

## **Boiler room routines (part 3)** **by Harry de Jong**

Normal operation of a boiler room and all its associated equipment can become mundane. Day by day, week in and week out, the same chores are performed repeatedly. To achieve trouble-free operation, these chores must be performed with diligence. Safe and reliable operation is dependent, to a large extent, upon the skill and attentiveness of the operator. A skilled operator should:

- Have suitable background training
- Have good knowledge of fundamentals
- Be familiar with the equipment
- Be capable of diligently performing routine tasks

It's also very important that preventative maintenance be performed on an established schedule. The following are recommendations on schedules, as well as additional suggestions to assist in keeping the uptime of a boiler and associated equipment to the highest level.

### **Boiler Room Care**

1. Know your equipment. Information is available from your local authorized representative and from the manuals and drawings supplied with your equipment and from your supplier. Keep this information in boiler file and train personnel to consult this information first whenever they are in doubt.
2. Maintain complete records. Each individual component should be listed on an index card or computer data base as to model, serial number and date of installation. Get replacement part numbers from your local authorized Cleaver Brooks Representative.
3. Establish a regular boiler inspection schedule. The schedule should include daily, weekly, monthly, semi-annual and annual inspections or activities.
4. Establish and use boiler log sheets. Log sheets should be tailored to your equipment. Review of log sheets will help in establishing a planned maintenance program. See additional information later in this chapter.
5. Establish and keep written operating procedures updated. The ideal time to originate the procedures is when the equipment is placed in use. A detailed start-up procedure is essential in standardizing the boiler room routine. Posted procedures constantly remind you of the things to be done and help the inexperienced person to assume their proper roll.
6. Good housekeeping is a must. Housekeeping is the one unalterable truth as to the quality of boiler room maintenance.
7. Keep electrical equipment clean. The most common cause of nuisance electrical control problems is failure to maintain equipment properly.
8. Keep an adequate fresh air supply. Proper combustion and burner operation require adequate air. Filters must be kept clean. In severe winter areas, it may be necessary to heat the room to an acceptable ambient temperature.

9. Keep accurate fuel records. A system of recording fuel consumption can keep you informed of any unusual fuel demands, thus enabling you to spot a problem or a waste before it gets out of hand.
10. SAFETY - SAFETY - SAFETY. When a boiler is taken offline, follow good safety practices such as: disconnect all power supplies and lock switches in the off position. Whenever there is more than one boiler connected to a common header, establish routine procedure of locking the header valve on any unit that is down for cleaning or inspection, close any flue gas outlet dampers, and all pieces of equipment required to isolate the boiler.

### **Basic Record System**

**A simple and effective system can be established using 5" x 7" lined file cards or a computer data base, and it should contain the following basic information:**

11. Boiler and auxiliary equipment nameplate data. Include information such as model number, serial number, fuel series, design pressure and all other related data. Also maintain data on each major component. Keeping accurate data will assist in establishing a record to determine if you carry a required spare part in your inventory, if the part is stocked by your local authorized representative, if the part is stocked by your supplier or if it has a long lead time.
12. The name, title, address and phone and fax numbers for your authorized Cleaver Brooks representative, your insurance inspector, state boiler inspector, water treatment company and anyone else that you would have to contact in an emergency.
13. In addition to the basic record card, a file should be established to contain information such as:
  - a. Manufacturer's data report
  - b. Start-up reports
  - c. Operating manuals
  - d. Parts lists and part numbers
  - e. Fuel supplier
  - f. Copy of all pertinent correspondence
  - g. Operating logbook
  - h. Operating procedures

### **Daily Maintenance**

14. Check water level. An unstable water level can indicate several problems such as excessive solids or water treatment, contamination from oil, overload or control malfunction. Ensure there is water in the gauge glass every time you enter the boiler room. See additional information later in this chapter.
15. Blow down boiler. Blow down the boiler in accordance with the recommendation of your feed water consultant. A water quality and chemical treatment program will dictate frequency of boiler blow down. See additional information later in this chapter.
16. Blow down the water level controls to purge the float bowl of possible sediment accumulation. Operating conditions will dictate frequency of this check. See information later in this chapter.
17. Check combustion visually. Look at the flame to see if something has changed. Changes may be an indication that a problem is developing.

