

Optimizing Efficiency Through Proper Boiler Maintenance



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Is your boiler operating as efficiently as it did during initial start-up? When did you last check the performance of the boiler and burner? Properly maintaining your boiler ensures that it will continue to operate at peak efficiency, saving money in fuel and operating costs both now and in the future.

When looking at ways to optimize the boiler system, analyze the performance of the boiler and burner with regard to excess air and turndown. When conducting the evaluation, be sure to check emissions levels and stack temperature to ensure they are at reasonable levels. If needed, make adjustments to increase the boiler system's efficiency.

If the burner is operating at its peak, explore equipment options that will help it perform even better. For example, a variable speed drive (VSD) can be added to the fan motor to slow it down when the boiler is operating at less than full fire. Another consideration is an O₂ Trim system with an oxygen-sensing probe that can be placed in the stack to sense oxygen content and trim the damper to the set points for maximized fuel-air ratio control. This will minimize losses associated with too much excess air. With the addition of O₂ Trim, consider utilizing a parallel positioning control in lieu of a linkage fuel-air ratio control. This will provide consistent and repeatable fuel-air control throughout the firing turndown range of the burner.

In addition, an economizer can be installed to capture waste heat, recycling it to increase the temperature of boiler feedwater. Also, specific to hot water boilers is the issue of water leakage, which decreases energy efficiency. To monitor for water leakage, add a water meter to the makeup line and check periodically to determine if there are unseen water losses in the system.

Besides equipment upgrades, the boiler room itself should be scrutinized to ensure the best conditions for combustion. For example, in colder climates, sometimes the dampers are either stuck open or the manual dampers are left open so cold air enters the boiler room at all times, even when the boiler is not operating. As a result, the cold air is cooling the boiler, causing energy to be lost. These dampers should be controlled to be driven open when the boiler is on and driven closed when the boiler goes offline. To minimize cold air entering the boiler room, add an air-to-air heat exchanger that preheats the air coming into the boiler room. It should be noted that a boiler room that is too hot is just as bad. Hot ambient conditions can exceed the operating limits and lead to premature damage of some boiler components or cause them to behave erratically.

The air quality in the boiler room should be relatively clean. The room should not have a lot of dust in the air, especially around a smaller boiler that is using a fiber mesh, premix burner. Occasionally, burners incorporate "sealed combustion ducts," and if dirty or contaminated air enters the duct, it will get into the burner and imbalance the fan or harm the burner parts. If the burner is a fiber mesh type, dirty air will plug up the burner canister, which can cause combustion issues. Air quality also affects larger burners. On larger burners, poor air quality eventually will



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cause the fan to go out of balance and the motor or fan will need to be replaced, affecting the fuel-air ratio and diminishing the operating efficiency.

Air pressure in the boiler room should be slightly positive. If the door to the boiler room is hard to open or if there is a pull on it, the air pressure in the boiler room is negative. Negative boiler room pressure will seriously affect combustion to the point that there is incomplete combustion, which is detrimental to the operation of the boiler as well as to the people around the boiler.

A boiler room can have negative pressure due to an exhaust fan. If an exhaust fan is used, make sure there is a balancing device to keep the room neutral when the exhaust fan is on. An easy solution is to install a louvered boiler room door. This ensures a cross-flow through the boiler room at all times. Be sure the boiler room is not used as a storage area and do not block access to the burner combustion air intakes.

High-pressure steam boilers that do not have a full-time boiler operator should be serviced at least once a month and have a full inspection conducted annually. During the monthly service, a technician will look for cracked wires, faulty controls, broken or worn-out gaskets, visible signs of gas-side or waterside leakage, corrosion on the fireside or waterside, and broken items in the burner itself. The service technician should also review any recommended spare parts to determine if these are in the boiler room for standard and emergency replacement periods.

Maintenance on a heating boiler should be conducted at the seasonal start-up and shut-down, at a minimum.

Oftentimes, it takes a boiler room failure to serve as a reminder of the importance of routine maintenance. If there is not a boiler operator on staff, contact the local boiler service representative who sold the equipment, or a reputable service organization, to perform regular maintenance. It is well worth the cost.

To learn more about products that will increase boiler system efficiency, or to locate a Cleaver-Brooks representative near you, visit cleaverbrooks.com.