Advanced Ultrasonic Inspection Techniques
Electromagnetic Acoustic Transducers (EMAT)

HIGH TEMPERATURE THICKNESS MEASUREMENTS USING EMAT

IRISNDT uses EMAT bulk waves to track piping metal losses while the part is in service at high temperature (up to 1200°F). This non-contact method does not need a couplant. It can inspect through coatings and needs minimal (if any) surface preparation. EMAT can generate longitudinal or shear waves to assess thickness. IRISNDT operators integrate different sets of magnets and radio frequency (RF) coils to obtain thickness measurements at various ranges.

EMAT Scope Displaying Ultrasonic Thickness Readings

APPLICATIONS

- Ideal for dry (no couplant) thickness measurement applications
- Ideal for internal thinning wall measurements i.e. sulfidation corrosion

FEATURES

- Measures the thickness of parts up to 5 in.
- Does not need wedges and couplant making the inspection easy and fast
- Is less sensitive to surface conditions such as dirt or coating than traditional ultrasound tests
- Can display A, B and C scans
- Implements changes in sound velocity to correct for temperature changes

IRISNDT Technician Performing EMAT High Temperature Piping Thickness Measurements While Using Rope Access Technology (Dual Trained Personnel)

INSPECTION PREPARATION

- Access to the inspection location is needed
- The insulation must be removed at the test location
- If the surface where the EMAT probe is placed has external corrosion/pits it must be ground flat

LIMITATIONS

- Can only be used for thickness spot checks
- Surface preparation might be needed if external corrosion/pits are present. Rough surfaces can impede good sound transmission by attenuating the signal

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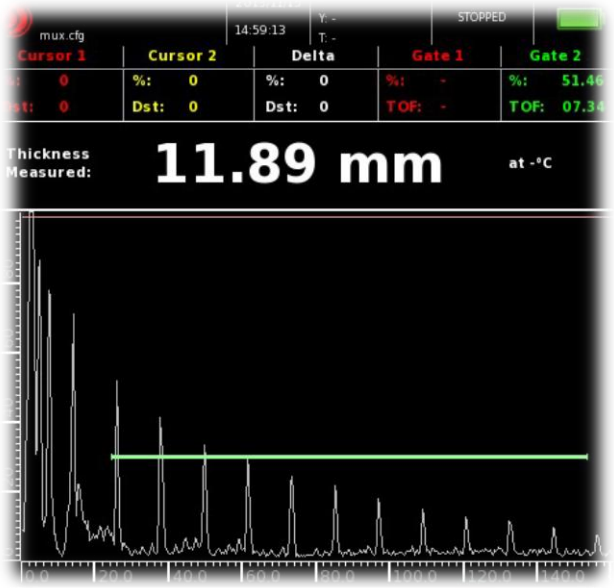
HOW HIGH TEMPERATURE THICKNESS MEASUREMENTS ARE OPTIMIZED

Auto-Correlation Functions Algorithm (ACF): Echo-to-Echo Measurements

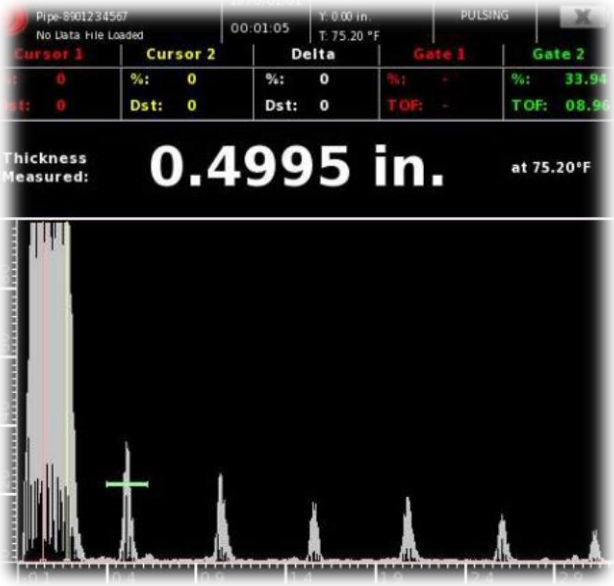
- These waves allow one to calculate thickness values based on multiple peak to peak echo measurements. Typical high temperature ultrasound thickness measurements are based on the information from the first two peaks. The information from multiple echo measurements makes EMAT more accurate for high temperature measurements than traditional ultrasound
- Based on this technique, at least two back wall signals are examined in the A-scan



Thickness Measurement – Auto-Correlation Algorithm Represented In Millimeters

Zero-Crossing Algorithm: Pulse-Echo Measurements

- For these measurements, only one back-wall is examined in detail
- The algorithm measures the distance from the start of the pulse to a specific point of the waveform
- The intersection with the zero (X axis) of one of the features of the waveform (either the peak of the waveform or a point in the waveform that crosses the threshold) is the point of measurement
- At least two thickness calibration points are required for zero-crossing calculation; this is needed for velocity and sensor offset calculations



Thickness Measurement – Zero-Crossing Algorithm Represented In Inches

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