Honeywell
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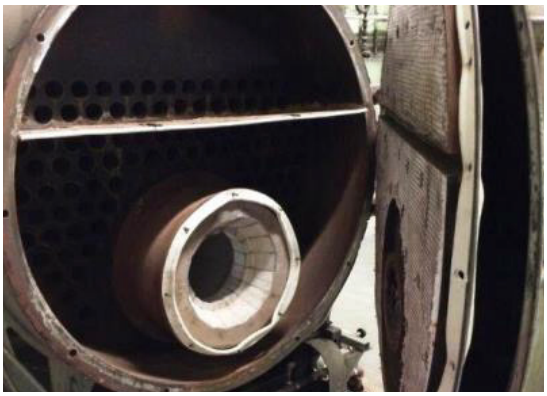
Fall Boiler Start-up, Fuel System Tips to Keep You Safe

Safety Note

In fall, the nights get a little cooler, the leaves start to change, football season begins, and for some it is time to get boilers started up. Handling a seasonal start-up correctly is important. Serious and life-threatening accidents related to boiler start-ups occur every year. They are unnecessary, however, and can be avoided by carefully reading and communicating the tips below. These lessons focus on the boiler's fuel and flame safety systems.



Avoid serious and life-threatening accidents by correctly handling seasonal start-up. Never walk up to a boiler or any combustion equipment that has been down for a long period of time.

1. **Your firebox may be full of fuel... And one false move could make for a disaster!**

   Never, ever, walk up to a boiler or any piece of combustion equipment that has been down for a long period of time, especially a heating boiler that is been down all summer, and just hit the start button. A firebox concentration of only 4.3 % natural gas can create a flammable mixture. Some valves leak through 1 cubic foot of gas per hour or more. Consider the consequences of a valve leaking through at this rate for several months while your boiler is laid up. Making a wrong move could trigger catastrophic explosion.

   There are several shut-off valves in your gas train, which are supposed to be tight. These keep gas out of the firing chamber when the unit is off. However, 60% of lubricated plug valves leak when in the closed position. In addition, automatic safety shut-off and solenoid valves can leak when closed.

   By design, manual lubricated plug valves are nothing more than two pieces of metal with an air gap between them. A tight shut-off seal only occurs when a special sealant is present. This sealant lubricates and seals the surfaces. If this sealant does not exist, the valve body will tend to corrode and lock into a fixed position with the plug. The result is that you will not be able to move the valve from its fixed position no matter how hard you try. If a serious gas leak is discovered or a fire breaks out, this valve will not budge.
   Most sites do not understand how these valves work and do not have the proper sealant or injection equipment.

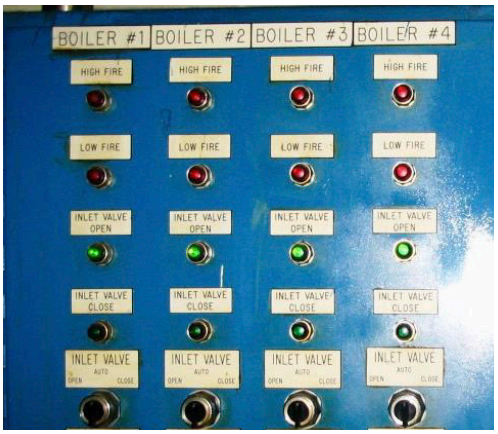
The process of tightness testing automatic safety shut-off or pilot valves should be completed at least annually. The objective is to measure the rate at which bubbles flow downstream of a supposedly closed valve. This process requires training for it to be performed safely.

If you cannot verify that you do not have a hazardous situation on your hands, you should treat the situation as if it is. Carefully insert a flammability meter probe into the firebox and measure the LEL (lower explosive limit) of the firebox atmosphere. If you are even close to the LEL, make sure you safely purge without any possibility of a spark before proceeding.

2. **Your safety interlock protection may not be working!**

Time and inactivity are two factors that must be considered during start-up. Inactivity means parts have not moved in a long time. The passage of time invites changes in environmental factors such as moisture and temperature. These two issues alone can make for unwelcome surprises. When parts cool off they come closer to the dew point temperature of the surrounding ambient air, which means moisture will condense on a surface. If that surface is the electrical contact of a switch or a vertical piece of vent pipe, corrosion can occur. Corrosion of components can mean the flaking off of rust that can create wedges between valve seating surfaces.

It can also mean switch components get stuck in position due to corrosion, or even cause switch contacts to no longer make and break reliably.



Cooled boiler components and summer breezes will also create a more comfortable living environment for insects and birds, which regularly clog vent line terminations. Start-up is the right time to look for and correct these items.

