WinS
WavesInSolids LLC

ULTRASONIC TESTING TRAINING COURSE

Level I - Outline

I. Basic Ultrasonic Course

1. Introduction
    a. Definition of ultrasonics
    b. History of UT
    c. Applications of ultrasonic energy
    d. Basic math review
    e. Responsibilities of levels of certification
2. Basic Principles of Acoustics
    a. Nature of sound waves
    b. Modes of sound wave propagation
    c. Velocity, frequency and wavelength of sound waves
    d. Attenuation of sound waves
    e. Acoustic impedance
    f. Reflection
    g. Refraction and mode-conversion
    h. Snell's law and critical angles
    i. Fresnel and Fraunhofer effects
3. Equipment
    a. Basic pulse-echo instrumentation (A-, B-, and C-scan)
    b. Digital thickness instrumentation
    c. Transducer operation and theory
        i. Piezoelectric effect
        ii. Types of crystals
        iii. Frequency (thickness-frequency relationships)
        iv. Near field and far field
        v. Beam spread
        vi. Construction, materials and shapes
        vii. Types (straight, angle, dual, etc.)
        viii. Beam intensity characteristics
        ix. Sensitivity, resolution and damping
        x. Mechanical vibration into part
    d. Couplants
        i. Purpose and principles
        ii. Materials and their efficiency
4. Basic Testing Methods
    a. Contact
    b. Immersion

II. Ultrasonic Technique Course

1. Testing Methods
    a. Contact
        i. Straight beam
        ii. Angle beam
        iii. Surface wave
        iv. Pulse-echo transmission

        v. Multiple transducer
        vi. Curved surfaces
    b. Immersion
        i. Transducer in water
        ii. Water column, wheels, etc.
        iii. Submerged test part
        iv. Sound-beam path – transducer to part
        v. Focused transducers
        vi. Curved surfaces
    c. Comparison of contact and immersion methods
2. Calibration (Electronic and Functional)
    a. Equipment
        i. Oscilloscope, CRTs
        ii. Recorders
        iii. Alarms
        iv. Automatic and Semiautomatic systems
        v. Electronic distance/amplitude correction
        vi. Transducers
    b. Calibration of equipment electronics
        i. Variable effects
        ii. Transmission accuracy
        iii. Calibration requirements
        iv. Calibration reflectors
    c. Inspection calibration
        i. Comparison with reference blocks
        ii. Pulse-echo variables
        iii. Reference for planned tests (straight-beam, angle-beam, etc.)
        iv. Transmission factors
        v. Couplants
        vi. Materials
3. Straight Beam Examination to Specific Procedures
    a. Selection of parameters
    b. Test standards
    c. Evaluation of results
    d. Test reports
4. Angle-Beam Examination to Specific Procedures
    a. Selection of parameters
    b. Test standards
    c. Evaluation of results
    d. Test reports