FROM THE FIELD

Condensing boilers

BY DAN FOLEY CONTRIBUTING WRITER

I installed my first condensing boiler back in early 1990s. It was a GlowCore, a boiler ahead of its time. While it was efficient, at over 90 percent AFUE, it had other issues that made it less than ideal. It was low mass so it short cycled, which caused it to go through igniters like mad.

My company has installed all types of boilers over the years. We have installed commercial, residential, cast iron, steel, atmospheric, induced draft, power vent, steam and hot water. If it heats or boils water, we have installed it. Lately, our go-to boiler has been the modulating, condensing boiler.

I installed my first condensing boiler back in early 1990s. As seen in Photo 1, it was a GlowCore, a boiler ahead of its time. While it was efficient, at over 90 percent AFUE, it had other issues that made it less than ideal. It was low mass so it short cycled, which caused it to go through igniters like mad. The draft motor was very noisy and the heat exchanger had a fairly high pressure drop, requiring a high-head pump. Reliability was also less than stellar. Nonetheless, it was a trailblazer into the condensing boiler territory. This company is long defunct but it got me started with condensing boiler technology.

From there, I gravitated to the Monitor MZ boiler. This was also a 90 plus condensing boiler. It featured a hybrid stainless steel/aluminum heat exchanger. The water flowed through an aluminum block and then through finned stainless steel tube heat exchanger, where the flue gasses condensed into a stainless steel pan. The heat exchanger featured a lower pressure drop than the GlowCore and it also proved to be a fairly reliable boiler. The biggest issue I had with it is that it did not modulate, although the larger of the two sizes did feature a two-stage burner. Short-cycling was an issue with this boiler. See Photo 2 for an MZ boiler we recently replaced after 10 plus years of service. Monitor pulled out of the U.S. boiler market a few years ago.

Photo 1

Once the modulating, condensing boilers hit the market a little over 10 years ago, many of the short-cycling issues were resolved. Reliability was an issue with some of the early models. We have used most, but not all, of the condensing boilers available today. We have our favorite models but no one boiler has all of the features on my wish list.

If I were a design engineer at a boiler manufacturer, these are the features I would like to see in a condensing boiler, from the perspective of an installing contractor:

1. Reliability: This is the overriding factor with regards to boiler design. All the other features and benefits do not matter if the boiler is not reliable. Most of our designs incorporate DHW so when the boiler fails, the client not only loses heat but domestic hot water as well. One early model proved so unreliable that for a couple of years, if my phone rang on nights, weekends or holidays, it was almost sure to be a "no heat/DHW" call from one of these boilers. I had to bite the bullet and replace the dozen or so of these I had in the field to avoid losing my sanity. This boiler was released before all the kinks in the design were worked out, with me and my clients as the BETA testers. The boiler has to be reliable above all else.

2. Heat Exchanger: I prefer to see a stainless steel heat exchanger on the boilers we install. I do not know enough about metallurgy to have an opinion on the flavor of stainless steel: 409C, 316Ti, 439, 444 and others have all been used without failures. A low pressure drop design allows a standard pump to be used. A little bit of water content tends to smooth out the cycling of the boiler. A

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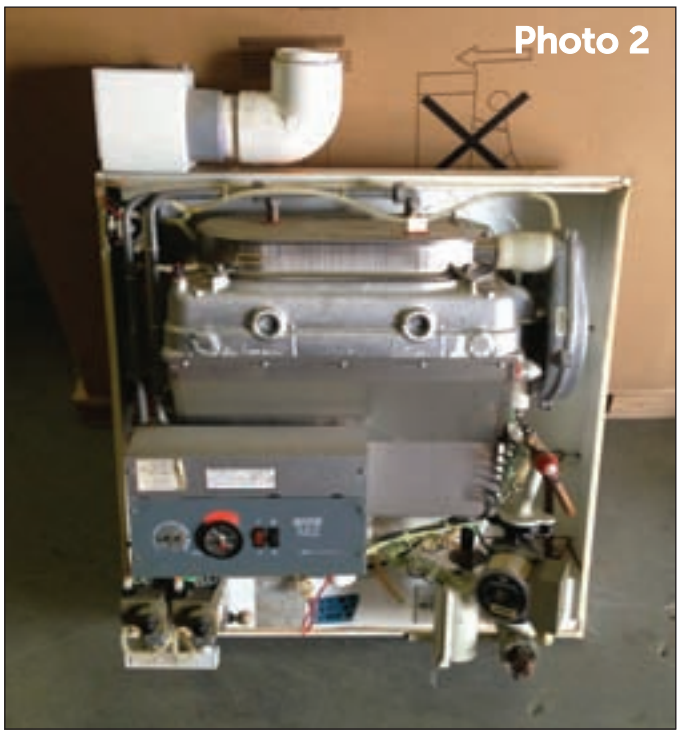

