

Steam-Cooled Spacer Tube Related Cracking of Secondary Superheater Outlet Headers

Purpose

To advise owners and operators of B&W drum and once-through coal-fired design boilers, equipped with secondary superheater steam-cooled spacer tubes, to inspect the secondary superheater outlet header internal surfaces for cracks in the vicinity of the steam-cooled spacer tube entries. The steam-cooled spacer tube design (see Figure 1) is used on many units to maintain superheater section side spacing.

Problem

Internal, longitudinal cracks may develop on the inside of the outlet header in the vicinity of the steam-cooled spacer tube entries. These cracks are caused by thermal quenching from water that clears the spacer tube during startup and impinges on the higher temperature outlet header internal surface. Longitudinal-type cracking may also develop in the spacer tube bore holes because of this thermal quenching.

Recommendations

To avoid the quenching and prevent header damage, the spacer tube should be boiled out simultaneously with the secondary superheater before the startup gas temperature limit is released. The following recommendations are provided to determine if header damage is developing on a unit, and to identify the corrective measures to help prevent further damage.

1. If the spacer tube outlet legs are not instrumented with thermocouples to monitor boil-out during startup, install thermocouples near the outlet header. Collect data during several startups to determine if the tubes are cleared of water prior to releasing the startup gas temperature limit.
2. A problem is indicated if a spacer tube temperature rises rapidly, some time after release of the startup gas temperature limit. If this delay in clearing is evident, then the header could possibly have existing damage. The spacer tube could also be damaged from overheat, caused by trapped

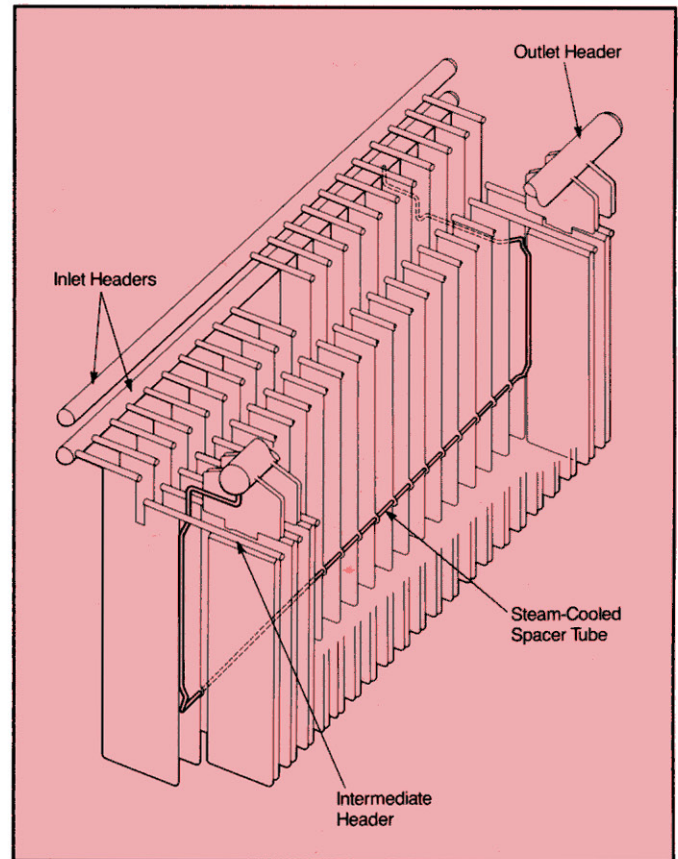


Figure 1 Pendant superheated with steam-cooled spacer tube.

- water restricting steam flow.
3. Inspect the internal header surfaces in the vicinity of the spacer tube entries and the spacer tube bore holes for cracking damage. Normally, cracking is oriented with the longitudinal axis of the header. This damage should not be confused with tube ligament cracking, which can occur in the same area and is radially oriented around the tube holes.
4. Inspect the spacer tubes along their lengths for overheat damage as evidenced by warping, swelling, or support tie misalignment.

(continued on reverse side)

5. If damage is evident from the inspections (3 or 4, above), an additional startup technique may be required. This would allow time for trapped water to clear the spacer tube prior to release of the startup gas temperature limit.
6. If the startup technique cannot be modified, it may be necessary to revise the spacer tube design to a different tube routing or circuitry; a second option is to modify the inlet and outlet spacer tube

stub to the top of the headers, to minimize draining of condensate into the spacer tube.

7. If header damage is observed, an analysis should be performed to evaluate remaining life.

Support

If any problems are encountered or if you require more information or assistance, please contact Babcock & Wilcox Field Service Engineering.

For more information, contact your nearest B&W Sales and service office.

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