Monday, April 4, 2016

Swimming Pool Water Heaters and Condensing Technology Part 3: Heater Controls

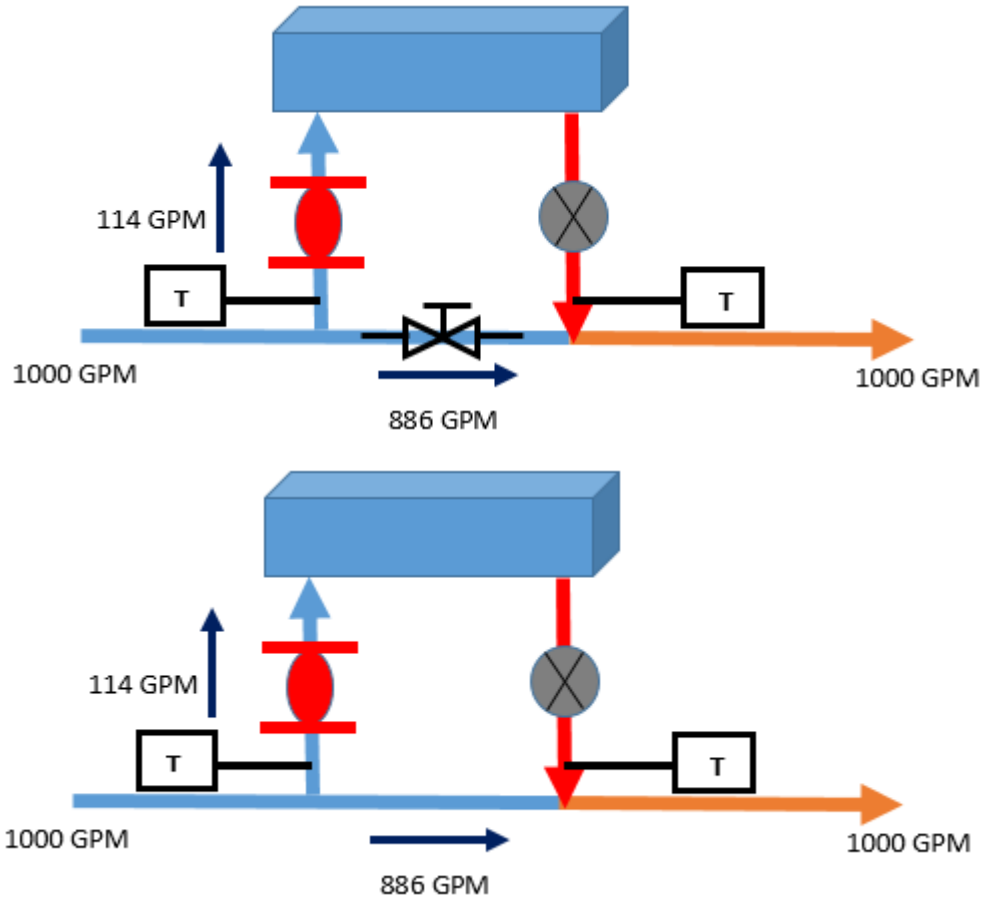
In the last two weeks we discussed a great way to use a condensing boiler and a B&G heat exchanger for swimming pool water heaters. Last week, the Monday Morning Minute post selected a Bell and Gossett BPN brazed plate heat exchanger for a pool application and coupled it to a condensing boiler. Now let's tackle the control schemes.

How to Control the Flow Rate and Temperature in the Boiler Loop

The boiler side of our swimming pool water heater is simply a closed heating system. The boiler pump flow rate is controlled by a small pump, which has a fixed flow rate and head since we're varying temperature rather than the flow rate. The boiler set point will be at 180°F for cold startup and 90°F for normal operation. This low return temperature is perfect for our high turndown, stainless steel condensing boiler. These set points can be automatically changed through a temperature sensor on the pool side. If the pool return temperature is below 75°F, we expect the system is in startup mode. At temperatures above 75°F, the system is in normal heat loss mode. These points can be adjusted in your design and on the jobsite.

How to Control the Flow Rate and Temperature in the Pool Loop

The pool side of the heat exchanger can use a valve to throttle and force the correct flow rate through the heater (left). We could also use a one-pipe primary system design (right). The advantage of the throttle valve is less cost. The advantage of the pump is less chance of the owner adjusting the flow and a more accurate flow rate.



