Improving Boiler Reliability Through NDT

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TesTex
State of the Art Products and Services for NDT
Keys to Improving Boiler Reliability

1) Explain Problems to NDT Company
2) Provide Samples and Drawings
3) Cut-out some findings to verify and to improve calibrations and calls.
4) Make proper repairs
5) Take corrective actions to prevent/reduce future failures.

**Please remember that using NDT will improve your Time Between Failures. It will not eliminate all tube failures.**
Waterwall, SuperHeater, and Reheater Inspections
AVAILABLE INSPECTION TECHNOLOGIES

- Standard Ultrasonic Thickness Testing
- Magnetic Particle Inspection of Seam Welds
- Radiography
- EMAT
- Low Frequency Electromagnetic Technique (LFET)
What is LFET?

With no Flaw, Sensor sees uniform magnetic Field as Probe sweeps across the Plate.

With Flaw, Sensor sees Distorted Magnetic Field near the Flaw as Probe sweeps across the Plate.
The Low Frequency Electromagnetic Technique is used to inspect tubes and pipes from the O.D. It detects and quantifies I.D. and O.D. defects in ferrous and non-ferrous materials.

The TS-2000 is a multichannel system that uses a dry non-contact method based on electromagnetics. It is forgiving to uniform surface scale and tests at a scanning speed of 10 to 15 ft per minute.

Furthermore, the system can be adapted to many different applications, such as testing bends, space constricted areas, and small diameter tubing.
Dry non-contact method. No couplant necessary

Forgiving to uniform surface scales, rust and coatings

Scanning speed up to 10 to 15 feet per minute

8 sensors to achieve up to 160 degrees of coverage in a single scan on a furnace wall tube

Variety of contoured scanners to fit any tube/pipe diameter

Special application scanners available for many different tasks such as bends, space constricted areas and small diameter tubing

Light weight, modular, DSP (Digital Signal Processing) based electronics/PC operated

Real time data display with advanced signal processing

High resolution color graphics with 3D display
Typical Defects Found

• Caustic and Phosphate gouging

• Hydrogen damage

• Oxygen pitting

• Cracking (including stress corrosion cracking on stainless steel)

• Flu gas/low Nox erosion

• Manufacturing defects (baseline inspections)
REPORTING

LEGENDS:

- DENOTES THK. > 3.9mm
- DENOTES THK. 3.5 TO 3.9mm
- DENOTES THK. 2.6 TO 3.4mm
- DENOTES THK. <= 2.5mm
- DENOTES REFRACTORY
- DENOTES DENT
- DENOTES GROOVES

Note:

- All dimensions are in mm.
- 0 Mtrs. Level from End of bottom U tube.
Various Scanners (Bend)
Various Scanners (Low Profile)
Problem: Tube failures in the Horizontal Reheater due to oxidation pitting. Access between tubes is .75”. Pendants are spaced tightly together.

Western PA

3 – 835 mw coal-fired Foster Wheeler units.

Tube Dimensions:

Tube OD: 2.5” OD

Tube Wall 0.180” wall

Material SA-213 T22
Case Study 1

Legend

Not Tested
Section A
Section B
Section C
Section D
Section E
Section F
Section G
Section H
Section I
Section J
Section K
Section L
Section M

NOT DRAWN TO SCALE
Western PA Boiler

#3 Boiler

5 Areas Inspected

44 tubes with defects found

Major flaws found were cut-out and replaced with Dutchmans.

Minor defects were pad welded.
Case Study 1
Results:

Due to the amount of indications found in unit 3’s reheater section, it was determined to also scan units 1 and 2’s reheater section.

All 3 units’ reheater sections were replaced during the next scheduled outage.
Case Study 2

Problem:
A power plant in southern California was experiencing roof tubes rupturing in their Unit 3 boiler due to hydrogen damage.

Tubes: 1.75” OD
0.180” NWT

A 100% scan of the roof tubes was conducted.
Case Study 2
Results:

14 tubes were found to contain hydrogen damage.

All tubes with indications were cut out and verified immediately after detection.

Plant has reported no more problems with roof tubes rupturing.
Details needed for a successful inspection

- Tube Dimensions
- Any Available Drawings
- Failure History
- Repair History
- Scaffolding Plans
- Available Time for Inspection
Remember the Keys to Success

• Explain Problem to NDT company

• Provide Samples and Drawings

• Cut-out some findings to verify and to improve calls

• Make proper repairs

• Take collective actions to prevent/reduce future failures
Conclusions

• Results in less plant down time due to equipment failure, unscheduled maintenance, and safety issues

• Provides more efficient boiler operation

• Is backed by the most state of the art, versatile products developed in the industry today

• Insures a method which is fast, accurate, cost effective, and field proven