FROM THE FIELD

Fluid quality in hydronic systems

BY DAN FOLEY CONTRIBUTING WRITER

I was cursing the pump manufacturer as I was replacing a failed pump on a cold Saturday morning several years ago. Components never fail on a weekday during business hours, only on nights, weekends and holidays. To top it off, this pump had been in service for less than two years. I also had the homeowner breathing fire down my neck. He was wondering why he had no heat, and reminding me that he took an ice-cold shower that morning.

My first goal was to restore the heat and DHW. Only then could I start to figure out what could cause a fairly new pump from a reputable manufacturer to fail prematurely. I would soon find out that my anger was misdirected at the manufacturer. I would do better to look in the mirror to find the culprit.

That experience got me thinking about the fluid in

Sorbox hydronic filter unpacked and ready to install.

Sorbox filter installed in hydronic radiant system with bypass, balance and isolation valves.

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hydronic heating systems. I thought back to the jobs I did when I was first breaking into the trade back in the mid 1980s. Back then, I was working at Arlington Heating with lead tech, Doug Ashwood. Doug, along with Tom Lamb (R.I.P.) were the boiler guys there. I knew nothing about boilers. But, I was interested in them, and asked to work with these two whenever a boiler change-out came along.

I would tag along with Doug and Tom and watch, learn and help where I could. Typically that meant helping to demo and remove the old boiler. I learned to cut the threaded tie rods with a Sawzall and then break the sections apart with a 3-pound No-Bounce and a brick chisel, carefully prying the sections out one-by-one like slices of bread from a loaf. Hopefully this task was completed without smashing any fingers, thumbs or toes.

Many of these systems were old gravity systems with monster cast iron boilers, 2-inch and 3-inch steel mains, black iron threaded fittings and column radiators the size of a small meteor. One thing that struck me was the water that drained out of these systems. I expected it to be rusty and red in color. If you have worked on these old beasts, you know that is not true. The water that drained out of the hose at the end of the driveway and that dripped out of the broken boiler sections was an inky, jet-black color. You had to be careful, as it would stain concrete driveways and basement slabs. That black fluid, which I later learned would age like a fine wine, had a distinct odor that I came to associate with "heat."

At the time, I did not know enough to even inquire why this fluid was not rusty red but rather jet black. I just knew that it was. I now know that it is caused by oxidation in a low oxygen environment, in essence iron oxide. I am not smart enough to understand or explain the chemistry of this process, but I do know that it is a good thing. It coats the inside of the pipes, boilers and radiators forming a barrier to further corrosion.

When running maintenance service calls back then. I was often asked by homeowners to drain and flush their radiator systems, refilling them with clean water. I explained this would not be a good thing. This black boiler water was what we called "dead" water. It was inert and would not cause any further oxidation. It was best left as is.

I think about these old systems as we are installing and

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servicing modern hydronic and radiant systems. A typical new installation may include a condensing boiler with a stainless steel heat exchanger, copper near boiler piping and fittings, a brass hydraulic separator, Pex radiant tubing, brass or stainless steel manifolds, and Multi-Cor P-A-P runs to remote manifolds. What's missing from these systems? Iron.

The only iron or steel in modern hydronic systems may be in the pump volutes and the expansion tanks. Contrast that with the older systems with iron or steel in the entire system: boiler sections, piping, fittings, pumps, expansion tanks and radiators. Any free oxygen has plenty of surface area to attach to and oxidize.

While we have not installed many aluminum block boilers, we have seen a similar occurrence in these installations. In servicing these boilers, we have observed condensate traps clogged with

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aluminum oxide, boiler blocks leaking and collector boxes corroded. Water treatment to manufacturer specifications, as well as proper commissioning on the fire side, is critical with these boilers or they are not going to have a long service life.

Back to my failed pump. It was completely clogged with corrosion and oxidation. I thought back to this system and how it was installed. It was brought on-line in stages as the house was being built. Zones were brought on-line, DHW added and zones were modified. The radiant was punctured several times by the hardwood flooring installer. Even with nail plates, the trim carpenter hit the mains a couple of times.

In all, I bet the system was drained and filled over a dozen times in the first six months of operation. Each time, a fresh dose of oxygen rich water was added to the system. With no other iron in the system, the corrosive oxygen laden water attacked the cast iron pump volutes, causing the premature failure. This was hardly the pump manufacturer's fault.

We now do things a little differently with this knowledge in place. When we commission a new system, we flush it out with Rhomar Hydro-Solv cleaner. On a new installation, we let it circulate

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Older column-style cast iron radiators provided plenty of surface for free oxygen to bond.

Boiler replacement project in Frederick, Md., featuring a Sorbox hydronic filter tied to existing basement slab radiant system.

for a few days to clean and passivate the metals in the system. It also helps to remove system contaminants such as flux and oils. We return and flush out the system and add Rhomar Pro-Tek hydronic conditioner and oxygen scavenger. We have had good luck using this system to protect the components in our hydronic systems.

It takes time and adds cost, but it is preferable to the alternative of replacing pumps and components prematurely at inopportune times. It is also the mark of a professional, doing the job the right way.

Several new products have made their way into the marketplace that help clean, filter and remove contaminants from hydronic heating systems. Caleffi, Fernox and Sorbox have all recently introduced filtering systems with magnets designed to keep the system fluid clean and pure. Sediment is filtered, dissolved air and gases are removed, and iron particles are captured by strong magnets.

We recently had the opportunity to test the Sorbox filter on one of our projects (See photos 1 and 2). My first impression taking it out of the box was that it was solid and well-built, constructed of stainless steel and brass. Integral isolation valves allow for easy maintenance. I then passed it on to my lead tech, Harvey Youker, to test out on a current jobsite.

This job would be a good test. A radiant system had been installed by another contractor in my client's home about eight or nine years ago. The system had been abandoned and the house sat vacant for six years. There were multiple leaks where the PEX froze and split, even in the concrete slab. My company was retained to restore the system. We installed two condensing boilers, a DHW tank, near boiler piping and specialties controls, and new radiant manifolds.

Harvey repaired multiple splits in the PEX tubing. He then pressure tested the radiant system and flushed it out. Sediment, sand, grit and sludge poured out the system. The basement slab was the worst, as this is where most of the particles settled out. Harvey added the Sorbox unit to the radiant zones, piping it in a bypass configuration with balance valves to control system flow and bypass flow.

This system was brought online in March, and only ran for a few weeks before heat was no longer needed. I will report back on the operation of the Sorbox filter next fall. I expect that it will work as advertised, and I anticipate using this and similar products on future installations. ●

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