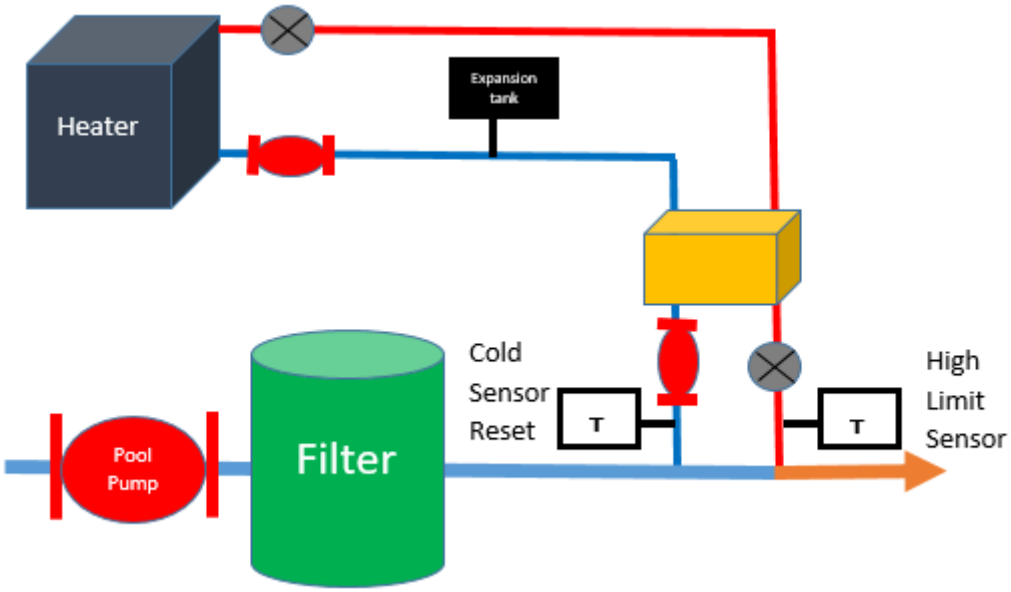
The challenge with the throttled butterfly in the main pool line is turndown. In a pool as large as our example, the filter flow rate could be 1000 GPM. It is challenging to throttle a 10" butterfly valve to bypass 114 GPM.

If we employed a dedicated bypass pump, it would be small. In our example, let's assume less than 200 feet of pipe from the pool filter area to the location of the heat exchanger.

The pump capacity would be 114 GPM at 20 feet. Don't use bronze fitted or stainless fitted pumps for pool water. In this application I would use a[Goulds GWS 3656-4AI all-iron pump](#) for this capacity.

The temperature control is simple. Let the heat exchanger do the work with no normal temperature controls. Since we're bypassing such a small amount of water, there is no need for very tight controls. I would suggest we put a high limit control on the heat exchanger outlet and set it at 130°F if you have PVC pipe. It can be set to other

temperatures for other pipe or system limitations. A supply sensor is used to reset the boiler set point, as discussed in~~our last MMM article~~.



Using the Condensing Boiler Heating System for Swimming Pool Water Heaters

One last thought. If you have a heating system with high turndown condensing boilers, why not use them for the pool heater? Using the B&G exchanger we have described separates the boiler water from pool water. Why not use the standby boiler from the heating system as the startup boiler for the pool on those absolutely rare occasions when the pool is drained?

Just add the heat loss BTUH, 330,000 in our example, to the heating system boiler load. Use a separate pump for the pool heat exchanger. Your client will save the cost and maintenance of an additional gas-fired boiler; the trade-off is the chance that the pool will be drained when the standby boiler is down, the outdoor temperature is near design, and people are in the building 24 hours that day. Your chances might be better buying a lottery ticket than all of that happening at the same time.

If you're in Michigan or Northern Ohio, call your R. L. Deppmann sales engineer for help in implementing this strategy in your next design. If you're located elsewhere,

contact your Bell and Gossett representative for help with selecting pumps or heat exchangers, as well as with any questions about the design or controls.

I would recommend you specify an ASME “U” stamped heat exchanger since it’s under pressure. Why ASME? Check out next week’s R. L. Deppmann Monday Morning Minute for the answer.