18. Treat water according to the established program. Add chemicals and take tests as outlined by your chemical feed water consultant. See information later in this chapter.
19. Record boiler operating pressure or temperature. An excessive steam or water temperature drop will alert you to excessive loading on the boiler.
20. Record feed water pressure and temperature. A change in pressure or temperature may indicate a problem is developing with your feed pump(s), deaerator or packaged feed system.
21. Record stack temperature. Changes in stack temperatures could indicate the boiler is sooting, scaling or there is a problem with baffles or refractory.
22. Record oil pressure and temperature. Changes in pressure and/or temperature could have an effect on combustion in the boiler and could indicate a problem in the oil regulators or oil heater.
23. Record oil atomizing pressure. Changes in pressure could influence combustion in the boiler.
24. Record gas pressure. Changes in pressure could influence combustion in the boiler and indicate a problem in the gas delivery system.
25. Check general boiler/burner operation. Maintaining top efficiency is the simple and basic reason for having operating personnel. Is anything different than it was the day before? If so, why?
26. Record boiler water supply and return temperatures. On hot water boilers, record these temperatures to assist in detecting system changes.
27. Record make-up water usage. Excessive make-up water could be an indication of system problems in both steam and hot water systems.
28. Check auxiliary equipment. There is a vast difference between “is it running” and “is it running properly.” Take nothing for granted, as auxiliary equipment can shut down your operation.

### **Weekly Maintenance**

29. Check for tight closing of fuel valves. Check to ensure fuel does not flow through the fuel valve (s) when the burner is shut off.
30. Check fuel and air linkages. Check to ensure that all set screws on linkages are tight and are securely holding the linkage in place.
31. Check indicating lights and alarms. Check for burned out or loose light bulbs. Also check to ensure the alarm bell or horn sound on the appropriate shut down condition.
32. Check operating and limit controls. Check to ensure these controls shut the burner down at their predetermined set point. Settings should be verified by checking actual pressures and temperatures on the boiler gauges.
33. Check safety and interlock controls. Check to ensure these controls shut the burner down at their predetermined set point. Settings should be verified by checking actual pressures and temperatures on the boiler gauges.
34. Check operation of water level controls. Stop the boiler feed pump and allow the control to stop the boiler under normal low fire conditions. See your operating manual for a more detailed procedure. See information later in this chapter.
35. Check for leaks, noise, vibration, unusual conditions, etc. Checking for these items is a cost-effective way to detect system operational changes. Small problems can be corrected before they become large problems.
36. Check operation of all motors. By developing a routine, any change in operation or bearing temperature will usually be caught in time to avoid a failure.

37. Check lubricating levels. Check levels of any oil bath filters, oil level in air/oil tank, oilers on pumps, etc. Add oil in accordance with the manufacturer's recommendations.
38. Check the flame scanner assembly. Using the appropriate meter, check the Flame signal strength at the program relay flame amplifier. Ensure the scanner assembly is clean and dry.
39. Check packing glands on all pumps and metering devices. Proper tension on packing glands will extend life of the equipment. 12. Check gauge glass. Ensure there are no cracks or etching in the glass or leakage around the packing.

### **Monthly Maintenance**

40. 1. Inspect burner operation. Do a visual inspection of the pilot flame, main burner flame throughout the firing range, free movement of linkages and general burner operation.
41. Analyse combustion. Take the flue gas analysis over the entire firing range, comparing the combustion analysis and stack temperature readings with previous month.
42. Check cams. Inspect the cam springs for scoring, tightness of set screws, free movement, alignment of cam followers and other related parts.
43. Check for flue gas leaks. Ensure something hasn't changed in the breeching, stack or overall system that allows flue gas to be drawn into the boiler room.
44. Inspect for hot spots. Inspect the boiler to ensure no hot spots are developing on the outside of the boiler. Hot spots can indicate a refractory failure or baffle failure, which could cause improper gas flow through the boiler or the cooling lines could be plugged or disconnected.
45. Review boilers blow down to determine that a waste of treated water is not occurring. Check water treatment and testing procedures with your feed water consultant. See additional information later in this chapter.
46. Check all combustion air supply inlets to the boiler room and burner to ensure sufficient air is being supplied.
47. Check all filter elements. Clean or replace as needed. On "self-cleaning" filters, make certain that impurities are flushed or discharged from filter body.
48. Check the fuel system to make certain that strainers, vacuum gauges, pressure gauges and pumps are properly cared for.
49. Check all belt drives for possible failure. Tighten V-belt sheaves and make certain that belts operate with proper tension.
50. Check lubrication requirements of all bearing supported equipment. Do not over-lubricate electric motors.

