

M2110

MAGNETIC PARTICLE INSPECTION

COURSE OUTLINE

Day One

LESSON 1 – Introduction to the Method

- Course Objectives
- Capabilities and Limitations of the Method
- Objectives of Testing
- The Magnetic Particle Testing Process

LESSON 2 – Basic Principles of Magnets and Magnetic Fields

- Historical Overview
- Basic Principles of Magnetism
- Origin of Magnetic Force
- Dipoles, Atoms and Domains
- Magnetic Behaviors: Diamagnetism, Paramagnetism, and Ferromagnetism
- Magnetic Sources
- Characteristics of Magnetic Flux Fields
- Section Quiz

LESSON 3 – Magnetic Properties – the Hysteresis Loop

- Permeability
- Reluctance
- Residual Magnetism
- Retentivity
- Coercive Force
- Relationship of Magnetic Properties
- The Hysteresis Loop
- Section Quiz

Day Two

LESSON 4 – Effects of Discontinuities on Magnetic Fields

- Detecting Discontinuities: Surface and Subsurface
- Discontinuities and Magnetic Field Distortion
- Relevant Discontinuities
- Non-relevant Discontinuities
- False Indications
- Section Quiz

LESSON 5 – Using Magnetic Fields

- Direct and Indirect Magnetic Induction
- Magnetic Field Patterns
- Circular Magnetic Fields
- Longitudinal Magnetic Fields
- Choosing the Appropriate Technique
- Test Materials: Magnetic Particle Media
 - Dry Method
 - Wet Method
 - Plotting Sensitivity
- Section Quiz

LESSON 6 – Types of Currents for Producing Magnetic Fields

- Direct Current
- Alternating Current
- Rectified Current (HWDC and FWDC)
- Computing Current Requirements for Circular and Longitudinal Fields
- Section Quiz

LESSON 7 – Principles of Demagnetization

- Principles of Demagnetization
- AC Demag Techniques
- DC Demag Techniques
- Reasons to Demag
- Section Quiz

Day Three

LESSON 8 – Equipment

- Equipment Selection Criteria
- Stationary Equipment and Accessories
- Mobile Equipment and Accessories
- Portable Equipment and Accessories
- Section Quiz

LESSON 9 – The Nature and Origin of Discontinuities

- Sources of Discontinuities
 - Inherent Discontinuities
 - Processing Discontinuities
 - Inservice Discontinuities
- Section Quiz

EXAMINATIONS:

- **General Exam** – covers the basic principles (Body of Knowledge) of Magnetic Particle Testing.
- **Specific Exam** – tests ability to read, interpret and apply specific procedure material for the method.
- **Practical Exam** – hands-on demonstration of the ability to operate test equipment, perform specific calibrations and tests in order to find and report flaws of sample materials according to appropriate specifications.

