



UNIVERSITY OF WEST FLORIDA
Facilities Management

Pensacola, FL 32514-5750
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STANDARD OPERATING PROCEDURE # FAC 6.012

Subject: Central Energy Plant Boiler Operation

Purpose and Scope: The purpose is to provide general knowledge of the boiler systems located in Building 40 (Central Energy Plant) and how they operate to supply heating hot water to the campus of the University of West Florida.

The Central Energy Plant has seven (7) Lockinvar hot water boilers that are rated at 5,000,000 BTU/hr. There is space and piping allotted for an additional three (3) more units of the same type. There is also an old 8,000,000 BTU/hr hot water boiler sitting behind the stated units above that is abandoned in place and will be removed sometime in the future.

The Lockinvar boilers are condensing boilers. Condensing boilers are water heaters fueled by gas or oil. Our units are fueled by natural gas. They achieve high efficiency (typically greater than 90% as compared to the normal 70-80% range of a regular unit) by condensing water vapor in the exhaust gases and so recovering its latent heat of vaporization, which would be wasted otherwise. The condensed vapor leaves the system in liquid form down the drain.

This condensate produced from the exhaust gases is slightly acidic (3 – 5 pH), so suitable materials must be used to the areas where the liquid is present. Aluminum alloys and stainless steel are the most common materials used for the high temperature areas of the equipment while plastics can be used on the low temperature areas.

An advantage of a condensing boiler is that you can have your operating fluid that you are heating to return to the boiler at temperatures of less than 140°F without damage to the boiler. This gives better efficiency during summer months when the heating hot water does not need to be very hot to heat up any space that requires it. The return water temperatures can be less than 140°F and not damage the internal sections of the unit. A normal, non-condensing boiler would be destroyed internally in a very short period of time if operated in this fashion.



Operation:

The boilers are set up to come on one at a time to maintain the desired water temperature of the heating water. As one unit gets maxed out on its output, the next unit in line will come on to provide additional heating as needed. This sequence will continue as needed till all seven (7) units are at maximum fire rates.

Sequence of Operation:

1. Upon the call for heat, the boiler controller turns on the appropriate pump for the boiler to be fired. (One boiler in the group is the master unit that brings each of the others on as needed)
2. The control confirms that the low water cut-off switch contacts are closed. This ensures that the boiler has the proper water level to be fired.
3. The control system then confirms that the gas pressure switch, block drain switch and all limit switches are in their proper position before firing. The pre-purge cycle begins to clear the firing chamber of any unburned fuel from previous runs.
4. The controller confirms that the blowers come up to the desired required speeds. Both blower switches and air pressure switches must close before going to next step.
5. Once the pre-purge cycle is complete, the controller lowers the blower speed, initiates sparking of the ignition electrode and opens the gas valve.
6. After a short period of time, the control stops the sparking and checks for the presence of flame current through the flame sense electrode.
7. If the control does not detect the flame at this point, the control unit will shut all valves and lock the unit out indefinitely. To restart the unit at this point requires an manual reset of the controls at the individual boiler.
8. If the control detects the presence of the flame, it will hold the speed of the blower at a constant for a period of time so that the fame can settle out to a normal burn. Once established the controller will start to modulate the system to a higher firing rate to meet the load requirements.
9. The control will modulate the pump and blower unit to meet the heating demand.
10. If demand is greater than the one firing unit in the boiler can handle to maintain setting, the controller will bring on the second internal firing unit. It will be fired from the flame of burner #1. The control will modulate both gas valves and blowers as required to meet the load demand.
11. If additional boilers are needed for the load, each one will be brought on by the master boiler of the row to meet the firing demand for hot water.



12. Once the total heating requirements have been met, the control will shut down units, turn off the gas valves and begin the post-purge cycle. Once completed, the unit(s) will go into standby until the next call for heating occurs.

A key point to these units operating properly is to keep clean filters on the air intakes for the burners.

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