Very few sites conduct regular interlock and safety control testing. In most states, lack of regular testing is against the law. It is especially foolish to not test safeties and interlocks in the case of a cold start-up after a down period.

Boiler safety interlocks that require regular testing include the following:

a. High and low gas pressure switches

b. Low water cut-offs

c. High steam pressure switch cut-offs

d. Flame scanners

e. Air flow proving switches

f. Valve proof of closure switches

g. Low fire start switches

Interlock testing can and should only be done once you are sure the firebox does not contain a flammable mixture. Whoever is conducting this testing must be trained and experienced.

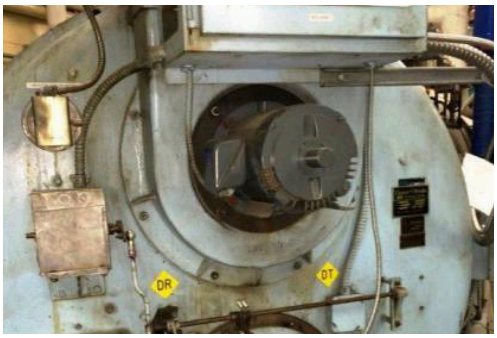
3. **Fire in the Hole! A Pre-Start Walk Around is a Must!**

A walk down procedure that trains people to look for obvious problems should be established prior to starting up. For example, purge fans are supposed to move fresh air through the firebox in case gas valves have leaked through. If the fans are dirty or have the Sunday newspaper stuck to the air intake, all bets are off. In these cases the purge may not happen properly.

Likewise, if the high and low gas pressure switches, air switches or purge timer are set incorrectly you will have lost their ability to protect you and your equipment.

After a thorough walk down, remember there are good and bad places to stand during a light-off. One should never stand in front of a burner or any bolted connection like a flue stack. Likewise, some boilers have relief panels built in, which will come apart and off in the case of a firebox explosion. In the case of fire tube boilers for example, it is usually best to stand to the side.

There have also been a number of people who have lost their vision looking into sight view ports during light-offs. This is a place to look only using eye protection, and never, ever, during a light-off. Always move the view port sight shield, if one exists, and test for hot firebox gasses first before putting your eyes and head in harm's way.



When the pilot and main flame are lit, immediately look for items such as the quality of the flame and the gas pressure stability entering the burner.

,A good flame is full and complete along the burner ring. It has movement and is blue with yellow and/or orange tips. If your flame is unstable (going on and off in places), lacks movement, is bright orange or yellow and/or you see soot coming out of the stack, you have major problems. These conditions occur because the air-fuel mixture is too rich. If the unit is shut down in this condition, do not try to restart again without allowing a cool down period and the fuel rich atmosphere to dissipate.

Remember, flame scanners and flame detection equipment are not designed to distinguish between good flames and bad flames. This must be done by a trained human eye.

The process for walking down the system and knowing what to look for should become part of a well-documented start-up/shut down procedure. Include digital pictures of the control panels with close ups of the buttons and labels. Everything should be explained in clear and simple terms that anyone operating the equipment understands.

The issues discussed above are not all-inclusive but are a good beginning. Many consider steam and the water side related start-up issues, but do not consider basic fuel and combustion system issues until it is too late. Consider the American Society for Mechanical Engineers CSD-1 standard for more details regarding interlocks, testing and good practices: it provides important safety information regarding controls and safety devices for automatically fired boilers between 400,000 and 12,500,000 btuh input. This code has been adopted as law in most states. For larger equipment, NFPA 85 (National Fire Protection Association) is a good reference.

Remember, start-up is the most dangerous few minutes in the life of each boiler and operator.

ABOUT US

Honeywell Combustion Safety is a part of Honeywell Thermal Solutions, an industry leader in commercial and industrial combustion solutions. Honeywell Combustion Safety, formerly known as CEC Combustion Safety, has been in business since 1984. With engineers and staff members that sit on Code committees such as NFPA 56, NFPA 85, NFPA 86, and NFPA 87, our inside expertise is integrated within all of our practices, and our global reach ensures that customers around the world are kept safe. Honeywell offers testing and inspections, engineering & upgrades/retrofits, gas hazards management, training, and field services for all industrial facilities and different types of fuel fired equipment. By assisting organizations and their personnel with the safe maintenance and operation of their combustion equipment, Honeywell aims to save lives and prevent explosions while increasing efficiency and reliability of combustion equipment.

For more information

Learn more about Honeywell Combustion Safety, contact info@combustionsafety.com, visit www.combustionsafety.com or contact your Honeywell Sales Engineer.

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