

## Answering Homeowner Questions

*This question came into the RHWHA website and Director Paul Stevenson of EMCO Ltd in Victoria took on the challenge of answering. We print this here in hopes it will be of use to both contractors and suppliers when answering questions regarding fixes to older hydronic systems.*

### The Questions

I am a residential homeowner who has found difficulty getting some honest advice on my hot water heating system. For this reason, I am writing to you in hopes of getting some facts and recommendations.

In my house, I have poly-b pipes used in baseboard and radiant heat (top 2 floors baseboard, basement radiant). The house is about 12 years old and my boiler heat exchanger has started to leak. I asked a few heating service technicians to quote me the cost for the repair and I got the following different opinions after they looked at the problem.

Option 1: Replace existing boiler with new boiler and install new isolation heat exchanger with 3 way mixing for radiant portion.

Option 2: Replace existing boiler with new boiler that uses all non-ferrous material and add 3 way mixing for radiant portion.  
Addendum Option 1/2: Add indoor/outdoor control to help regulate temperature in boiler to reduce water temperature going through poly-by pipe. To complicate matters, I think I have an oversized boiler for my house. My house is 2400SF and I have a super hot Saturn series boiler SG-180 (180,000 BTU boiler).

#### My Questions

- 1) What will last longer: going with a separate stainless steel heat exchanger or non-ferrous boiler. (i.e. what is the better solution?)
- 2) What water temperature can I run my poly-b pipes? Will poly-b start to leak or degrade if temperature is too high?
- 3) Will an indoor/outdoor regulator help my case because I have poly-b pipe? This question arises due to possible limitation of how low and high I can run my boiler water temperature due to poly-b pipes. I am worried about high temperature for poly-b and low temperature for boiler condensation in flue.
- 4) Does having an oversize boiler lead to pre-mature failure of heat exchanger (excessive boiler cycling) or just energy inefficiency? What size boiler is good for a 2400SF home?
- 5) If existing boiler is still in good shape, can I just replace larger boiler heat exchanger and go with isolation stainless-steel heat exchanger?

### The Answers

Unfortunately, your problem is quite common among systems installed before any installation and design guidelines were put into place. There are a number of options available to you, including the suggestions that have been made to you.

There are two issues that need to be addressed with your system. Oxygen permeation occurs with all plastic pipes without an oxygen barrier. Oxygen (air) permeates through the walls of the pipes, into the closed loop heating system, causing corrosion of the ferrous components such as heat exchangers, expansion tanks and causing a sludge build up which effects the circulators. The amount of permeation is related to system temperatures and pressure.

The other situation, which causes significant problems, is the over-sizing of boilers, which causes short cycling that leads to condensation of flue gases in the chimney which corrodes the heat exchanger and impairs performance.

Question 1: Both options, conventional boiler with a stainless steel isolating heat exchanger, or an all non-ferrous system, properly sized and designed, will provide many years of reliable service.

Question 2: Polybutylene pipe is rated for 180°F @100 PSI. Most closed hydronic systems operate at 20–25PSI, so operating at under180°F, should not cause problems with the pipe. Most radiant floor systems operate at 100–130°F, while a typical baseboard system operates at 170–190°F. When using plastic piping for connecting baseboard, care should be taken with the safety control settings to assure that the system temperature does not rise above 180°F. There can be some discrepancy situations between control setting and actual temperatures.

Question 3: Indoor/Outdoor reset control can help with the overall performance of an hydronic system. There are a number of options of outdoor reset available—boiler, mixing, DHW (domestic hot water) and whole house control. Outdoor reset adjusts the supply water temperatures to provide adequate heat based on the outdoor temperature. Most reset controls have integral boiler protection.

Question 4: Over-sizing of boilers causes numerous problems to any system. Short cycling of the heating appliance, symptomatic of over-

sizing, does not allow the flue gases to get to the temperatures required to take the products of combustion up the chimney. The products of combustion condense, creating acid, which can eat out the chimney as well as boiler components. This short cycling also affects the efficiency performance of the boiler. A good contractor will do a heat loss calculation on your home based on the location, house size, construction type and insulation values. Boiler sizing is based on the outdoor design temperature of your location in the winter months. This means that in spring and fall, you may only need about 50% of the capacity of the boiler to provide comfort in your home. This fact exaggerates the problems of over-sizing a boiler for the winter design temperature.

Question 5: The boiler should be inspected by a qualified heating contractor, who will check the overall condition of the boiler, and its components. The amount of degradation of the boiler will dictate if it is feasible to replace only the heat exchanger. Again sizing becomes an issue, and if you replace like for like, and it is actually oversized, even with the isolation exchanger, you will still have the problems with condensation.

I hope this helps. There are numerous ways to resolve your problem correctly. Different contractors have their preferences of brands and products, which installed properly, will work fine. There are a number of piping and control options available to contractors concerning these situations. The best advice I can give you is to ask questions—how the contractor arrived at his recommendations—and his experience in the industry.

—*Paul Stevenson, RHWHA Director*