

Recovery Boiler Floor Tube Inspections

Purpose

This bulletin advises recovery boiler owners and operators of the necessity to thoroughly clean and inspect recovery boiler furnace floors during each maintenance outage.

Problem

Recent industry-wide inspections of recovery boilers of various designs have revealed isolated cases of cracking in composite (Type 304L/SA-210 A1) floor tubes (Figure 1) and locally accelerated wastage of carbon steel pin-studded floor tubes (Figure 2), which in some units resulted in tube failure. In composite tube floors, the cracking of the stainless cladding is random and predominantly appears in a crazed pattern on the crown of the tubes, adjacent to the membranes or on the furnace face of the membranes. In pin-studded carbon steel floors, wastage may be random and can be confined to very localized areas of only a few square inches of the tube surface.

The cause of the cracking and locally accelerated corrosion is not entirely understood. It is believed to be due to thermal cycling or aggressive corrosion attack from molten smelt in direct contact with the tubes. Floor tube damage has also been associated with significant dents in the furnace floor. Dented tubes, as well as tubes immediately adjacent to dents, should be thoroughly inspected.

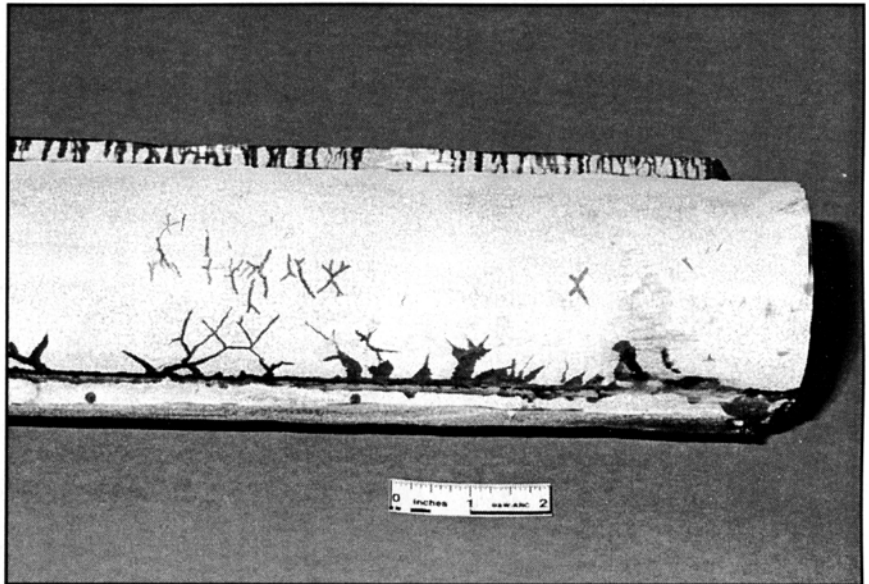


Figure 1 Composite tube cracking.

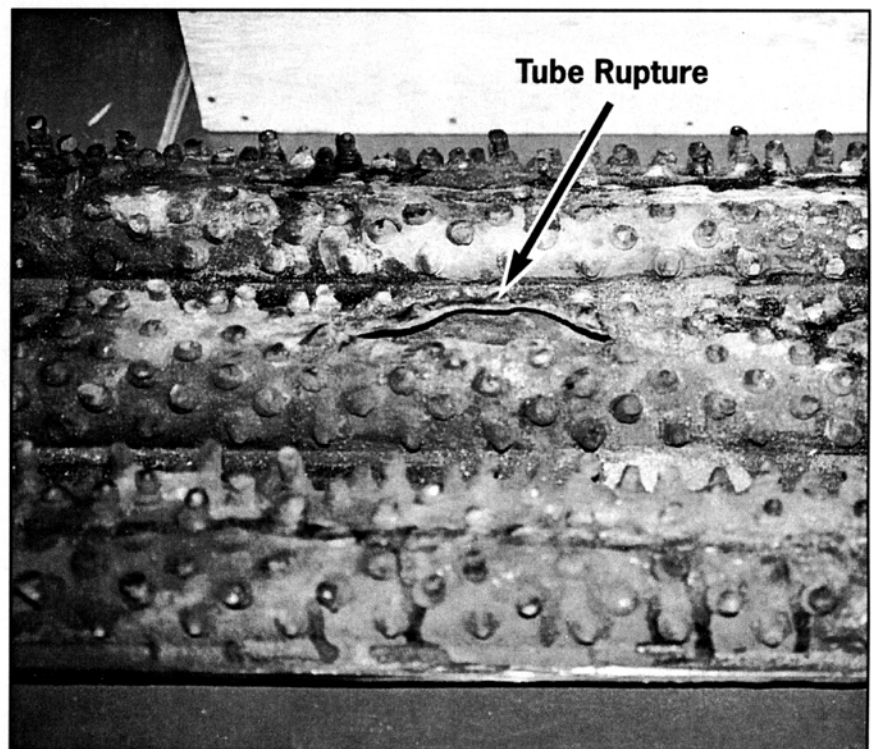


Figure 2 Floor tube failure and associated wastage of pin-studded tubes.

(Continued on reverse side)

Recommendations

Composite Floor Tubes

1. Thoroughly clean the furnace floor to remove all smelt and ash deposits.
2. Establish a program of regular ultrasonic testing of the floor tubes to detect tube wastage and thinning. If any localized wastage/thinning is visually apparent, confirm with ultrasonic testing (specialized equipment is required for ultrasonic tests of composite tubes).
3. Visually inspect the floor tubes and membranes for evidence of cracking. Confirm suspected cracking with liquid penetrant testing.
4. Repair or replace tubes where cracking is identified.*
5. Repair or replace tubing where wastage or thinning has resulted in loss of the stainless steel outer layer.*
6. Replace refractory over the appropriate regions of the

furnace floor before placing the boiler back into operation. Appropriate regions include the floor to spout wall seal, and the side wall to floor seals.

Carbon Steel Pin-Studded Floor Tubes

1. Thoroughly clean the furnace floor to remove all refractory, smelt and ash deposits for the initial inspection. For subsequent inspections, tightly-bonded refractory may remain in place.
2. Establish a program of regular ultrasonic testing of the floor tubes to detect tube wastage and thinning.
3. Visually inspect the floor tubes for pin-stud wastage and tube wall thinning. Look for very localized areas of significant pin-stud loss relative to the floor in general. Determine the wastage of the tube wall on visually thinned areas using ultrasonic testing.

4. Repair or replace pin studs and/or tubes that have experienced significant stud wastage or thinning.*
5. Apply refractory as required to cover the entire furnace floor before placing the boiler back into operation. The refractory manufacturer's installation and curing procedures should be closely followed.

It is believed that damage can be reduced by preventing molten smelt from directly contacting the floor tubes. Refractory or operating techniques that maintain a protective layer over the tubes should be used to minimize damage. B&W is continuing to investigate the causes and determine methods to prevent damage to the floor tubes.

Support

For more information or assistance in performing these inspections, contact Babcock & Wilcox Field Service Engineering.

*If severe cracking or localized thinning is discovered, contact your local B&W Field Service Office for assistance in developing appropriate repair procedures.

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