Q&A FOR HYDRONICS PART III WEBINAR

JUNE 21, 2017

Q: Do you need neutralization of condensation drain if the drain pipes are PVC?

A: Yes, because the reason for neutralization is to neutralize the condensate being discharged into the sewer system, which increases the pH to 7 or higher. Neutralization is important not only for the drain piping materials of construction, but also to prevent the acidic condensate from coming in contact with concrete, equipment, maintenance staff, etc. additionally local jurisdiction may require specific water quality before discharging into the local sewer system.

Q: Downstream the condensate neutralization system, where does Cleaver Brooks typically see this discharge lead to? Storm or Sanitary? Acknowledging in the end it is up to the local AHJ.

A: Our recommendation has always been to discharge into the sanitary system in case the condensate produced has not been properly neutralized. This is typically governed by the local jurisdiction.

The condensate could also be discharged to a cooling tower basin as the acidic condensate can help eliminate algae in the cooling tower.

Q: Given the low cost of gas, how do we get the purchasers to see the value and the life cycle costs to get them to buy the higher cost condensing boilers?

A: Let's look at the considerations that go into *Life Cycle Cost* analysis then address the question as it relates to a high mass condensing boiler:

1) *Life expectancy* with the high mass condensing boiler will be the same as a rugged non-condensing boiler which can easily exceed 20 years and more likely 35-40 years.

2) *Capital investment including install* may be less when variable flow primary (VFP) is the piping system of choice because of less piping, reduced number of pumps, as well as a reduced number of system components.

3) *Maintenance costs* do not really exceed standard non-condensing boiler, and in some cases are even reduced.

4) *Energy cost* is less because of the much higher fuel efficiencies and electrical savings due to less pumping energy consumed because of VFD and fewer pumps when variable flow primary is utilized.

5) *Repair/Replace cost: If comparing premium High mass boilers to a less expensive low mass design, you will typically need to refer back to the equipment life expectancy to evaluate this properly. In many cases, you may be replacing a low mass boiler at least once during the life expectancy of a high mass design.*

6) *Salvage value:* for boilers this is typically not a major consideration as there is not a significant salvage value for most designs.

Weighing and valuing these factors and applying the formulations for calculating NAV and IRR will in many cases convince the owner to go with the condensing boiler option as the Lowest Cost of Ownership.

Q: In some retrofit piping schematics you talk about using 2- way valves but looks like the piping schematics still shows 3-way valves?

A: It would be recommended to omit the three-way valves and provide two-way valves when possible. Remember three-way valves allow constant flow at the terminal unit, so their use should be limited only to maintaining system minimum flow when required.

Q: I work as a consultant. One challenge I encounter is estimating the O&M costs of a proposed condensing boiler system. Any leads on authoritative data? I am finding only generalized examples (e.g. "20% reduction")

A: Giving a concrete "rule of thumb" answer about operating savings with condensing boilers is really very difficult because of the many variables to be considered. These include: 1) The boiler size to load selection. 2) Boiler staging and cycling losses. Excess cycling will negatively affect the overall efficiency. Proper condensing boiler staging will lead to better operational efficiencies. 3) System reset temperature strategies, generally outside air reset to lower the return water temperature and improve the operating efficiency. 4) Burner performance and turndown. Consistent, efficient burner performance increases the overall efficiencies. 5) How will the boiler be piped, Variable Flow Primary or Primary Secondary, and how do the other electrical loads impact the operating costs.

Even if you just do nothing other than operate in a condensing mode at the same temperature all year (no reset), assuming you are running at 140 to 100 temperatures, you are automatically going to get 93% efficiency compared to what you currently have, which is many times 85% or so. This is an automatic 8% efficiency gain. Everything else, like reset schedules, are just a bonus after that. It makes a very simple comparison with little effort.

As far as the maintenance is concerned, this high mass boiler requires no more maintenance than the non-condensing equivalent.

Q: Though mentioned, it was not shown in any examples...use of isolation valves for control and efficiency. How often do you run into this scenario and is the use of isolation valves critical?

A: The isolation valves are used to isolate the boilers when they are not on line be it a hybrid system or a full condensing variable flow primary system, and yes, they are highly recommended. We would not recommend using the isolation valves at the boiler for control as the purpose is just to isolate flow through the boiler when it is not on. If we are using it as a throttling device, we are adding additional pressure drop to the system that could be better handled by varying the pump speed. The throttling of control valves should be saved for the terminal units based on discharge air or space temperature.

The automatic isolation valve is used to isolate the off boilers, eliminating mixing in the supply header.

Q: What do you recommend for freeze protection of low temperature water systems in cold weather climate zones?

A: If you are not running any piping outside, and the only freezing potential is at the coils, I would recommend a pumped hot water coil. In this scenario, a pump is provided in a tertiary loop dedicated to the heating coil and the control valve is outside of that loop. The flow in this pumped loop remains constant to prevent freezing conditions (even with 100% water) and the control valve modulates to bleed hot water into the loop when more is required by the discharge air or space temperature.

Glycol is also an option, but has some operational limitations that have to be considered. Indirect glycol loops separated from the water system by a heat exchanger are one way to minimize these limitations on the system.