The Barn Raiser

Mid-South Engineering Company

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# Re-Starting a Boiler

*Adapted from: Engineered Systems, November 2002*

After a boiler has been shut down and it is time to consider restarting it, you should be aware of some items to check so that the equipment is safely brought back on-line. This list is not "all inclusive" but it can serve as a guide.

The first sources of information for any boiler system are the operation and maintenance manuals specific to your equipment. Many times these manuals are not maintained, and therefore are not readily available to the operators. With the advent of scanners it is possible to have a manual electronically copied as a "*.pdf" document that would allow you to keep the information on your computer for reference, and print out additional copies as the need arises. It is the owner and supervisor's responsibility to have these instructions available to the boiler operators, and to see to it that they are read and followed.

While the boiler is shut-down a number of preventive maintenance items should be checked, including:

- Drain and flush the boiler, open all hand holes and manholes, clean and remove soot and scale from the firesides. Examine the boiler for damage and corrosion.
- Have the boiler inspected by an authorized inspector, as required.
- Install new gaskets, replace all hand hole and manhole covers as needed, refill boiler, and perform a hydrostatic test, if required.
- Institute a suitable boiler waste treatment program to reduce scale buildup and corrosion. *(many systems should have their make-up water tested and treatment systems added for items such as hard water or minerals and contaminants).*
- Have the fuel-burning equipment cleaned and adjusted by a competent technician. Verify operation of all operating and limits controls, interlocks, and gauges. Have the technician disassemble the low water cutoff and water feeding devices, clean, recondition, and reassemble them. Have the technician leak test all fuel safety shutoff valves.
- Lubricate all mechanical equipment such as fans and pumps, and verify motor rotation.
- Check all boiler piping for leaks and missing insulation. *(Your water source can be the cause of many leaks and corrosion, and treating the water may give you numerous paybacks in the life of your pipes and less maintenance costs).*
- Maintain a boiler log of all work and operations to track trends and predict maintenance needs.

Immediately prior to boiler start-up the following items should be addressed:

- Check that all ventilation and combustion air openings and louvers are clean and free of debris and obstructions.
- Verify boiler water level.
- Check that all stack dampers are open.
- Examine the boiler furnace for foreign material.
- Check the furnace and flue passes for fuel accumulation.
- Make sure the manual fuel valves are open.

After completing the start-up checks, close the operating switch and commence the normal starting sequence. The following list suggests a typical starting sequence for fossil fuel boilers (*again refer to your specific equipment's manuals for a more complete list):*

- Close operating controls;
- Close interlocks (safety controls);
- Start fans and purge the boiler;
- Meet purge requirement;
- Energize igniter;
- Establish main fuel valve(s);
- De-energize ignition, prove main flame, and
- Release firing rate (combustion) control to demand normal operation.

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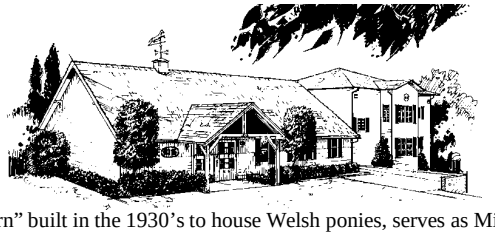

"The Barn" built in the 1930's to house Welsh ponies, serves as Mid-South's offices.

## Re-Starting a Boiler

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This starting sequence should be carefully observed to make sure that all steps are normal. Readings on flame signal strength meters (if fitted) should be observed and recorded in the boiler log.

A normal shut-down should be initiated by opening the manual burner switch. After the post purge has been completed, check the furnace for flame cutoff and make sure there is no residual flame in the furnace. Have fuel safety shut-off valves repaired or replaced if required.

Addition guidance can be found in ASME CSD-1, "Controls and Safety Devices for Automatically Fired Boilers," or in the National Fire Protection Associations (NFPA) 8500 standards on prevention of boiler furnace explosions.

## Electrical Wire Insulation

*By: Dileep Pargaonkar*

Below 600 volts, the most common insulating materials for electrical wire are polyvinyl chloride (PVC) and cross-linked polyethylene (XLPE). The most common insulation types are THWN/THHN, XHHW and RHW/RHH/USE. The National Electrical Code (NEC) refers to PVC insulation as *"thermoplastic"* and to XLPE insulation as *"thermoset".* THWN/THHN insulation is thermoplastic PVC. XHHW and RHW/RHH/USE insulation is thermoset XLPE.

While both types of insulation can be used at the same continuous normal operating temperature, thermoset insulation provides a higher safety margin at over-temperatures. The maximum *"overload"* temperature for thermoplastic insulation is 105 deg. C, versus 130 deg. C for thermoset insulation. And the maximum *"short circuit"* temperature for thermoplastic insulation is 150 deg. C, versus 250 deg. C for thermoset insulation.

Thermoplastic insulation such as THWN/THHN has a very thin layer of nylon as a protective outer jacket. This nylon layer is very easily damaged when installing the wire in conduit, particularly in the larger wire sizes. Thermoset insulation such as XHHW and RHW/RHH/USE does not need the nylon outer layer.

Thermoset insulating material will soften, but will not revert to a liquid state when over-heated. Thermoplastic materials will actually flow when over-heated.

Generally speaking, wire having thermoplastic insulation has a smaller overall outside diameter, and sells for a lower price, than the same size wire having thermoset insulation.

Considering all the above, it is recommended that thermoplastic insulation such as THWN/THHN be specified for the smaller wire sizes (#14 to #4 AWG) typically used for *branch circuits.* It is recommended that thermoset insulation such as XHHW or RHW/RHH/USE be specified for the larger wire sizes (#4 AWG and larger) typically used for *feeders.*



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