

Boiler Water Phosphate Chemistry

Purpose

The purpose of this bulletin is to re-emphasize to all utility operators the potential chemistry control problems that can lead to serious furnace tube corrosion. Monitoring of boiler water chemicals has always been necessary. However, units operating at high drum pressures require even closer monitoring.

Background

The coordinated phosphate treatment uses the feed of sodium phosphates in maintaining the boiler water pH. One of the disadvantages of this treatment is that, on high-pressure drum type units, the detectable concentration of phosphate in the bulk boiler water can decrease with increasing load and pressure, and then return to the original levels on subsequent load or pressure reductions. This phenomenon, known as "phosphate hideout," can make it difficult to maintain close control of the pH phosphate concentration. Both the magnitude of the phosphate hideout and the variation in load required to cause the phenomenon can vary considerably from one boiler to another. The attached background letter and technical paper give additional information concerning this problem.

Problem

Recently, a high-pressure (2,600 psig) drum-type utility boiler experienced severe internal furnace tube corrosion. The attack encompassed the fire side of tubes in all four walls of the furnace in the burner zone. Major quantities of sodium iron phosphate were found in the affected tubes, indicating that the sodium phosphate from the boiler water had participated in the corrosion mechanism. Figure 1 and Figure 2 show the corrosion.

Recommendations

Utilities operating drum-type boilers on phosphate base treatment should:

1. Monitor chemical injection practices closely during phosphate hideout and return conditions.
2. Evaluate the loss of phosphate from the system by material balance calculations.
3. Limit or eliminate phosphate feed during hideout conditions—do not feed phosphate below a Na/PO₄ ratio of 2.5-to-1.

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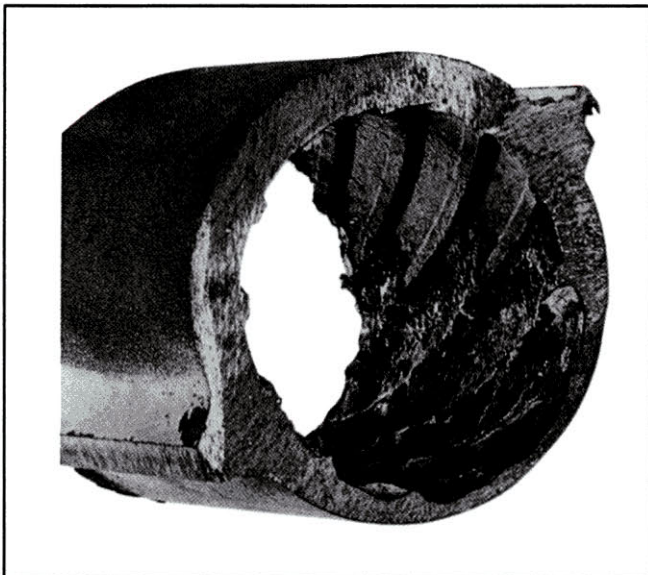


Figure 1



Figure 2

4. DO NOT FEED MONO-SODIUM PHOSPHATE, as it is more acidic than the typical di- or tri-sodium phosphates.
5. Limit boiler blowdown to ensure that excessive chemical losses and unreacted additive losses are minimized.

Support

Contact Babcock & Wilcox Field Service Engineering if you have any questions or require further information.

For more information...

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