FocusOnFACILITIES

Boiler Maintenance—A Broad Range of Challenges

By Howard McKew, P.E., C.P.E.

This month we share with our readers the topic of boiler maintenance needing to be provided annually to ensure equipment is operating when needed through the four seasons, and that it is operating safely and efficiently. Without boiler system reliability a facility is not only going to get very cold in the heating season but, may also require the cancellation of the school it serves and/or the sending home of employees and visitors from affected buildings. All this results in lost revenues, as well as disruption in one's daily schedule. Further, all boilers require annual jurisdictional inspections through the Diocesan Insurance Program, The jurisdictional Inspection Hotline for the Diocese is 800-425-4119. Email is boilinsp@travelers.com.

Unless a facility is an "all-electric" heating system, e.g., heat pump system, the building will have a boiler to keep the facility warm and its occupants comfortable. Like any piece of equipment, it requires routine maintenance. For example, one's automobile requires engine oil changes after a number of miles traveled, tires rotated, also after miles travelled, etc. The same applies to boilers to receive planned maintenance after a set time period, e.g., weekly, monthly, quarterly, semi-annually, and/or annually depending on the maintenance task at-hand.

Before we can address boiler maintenance, we should highlight the different types of boilers that are manufactured and briefly describe these different boilers based on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) https://www.ashrae.org 2020 ASHRAE Handbook-HVAC Systems and Equipment, Chapter 32 Boilers:

1. As a rule, boilers can "be cast-iron, carbon or stainless steel, aluminum, or copper pressure vessel heat exchanger designed to (1) burn fossil fuels (or electric current) and (2) transfer the released heat to hot water (in water boilers) or to water and steam (in steam boilers)."

2. Boiler Classifications: "may be grouped into classes, based on working pressure and temperature, fuel used, material of construction, type of draft (natural or mechanical), and whether they are condensing or non-condensing."

3. Working Pressure and Temperature for:
   - Low-Pressure Boilers
   - High-Pressure Boilers
   - Steam Boilers
   - Water Boilers

4. Fuel Used:

- Coal
- Wood
- Oil
- Gas

What type of boiler(s) is in the facility in which you are an occupant or maintenance person?

Boiler Applications:

Each boiler type noted above has specific applications based on the design intent for that building. The decision on boiler selection is usually determined by a heating system design engineer in sync with the building owner's use of the facility and the existing or future operation and maintenance staff. Thoughts to be considered in the selection, sizing, and redundancy requirements for boiler type may be, but not limited to:

1. Building program, such as will steam be needed, e.g., to serve numerous sterilizers?
2. Type of fuel based on an economic assessment, e.g., cost of fuel, environmental impact, etc.?
3. First cost versus life cycle cost comparison of different types of boilers, e.g., condensing or non-condensing boilers?
4. Straight replacement of antiquated boiler, e.g., like-for-like?
5. Installing constraints when rigging in a new boiler into an existing building, e.g., assemble a cast-iron sectional boiler in place?
6. Reduction in the building's carbon footprint, e.g., uses of oil versus gas?

The above examples are just six questions to be asked between designer and owner.

Maintain In-House or Contract This Requirement:

Boiler maintenance depends on the application. If the boiler(s) serve a healthcare facility, it will most likely require closer and more regularly scheduled attention to how often this equipment will need to receive some "planned" maintenance. This could include maintaining an operator log where the in-house service person will routinely complete a walk-around, noting pertinent operation data based on the building application and the importance of keeping record of temperatures, pressures, etc.

No matter how simplistic the boiler may be, regular maintenance will probably require an annual contract with a local heating contractor's service department. Here a trained, experienced technician will visit the site to start up the boiler at the beginning of the heating season and shut it down at the end of the heating season. Or, if the boiler(s) operate 24-7, 365 days a year, then preventive maintenance may require quarterly service contractor visits to provide planned maintenance while in-house staff may be expected to routinely check on this equipment each week to look for potential leaks, unusual noise or vibration coming from the boiler and/or its burner, etc.

A service technician will separate the boiler maintenance into three sections:

1. Inspection and subsequent maintenance tasks on the "fireside" segment of the boiler including the flue exhaust, making sure there is adequate combustion air ventilation.
2. Inspection and subsequence maintenance tasks on the "waterside" segment of the boiler including flushing of strainer(s), temperature and pressure readings, testing safety relief valves, etc.
3. Complete system diagnostics review since there are various control sensors, transmitter, digital components, etc.

With each of the above tasks, a service contractor will bring the appropriate equipment to perform the preventive maintenance. This includes calibrate devices, special filters, etc. that an in-house operation and maintenance staff will most likely not have available nor will the in-house person have been trained on the use of this equipment.

A few examples of preventive maintenance task, depending on the type of boiler are:

- Review the equipment manufacturer's operation and maintenance manual for required visual inspection and actual maintenance tasks

- Inspect and test valves including safety relief valves
- Inspect electrical terminals and recalibrate control points
- Blowdown lowest point in the boiler to remove sludge and sediment
- Take a sample of water for chemical treatment level

Preventive Maintenance: Boiler Maintenance and Servicing

We refer you to our past *Focus on Facilities, Facility Management and Asset Management* columns:

What a Preventive Maintenance Work Order Includes?
Discussion on the 9-Types of Maintenance
Scheduling Preventive Maintenance Based on the Building Application
Soliciting Service Contract Bids
Seasonal Maintenance-Why It Is Done

It is important to note that the phrase, "preventive maintenance" doesn't prevent anything from failing. It can be better defined as "planned maintenance" because no equipment lasts forever but, proactive maintenance can maximize the useful service life of the equipment, as well as keep it operating efficiently.

###

Howard McKew is a registered engineer and president of Building Smart Software. Howie has a ton of experience to draw from the various industry jobs he's held and often writes about that experience in his columns in Engineered Systems Magazine. He is the author of 3-books, contributor to other author's books, lectures, and is an active member and Fellow in ASHRAE.

www.buildingsmartsoftware.com
hmckew@bss-consultant.com

The links to third-party websites included in this article are meant for convenience only. The Diocese of Cleveland Facilities Services Corporation does not review or control these third-party websites and is not responsible for any third-party websites or any content of those sites. Inclusion of any linked website does not imply our approval or endorsement of the products, services, or opinions of the third-party website. Linking to any other site is at your own sole risk and the Diocese of Cleveland Facilities Services Corporation will not be responsible or liable for any damages associated with linking to the third-party websites or any subsequent links.

For more information:
facilities@dioceseofcleveland.org

Facilities Services
Catholic Diocese of Cleveland