TIP SHEET

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Steps to Properly Treat Boiler Water

Part 2 -- Chemical Means

To maximize boiler efficiency and ensure equipment longevity, it is important to properly treat boiler feedwater and keep the internal boiler surfaces clean. Water contains minerals and gases, which when heated lose their solubility and become very hazardous to the boiler and its connected components. Improperly treated boiler water can lead to corrosion, scale and biological fouling.

All scale and deposits, regardless of composition, have a lower ability to transfer heat than steel and will raise tube metal temperatures. This can cause blisters and overheating failures in watertube boilers and a significant decline in efficiency of firetube boilers.

Boilers are blown down to control their chemistry and minimize the likelihood of scale and deposits, corrosion and carryover. When boiler water is allowed to over concentrate, continuous blowdown may result. Bottom blowing a boiler removes the particulate and sludge that has accumulated, but it is not recommended to control boiler chemistry.

Scale and deposition can be limited by minimizing the feedwater contaminants entering the boiler, implementing a sound treatment approach and accurately controlling the blowdown rate.

A sound water treatment approach involves a two-step process. Mechanical equipment typically removes 90 to 95 percent of impurities, and the last 5 to 10 percent can be handled by chemical water treatment.

There are 3 types of chemical treatment programs commonly used today in firetube boilers operating at or below 300 psig. The first is a precipitating program that uses phosphate, which is a very old, reliable chemistry. Another type of boiler treatment program is threshold scale inhibitor. This program is a good fit for a firetube boiler operating at pressures below 300 psig. This approach can better handle moderate to severe hardness upsets compared to the phosphate treatment. The last type of boiler treatment program is a solubilizing program using an all-polymer treatment. Boiler internals tend to be much cleaner using this type program compared to phosphate or threshold inhibitor treatments and because no precipitate is formed, blowdown can often be reduced.

For hydronic systems, corrosion is typically the biggest problem. Hydronic boilers are used in many applications ranging from a temperature as low as 140°F to over 400°F. Regardless of temperature, the requirements to maintain these systems are very similar. Softened water make-up is recommended for all hydronic boiler systems. This reduces the tendency for the formation of calcium carbonate and magnesium silicate scales.

There are 3 basic programs used for hydronic boilers. A nitrite/azole program is a good choice for all mild steel systems operating at temperatures below 300°F with less than 1-2 ppm oxygen. If higher oxygen levels exist in a system, this chemical program will struggle to maintain good corrosion protection of steel.

A combination molybdate/nitrite/azole program is similar to the previous treatment with molybdate added to the mixture at 100 ppm. Molybdate can be costly relative to nitrite. This combination is less prone to problems from oxygen due to the molybdate present, however, some areas limit the amount of molybdate that can be discharged.

A third approach is the molybdate/azole program. Molybdate levels are maintained at 300 ppm or higher. At temperatures above 250°F, the molybdate concentration should be increased to 500 ppm to maintain performance.

To learn more about proper boiler water treatment, watch this webinar. For questions about a chemical approach to treating boiler feedwater, contact a chemical treatment company such as Nalco. To learn more about treating boiler feedwater with mechanical equipment, contact your local Cleaver-Brooks representative or visit cleaverbrooks.com.