

Eagle 2000 Plus Multi-channel NDT System Discovers Pitting in Boiler Tubes at a Chemical Plant in Eastern Tennessee



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



Problem:

A large chemical plant in Eastern Tennessee was experiencing a number of tube leaks in one of their boiler generating banks. The cause for the failures consisted of two specific flaw mechanisms revealed through destructive tube samples, which are listed below:

- 1) ID pitting as small as 3/16" diameter occurring between the mud drum tubesheet and mud drum bend, which was mainly found on the cold side.
- 2) ID longitudinal grooves as small as 1/8" in width located between the steam drum tubesheet and steam drum bend was found on the hot side tubes.

Conventional ultrasonic thickness testing was not possible due to OD accessibility in the Generating Bank. Access from the steam drum was impossible due to complications in removing the Steam Drum internals. The only way to complete this inspection in the timeframe required was to test the generating bank tubes from the mud drum.

The customer's goal for this outage was to

1. Replace the entire hotside of the generating bank, which experienced the failures and
2. Have [TesTex, Inc.](#) inspect and assess the condition of the tubes on the coldside of the generating bank.

The tube specifications were 2.5" OD, 0.165" wall, Carbon Steel swaged to 2.0"OD. There were a

total of 1,534 tubes in the generating bank. TesTex personnel performed a 100% inspection on the cold side totaling 767 tubes. The entire inspection was performed from the mud drum that was 48" in diameter with a 16" manway.

The Solution:

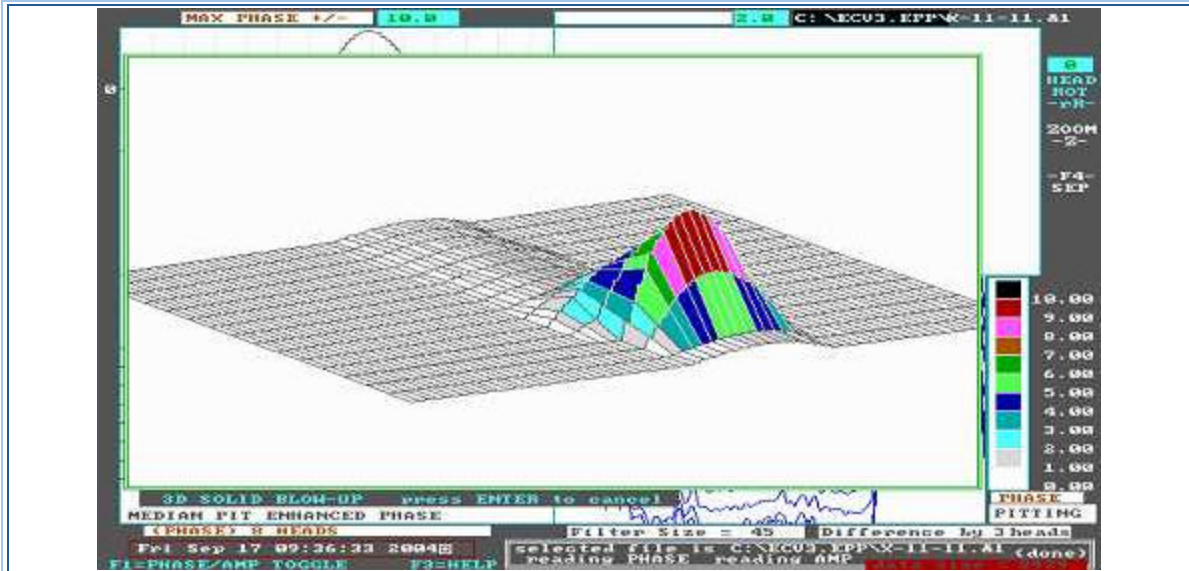
The most practical way to perform this inspection was to use the [TesTex, Inc.](#) developed [Eagle 2000 Plus Multi-channel NDT system](#). Based on the principles of Remote Field Electromagnetic Technique, the [Eagle 2000 Plus Multi-channel](#) conducts a full circumferential test over the entire length of the tube including the bends, not just at random points, as with some other NDT methods. Alternative methods such as IRIS would find it near to impossible testing from the mud drum due to the need to fill the tubes with water. The [Eagle 2000 Plus](#) requires no couplant and can test generating bank tubes from either the mud drum or the steam drum. Calibration tubes are manufactured for any flaw type, which aids in flaw detection through pattern recognition, and allows for quantification of defect depth and diameter.

A total of 7 tubes were identified with pitting. The most severe indication exhibited >45% wall loss. The other 6 tubes exhibited between 20-25% wall loss. The tube identified as having >45% wall loss was proved-up using a boroscope.

The RFET Inspection found no signs of grooving in the cold side tubes. This was confirmed with a boroscope.



These pictures show the [Eagle 2000 Plus Multichannel Probe](#). These probes are flexible; this allows the bends to be tested with full detection/quantification capabilities.



This waveform shows the pit exhibiting >45% wall loss based on a nominal wall thickness of .165".
 This isolated pit was found between the mud drum tubesheet and bend.



These pictures are the boroscope still shots, showing the isolated pit that was found exhibiting >45% wall loss using the [Eagle 2000 Plus Multichannel NDT System](#).

All 7 flaws in the generating bank cold side were scheduled for plugging. This assessment of the cold side of the generating bank has minimized the potential need for a forced outage.

For more information on the [TesTex, Inc. Eagle 2000 Plus Multi-channel NDT system](#) or other [TesTex products and services](#), please contact us at info@testex-ndt.com or call at (412) 798-8990.

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