

A Square Peg in a Round Hole

Tankless Water Heaters and Radiant Heating

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Twenty years ago, when Paloma and Aquastar brought tankless potable water heaters to the market, we radiant heating experimenters immediately got excited. Here, we thought, was a highly efficient, low cost alternative to the conventional cast iron boiler. It was not only compact, but you could dial in just the right temperature for radiant floor heating. Where conventional boilers required mixing to get water temperatures in the radiant floor range, domestic instantaneous water heaters are designed to make water at just the right temperature. It all sounded too good to be true. We ran out and bought tankless water heaters to hook up to our systems with our little circulators. We took great pride in the wonderful strides we were making to bring radiant to the average home. We were about to make things start popping, literally.

The first challenge was how to control this newly discovered device. Never mind if it wasn't designed for space heating. It WAS designed to heat water when water began to flow. That seemed simple enough. Hook the thermostat to the pump and when the pump turned on, water would flow through the water heater, turning on the burner. Viola, instant hot water. The only problem was, when the pump was turned on, the water would only

trickle and there was no instant heat. This was the first indication that things weren't as simple as they seemed.

Tankless water heaters are designed for the pressure drop between the city supply and your faucet. That may be fifty or sixty pounds of pressure. That head pressure requirement far exceeded our little centrifugal pumps. Take a look inside one of those heaters. The tubing is real small. Not only that, most of them have a restriction orifice with an even smaller hole to make sure there is enough pressure to trip the pressure switch when a faucet is opened.

OK, so much for "plug and play." A little disassembly and out pops the restriction orifice. Now the circulator can move more water through the unit. It only has to contend with the head pressure of a whole bunch of quarter inch or three eighths inch copper tube wrapped around a heat exchanger. So, water is now flowing, maybe not as much as we had hoped for, but there is still no instant heat.

The pressure switch is there for a reason. In the domestic water system the tankless water heater was designed for, the unit won't fire if there is low water pressure. Usually a minimum of thirty pounds. Our little circulator won't generate that kind of head pressure. So, the natural course of action is to discombobulate the pressure switch, or pressurize the system to forty plus pounds. Since pressure relief valves come in standard 30 lb or 150 lb models, we choose to bypass the pressure switch circuit. Anybody getting uncomfortable? Of course we substituted our own 10 lb pressure switch so we could use the 30 lb pressure relief valve and a standard hydronic expansion tank.

About this time we knew we had left the warranty in the dust. Of course, we did a lot of that in the 80's. That was a time when even boiler manufacturers wouldn't warranty their products used in radiant floor installations. As I said, we were radiant experimenters. Finally we had a wall hung, neat looking package, that circulated hot water through our radiant floor. What we didn't have was anything near the output the unit was rated for. Of course we didn't take into consideration that a tankless water heater's output was rated at a seventy-degree rise in water temperature. That means taking in cold city water and bumping it to 130 degrees (remember, it was the early 80's). Our radiant systems were designed around a ten-degree rise. Sending water to the floor at 120 and having it return at 110. Basically, that meant we had to push seven times as much water through the unit per minute to

reach the rated output. Fat chance.

Also remember that much of the energy savings advertised for tankless water heaters comes from the fact the you aren't keeping a 30 gallon tank of water warm 24/7, nor do you have a constant pilot light burning up the gas. It isn't at all the same as the efficiency rating on a boiler.

Oh, and the popping I mentioned. It's called kettling in some circles. You hear it in low mass boilers when the water pressure gets too low. It happens when water in the boiler is "really" boiling. Usually at the surface of the heat exchanger. This isn't supposed to happen in a hydronic boiler or a tankless water heater.

Of course we could have, and some did, convert the whole radiant system to open loop. Run the domestic water right through the radiant system. About all that does is eliminate the water pressure problem. Pump, head pressure and heat output problems still remain plus you gain a few more potential headaches. Some things don't change much. Ever since those "early years" I have seen the tankless water heater hanging around the fringes of the radiant industry. Each new generation of radiant newbies have those individuals who can't help be enticed by the lure of the apparent potential of more efficiency for less money. The truth is, there have been some real improvements in tankless water heater technology, like modulating burners and stainless steel heat exchangers, so occasionally it makes sense to take a second look. One of the biggest improvements for the radiant industry is the combining of a tankless water heater with a tankless boiler. Now we don't have to make a square peg fit into a round hole. The tankless boiler is all the tankless water heater appeared to be for the radiant industry without the field modifications. It is designed for the pressure, flows and temperature drops found in a hydronic system.

For those who still want to make those tankless water heaters, not to be confused with tankless boilers, a part of their radiant heating system, beware. The pitfalls haven't changed much in twenty years. Read the manufacturer's recommendations and the warranty carefully and decide if you really want to carry all the risk. I have yet to meet anyone who is happy with their tankless water heater/radiant system, although some years back I did visit a house where a Paloma was still sizzling away heating a slab after fifteen years. It can be done, but with all the options in equipment designed to do the job, why choose an outsider?