### **Semi-Annual Maintenance**

51. Clean low water cutoff (s). Remove the head assembly or probes and inspect and clean out any sediment or contamination in the column or piping. Determine why sediment or contamination condition exists. See additional information later in this chapter.
52. Check oil pre-heaters by removing the heating element and inspect for sludge or scale.
53. Repair refractory. Immediately upon opening the fireside areas, give the refractories an inspection and start repairs as soon as possible. Read and follow refractory repair instructions.
54. Clean oil pump strainer and filter. Ensure they are not plugged, thus reducing the flow of the required oil to the burner.
55. Clean air cleaner and air/oil tank. Inspect and clean out any sediment or contamination. Add oil in accordance with the manufacturer's recommendations.

56. Check pump coupling alignment. Check alignment of all couplings to ensure the tolerances are within the manufacturer's recommendations.
57. Reset Combustion. The entire combustion process should be carefully checked, O<sub>2</sub> readings taken and necessary burner adjustments made. Make certain the readings are recorded and used as a basis of comparison for future tests. Combustion adjustments should only be made by those thoroughly familiar with all aspects of burner adjustment and combustion.
58. Inspect mercury switches. Inspect mercury switches for contamination, loss of mercury, and cracked or broken wires. Replace if any of these conditions are found.

### **Annual Maintenance**

Note: Annual maintenance should be coordinated with the regular pressure vessel inspection performed by insurance or government groups. Establish a firm procedure with all outside inspection groups so that your equipment will be in a proper state of readiness. As a matter of routine, establish a procedure using good safety practices whenever a boiler is taken off the line. Disconnect all power supplies and lock switches in the off position. Whenever there is more than one boiler connected to a common header establish a routine procedure of locking the header valve on any unit that is down for cleaning or inspection, close any flue gas outlet dampers, and all pieces of equipment required to isolate the boiler.

59. Clean fireside surfaces by brush or use a powerful vacuum cleaner to remove soot. After the cleaning process and if boiler is to be left open, it is advisable to spray all fireside surfaces with some type of corrosion preventative.
60. Clean breeching. Inspect breeching and stack and remove any soot build up.
61. Clean waterside surfaces. Remove all handhole and manway plates, inspection plugs from water column tees and crosses and float assemblies from water columns. Thoroughly wash all waterside surfaces.
62. Check oil storage tanks. Oil storage tanks should be inspected for sludge and water accumulation. Keep the tank filled with oil to prevent condensation during summertime.
63. Check fluid levels on all hydraulic valves. If any leakage is apparent, take positive corrective action immediately.
64. Check gauge glass for possible replacement. If internal erosion at water level is noted, replace with new glass and gaskets. On all unattended boilers, the gauge glass mounting should be of the safety style with stop-checks in case of glass breakage.
65. Remove and recondition safety valves. Have them reconditioned by an authorized safety valve facility. The safety valve is an important device yet possibly receives less attention than any other device. See additional information later in this chapter.
66. If oil fuels are used, check on the condition of the fuel pump. Fuel pumps wear out and the annual inspection time is the opportune time to rebuild or replace them.
67. Boiler feed pumps. Strainers should be reconditioned. Feed pump elements wear and must be replaced. Sometimes a review of the condensate return system and chemical feed arrangement

will reveal causes of short pump life. See additional information later in this chapter.

68. Condensate receivers should be emptied and washed out. Make an internal inspection, if possible. If the receiver has a make-up valve mounted, it should be overhauled and checked for proper operation.
69. Chemical feed systems should be completely emptied, flushed and reconditioned. Metering valves or pumps should be reconditioned at this time.
70. Tighten all electrical terminals. All terminals should be checked for tightness, particularly on starters and movable relays.
71. Check deaerator or boiler feed systems. Inspect them to ensure they are not contaminated, corrosion is not taking place and that the lining has not deteriorated and fallen off. Check all other mechanical aspects of the equipment. See information later in this chapter.
72. Check linkages. Check to ensure the linkage ball connectors have not worn out. Worn connectors can cause inconsistency in the linkage movement and result in unrepeatability in excess air levels in the combustion process.

*Above article is part of the Cleaver Brooks Boiler Room Guide and was submitted by Harry de Jong of Canadian Boiler Industries Ltd. Harry can be reached at 403-255-0186 for further information.*

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