X-R-I TESTING
DIVISION OF X-RAY INDUSTRIES, INC.

Magnetic Particle Training--Level I & II

Course Outline

1. Introduction

- NDT Introduction
- Facility Tour & Method Demonstrations

2. Introduction to Magnetic Particle

How Magnetic Particle Works

- Basic Principles Of MT
- Magnetic Particle History
  - Source Of Magnetism
  - Ferromagnetic Materials
  - Diamagnetic Materials
  - Paramagnetic Materials

3. Magnetic Domains

Magnetic Field Characteristics

- Magnetic Fields Of Force
- Magnet Properties
  - Other Sources Of Magnetic Fields
  - Magnetic Fields Produced By Coils
  - Quantifying Magnetic Properties

4. Hysteresis Loop Magnetic Properties

Hysteresis Loop Magnetic Properties

- Retentivity
- Residual Magnetism/ Residual/Flux
- Coercive Force
- Permeability
- Reluctance

Magnetic Field Orientation

- Circular
- Longitudinal

❖ Review Of Training Center Magnetic Particle Systems

5. Magnetizing Methods

Direct Induction

- Head Shots
- Prods, Clamps Etc.

Indirect Induction

- Yoke
- Central Bar Conductor (CBC)
- Coil / Solenoids

6. Magnetizing Currents

Magnetizing Currents

- Alternating Current
  - Rectified Alternating Current
  - Half Wave (HWAC)
  - Full Wave Single Phase (FWAC)
  - Three Phase Full Wave (FWAC)
- Direct Current

7. Magnetizing Fields

Longitudinal Magnetic Fields

* Coil Shot
* Amperage Calculations

Circular Magnetic Fields

* Coil Shot
* Solid Central Conductor
* Hollow Central Conductor

Skin Effect (AC)

8. Demagnetization

Measuring Field Strength

* Field Strength Indicators (FSI)
* Hall Effect Meter (Gauss/Tesla)
* Pie Gage
* QQI's

9. Magnetic Particle Equipment

Portable Magnetization Equipment

* Permanent Magnets
* Electro Magnetic Yokes (AC/DC)
* Prods
* Portable Coils
* Portable Power Supply

Stationary Magnetization Equipment

* Wet Horizontal

Characteristics of Wet Horizontal Equipment

* Head Shot System
* Coil Shot System
* Central Bar Conductors
* Multi Directional

Lighting

* Ultra Violet Lights (Black Lights)
* White Lights

9. Magnetic Particle Equipment

Magnetic Field Indicators
* Gauss Meters (Hall Effect Meters)
* QQI's - Quantitative Quality Indicators (Advantages & Disadvantages)
* Pie Gages (Advantages & Disadvantages)

Magnetic Particle Materials
* Dry Magnetic Particles
* Wet Magnetic Particles
* Fluorescent Magnetic Particles

Suspension Liquids
* Petroleum Based
* Water Based

10. Magnetic Particle Inspection

Dry Particle Inspection
* Process Steps

Wet Particle Inspection
* Process Steps
* Continuous Technique
* Residual Technique

Field Direction & Intensity
* Determining Field Direction with QQI, Gauss Gage, Pie Gage

Field Direction & Intensity
* Hall Effect Gage
* Transverse Probes
* Axial Probes

11. Magnetic Particle Equipment Quality Checks

* Particle Concentration & Condition
* Water Break Test
* Internal Short Test
* Ammeter Check
* Quick Break Test
* Ketos Ring
* Lighting Black & White Lights

12. The Human Eye

Eye Adaptation
How The Eye Works
Photo Receptors (Rods & Cones)
Contrast Sensitivity

13. Test Sample Indications

Sample Test Pieces With Indications

s

14. Inspection Procedures & Standards

- Understanding And Interpreting Specifications, Standards
- Following Written Procedures
- General Documentation Procedures and Record Keeping

15. Material Processes

- Inherent Discontinuities
- Processing Discontinuities
  - Primary
  - Secondary
- In Service Discontinuities

16. Laboratory Exercises

- System Maintenance and Operational Checks
- Technique Development and Applications
- Parts Processing
- Interpretation and Evaluation