Low Frequency Electromagnetic Technique (LFET) Low Profile Scanner Helps Find Wall Loss in Boiler

TesTex STATE OF THE ART PRODUCTS AND SERVICES FOR NON-DESTRUCTIVE TESTING

FROM THE FIELD

Problem:

A large utility plant in Western Pennsylvania, with three identical boilers, experienced a tube leak in one of Unit #3's horizontal reheater pendants. The cause for the failure was oxidation pitting due to out of service corrosion. Destructive samples showed ID pitting as small as 3/16" diameter occurring on the bottom half of the tubes.

Inspection from the ID was not possible due to accessibility. In addition, the 90 and 180 degree bends would prevent a probe from negotiating the ID even if access was somehow provided. Each reheater pendant has eight tubes that are stacked on top of each other with approximately 1" of vertical clearance between the tubes. The only way to inspect the tubes was from the OD with a scanner less than 1" in height that could detect and size small ID pits. (See pictures below)

The customer's goal was to inspect the bottom of as many tubes that could be accessed with limited cleaning. Due to the short outage span, no sandblasting or hydroblasting could be performed. The tubes were blown off with air. Some light

wirebrushing was also performed.

The tube specifications are 2.5” OD, 0.180” wall, T22 material.

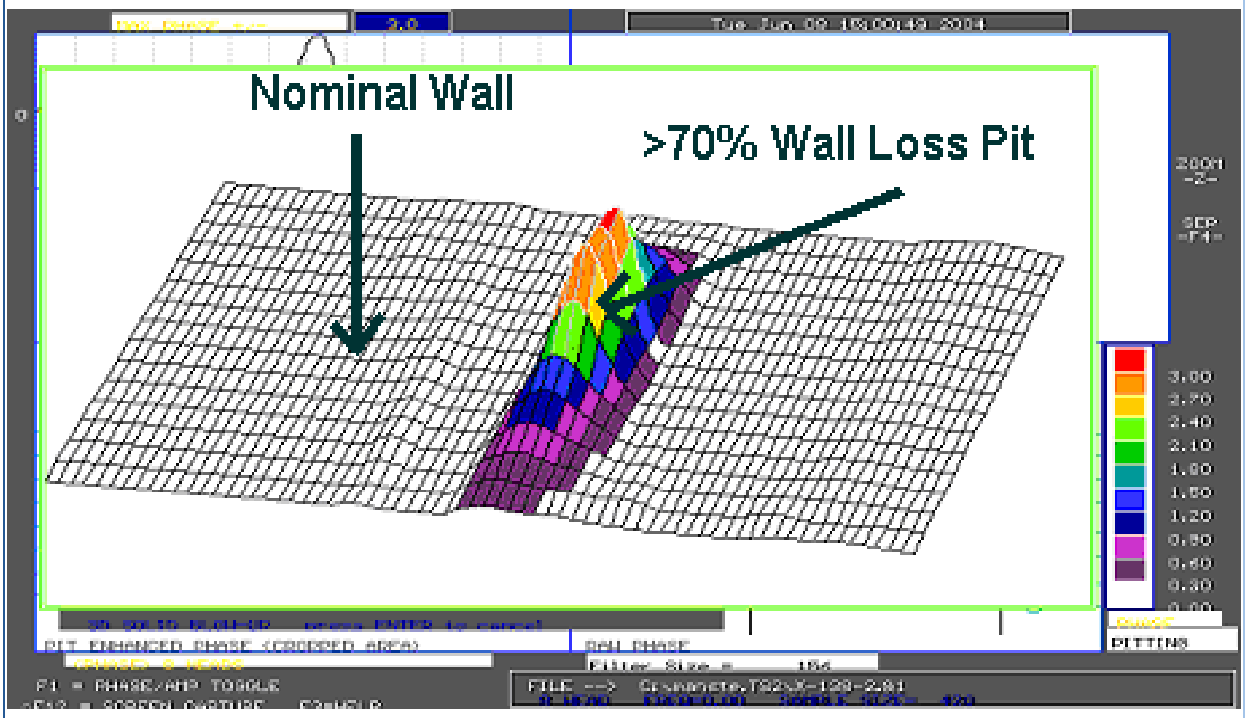
Solution:

TesTex, Inc. developed a Low Frequency Electromagnetic Technique (LFET) Low Profile Scanner that is 0.6” thick and is contoured to the 2.5” diameter tubes. A calibration tube was machined with 3/16” pits to verify detection capabilities and provide accurate flaw sizing. TesTex manufactured 5 Low Profile Scanners with plans to place 4 teams on day shift and on night shift to inspect as much as possible in a 24 hour period.

These pictures show the LFET Low Profile Scanner and the geometry of the reheater tubes.

There were 158 pendants in the reheater. The inspection area was dictated by accessibility. The reheater design allowed access to 6 areas for inspection. Some scaffolding was installed at the inlet header. Most of the inspection was performed in crawl spaces where the tubes above and below were accessible.

A total of 58 tubes were identified with pits ranging from 20-30% wall loss to >70% wall loss. A few of the tubes had several pits along a 3’ area. A tube identified as having >70% wall loss was cut out. This cut-out contained a pit with less than .054” wall remaining or >70% wall loss.



This waveform shows a pit with >70% wall loss.

Fifty-eight flaws in the plant's Unit #3 Reheater were located and repaired with dutchmen or pad welds. Thus, 58 potential forced outages were avoided. According to plant personnel, it takes a minimum of 72 hours to bring the boiler down and repair a tube leak on the 700mw unit.

Boilers #1 and #2 were tested in the same areas where flaws were found in Unit #3. No signs of pitting were found.

For more information on the TesTex, Inc. Low Profile LFET scanners or other TesTex products and services, please contact us at info@testex-ndt.com or call at (412) 798-8990.