

Lighting a Fire Under Boiler Maintenance. **by Henry Shir**

Boiler system upgrades won't deliver their full benefit without a PM program

Boiler system upgrades offer facilities numerous potential benefits, including energy savings and improved environmental performance. These upgrades often include the implementation of low-nitrogen oxide (NOx) burners, gas-conversion burners and advanced control systems.

Savings generated by these retrofits will not last, however, without a proper preventive maintenance (PM) program. For maintenance and engineering managers, the challenge of a boiler system upgrade is to carefully consider system maintenance and operation issues during the specification process.

When performed by competent personnel, PM ensures the plant will operate safely and reliably. PM procedures and tests should be performed by individuals who are certified to work on fired pressure vessels, regardless of whether the boiler is operated by an on-site fireman.

Some of the tests — those for safety valves and low water cut-offs, as well as any procedure requiring a person to enter the boiler shell — can be very dangerous if they are performed by unqualified individuals. Persons who are not licensed firemen or boiler inspectors should consider the following information for reference only.

Logging in

A properly maintained boiler log is one of the most essential components of a comprehensive boiler PM program. The log allows boiler operators to track boiler operation over an extended period of time and log key data, including the intervals between system safety tests.

Boiler maintenance personnel can compare data recently logged to normal operating parameters and analyze deviations that occur to ensure proper and safe operation. For the log to be accurate, technicians need to install and accurately calibrate pressure gauges and thermometers in the boiler room.

Many facilities require a fireman to be present in the boiler room around the clock. Such facilities typically include campus type systems employing steam boilers, which fire at pressures more than 15 psig. At these plants, operators should maintain the boiler log with hourly data recorded 365 days per year.

Operators in other facilities should update the log as often as possible — typically when maintenance personnel enter the boiler room. Boiler manufacturers can supply standard log sheets, which list major parameters that must be recorded.

Water and air temperatures.

Operators should record pressures and temperatures for all boilers. This step includes recording steam pressures for steam boilers, along with condensate return temperatures. They also should record supply and return water temperatures for hot-water boilers.

Outdoor temperatures also are typically recorded in the log so that maintenance personnel can account for outdoor weather conditions at the time of the log reading. If a boiler cannot maintain its design water

temperature or steam pressure when it is cold outside or when the process load is at its peak, then something is wrong with the plant that requires further investigation.

Similarly, if a boiler plant is designed to lower water temperatures during warm outside air conditions and the log reveals no change in supply water temperature, then a controls malfunction is likely and again must be investigated.

Flue-gas temperature.

Measuring and logging flue gas temperature requires the installation of an accurate thermometer in the boiler stack. The thermometer must be able to read temperatures up to 600 degrees. An excessive flue gas temperature can indicate dirt or scale on the boiler surfaces or an improperly adjusted burner.

Manufacturers should determine the proper flue gas temperature for a particular boiler. Operators also should log CO and CO₂ readings and compare them to optimal values to determine the best combustion efficiency. Again, technicians must install sensors in the exhaust stack and regularly calibrate them.

Pressures.

Another important component of the boiler log is listing fuel-oil pressure and gas pressure. Low oil pressures indicate dirty strainers or a malfunctioning fuel oil pump and might indicate a blocked fuel oil line. Technicians can use manufacturers' published data to determine proper oil pressure.

If the gas pressure falls below the required level for proper burner operation, a safety trip-out will occur. Most burners will not automatically restart, which can be a major problem in the heating season.

If the trip-outs are due to low pressure in the street gas mains, then technicians may need to install a gas-pressure booster system in order to ensure reliable operation during cold conditions and at peak process loads.

Heavy oil burners — those using No.4 or No. 6 fuel oil — require that oil be preheated to flow. The log should list the temperature of the oil coming off the preheater to ensure that the preheater is operating properly.

For oil-fired boilers, the gallons noted on the fuel oil inventory gauge should be listed along with whether any alarms have registered from the interstitial monitoring alarm system for double wall fuel oil tanks. Operators also should record any actions that were taken to remedy the problem.

Activities and tests.

Finally, operators should note in the log all of the dates they performed a blowdown on steam boilers, along with the dates and results of the last complete combustion efficiency test. The log also should list dates of safety tests, such as testing of relief valves, low-water cutoffs and flame safeguard systems. Where they note a malfunction, they also should list the date that action was taken to correct the problem.