

Maintenance Instructions

1. **Keep tubes clean:** In order to maintain high boiler efficiency and boiler life, the boiler tubes should be cleaned periodically, both inside and outside. The frequency of cleaning the inside of the boiler tubes depends on the characteristics of the water and the type of installation. When a large amount of makeup water is used, it is good practice to inspect and clean, if necessary, the inside of the tubes after 30 days. The accumulation of lime and other solids within this time will establish the criterion for how often the boiler tubes should be cleaned. On closed systems, where only a small amount of makeup water is used, the insides the boiler tubes should be examined and if necessary, cleaned at the end of the heating season. When makeup water is negligible, such as boilers connected to unit heaters or radiators, the boiler should be flushed at the end of each heating season. All water boilers should have a tee installed at the boiler inlet for draining the boiler. Clean tubes will not only ensure higher boiler efficiency but will also prevent possible damage to the boiler. The boiler should never be fired unless it is full of water.
2. **Gaskets:** Tighten gaskets during start up and periodically thereafter. Leaky gaskets will cause the use of excessive makeup water and could cause corrosion of the stud bolts. It is good practice to use a new gasket; however, if the gasket is not damaged, it may be reused. Use a soft gasket compound on both sides of the gasket. Specify boiler model number and the height and width of the boiler head plate when ordering new gaskets.
3. **Studs:** Keep studs protected from corrosion with paint or oil. Keep stud bolts tight to prevent leaky gaskets. Stud bolts will not corrode if they are kept dry and protected. Use caution in removing and reinstalling head plates. The boiler must be shut down and drained. Before removing the nuts, apply penetrating oil and allow it to set for a few minutes. Tap the head plate lightly around each stud bolt before trying to break the nut loose. Forcing the nut off could cause breakage. Use a torch to heat the nut and it will come off easier. If a torch is not available, take a cold chisel, place it across the flat of the nut, and strike several sharp blows with a heavy hammer. This should loosen the nut. If necessary, it is better to split the nut open and replace it than to break the stud off.

Should, for any reason, a stud bolt on a boiler head be broken, it can be replaced as follows: without removing the heat plate, use a slow speed drill to drill out the remaining portion of the stud. Re-drill the header and tap using a standard thread tap. Spare studs may be obtained from the factory.

4. **Controls:** Under normal conditions, controls furnished with the Ajax Boiler require very little service. It is important, however, that the controls be protected from moisture and dirt. All controls should be checked frequently to make sure that they are working properly. Turn both the operating controls and the safety controls up and down to verify that they will operate satisfactorily. The high limit control furnished with the boiler should only be used as a safety control.
5. **Power burner:** Reference the maintenance and service instruction in the burner manual.
6. **Relief valve:** Boilers are equipped with a lever type relief valve of "ASME" rated capacity. To maintain the valve in good working condition, it should be manually opened once a month on "closed" systems and once a week on "open" systems. The relief valve outlet should be piped directly to an open drain and the drain checked frequently for discharge. If the relief valve is leaking or does not operate freely, it should be replaced.
7. **Low water cut-off:** A low water cutoff is furnished to protect the boiler against damage by preventing it from operating without water. This is particularly important when the boiler is installed above the water level, i.e., on a roof. Low water level cutoffs should be checked periodically by lowering the water level in the boiler and verifying that the safety circuit opens. Float type low water

cutoffs should be flushed at least once a week on “open” systems and once a month on “closed” systems (if applicable). If neglected, accumulation of sediment within the low water cutoff casing may render the control inoperative and thereby become a safety hazard. Probe low water cutoffs may accumulate deposits on the grounding element. These should be carefully cleaned.

8. **Operating control:** The operating temperature control sets the desired boiler water temperature output. To adjust the water temperature, insert a small straight screwdriver into the slotted screw hole at the front of the controller. This controller has an adjustable differential wheel under its casing.
9. **High limit manual reset:** The boiler is equipped with a manual reset high limit temperature safety designed to shut down the boiler in the event the boiler water temperature exceeds the high limit set point. The high limit should be set 15°F above the operating temperature controller.
10. **Gas pressure switches (Optional, where applicable):** The low gas pressure switch is designed to shut down the boiler if the gas supply drops below its set point. The high gas pressure switch is designed to shut the boiler down if the gas pressure exceeds its set point. Both switches will lock out and must be manually reset if tripped.
11. **Anodes:** Magnesium anodes are standard on all copper tube boilers. They will extend the life of the boiler, and must be replaced periodically. The replacement frequency can vary from six months to several years. Higher temperatures and/or higher total dissolved solid contents in the boiler water will speed electrolysis and decrease the life of the anodes. Normally, two anodes in each header are adequate for header protection. Under adverse conditions, it may be necessary to install as many as three or four anodes in each header. New anodes may be purchased from your Ajax Boiler representative.
12. **Venting system (indoor boilers):** Examine the venting system externally at least once a year for:
 - a.) Tightness of all joints and connections including the draft hood to the boiler and the vent connection from the draft hood to the stack.
 - b.) Corrosion of metal in the vent ducting.
14. **Flue gas passageways:** Inspect and clean, if necessary, at least once every five years.
 - a.) Shut off gas and turn off electric power to boiler.
 - b.) Disconnect vent pipe and remove draft hood(s) or vent cap on outdoor boilers.
 - c.) Examine flue gas passageways and the inside of the venting system for soot and corrosion.
 - d.) If cleaning is needed, open front door, remove main burners, and cover burner orifices and pilot burner with a waterproof covering.
 - e.) Protect controls, electrical, etc. with waterproof covering.
 - f.) Clean tube bundle through vent opening(s) at top of boiler using a water or steam hose. Clean out and reassemble boiler after cleaning.

