ULTRASONIC TESTING

1 -Review of Ultrasonic Technique Course

- History of Ultrasonic Testing
- Advantages and limitations of ultrasonic testing
- Principles of ultrasonic
- Generation and characteristics of ultrasound
    - Acoustic Waves
    - Velocity, Wavelength and Frequency
    - Types of Waves (Modes)
        - Longitudinal Waves
        - Shear Waves
        - Surface Waves
        - Lamb Waves

2 -Propagation of Ultrasound

- Near Field and Far Field
- Attenuation
- Reflection
- Refraction
- Mode Conversion

3 - Ultrasonic Testing Equipment

- Transmitters/ Pulsers
- Clock Circuits/ Time Base Generators
- Repetition Rate
- Pulse Duration
- Receivers
- Power Supplies

4 - Displays

- A-scan
- B-scan
- C-scan
- Computerized systems

5 - Probes/ Search units

- Types of Probes
    - Contact Probes

- Immersion Probes
- Probes for special application

Probe Design
- Case
- Backing Material
- Electrodes
- Transducers/Piezoelectric elements
- `Wear Face
- Resolution
- Sensitivity

6 - Special Circuits

Gates, Distance Amplitude Correction/Time Controlled Gain

7 Ultrasonic Testing Techniques

Calibration Blocks
Calibration
- Straight beam
- Angle beam
- Resonance
- Special applications

Techniques
- Couplant
- Pulse echo techniques
- Through Transmission Technique
- Contact Testing

Immersion Testing

Special Techniques

8 Evaluation of Base-Material Product Forms

- Ingots -Process review
  - Types, origin and typical orientation of discontinuities
  - Response of discontinuities to ultrasound
  - Applicable codes/standards
- Plate and sheet-Rolling process
  - Types, origin and typical orientation of discontinuities
  - Response of discontinuities to ultrasound
  - Applicable codes/standards
- Bar and rod-Forming process
  - Types, origin and typical orientation of discontinuities

Response of discontinuities to ultrasound
Applicable codes/standards

Pipe and tubular products-Manufacturing process
Types, origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

Forgings-Process review
Types, origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

Castings-Process review
Types, origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

Composite structures-Process review
Types, origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

Evaluation of Bonded Structures-Manufacturing processes
Types of discontinuities
Origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

9 - Evaluation of Welds:

Welding process
Weld geometrics
Welding discontinuities
Origin and typical orientation of discontinuities
Response of discontinuities to ultrasound
Applicable codes/standards

10 - Discontinuity Detection:

Sensitivity to reflections
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
Degrees of operator discrimination
Effects of ultrasonic frequency
Damping effects

11- Determination of discontinuity size:

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

12 - Location of discontinuity:

Various monitor displays
Amplitude and linear time
Search technique

13 – Evaluation:

Comparison procedures
Standards and references
Amplitude, area and distance relationship
Application of results of other NDT methods

14 - Object appraisal:

History of part
Intended use of part
Existing and applicable code interpretation
Type of discontinuity and location

Conclusion