



On-Farm Energy Case Study
Wood Pellet Furnace for Small Scale Greenhouse Heat
Your Farm, Fairlee VT



Kevin and Laura Channel are the owner operators of Your Farm, in Fairlee VT. They started this farm only a few years ago; all the land was in hay when they purchased it. Since that time they brought 6 acres into mixed vegetable and cover crop rotation, and they constructed a 26' by 48' greenhouse for starting transplants in the spring and raising greenhouse vegetables in the summer and fall. They market through a CSA, farmers markets and restaurants.

To heat their new greenhouse they bought a Harman PF 100 forced hot air pellet furnace (Harman Stove Company, Halifax, PA www.harmonstove.com) from Upper Valley Stove Company in Lebanon, NH (www.uppervalleystoves.com). They dealt with the owner directly and found that he was very helpful even after the purchase, for example, troubleshooting over the phone at no charge, to save service calls.



Kevin did the installation on his own with a dolly and a trailer and one other man help. He found the manual to be very self explanatory on maintenance, but he also benefitted from supplementary tips that the store owner provided such as using a long-handled screwdriver to scrape the burnpot instead of the factory-supplied tool.

Kevin hooked up the direct vent himself and installed baffles. He assembled and attached the blower fan pretty easily. It took a few hours to unload, and install/assemble. He had the plenum fabricated by a sheet metal shop for a couple hundred dollars, and assembled it after the furnace was in place. The vent pipe is double walled and a little more expensive than normal so a short run is desirable.

An electrician hooked up the direct wire and the thermostat, but Kevin says he could have done it himself with the diagram from the manual; the electrician was on site anyway doing some other more professional work at the time.

The furnace is located in a 12' by 16' potting shed that is attached to the greenhouse, sharing an end wall. There is shared air between the greenhouse and potting shed through a 8'W X 7'H opening in the shared wall. However the furnace is behind the end wall, the plenum protrudes through the end wall 7' high. The blower fan is always kept on "High" setting.



There is an HAF fan that circulates the forced hot air 12' (3rd bow) from the plenum outlet throughout the house. A second HAF fan is located at the other end of the house. The thermostat is located in the middle of the greenhouse 4' above the ground. The potting shed is insulated with 2" rigid foam (R-9 or R-11 value.)

During the first season, the furnace we used 2.75 tons of pellet fuel from March 17 through May 30 when it was shut down. Only half of the 26' x 48' house was heated (using a sheet of plastic as a partition in the middle of the house) from March 17 through April 28. Then they took down the partition and heated the whole house.

The second season the furnace was fired up on March 5 and shut it down on May 30 again. They partitioned greenhouse from March 5 to April 1, but cracked the partition at night to let heat into the area where early greens for market were growing in the ground. They used 3.5 tons of pellet fuel during this time period.



Kevin maintains the furnace carefully. "I give the heat exchanger a good cleaning after every ton, about 3 times a heating season, and I empty the ash pan, scrape the fire box and clean out the fines from the igniter box after each ton. This takes 30 to 45 minutes. At the end of the season a more thorough cleaning gets done including cleaning the combustion fan, the complete fire box, auger mechanism and the Sensor (the brains of the furnace). It takes two hours to do that well."

They used "premium" pellets, brand name "Energex" (www.energex.com) purchased from Upper Valley Stove Co. They come from Quebec or PA. Premium is mostly hardwood and some soft wood pellets. This gives high BTU with hardwood and good high heat exchange with soft woods. It also has less "fines" which can clog up the auger mechanism in the furnace than other brands they tried such as New England Wood Pellets.

The price of wood pellets has been volatile in recent years, along with many other fuels. In 2007 the Channells paid \$210 per ton, in 2008 they paid \$230, and in 2009 they prebought at \$275 per ton due to fuel surcharges, "which will hopefully tail off now that fuel prices are down again" says Kevin.

There system has worked well overall. "The only trouble we have faced is a failed auger motor. The auger feeds pellets as the thermostat calls for heat. So one morning I came in to find the temp at 37 degrees! It was easily replaced in 30 minutes once I did the troubleshooting and retrieved the part. Thankfully it was a sunny day and the stove company had them in stock. This is a common failure with this unit. Keep an extra on hand if you are going to go this route."

"Down the road I am concerned about the rust building up on the heat exchangers. I'm keeping a close watch on that and the efficiency and durability of the unit in the long run. The manufacturer said this is their first greenhouse application...we're all holding our breath, but thankful to be using renewable fuels."

- Vern Grubinger 12/9/08