Improper Boiler Shutdown Can Cause Severe Corrosion

Technical Bulletin 1-018
Boiler Systems

The Problem
With natural gas prices higher than ever, more and more boiler owners are considering turning off their boilers at night and/or over the weekend to help reduce fuel costs. While this practice can cut fuel usage, the repeated intrusion of oxygen that occurs as the boiler cools can cause severe oxygen pitting and tube failure, even if a normal sulfite residual is maintained in the bulk water. Because the oxygen drawn into an idle boiler tends to collect at the interface between the water and metal surfaces, the sulfite can be consumed immediately next to a boiler tube without being used up in the bulk boiler water.

What Should Be Done?
It is important the boiler manufacturer’s instructions for operating, maintaining, and shutting down a boiler are followed. Shutdown procedures can be quite involved and generally require more than just turning the boiler off when it is not in use. If possible, the procedures outlined in Wet and Dry Boiler Storage Procedures (TB1-002) should also be followed whenever a boiler is taken out of service. If the boiler owner considers the wet storage procedures too involved for overnight and/or weekend shutdowns, at a minimum the sulfite residual in the boiler water should be increased to at least 100 ppm prior to shutdown with at least 400 ppm of P-Alkalinity present. However, it should be understood that these chemical measures are not a 100% reliable means of preventing oxygen corrosion in this situation.

Some boilers are equipped with a night switch that lowers the operating pressure during off hours to reduce fuel usage. Oxygen corrosion is less likely if the boiler is kept pressurized at all times.

In the end, the owner of the boiler must make the decision whether the fuel savings associated with shutting off a boiler justifies the increased risk for corrosion and tube failure. Unfortunately, many different factors that cannot easily be measured determine how much fuel is actually saved by turning off a particular boiler versus letting it idle on low fire. The owner may not be saving as much money as thought, especially if the increased potential for corrosion and downtime is also factored into the equation.