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Reduce Boiler System Operating Costs with Automated Blowdown Control

The typical steam boiler system accounts for upwards of 80% of a facility's fuel usage. The average cost to produce 1000 lb. of steam currently stands at around $11.00, and with the price of natural gas and other fuels on the increase, this number will only rise in the future. At this steam cost, even a relatively small boiler system is expensive to operate.

For example, a boiler system developing 100 horsepower will produce 62,100 lb. of steam in an 18 hour day. At $11.00 per 1000 lb. of steam, this amounts to $683.00 per day, or more than $180,000 per year, based on 270 days of operation. As costs continue to rise, it will be increasingly important for facility managers to find ways to keep boiler operational costs down.

One option the facility manager should consider for savings is an automatic blowdown controller. Boiler blowdown has two functions. Bottom blowdown is conducted on a regular basis to remove sludge that accumulates as the result of precipitated hardness and other impurities. Surface blowdown, or skimming, is done continuously or semi-continuously to control the concentration of dissolved solids (TDS) that are left near the water's surface when steam is generated. Surface blowdown accounts for about 80% of the total blowdown from the average boiler.

With manual surface blowdown control, a needle valve or other type of throttling valve in the surface blowdown line is set to remove boiler water at a constant rate. If steam production remains stable, manual control will provide fairly consistent boiler water TDS levels. However, when steam production increases, the TDS will increase proportionately, creating a situation in which scale is likely to occur, resulting in decreased heat transfer efficiency and increased fuel use. On the other hand, when steam production decreases, the constant surface blowdown flow will be greater than necessary, lowering TDS and wasting water, treatment chemicals and fuel.

Installation of an automatic blowdown controller will correct this situation. A basic system features a conductivity monitor, a conductivity probe installed in the surface blowdown line, an automatic blowdown valve, which is either a steam solenoid or a motorized ball valve, and a throttling valve. The controller intermittently opens the blowdown valve, allowing boiler water to flow past the probe, which measures the boiler water conductivity. If the conductivity, which is proportional to TDS, is below a predetermined set-point, the controller closes the blowdown valve until the next sample time. When the controller measures a conductivity reading above the set-point, it leaves the blowdown valve open until the conductivity falls back below the set-point; the controller then closes the blowdown valve.

Operating in this manner, the blowdown controller will maintain boiler water TDS within a narrow range. This helps assure that the chemical treatment program will keep the boiler waterside surfaces free of scale, maximizing boiler heat transfer efficiency, while at the same time minimizing the waste of water, chemicals and fuel in excessive blowdown.

The amount of savings provided by the installation of a blowdown controller will depend on feedwater chemistry, pretreatment equipment and the operational characteristics of the boiler system. Savings of 1 – 3% of total steam production costs are very common, with some systems realizing savings of 10% or greater. In the example cited here, savings of 1 – 3% would amount to $1800 - $5400 per year. With an installed cost of under $2000 for a basic blowdown control system, this would yield a payback of a year or less. Of course, the savings would continue to accrue after the initial investment was returned.

Faced with rising costs and tightening budgets, facility managers should consult with their water treatment representative to see if a boiler blowdown controller is a good fit for their system.

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