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Inspection Technologies

Application Solutions

Ultrasonics

70024EH
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Boiler tube oxide scale thickness measurement with USN60 / USN58L

Industry Segment
- Energy

Material
- Steel

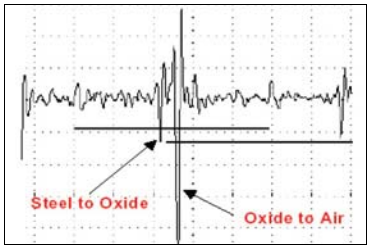
Application

A hard oxide coating will gradually build up on the inside of power generation boiler tubes. The thicker the oxide layer, the less efficient the boiler becomes and additional heat build up will shorten the life of the boiler. Ultrasonic thickness measurement helps predicting remaining tube service life to result in less unscheduled shutdowns due to boiler tube failure and required repairs.

Your Solution

The object of the test is to perform a separate thickness measurement of the steel tube wall and the oxide scale layer located on the ID of the tube.

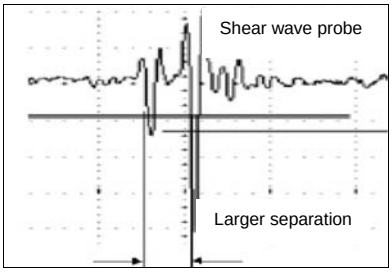
The interface echo from the tube-to-oxide is much smaller than the echo from the oxide-to-air interface, thus, the difficulty is separating these two echoes from each other and making the measurement between the two echoes.

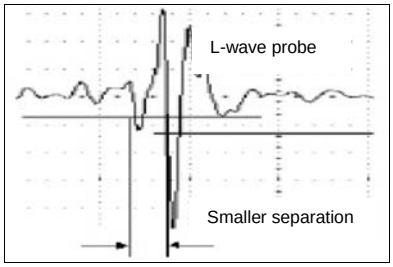


The example above shows the steel to oxide interface echo at about 1/3 the amplitude of the oxide to air interface echo.

Using a highly damped “Alpha” type straight beam Shear Wave probe is the key to obtaining thin oxide layer measurements. The shear waves have ½ the velocity of L-waves which doubles the time resolution and enables the system to measure thinner layers than with conventional L-wave probes.

NOTE: loose scale measurement is not possible





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The USN set up requires a simple set-up to make two thickness measurements.

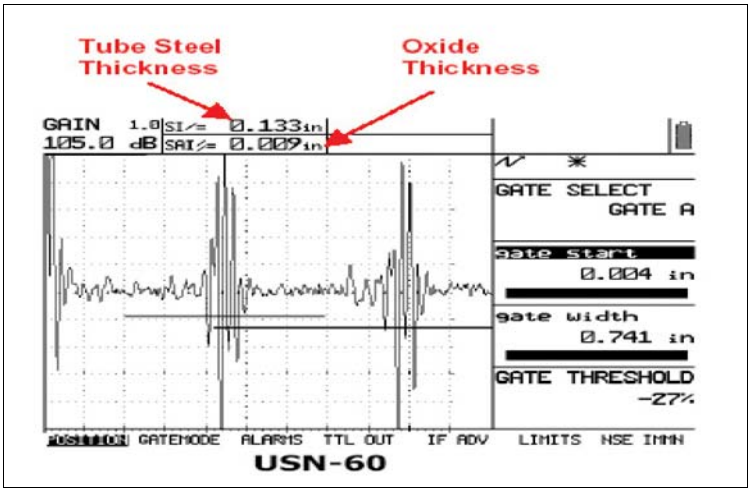
- Set the USN to the immersion mode
- Set the water path velocity to the velocity of steel, shear wave
- Set the main velocity to the velocity of the oxide
- Set gates to flank detection
  Gate settings (echoes):
  1st gate to inner surface of tube
  2nd gate to inner surface of oxide

What you need

- USN 58L or USN 60
- IF Gate option (for either unit)
- Shear Wave DFR Probe 291-484-700
- BNC-MD or Lemo-MD cable
- SLC-70 couplant
- optional UltraDOC 4.x and RS232 cable

How you benefit

- Special Data Set optimizes the instrument for the application
- Measure Thinner Oxide/Scale Layers
- Measure Oxide on Thick Wall Boiler Tubes
- Save A-Scan and instrument parameters in Data Sets
- Use “compare mode” to view set-up standard against actual measurement
- High display resolution and range allows for clear signal interpretation and resolving the measurement



- 20 MHz ¼” crystal size
- Special Y-Cut ceramic produces Shear wave and an excellent “Alpha” waveform
- Replaceable delay lines for easy change out.

Shear waves are being used for the thickness measurements thus an attenuative couplant is needed. SCL-70 couplant provides the best shear wave transmission into the boiler tube.

Minimum Measurement Capability (under ideal test conditions) 0.005” (130 microns) with shear wave probe 291-484-700

NOTE: Oxide scale measurements using the USN can also be carried out using the Alpha2 / CLF4 DFR probe with a special delay. Under ideal test conditions the minimum measurement capability with this probe is about 280 microns.

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