

Steam-heating boiler inspection and maintenance

Risktopic 2-12.001

Introduction

Even as our society changes to a modern, fast-paced financial environment, many entities still use low-pressure steam boilers in various types of applications. As long as society has manufacturing and heating needs, there will be applications for low-pressure steam boilers. However, even with the advent of more complex and automatic safety equipment, there are still cases every year where low-pressure steam boilers cause property damage, personnel injuries, and extensive loss of income due to business interruption.

Zurich Services Corporation Risk Engineering takes the use of this equipment and its care very seriously and provides a group of risk engineers dedicated to protecting both personnel and property by performing regular equipment assessments designed to help safeguard against boiler losses and accidents. However, safe boiler operation not only needs the watchful eye of a third party, but the commitment of the boiler owner to operate this type of equipment in a safe and efficient manner. Boiler manufacturers have developed many automatic devices and improved upon them over the years to help the owner do this, but the owner/operator needs to understand and properly care for this type of equipment to ensure its operational effectiveness. We offer the following general information regarding this equipment's primary automatic safety devices to help the boiler owner or the owner's employees monitor this equipment regularly, helping to ensure the safety of the business property and employees.

Pressure relief devices - The Pressure Relief Device (PRD) is the primary safety device installed on low-pressure boilers to protect against boiler overpressurization. Manufacturers design the PRD to relieve all of the pressure the boiler can generate. When the boiler is in operation, manually test the safety valve by lifting its test lever. The boiler operating pressure should be at least 75% of the safety valve set pressure when testing the safety valve manually. An alternate method of testing the low-pressure boiler safety valve is to remove it from the boiler during the boiler maintenance period and send the PRD to an ASME-accredited testing facility for bench testing. In either case, the boiler owner should have a program in place that ensures regular testing of this important safety device.

Low water fuel cut-off - Since low water conditions in boilers are a frequent cause of boiler outages and damage, the low water fuel cutoff is a very important device designed to cut off the boiler burner in the event a low water condition occurs. Most jurisdictions now require that there be two of these devices installed on all low-pressure boiler steam boilers, one as the primary protection with a second installed backup device.

The boiler owner should verify its proper operation at least on a daily basis. Flush the low water fuel cut-off daily to remove sediment and verify the piping is unobstructed. Wherever possible, continue the flush until the boiler actually turns off to test the automatic function capability of the device. The purpose of this flush is to verify that the boiler feed pump starts, the burner stops operating and to flush out sediment from the float chamber. Also, blow down the water level gauge glass while working with the low water fuel cutoff device to ensure the gage glass' proper operation. When operating properly, the water level gauge glass should always have a water level between a third and a half of the glass.

Burner operation – Flame failure scanner - To prevent boiler fireside explosions, the boiler owner/operator must verify that some type of flame-sensing device is in use to ensure that flame conditions are safe on the boiler burner side. In the event of flame failure during operation, the flame-sensing device must be capable of stopping the boiler fuel supply, initiating an alarm and causing an air purge of the boiler fireside passes to remove latent fuel fumes from the boiler's firesides.

Check the burner operation and flame pattern regularly and flame failure scanner periodically, preferably at least weekly. In general, listen for unusual noise, check for fuel leaks, check the position of dampers, and look or smell for indications of flue gas leakage. Observe the boiler stack temperature to verify it is within the normal operating range. Follow the boiler manufacturer's guidelines and the ASME CSD-1 Code for burner maintenance and testing of the flame failure scanner. If the burner shows any indications of abnormal operation, contact your boiler repair contractor.

Boiler steam gauge - The boiler steam gauge allows the boiler operators to see how much pressure the boiler is generating. Steam gauges should be clearly visible and in good operating condition.

High limit controls- Each boiler must have high limit controls installed. These devices will act as a backup control to the normal operating controls. On a low-pressure steam boiler, there will be an operating limit switch set to have the boiler burner fire when pressure drops to a set amount and then cut off when pressure reaches a predetermined setpoint. If steam pressure exceeds the Normal Operating Pressure (NOP), the high-limit control switch is designed to send a signal to the boiler controls that will stop fuel flow and cut the boiler off, similar to the flame failure scanner. Have a qualified boiler contractor test these devices during any normally scheduled maintenance period to ensure the proper signals are being conducted at the normal device setpoints.

Conclusion

There are other devices used on low-pressure steam boilers that are very important to the boiler's safe and efficient operation – temperature gauges, pressure gauges, fan controls, etc. to name a few. All of these devices have maintenance requirements that are just as important as the maintenance to the automatic safety devices and should be maintained just as rigorously to ensure proper boiler operation. Care for all of these devices should always be left to a fully qualified boiler contractor or mechanic trained in the operation and testing of steam boiler equipment.

In addition, the boiler owner/operator should never hesitate to contact his/her assigned Zurich risk engineering consultant or the Zurich Machinery Breakdown Hotline at 800-562-5814 for any questions that may arise regarding the application of local boiler codes and/or safety rules enforced where the equipment is installed.

References

1. National Board of Boiler & Pressure Vessel Inspector's Code.
2. ASME Boiler & Pressure Vessel Code, Section VI and CSD-1.

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