

Shotwell Wood Boiler – Operation, Inspection & Cleaning Ver.1 Jan 26, 2013

Note that there is an Automated Logic system PC located on the wall outside the boiler room. Access the campus ALC WebCNTRL just as you would anywhere else on campus with the proper username and password. The boiler & building systems are viewable here.

Every Day (with good dry clean wood chips, this could be every 2nd or 3rd day) **15-45 min**

1. Check boiler HW temperature & pressure at boiler
2. Check boiler control panel for alarms (red light). If there is an alarm, fix the issue and press OK to clear. If the alarm condition causes the boiler to shut down, you will need to restart by pressing F1. Prior to restarting, you should clean firebox as in #6 below.
3. At boiler panel, press F3, and toggle to the right to view %O₂
4. Verify chip extraction auger inspection door is closed and OK
5. Open firebox access door and scrape ash into ash drop opening. Stir burning fuel to make sure it is loose with no clinkers and good air movement from bottom.
6. Optional: at every inspection or at least every other inspection, you should shut down boiler, allow fuel to burn out, clean firebox, & restart.
 - a. To do this: **Press F1 to disable boiler** (green light will go out & brass plate will slide closed)
 - b. Wait 15-20 minutes for fuel feed (worm drive) to run chips into boiler & burn out
 - c. With flashlight, clean firebox of ash. Manipulate the chip agitating fingers to free up of ash, sand or gravel. Careful not to dislodge fingers out of position. They will come out if you are too forceful or pick them up too high. Combustion air flows from below these fingers up into chip pile. Clean & open grate is necessary for proper combustion & full heat capacity.
 - d. Ensure all fingers and sliding plates are in order, close firebox door & **restart by pressing F1 on boiler panel**. Any air into system will cause faulty O₂ readings & affect the operation.
7. Put finger over ash auger photo cell to verify ash auger runs. Hold for a short while to listen for problems and make sure auger is working OK.
8. Check wood chip supply:
 - a. from DDC level sensor, b. from top silo inspection door, c. from side silo access door.
9. Check ash bin level & empty as needed.

Every Other Week (in addition to the above cleaning & inspection, also do the following) **60-90 min**

10. Open & inspect boiler front.
11. At a minimum: pull out & turn tube rods 90% of the way to free up an remove some ash as best you can. Also carefully scrape bottom boiler ash into slot down to firebox & then clean firebox ash into ash extraction slot & auger.
 - a. Be careful with the bottom ash since the fire brick and insulation can be easily damaged.
 - b. Clean off metal front of boiler where rubber door seal contacts, to make a tight seal.
12. If needed, also clean boiler tubes. Large to 1st pass tubes use large brush. Small tubes use small bush.
 - a. Remove 5-6 tube rods and place on floor.
 - b. Use brush to fully clean the tubes.
 - c. Once 5-6 are done, move a new set of 5-6 rods into clean tubes and use clean these.
 - d. Repeat until finished and then replace the last rods.
 - e. Clean inside of front boiler door, close, and seal tight.
13. Open rear compressed air chamber behind tubes and clean out bottom. This will be the ash you just clean out of the tubes. Be sure to replace gasket material & all wingnuts for an airtight seal.
14. Open 90 deg joint cover on the Exhaust Gas Recirculation duct & clean out. (behind boiler, low)
15. Open the door below the firebox grate, pull out the ash container. Empty, clean, and replace.
16. Make sure the photo cell tubes (both sender & receiver side) are free and clean. Use smallest brush to clean. Unscrew cover, remove sight glass, clean with brush & replace. Make sure photo cell brackets are aligned properly when done. The yellow light will be on the receiver if aligned and working properly.

Once per Month (tubes should be cleaned once a month at a minimum, more often if necessary depending on the fuel and level of ash passed up to the tubes) This is item #12 above.

Troubleshooting

Nearly all of the problems arise from bad fuel with:

- High moisture,
- Large chip pieces,
- A lot of powder or fines that clog the air flow in the chip pile in firebox,
- Metal, dirt or gravel in fuel to clog or jam ash extraction

<i>Symptom</i>	<i>Action</i>
ash extraction auger motor has tripped	It is likely that stone or metal has jammed the bottom auger or ascending auger to ash bin. You can try resetting and seeing if it clears. If not, the 3-Phase motor wiring needs to be rewired to reverse motor, run for a short while, put back to original and run to see if it clears.
ash extraction cover open	If a large chunk of wood or other object comes down the silo to boiler auger (chip extraction auger) it may not fall into the round tube (receiving bin). If the cover pops open, a sensor will see the lid is ajar and stop the auger, shutting down the boiler. You need to give the allen head locking mechanism ¼ turn, open the lid to remove the obstruction. Once all free and clear, close the lid and turn locking mechanism back ¼ turn to secure lid. There is a spring in the locking mechanism to allow the lid to open 1 inch (tripping the alarm for a shutdown) but the lid will stay closed as to not dump wood chips on the floor of the boiler room.
Chip extraction auger motor has tripped	it is likely that a large piece of wood (or other) has jammed the long auger from the silo to the boiler. You can try resetting and seeing if it clears. If not, the 3-Phase motor wiring needs to be rewired to reverse motor, run for a short while, put back to original and run to see if it clears.
Photo cell error	Ash may have gotten into the sight tube. Unscrew tube cover, remove sight glass, clean tube with smallest wire brush & replace. The yellow light on the front photo cell (receiver) will light if it is working properly. The light goes out when the beam is interrupted.
High O2 level	(Most likely) Dirty firebox & air passages between fingers below chip pile are clogged & not letting air through for proper combustion.
High O2 level	Too much fines in fuel, blocking airflow thru chip pile in firebox
Poor fire or boiler not getting up to temperature	Fuel is too moist, or fuel has too much particulates & fines which blocks proper airflow through the chip pile in firebox
Boiler not getting up to temperature	Dirty tubes not allowing full heat transfer. Clean tubes.