Water Side Inspection of Industrial Boilers

W.R.B.A. Meeting 3/11/09
Ed Baumgartner & Jim Robinson
Who are we?

- Jim Robinson    Senior Boiler Consultant, Trevose, PA
- Ed Baumgartner Senior Project Sales, Spokane, WA
A Boiler?
We Have Lift Off!
The Big Bang!
What will we cover?

What to look for and accomplish in the waterside inspection of your water tube industrial boiler

• Water Tube Configuration

• Generally softened and/or DeAlk MU
Three Areas of Discussion

Presentation includes

• Preparation for the inspection
• Conducting the inspection
• Best Practices follow-up
Preparation for the Inspection

• Form a team for the inspection
  – Plant point of contact
  – Water treatment consultant
  – Insurance inspector if possible
Preparation for the Inspection

• Safety is paramount
  – LO&TO
  – DO testing
  – Man-Watch Always
Preparation for the Inspection

Before the inspection, research:

• Boiler Design (circulation issues, load issues)
  – Certain types of boilers have known issues
  – Loads higher than design can lead to carry-over and other issues such as level control
  – Low loads can worsen circulation issues
  – History of the boiler to be inspected
Preparation for the Inspection

Before inspection, research:

• Past inspection results (review past reports the day of the inspection, if possible)

• View any TV camera tapes from prior outages

• Know the current treatment program type and how it works: Chelating, Precipitating, or Dispersing
Preparation for the Inspection

• Preparation
  – Right gear
    – Clothing (not loose fitting, zippered pockets)
    – Tools (not too small, or tethered)
  – Digital camera
  – Plan for inspection discussed by the team before crawling in the boiler
  – TV camera
  – Other
Conducting the Inspection

• The Inspection
  – Make sure that LO&TO is done according to plant protocol
  – Man hole watch mandatory
  – DO testing
Conducting the Inspection

What to look for:

• Loose, plugged, or missing internals
• Level control indications in steam drum
• Indications of deposition concerns
• Indications of corrosion concerns
• Inspect all drums on boiler
• Inspect any headers if available
Conducting the Inspection

What to look for:

- Loose, plugged, or missing internals
  - Check for loose equipment
  - Note findings for report
- Water level control in steam drum
  - Note steam drum wall levels indications
  - Low or high
  - Varying across drum in certain areas
Conducting the Inspection

What to look for:

• Indications of deposition concerns
  – If deposits found in drums, sample if possible (note where they were taken)
  – Deposits in drum show real concern
  – No deposits visible in drum does not necessarily mean no deposition concerns on heat transfer surfaces
Conducting the Inspection

What to look for:

• Indications of deposition concerns
  – For best inspection of tube heat transfer surfaces, inspect tube with TV camera, or Boroscope
  – Preferably, tube specimens are taken and submitted for metallurgical evaluation and deposit weight densities of any deposit
Long Term Overheat
Short Term Overheat
Conducting the Inspection

What to look for:

• Indications of corrosion concerns or lack of passivation
  – Noted pitting
  – Noted redness on drum wall or, on or near, the feedwater line
Conducting the Inspection

What to look for:

• Indications of corrosion concerns or lack of passivation
  – Inspection of economizer if the boiler has one and it is accessible (economizers will take the brunt of any oxygen attack first and foremost)
  – Steam blanketing corrosion
Inspection Follow-up

- Discuss results and observations between the inspection team individuals (plant personnel, WT consultant, and insurance inspector)
- Send in deposit analysis samples if needed
- Send in any tube samples that have been taken for examination
- Also any TV camera footage should be reviewed by the team
Inspection Follow-up

- Inspection report should be written by the Water Treatment Consultant to cover:
  - Photographic record of inspection
  - Any deposit analysis results
  - Recommendations that came out of the findings
Inspection Follow-up

• Bottom Line of, and for, the inspection
  – The boiler condition is relative to prior condition and conditions
  – Is it the same, better, or worse in condition based on the inspection results versus prior inspections?
Inspection Follow-up

- Bottom Line of, and for, the inspection
  - Does everyone on the team agree?
  - Does everyone agree on the future course of action to protect the boiler?
  - Group consensus and action plan needed
Inspection Follow-up (Best Practices)

• The three most important things for good follow-up:
  1) Documentation
  2) Documentation
  3) Documentation