TUNDRA Process Solutions Ltd.

CLEAVER-BROOKS

Efficiency Benefits of a Boiler System Upgrade

- A boiler can last 20 years or more, but its efficiency significantly declines
- Adding parallel positioning can save as much as five percent in fuel costs
- Replacing the burner with a high-turndown one increases energy savings by reducing on-off cycling

With regular maintenance, a boiler can last 20 years or more, but it is likely operating well below the nominal efficiency of 80 percent. If the boiler pressure vessel is in good shape, consider upgrading the system to increase its efficiency and reduce ongoing operating costs. New developments in boiler controls and burners will enhance a system's performance and produce measurable efficiency gains that result in annual cost savings. Here are a few options to consider.

Fuel-Air Ratio Control. Many boiler burners are controlled by a single-modulating motor with a single jackshaft that has connected linkages/arms to the fuel valve and air damper. Over time, these linkages tend to wear, stretch and loosen, causing the fuel-to-air ratio to drift in to either very inefficient excess-air conditions or unsafe fuel-rich conditions, which is also inefficient due to the heat transfer limitations caused by the soot fouling.

To alleviate this problem, consider incorporating parallel positioning into the control system, replacing the single-jackshaft system. It is a control scheme that uses dedicated motorized actuators for the fuel and air valves, electrically tying them into the electronic firing-rate control on the boiler. Burners that incorporate parallel positioning can eliminate this unwanted and inefficient "drift" away from the optimum fuel-to-air ratio, consistently keeping the burner in sync as it modulates between low and high fire. Fuel savings of two to five percent are not uncommon with those boilers that modulate considerably during a given operational day.

Oxygen Trim. Another way to ensure peak efficiency is to use an oxygen trim sensor/transmitter in the exhaust gas stream. The sensor/transmitter continuously senses oxygen content and provides a signal to the controller that "trims" the air damper or fuel valve, maintaining a consistent oxygen concentration when environmental conditions such as ambient temperature, relative humidity and barometric pressure change. This system then minimizes excess air while optimizing the fuel-to-air ratio and, at the same time, helps to keep the burner from going excessively rich, which is not only inefficient, but very dangerous too. It should be noted as well that a two-percent increase in oxygen over the optimum set point causes a one-percent loss in efficiency.

Variable-Speed Drive. Adding a variable-speed drive (VSD) enables a motor to operate only at the speed needed at a given moment, rather than a constant RPM regardless of load demand. This speed variance results in the elimination of unnecessary electrical energy consumption because as the speed lowers, the power consumed decreases as a cube function of the speed. A VSD can be used on any motor, but is commonly found on boiler feed and circulating pumps and combustion air motors of more than 5 HP. These drives also exhibit quieter operation and softer starts compared to a standard motor, thereby reducing maintenance costs by decreasing the stress on the motor shaft and associated bearings.

Lead-Lag Control. Incorporating lead-lag control of multiple boilers that are incrementally sized for the load can substantially reduce energy costs due to a reduction of boiler cycling. Remember, every time a boiler cycles off, it goes through a pre-and post-purging cycle before reigniting. This means that ambient air is blowing through and across the heating surfaces of the boiler for approximately two minutes, purging valuable BTUs into the atmosphere.

CleaverBrooks

Click here watch The Art of Boiler Tuning webinar.

Toll free: 1 800 265 1166 3200 - 118 Ave SE, Calgary, AB T2Z 3X1 Info@TundraSolutions.ca

TUNDRA Process Solutions Ltd.

CLEAVER-BROOKS

Efficiency Benefits of a Boiler System Upgrade

- A boiler can last 20 years or more, but its efficiency significantly declines
- Adding parallel positioning can save as much as five percent in fuel costs
- Replacing the burner with a high-turndown one increases energy savings by reducing on-off cycling

Advanced Controls. Often called SCADA (supervisory control and data acquisition) systems, advanced control systems are PLC-based platforms incorporating burner management, combustion control and monitoring in one integrated package. By installing an advanced control system, a facility can expect to see better performance, enhanced safety, lower maintenance and reduced operating costs.

A key benefit of an advanced control system is that a boiler can be remotely monitored and managed within its safety parameters while at the same time gathering/trending valuable information relating to safety, energy consumption and maintenance trigger points. Operators can monitor boiler status via email, text messaging, voice mail, the Internet or an internal communication system. In the event of a boiler-system alarm or malfunction, the control system can automatically alert an operator in a nearby or remote location.

High-Efficiency Burners. Upgrading the burner after about 20 years of service is strongly recommended due to the advances in burner technology. Today's burners are designed for high-efficiency, high turndown and low emissions. Increasing the burner turndown rate will increase energy savings because on-off cycles are reduced. Often, high-turndown burners can work in conjunction with a multiple-boiler lead-lag control system, delivering even more energy savings due to an even further reduction in cycling.

Remember, even with the latest technology, regular maintenance is still necessary. Properly servicing a boiler system on a consistent basis will maintain its efficiency and lower fuel costs for years to come.

To learn more about boiler tuning, contact Tundra Process Solutions Ltd.

Click here watch The Art of Boiler Tuning webinar.

Toll free: 1 800 265 1166 3200 - 118 Ave SE, Calgary, AB T2Z 3X1 Info@TundraSolutions.ca