WATERLOO MANUFACTURING
COMPLETE BOILER ROOM SOLUTIONS

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TIP SHEET

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► A boiler stack economizer can increase a boiler's efficiency by 5 to 9% depending on feedwater conditions

► The payback on a flash tank economizer, which recycles heat and steam or uses it to heat new feedwater, is typically just a few months

► A blowdown heat recovery system recovers up to 90% of heat typically lost to blowdown

Heat Recovery Helps Your Bottom Line

In many boiler systems, the greatest single cause of heat loss is flue gas exiting through the stack. Reducing this loss is important to increase boiler system efficiency and reduce operating costs. The following are some of the heat recovery options available for boilers today:

A **boiler stack economizer** can reclaim BTUs from the combustion process and transfer them to the boiler feedwater. Utilizing these BTUs reduces the amount of heat energy required for the burner to raise the temperature of its fluid to the respective boiling point within a pressure vessel.

Based on a consistent firing rate, operating pressure and constant ambient temperature, a general rule is that for every 40 degrees the stack temperature is reduced, a full percentage point of fuel savings is gained. With the correct application, a stack economizer can increase a boiler's efficiency by 5 to 9% depending on feedwater conditions.

Stack economizers can be non-condensing or condensing. A single-stage condensing economizer saves fuel by capturing waste heat that would otherwise exit through the stack and using it to preheat virtually any cool liquid stream (e.g., make-up water, process water, hot water preheating). A single-stage economizer increases the amount of heat recovered by capturing both sensible and latent heat. The internal gas bypass can be used to maintain water temperature when too much heat is available.

A 2-stage condensing economizer captures heat through both a traditional stack economizer section and a condensing section. Both the single-stage and 2-stage condensing economizers condense only on natural gas. The single-stage economizer can be used for steam or hot water applications, whereas the 2-stage economizer is designed only for steam applications.

A **flash tank economizer** recovers heat and steam, which can then be recycled and used as is or used to heat new feedwater, thus saving fuel and money. This system can pay for itself within a few months with fuel savings resulting from recycled heat that would otherwise be wasted through venting.

A **blowdown heat recovery** system recovers up to 90% of heat typically lost to blowdown. Blowdown is necessary for proper boiler maintenance; however, energy is lost every time it's done.

Continuous boiler surface blowdown heat recovery (BDHR) is the most effective method of purging destructive solids from any steam boiler system. It also recovers heat from high-temperature blowdown and transfers it to the incoming cold make-up water to maximize boiler efficiency. A blowdown heat recovery system will typically result in a payback within a few months due to fuel savings. Blowdown heat recovery units are available for boilers of all sizes, including multiple boilers.

To learn how to integrate heat recovery into your boiler system, contact **Waterloo Manufactuing** your local Cleaver-Brooks representative.

Conducting a Boiler Room Assessment

Properly conducted, a boiler room assessment helps increase efficiency, sustainability, reliability and safety. Any facility that consistently focuses on these areas will perform at its optimal level. For most facilities, an outside specialist should conduct the boiler room assessment because it requires a specific methodology and expertise.

Efficiency. A boiler room assessor will determine the fuel-to-steam efficiency by evaluating the boiler's burner, its physical condition and features. The assessor will also use the procedure outlined in ASME PTC 4-2008 to determine actual efficiency. This procedure takes a number of variables into account, including: stack loss, steam and feedwater flow, moisture in the stack gas and clocking of the fuel meter for actual input. The goal is safe, efficient combustion, and optimal heat transfer in the boiler. To accomplish this, a burner is typically set at about 3% O2 or 15% excess air.

The assessor will then observe how well the boiler (heat exchanger) absorbs heat from the burner. If the burner is operating and combusting properly, the temperature of the flue gas should be approximately 50 – 100 degrees above the saturated temperature in the boiler. The assessor will also look for possible climatic variables, such as relative humidity in the boiler room or barometric pressure fluctuations, and most importantly, ambient air temperature. At the same time the professional is taking note of climatic conditions, he or she is also paying close attention to the burner's combustion control system.

Improving efficiency is not just limited to the boiler. There are many other areas in a boiler room that an assessor will evaluate, including the exhaust stack/breeching arrangement and support accessories.

Sustainability. Facilities today are seeking ways to conserve the finite resources of fuel, air and water. Fresh water is becoming a scarcity, and that is one of the important reasons why returning condensate is important. In terms of cleaner air, today there is an array of high-efficiency, low-emitting burners to dramatically reduce NOx and CO emissions. The assessor will evaluate current systems and recommend additional ways to conserve natural resources and reduce emissions.

Reliability. The assessor will thoroughly check the burner, its combustion control system and its burner management system (BMS), which controls all the burner sequencing and monitors the burner's safeties. It is important that a BMS includes all of the lock-out information in a clear and readily understandable way and has the capacity to log and store fault history. Today's systems that are PLC-based integrate not only the burner and its operation and faults, but all the accessory equipment too.

Another very important factor that contributes to reliable boiler operation is an ongoing maintenance program. The assessor will ask for service records detailing when tune-ups were performed, including efficiency checks. From a reliability perspective, the assessor will look for elevated stack temperatures that could possibly be caused by either fireside or waterside fouling, which along with energy loss, could seriously damage the boiler. The boiler room log is critical and must be maintained correctly and consistently or reliability and possible safety problems will result.

Safety. Among the safety items the assessor will look for are how steam line drip pockets are sized and located along with the steam trap location(s) and functionality. Improper location, sizing and functioning of these items can cause serious and dangerous water hammer. Another very key safety area that will be scrutinized is the condition of both the main and auxiliary low-water cutoffs. The piping for the boiler's safety relief valve(s) will also be checked.

After completing his observations, the assessor will review the findings with facility management and then prepare a formal report that includes the discoveries and a plan for the facility going forward. The report also will likely include mark-ups of the plant's existing P&IDs (process and instrumentation diagrams) that detail recommended changes.

To Learn more about boiler room assessments, watch the Key Factors and Methodology for Boiler Room Assessments webinar (by going to www.cleaver-brooks.com; Reference Centre; 2015 Webinars;
April 29, 2015) or contact **Waterloo Manufacturing** your local Cleaver-Brooks representative.