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How to stop rubber and plastic system corrosion

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TENS OF MILLIONS of feet of rubber and plastic tubing have been installed in the U.S. and Canada for the past 10 years or so to connect all types of radiation and convection units back to the boiler. Most of it, however, has been used in both residential and commercial radiant floor systems.

Recently members of the hydronic industry have recognized that oxygen diffusion in rubber and plastic tubing can cause corrosion in heating systems (January 1994, p. 1). This, unfortunately, was dismissed by leading U.S. pipe manufacturers for years as nothing more than unsuitable water conditions or mechanical system air leaks.

This is not to fault American or Canadian manufacturers. The Europeans went through the same learning curve we're going through now. Once the Europeans recognized the core of their problem, they reacted by introducing barrier pipe and rescued the radiant floor industry.

There was a lot at stake. The hydronic market in Europe is about 12 times that of the U.S. and Canada. We also have a lot at stake. Our hydronics market is growing, we're looking to increase our market share and radiant heating is a way to do it. But we must do it well!

Oxygen diffusion barriers on nonmetallic hydronic heating pipe are now finally standard in our industry. The DIN 4726 German oxygen diffusion standard was officially adopted by the U.S. Hydronics Institute as the guide to prevent oxygen corrosion in plastic systems. But, remember, this is an endorsement, not a law. In Europe it's law!

The unfortunate fact is that now thousands of building owners and contractors have to live and deal with these problem systems for years to come.

My answer is stay away from chemicals. Use the mechanical method. Even though both methods are listed in DIN 4726 as two of three solutions to combat oxygen corrosion caused by diffusion, the mechanical method is the dominant method for old existing non-barrier piping systems in Europe.

Grade 316 stainless steel heat exchangers are used to separate the mechanical equipment (the boiler side) from the rubber or plastic heat distribution system, thus dividing the system into a primary boiler and secondary radiation loop exposed to the non-ferrous tubing.

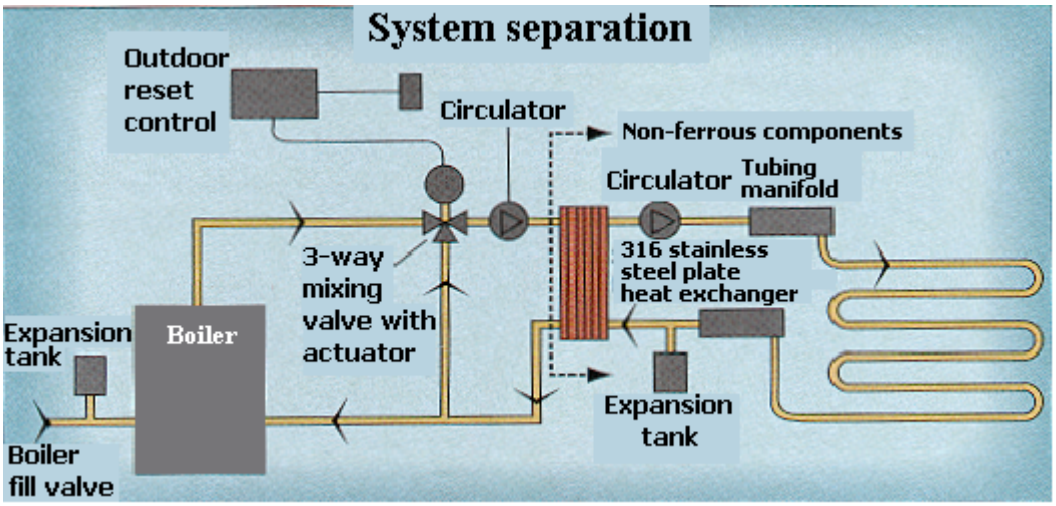
The system components in the secondary loop exposed to corrosive water conditions are the secondary circulator, the distribution manifold, the hard piping from the heat exchanger to the manifold and the secondary loop expansion tank. All of these components are available in 316 stainless steel except manifolds for which brass or copper is acceptable. High grade 316 stainless has proven to be the best long-term solution. A 316 stainless tank might be difficult to find even though in Europe they are readily available.

For the heat exchanger, it is best to use the plate and frame type which is most economical, compact and adds little to the pressure drop of the system.

After the rubber or plastic system has been hydraulically isolated from the rest of the system with non-ferrous components, the second most important consideration is to convert the system over from intermittent to constant circulation by means of an outdoor reset control on the primary side of the flat plate. This can be accomplished via mixing valve or boiler reset.

The reason for this is the lower system water operating temperature and the associated dramatic reduction of the oxygen diffusion rate through the pipe walls. Constant circulation, however, may not be suitable for all tubing. Check with the piping manufacturer to see if their tubing is suitable for constant circulation. The potential for premature internal tubing erosion could be an issue.

Before piping up the new system, flush the rubber or plastic system with water to remove any corrosion sludge in the tubing system and to



restore the Btuh output of the tubing. Chemical solvents can be used for this only upon consultation with and approval of the pipe manufacturer.

The initial cost of mechanical system separation is a relatively high one-time expense but definitely the preferred long term solution to dramatically extend the usable service life of the system.

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