

Feedwater Pipe Thinning

Purpose

Advise owners and operators to inspect and test intermediate temperature feedwater piping for internal wall thinning.

Problem

While not common, pipe wall thinning has been found in areas of turbulent flow in feedwater piping at intermediate temperatures. In at least one case, severe wall thinning to failure occurred downstream of a feedwater chemical injection point. This is of particular concern for piping outside of the boiler setting where failures can be hazardous to plant personnel and equipment.

The thinning is believed to be the result of an erosion-corrosion mechanism similar to that which has caused failures of piping in several nuclear power plants. The erosion-corrosion mechanism is reviewed in the Proceedings of the Fifty-Ninth General meeting of the National Board of Boiler and Pressure Vessel Inspectors, May 14-18, 1990 and it is described as flow-assisted dissolution of the protective oxide film that is normally present on the surface of steels. This type of thinning of carbon steel occurs at:

- Low pH (e.g., <9)
- Intermediate temperatures (e.g., 250-400F)
- Low oxygen levels (e.g., <100 ppb)
- Locally high fluid velocities

Action Required

Boiler owners and operators should inspect their feedwater systems for evidence of thinning. Particular attention should be paid to areas in and around bends, valves, tees, or wherever localized turbulence and higher fluid velocity are possible. The thinning is such that ultrasonic longitudinal wave inspection for wall thickness will suffice to locate and gauge its severity. If thinning is found in one area, other areas carrying the same water, such as (but not limited to) spray water temperature piping and water coil air heater piping, should be inspected.

Any reduction in pressure part wall thickness must be evaluated with regard to safety. Turbulent flow conditions should be alleviated, if possible, by eliminating abrupt changes in flow path or ID contour (e.g., at valve butt welds.) If flow or operating conditions cannot be modified, erosion-corrosion can be largely arrested by the use of ferritic alloys with a chromium content greater than about 1% (e.g., A-335 grades, P11, P12, or P22).

Support

If you have any questions or need assistance performing the inspections, contact Babcock & Wilcox Field Service Engineering.

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

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