CASE IN POINT

Maintaining A Healthy Pulse

by William A. Lotz, P.E.

The pulse furnace was developed by the Institute of Gas Technology in Chicago back in the 70s. It has been the greatest advance for residential gas furnaces since the invention of the return fan.

Lennox was the first to market the product for warm-air furnaces and Hydrotherm sells a pulse hot-water boiler. Several companies have jumped on the bandwagon with condensing furnaces. Unfortunately some of these companies have had terrible corrosion problems with their product.

The pulse furnace is only made by Lennox. It is a condensing furnace, meaning that water condenses in the process of extracting Btus from the exhaust gas. This results in a thermal efficiency of over 90 percent. Many other companies sell condensing furnaces with similar efficiencies. Ten years ago, the typical gas furnace had a thermal efficiency of 65 percent, and many of these type products are still on the market.

In order to attain a thermal efficiency over 90 percent, the furnace must have an electronic pilot (not a constant flame) and draw its combustion air directly from outdoors (not warmed indoor air) plus a very efficient heat exchanger which reduces the exhaust gas temperature to about 100°F. The pulse fulfills all three of these requirements.

Contractor's Home

A very large southern N.H. house had a connected LP gas load of 500,000 Btus that included two pulse furnaces. The owner called me in a panic on the first 0°F day in December. The house was cold and the furnaces would not stay lit. I asked the gas mechanic and the contractor to meet me at the site immediately. The contractor said there was low gas pressure at the furnace. The pulse requires 9 inches of water column gas pressure at the furnace and it is very sensitive to low *or* high pressure. I noticed that the main gas pipe from the 1,000-gallon tank was ½-inch, whereas the design specified a l-inch pipe. I asked the gas man why he had installed a ½-inch pipe when the plans clearly required a 1-inch pipe. He replied by stating . . . "I only carry half-inch pipe on my truck." When asked to install a l-inch pipe he repeated, "I only carry half-inch pipe." Somewhat frustrated, I asked if he could install another ½-inch pipe parallel to the existing one. He did this and it worked fine.

Consultant's Office

A backwoods Maine consultant designed himself a new heating system using a pulse furnace since he was getting too feeble to cut ten cords of wood a year.

The local LP gas supplier hooked up the horizontal pulse furnace in the attic. A pair of 2-inch PVC pipes went through the roof for combustion air and the exhaust vent. The furnace would not start at first because the dealer had not yet changed the pulse from natural gas to LP gas. (The LP gas kit had to be field-installed.) After this was corrected, the furnace ran great until the first cold weather. The contractor had not yet insulated the PVC exhaust vent, which passed through a cold woodshed before penetrating the roof. The moisture in the exhaust pipe condensed and filled the pipe with water which blocked the flue gas flow. The owner temporarily fixed the problem with a hacksaw—by cutting off the exhaust pipe in the woodshed—until the contractor could come back, re-install the pipe, and insulate it with ¾-inch-thick Armaflex insulation.

The next problem occurred on a 0°F morning with 2 feet of snow on the roof. The furnace shut off at 5 am. The warm moist exhaust gas was exiting the vent pipe and recirculating into the nearby combustion air intake. The frost plugged up the intake and shut down the furnace. Again the owner solved the problem with a hacksaw by lowering the exhaust termination and making more distance between it and the air intake. This was enough to prevent cross contamination.

The furnace ran for awhile with no ductwork, but it was very noisy. The noise stopped when they installed fiberglass ducts on the supply and return. If lined sheet metal ducts had been used, flexible connectors would have been required at both ends of the furnace to cut the noise. Although the pulse can be noisy if not properly installed, it can be made to run very quietly. The designer and installer must be sensitive to the possible acoustical problems.

Office Building

An office building had two pulse furnaces for three levels. The owner complained of hot and cold areas and filed suit against the contractor. The contractor asked me to troubleshoot this design/build project. The pulse furnaces ran fine and were not a part of the problem. The main problems were inadequate zoning and too much flexible duct, which made it impossible to balance the system for comfort. This was a classic case of an owner insisting on a price that was too low for the contractor to do a decent job.

I specify pulse furnaces on many of my residential and small commercial projects. I like the pulse because it is the most efficient warm-air furnace on the market. It can be installed anywhere in a building that you can run a gas pipe, condensate pipe, and 2-inch PVC intake/exhaust pipes (no chimney).

There are limits to the Btu capacity available with pulse furnaces, which range from 38,000 to 95,000 Btus. The heat exchangers have a lifetime warranty.

If you want to use pulse technology on hydronic systems, you can use the Hydrotherm pulse gas-fired boiler. These are available from 44,000 to 88,000 Btus, and several can be installed to fire in sequence for buildings with larger loads.

Several manufacturers make condensing (not pulse) gas or oil furnaces. Yukon makes the EX-95 oil-fired furnace which has an efficiency of 91 percent. Heil makes the gas Energy Marshal I from 38,000 to 115,000 Btus. Magic Chef makes condensing gas furnaces from 38,000 to 94,000 Btus. Glow Core also makes condensing gas furnaces in 54,000 and 72,000 Btus capacity.

I prefer the pulse-type to other condensing furnaces and boilers, because it has more field experience and more years of hassle-free use than the others. The Lennox pulse was the first condensing furnace in recent times and has been largely problem-free. Some types of condensing furnaces have suffered serious corrosion problems. ■

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