Training program for ultrasonic inspection (UT)

In the NDT training course the following knowledge will be educated.

Subject	**Level 1**	**Level 2**	**Level 3**
Basic principles	+	+	+
- Requirements	+	+	+
- Mathematical principles	+	+	+
- Physical principles	+	+	+
- Wave types (longitudinal, shear, surface waves)	+	+	+
- Generation of waves / piezoelectricity	+	+	+
- Sound velocity	+	+	+
- Acoustic impedance	+	+	+
- Sound beam aperture	+	+	+
- Sound field characteristics	+	+	+
- Coupling	---	+	+
Pulse	+	+	+
- Wide-band / narrow-band signal	+	+	+
- Pulse form	---	+	+
- Pulse repetition frequency	---	+	+
Sound behavior at boundary surfaces	+	+	+
- Reflection / transmission	+	+	+
- Phase reversal with reflection / transmission	---	+	+
- Angle beams	+	+	+
Inspection techniques	+	+	+
- Contact technique	+	+	+
- Immersion technique	---	+	+
- Sound transmission technique	+	+	+
- Pulse-echo technique	+	+	+
- Transmitter-receiver technique	+	+	+
- Angle beams	+	+	+
- Surface waves	---	+	+
Creep waves	---	+	+
- Multiple echoes	+	+	+
Constituent parts of an US inspection system	+	+	+
- Pulse generator / sender	+	+	+
- Receiver	+	+	+
- Display unit	+	+	+
- Manipulator	---	+	+
- Water tank	---	+	+
- Electric power supply	+	+	+
- Differences between analog and digital systems	+	+	+
Signal monitoring and representation	+	+	+
- A scan	+	+	+
- Aperture	+	+	+
- C scan	---	+	+
- B scan	---	+	+

continued

Subject	Level 1	Level 2	Level 3
- D scan	---	+	+
Transducers	+	+	+
- Transducer design	+	+	+
- Transducer material	+	+	+
- Selection of frequency and transducer diameter	+	+	+
- Focused transducers	---	+	+
Effects of surfaces and geometries to be inspected	+	+	+
- Surface roughness	+	+	+
- Concave / convex surfaces	+	+	+
- Component geometry	+	+	+
- Wave transformation with reflection	+	+	+
- Triangle reflection	+	+	+
- Angle mirror	+	+	+
Effects of material properties	+	+	+
- Sound attenuation	+	+	+
- Noise	+	+	+
- Scatter	+	+	+
- Sound attenuation coefficient	+	+	+
- Signal-to-noise ratio	---	+	+
Improvement of SNR	----	+	+
Artificial defects and defect types	+	+	+
- Flat-bottom holes	+	+	+
- Transverse holes	+	+	+
- Slots	+	+	+
- Ball reflectors	---	+	+
- Change of sound beam travel	---	+	+
- Change of artificial defect sizes	---	+	+
- Defect types	---	+	+
Adjustments and functional tests	+	+	+
- Reference blocks	+	+	+
- Adjustment of sensitivity	+	+	+
- Functional tests	---	+	+
- Analysis of transducer data	---	+	+
- Frequency of testing	---	+	+
Assessment of indications	+	+	+
- Types of indications	---	+	+
- Assessment depending on type and location of defect	---	+	+
- Localization of defect	+	+	+
- Half-value method	+	+	+
- Loss of back wall	+	+	+
- Comparison with artificial defects	---	+	+
- Assessment using limit table	---	+	+
Process procedure	+	+	+
- Inspection instruction	+	+	+
- Inspection report	+	+	+
Requirements on inspection personnel	---	+	+
Other NDT methods	---	+	+
Wall thickness measurement	+	+	+
- Simple linear measurement	+	---	+
- Transmitter-receiver	+	---	+
- Design-related particularities	+	---	+

continued

Subject	Level 1	Level 2	Level 3
Inspection of sheet material	+	+	+
- Defect types	+	---	+
- Laminations	+	---	+
- Foliation	+	---	+
- Laps	+	---	+
- Zones with segregations	+	---	+
- Inspection techniques	+	---	+
- Inspection of sheet material as per DIN EN 10160	+	---	+
- Scanning of defect boundaries using the half-value method	+	---	+
Angle transducers (in particular for contact technique)	+	--	+
- Introduction	+	---	+
- Design of angle transducers	+	---	+
- Sound field of angle transducers	+	---	+
- Determination of transducer data	+	---	+
- Checking the beam exit point and beam angle	+	---	+

\+ subitem of the level
--- no item of the level

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