

***Boiler Blowdown – a Critical Function in Boiler Waterside Protection***

The cost of operating a steam boiler system has steadily increased in recent years, and has shot up dramatically in the past year on the strength of sharply higher fuel prices. When one considers that fuel accounts for approximately 75% of the cost of producing steam, it is small wonder that skyrocketing oil and natural gas prices are straining boiler system operating budgets to the breaking point.

A well-designed and maintained water treatment program can help control the cost of operating a boiler system. Newly developed chemical technologies and improved make-up water pretreatment systems together can allow boiler operators to maintain waterside surfaces absolutely scale-free; this maximizes heat transfer rates and minimizes fuel use. A properly controlled chemical program can pay for itself many times over in fuel savings alone by maintaining bare metal boiler waterside surfaces.

However, a state-of-the-art chemical program will not keep a boiler waterside scale-free if the program is not properly controlled. This involves, among other factors, the correct application of a critical component in a sound treatment

program – boiler blowdown. Blowdown, simply put, is the removal or draining of a portion of concentrated boiler water, allowing for its replacement with less concentrated feedwater and preventing the buildup of scale-forming impurities. This sounds simple, but correct blowdown operation and control is more complex than simply opening and closing a drain valve, and its function is absolutely critical to the success of the chemical treatment program. Furthermore, blowdown, if not properly conducted and accurately controlled, can itself unnecessarily increase the cost of boiler system operation.

It is important to understand that there are two types of blowdown – bottom blowdown and surface blowdown – and each has a specific function. To provide maximum benefit, each type of blowdown should be utilized only for its specific function, and only for the duration required to do the job. Too little or incorrectly applied blowdown will result in scaled boiler surfaces; too much blowdown will waste water, chemicals and fuel, needlessly increasing operating costs.

When feedwater is heated in the boiler to produce steam,

hardness and other dissolved feedwater impurities precipitate, or come out of solution in solid form – this is the material that forms scale. A well-designed chemical program controls this precipitation so that the material formed is relatively fluid and non-adherent. This “sludge” is heavier than water, and gradually settles to the bottom of a firetube boiler, or into the mud drum of a watertube boiler. The function of bottom blowdown is to remove the sludge, preventing it from accumulating to the point where it will deposit on the boiler tubes and bake into scale.

As steam is generated, only pure water vapor leaves the boiler; impurities (dissolved solids) are left behind in the water. The feedwater added to replace generated steam contains more dissolved solids, causing an increase in the total dissolved solids (TDS) concentration in the boiler water. As this process continues, the TDS will reach a level where precipitation, and

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the potential for scale, occurs. Since steam bubbles escape the boiler water at the water surface, the highest TDS concentration exists within the top few inches of boiler water. The purpose of surface blowdown is to lower the boiler water TDS concentration. This is effected most efficiently by drawing the boiler water off close to the water surface.

Bottom blowdown should be conducted as one or more short “blows” according to a regular schedule – once per day, once per shift, twice per week, etc, based on the operating characteristics of the boiler system. A qualified water treatment specialist, by analyzing feedwater chemistry, steaming rate, load factors and operating schedule, can establish a bottom blowdown schedule that will provide for complete removal of boiler sludge without undue waste of water, chemicals and fuel.

Surface blowdown is conducted either continuously or intermittently to maintain control within parameters established by the American

Society of Mechanical Engineers (ASME) for TDS, total alkalinity and silica. Surface blowdown is often effected using a needle- or other type of metering valve through which a small amount of boiler water is removed continuously at a constant rate. This method does a good job of controlling boiler water TDS as long as the boiler load remains relatively constant. However, if the boiler experiences load swings, the TDS will increase and decrease proportionately, and can exceed upper and lower limits. Boiler TDS falling below limits results in wasted water, chemicals and fuel; TDS above limits causes or accelerates scale formation.

An automated boiler blowdown controller alleviates these problems. The controller, using an in-line probe, senses the boiler water conductivity, an indirect measure of TDS. When the TDS rises above the upper limit, an automatic valve located on the surface blowdown line is opened, starting surface blowdown, which continues until the TDS level drops back to within set limits. Operating in

this manner, the blowdown controller maintains boiler water TDS within a narrow range, saving water, chemicals and fuel, while helping prevent the formation of scale on the boiler tubes.

Starting at around \$1000 for a controller, automatic blowdown valve and throttling device, a basic unit has a quick payback and will help optimize the performance of the chemical program. More complex, microprocessor-based control systems, capable of performing multiple functions, including controlling several boilers simultaneously, are available at costs ranging up to several thousand dollars.

Blowdown is a critical part of a well-designed and maintained boiler water treatment program. A boiler engineer needs to understand the functions of both bottom and surface blowdown, and conduct both correctly to control operating costs and assure the success of the water treatment program.

Are you blowing excess \$\$  
down the drain or losing money  
up the stack?

Ask your Chemtex Representative to give  
your boiler system an early season  
check-up!