Note: If any parts need tightening or replacement, consult a qualified serviceman.

It is highly recommended that an operator's log be kept as a record of boiler readings as a way of tracking operational changes that may affect warranty and/or boiler reliability.

Maintenance Intervals

Daily Maintenance

1. **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 (if applicable) every time you enter the boiler room.
2. **Check combustion visually:** Look at the flame to see if anything has changed. Changes may be an indication that a problem is developing.
3. **Treat water according to the established program:** Add chemicals and take tests as outlined by your chemical feed water consultant.
4. **Record boiler operating pressure and temperature:** An excessive steam or water temperature drop will alert you to excessive loading on the boiler.
5. **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.
6. **Record stack temperatures:** Changes in stack temperatures could indicate the boiler is sooting, scaling or there is a problem with baffles or refractory.
7. **Record oil-atomizing pressure (if applicable):** Changes in pressure could have an effect on combustion in the boiler.
8. **Record gas pressure:** Changes in pressure could have an effect on combustion in the boiler and indicate a problem in the gas delivery system.
9. **Check with general boiler/burner operation personnel:** Has anything changed from the day before? If so, why?
10. **Record boiler water supply and return temperatures:** On hot water boilers, record these temperatures to assist in detecting system changes. Return temperatures below 140°F will cause the boiler to condense.
11. **Record makeup water usage:** Excessive makeup water could be an indication of system problems (leaks) in both steam and hot water systems.
12. **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

1. **Check for tight closing fuel valves:** Check to ensure fuel does not flow through the fuel valve(s) when the burner is shut off.
2. **Check fuel and air linkage:** Check to ensure that all set-screws on linkages are tight and securely holding the linkage in place (Forced Draft boilers).
3. **Check indicating lights and alarms:** Check for burned out or loose light bulbs. In addition, check to ensure the alarm bell sounds on the appropriate shut down condition.
4. **Check operation of water level controls:** Stop the boiler feed pump and allow the control to stop the boiler under normal low fire conditions.
5. **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.
6. **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.
7. **Check the flame scanner assembly (if applicable):** Using the appropriate meter, check the flame signal strength at the program relay flame amplifier. Ensure the scanner assembly is clean and dry.
8. **Check gauge glass:** Ensure there are no scratches or etching in the glass or leakage around the package.

Monthly Maintenance

1. **Inspect burner operation:** Do a visual inspection of the pilot flame and main burner flame throughout the firing range.
2. **Analyze combustion:** Take the flue gas analysis over the entire firing range, comparing the combustion analysis and stack temperature reading with the previous month.
3. **Check cams (Power burners):** Inspect the cam springs for scoring, tightness of set-screws, free movement, alignment of cam followers and other related parts.
4. **Check for flue gas leaks:** Ensure something hasn't changed in the breaching, stack or overall system that allows flue gas to be drawn into the boiler room.
5. **Check boiler blow down:** Review boiler blow down to determine that a waste of treated water is not occurring. Check water treatment and testing procedures with your feed water consultant.
6. **Check all combustion air supply inlets:** Ensure sufficient combustion air is being supplied to the boiler room and burner.
7. **Check all filter elements (oil, gas and air):** Clean or replace as needed. On "self-cleaning" filters, make certain that impurities are flushed or discharged from filter body.
8. **Check the fuel system:** Make sure certain strainers, vacuum gauges, pressure gauges and pumps are properly cared for.
9. **Check lubrication:** Verify lubrication requirements of all bearing supported equipment. Do not over-lubricate electric motors.

Semi-Annual Maintenance

1. **Clean low water cut-off(s):** Remove the head assembly or probes, inspect and clean out any sediment or contamination in the column or piping. Determine why sediment or contamination condition exists.
2. **Pre-heaters:** Check oil pre-heaters by removing the heating element and inspect for sludge or scale.
3. **Repair refractory:** Repair all cracks and fill in gaps.
4. **Clean oil pump strainer and filter:** Ensure they are not plugged, thus reducing the flow of the required oil to the burner.
5. **Reset combustion:** The entire combustion process should be carefully checked, O₂ readings taken and necessary burner adjustments made. Make certain 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 adjustments and combustion.

Annual Maintenance

1. **Clean fireside surfaces:** Clean fireside surfaces by brush or use a powerful vacuum cleaner to remove soot. After the cleaning process, and if the boiler is to be left open, it is advisable to spray all fireside surfaces with some type of corrosion preventative.
2. **Clean breaching:** Inspect breaching, stack, and remove any soot build-up.
3. **Clean waterside surfaces:** Remove all head plates and inspect tubes. Inspect water columns, tee and float assemblies from water columns. Thoroughly wash all waterside surfaces.
4. **Check gauge glass for possible replacement:** If internal erosion at water level is noted, replace with new glass and gaskets.
5. **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.
6. **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.
7. **Chemical feed systems:** Chemical feed systems should be completely emptied, flushed and reconditioned. Metering valves or pumps should be reconditioned at this time.