low pressure drop heat exchanger also allows some installation flexibility. For example, we typically install some form of primary/secondary piping or incorporate a hydraulic separator on our condensing boiler installations, which require two pumps. On some installations, say a gravity system replacement with large radiators and large mains, we will pipe the boiler directly to the system with only one pump. This maximizes the efficiency by allowing the coolest return water back to the boiler. I would only pipe it this way with a low pressure drop boiler. Photo 3 shows a Triangle Tube boiler piped directly into a gravity-conversion system.

3. Installation Flexibility: Not all jobs are the same. Some are new construction, some are remodeling projects and some are replacement. Each job has different requirements. In most cases, wall-mount boilers make the most sense but some jobs require a floor mount model. For example, a retrofit job we recently did was in an old house with a fieldstone foundation wall. The rough surface did not afford an easy installation on the wall. A floor mount model would have been handy. Instead, we fabricated a mounting bracket out of strut and plywood. A boiler that can be either floor mounted or wall mounted gives the installer options. Venting flexibility is also desirable. Sometimes a concentric vent straight through a sidewall works best. Other times, a two-pipe vent system using PVC, CPVC or stainless steel works best. On many replacement jobs, we have used a flexible polypropylene vent kit using the existing chimney as a chase.

4. Controls: An integral outdoor rest control built into the boiler is a desirable feature and simplifies wiring. A wireless outdoor sensor option would be nice for replacement jobs with finished basements. Pulling a control wire to a north wall is not always easy. It would also be nice to have controls that are programmed in plain English rather than codes and numbers. The papers with the coding schedules are not always where we left them, and it is impossible to set or adjust the parameters without the manuals. As our local codes require a low-water cutoff safety on all boilers, it would be nice to have them factory installed. Some manufacturers do incorporate a pressure switch but the local code officials do not recognize this as a low water cutoff device necessitating a field installed control.

5. Serviceability: All boilers require routine maintenance, cleaning and service. This is true with condensing boilers as well. Make it easy to pull the burner and vacuum of the heat exchanger and it will get done on a regular basis. Components fail over time. Devices like draft motors, gas valves, control boards, transformers all should be easy to replace with common hand tools. If specialized tools are required, a service kit would be a nice option. Common parts among different sizes of boilers of the same line are helpful. I realize that this is not possible with all parts but the more components that can be used interchangeably on different models, the easier it is to stock parts and service our clients. One

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manufacturer we work with has a service kit with most operational parts housed in a foam lined case, as seen in Photo 4. This makes it very easy to properly service their product and having the parts on hand when needed.

6. Additional Features: Code officials are also requiring condensate neutralizers on our condensing boilers. It would be nice to have an easily removable and cleanable condensate trap with a float switch and condensate neutralizer built into the boiler. This would streamline the installation and avoid having to order separate components. As condensate traps can get clogged up over time with sediment, it is important to make this accessible and easily removable to clean and flush. An early model we worked on placed the drain in an all but inaccessible location. The entire burner assembly had to be removed to flush out the drain with water while simultaneously using a wet vac to suck out the dirt and sediment from the drain side of the trap. It took an hour to do what should be a 10-minute job due to poor design.

These are the features I would like to see in a condensing boiler. The boilers we presently use have most, but not all, of these features. I don't know of any one boiler that incorporates all of them. ●

Dan Foley *is president and owner of Foley Mechanical, Inc. based in Lorton, Va. (www.foleymechanical.com). FMI specializes in radiant, hydronic and steam systems, as well as mechanical systems for large custom homes. He can be reached at (703) 339-8030 or dfoley50@verizon.net.*