# Leveraging Boiler Room Control Data for Optimized Operations

May 27th, 2015

1) **Q: How is the boiler efficiency calculated? Is it in accordance with any standard or code?**

   **A:** The two basic ways to compute boiler efficiency is through the "input-output method" and the "heat loss method." The input-output method is more involved and requires instrumentation such as a calorimeter, steam flow meter, stack gas analyzer, stack thermometer, etc. The heat loss method is simpler and is based on stack temperature and an analysis of the flue gas products of combustion especially oxygen. In both cases the radiation and convection losses from the boiler must be considered and subtracted to arrive at a true fuel to steam or water efficiency.

2) **Q: Do you deal with zone valve controls?**

   **A:** Yes, we do in hydronic heating systems.

3) **Q: Is stack temperature usually close to steam temperature?**

   **A:** No. It is normally about 50 to 100 degrees above the saturated steam temperature and varies depending on firing rate and pressure in the vessel.

4) **Q: How do you design the steam header?**

   **A:** The steam header will vary in diameter based on the mass flow of the steam from the boiler, and its pressure; maintaining a maximum velocity to mitigate noise, water hammer and piping erosion. A rule of thumb is 6000 – 8000 FPM for high pressure steam and 4000 – 6000 FPM for low pressure steam.  It also needs to be properly supported and include a means of expanding.

5) **Q: Can you give some reference about rear door temperature? It can be steam pressure or stack temperature.**

   **A:** The rear door temperature is primarily the result of gas flow & temperature exiting the boiler's furnace before entering the 2nd pass of tubes. High temperature refractory and/or other insulating materials are used to cut down on the door's radiation loss; however, depending on the firing rate and length of time at the higher levels, the door can get very hot to the touch especially around the flange areas. Despite this, it is not recommended the area(s) be insulated as this could cause distortion of the door and eventual failure.

6) **Q: Isn't stack temp dependent on fuel being fired?**

   **A:** No. Stack temperature correlates with operating pressure/temperature and firing rate.

**7) Q: What about monitoring Low Water conditions. Normally you require a license steam plant operator present at all times never leaving the boiler room. Will a PLC Based System replace the required presence of an operator at all times once you automate all Boiler Controls and sensors?**

**A:** In some locales and states this indeed has been the case, but the responsible authorities within the various jurisdictions must be contacted to render a decision regarding any such variance even though safety devices exist which automatically monitor, lockout and alarm low water conditions. Cleaver-Brooks Level Master is such a device. .

**8) Q: For a low Pressure boiler operating about 10 Lbs is the stack temp difference around the same as a 110 LBS boiler?**

**A:** No.  The 110# operating boiler will have a higher stack temperature.

**9) Q: My Master ICS panel often loses communication with my Seimens panel. Any suggestions?**

**A:** It could be attributable to various causes such as the protocol translator could be failing, extraneous noise interference, wiring malfunctions, faulty I/O board(s), etc. Unfortunately, these problems can be tedious, and only solved through the process of elimination.

**10) Q: Can the Master Controller interface with an Autoflame controlled boiler?**

**A:** Yes; however, because of proprietary computer protocols, our systems can only speak to each other as it relates to basic boiler/burner functioning such as lead/lag control, firing rate, operating set point, night setback control, etc. We cannot read the boiler's normal operating conditions and parameters as we could if the Master panel were connected to our CB Hawk system.

**11) Q: How is boiler efficiency calculated? Is it in accordance with any standard or code?**

**A:** See Question #1, and also refer to ASME PTC 4-2008 for further details on the input-output method of calculating boiler efficiency.

**12) Q: What happens when the burner assembly is taken apart, and not adjusted after it is put back on the boiler?**

**A:** Bad things can happen not only affecting fuel efficiency, but safety as well. Always use a qualified and experienced service technician to set the burner up after any overhaul or replacement.

**13) Q: Can the data be ported to a SQL server? How is this done? Ethernet or MOD BUS**

**A:** Any number of data highways can be used including the ones you mention.

**14)Q: I see a lot of industrial plants that bring condensate back at about 210 deg. F event though they start with 300+ deg. F condensate at the coils. Flash tanks are used and a low pressure deaerator are used. What's the preferred approach?**

**A:** We always recommend returning the condensate back to the DA or Surge tank as hot as possible, and if you have flash steam coming off on a continuous basis, it too be used in the process or in the DA for deaeration. Remember, for every 10 degree rise in feedwater temperature you gain 1% in efficiency, and the flash steam supplements the steam from the boiler which the DA needs to remove O2 and CO2. Total win/win.

**15)Q: Can you send expected demand so the boiler stages up? For instance, we only need 90 psi when idle but 125 when in full production. This would help on the weekends.**

**A:** There are pressure and/or flow transmitters available which will sense reductions or increases due to process variations, feeding the signal forward to the boiler(s) control system, reducing or increasing steam output based on demand. A PLC based platform would be ideal for this application.

**16)Q: Is there a specific control option level required to best achieve the noted control integration capability?**

**A:** All PLC based packages have various levels of feature sets and degrees of sophistication to meet an array of needs. The main thing is to determine what your immediate and near future needs are, then select the package which best accommodates those needs, along with a supplier with the expertise and experience to readily assist and continuously support you after the sale.

**17)Q: Please explain again what you mean by a SCADA system.**

**A:** A SCADA System (Supervisory Control and Data Acquisition System) is a large scale system of communication highways tapping into various locations spread over large distances. It provides a system of communication sharing by which data which impacts the facility's operations can be fully optimized.

**18)Q: What does the Industrial Control System encompass, and how does it impact efficiency?**

**A:** The ICS encompasses Mfg., Maintenance, and Power Generation which of course impacts the Boiler Room which can be significantly optimized in order to save energy dollars.

**19)Q: You mentioned monitoring the dealkalizer, how will this result in energy savings?**

**A:** The dealkalizer reduces alkalinity which is a TDS, and by doing so you raise the cycles of concentration, reducing the amount of blowdown losses.

20)**Q: Do all the burner management systems produced by Honeywell, Fireye, etc. follow the same sequence of operation?**

**A:** Yes, this is a UL requirement.

21)**Q: We have several loop controllers monitoring/controlling various operations and conditions. Why would I change this out and go with a PLC based system?**

**A:** You wouldn't as long as the system is in place and operating properly. The benefit of the PLC based system is when you expand or put a system in new because of its integration, excellent graphics, user friendliness, and ease of field install.

22)**Q: We have a CB Hawk system on our boiler, why would I need a master panel?**

**A:** You don't. The Master panel is used when you have multiple boilers (over two), and you want to monitor them collectively and then stage their operation based on load demand. We call this lead/lag operation.