

## Ultrasonic Testing Training -Level 2

### COURSE OUTLINE

#### 1. Introduction

- \* NDT Introduction
- \* Facility Tour & Method Demonstrations

#### 2. Review of Basics

##### Principles of Acoustics

- \* Nature of sound waves
- \* Modes of sound – wave generation
- \* Velocity, frequency and wavelength of sound waves.
- \* Attenuation of sound waves
- \* Acoustic impedance
- \* Reflection
- \* Refraction and mode conversion
- \* Snell's law and critical angles
- \* Fresnel and Fraunhofer effects

#### 3. Review of Ultrasonic Course

##### Equipment

- \* A – scan
- \* B – scan
- \* C – scan
- \* Computerized Systems
- \* Magnet Properties

##### Testing Techniques

##### Calibrations

- \* Straight Beam
- \* Angle beam
- \* Resonance
- \* Special applications

#### 4. Calibration Blocks

- \* IIW Block Type I
- \* IIW Block Type II
- \* AWS Resolution Block
- \* Step Wedge
- \* Area-Amplitude Block
- \* Distance-Amplitude Block

## 5. Manufacturer/ Material Process

- \* Inherent Discontinuities
- \* Processing Discontinuities
  - o Primary
  - o Secondary
- \* In Service Discontinuities

## 6. Evaluation of Material Process Forms

Types, Origin and Typical Orientation of Discontinuities

- \* Ingots
- \* Plate and Sheets
- \* Bar and Rod
- \* Pipe and Tubular Products
- \* Forgings
- \* Castings
- \* Composite Structures

## 7. Evaluation of Secondary Processes

Welding Process

- \* Welding Geometry
- \* Weld Discontinuities
- \* Origin and Typical Orientation of Discontinuities

Bonded Structures

- \* Types of Discontinuities
- \* Origin and Typical Orientation of Discontinuities
- \* Response of Discontinuities to Ultrasound

## 8. Discontinuity Detection

Sensitivity to Reflection

- \* Size, type and location of discontinuities
- \* Techniques used in detection
- \* Wave characteristics
- \* Material and velocity

Resolution

- \* Standard reference comparisons
- \* History of part
- \* Probability of type of discontinuity
- \* Effect of ultrasonic frequency
- \* Damping effect

## 8. Discontinuity Detection (continued)

### Determination of Discontinuity Size

- \* Various monitor displays and meter indications
- \* Transducer movement displays and meter indications
- \* Transducer movement versus display
- \* Two dimensional testing technique
- \* Signal patterns

### Location of Discontinuity

- \* Various monitor displays
- \* Amplitude and linear time
- \* Search technique

## 9. Inspection Procedures & Standards

- \* Understanding And Interpreting Specifications, Standards & References
- \* Following Written Procedures
- \* Amplitude area and distance
- \* Application of results of other NDT Methods
- \* General Documentation Procedures and Record Keeping

## 10. Introduction to Advanced Techniques

- \* Time of Flight Diffraction (TOFD)
- \* Phased Arrays
- \* Immersion Testing
  - o Selection of Probes
  - o Focusing of Immersion Probes
  - o Scanning
  - o C-Scan Presentations

## 11. Laboratory Exercises

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