Magnetic Particle Testing
- ASTM E-1444: Standard Practice for Magnetic Particle Testing

Other codes and standards can be discussed if prearranged with the instructor at the time of registration

PRACTICAL TRAINING

- MT Yoke: Dry Visible, Wet Visible, Wet Fluorescent
- Central Conductor
- Coil Shot – Longitudinal
- Ketos (Betz) Ring – Depth of penetration
- Training on Weld flaw samples

EXAMINATIONS

- General
- Specific
- Practical

Candidates must score a minimum of 70 % in each individual test and a minimum average of 80% in all three tests.



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