Tuning-Up New Heating Systems

by Harris Hyman, P.E.

When I bought a new truck, the salesman was careful to invite me to bring it back in after I'd put 1,000 miles on it. At that time, the shop changed the oil, tightened down the head, fixed a couple of rattles, straightened a door hinge, and greased the tailgate. I paid for the oil and filter, but the rest of it—maybe two hours of work—was absorbed by the dealer as a normal part of doing business.

Last year, I designed a heating system for a school. It cost about *ten times* the amount of the truck. With typical perversity, the owner expected this extremely complex system to function perfectly from the instant the cold weather set in, and the plumbing contractor acted downright annoyed that he had to come back and give the thing a "1,000-mile tune-up."

After a lot of fussing and adjusting, the system began to work as it was designed to work, but it cost. It cost in the plumber's time, in my time, in parts and, worst of all, in the owner's anger. The extra costs took on the appearance of fixing a mess. In fact, they were a normal part of doing business, and could have been anticipated and handled gracefully.

I've been down this path a couple of times. I've managed to get the systems in order, but it has taken some painful work and I've had to eat a lot of the time myself. In asking around, I've found that a lot of us have had to eat these kinds of costs. It takes the pleasure out of designing efficient heating plants.

An architect friend, who drives in the fast lane where a $10,000,000 building is a "small, quick job," lectured me on the subject. He said that buildings in this class take a couple of years to bring to full working order. He cited a dozen jobs and discussed negotiating with his mechanical engineer over who pays the cost of tune-up. After a while, I began to believe him.

Maybe we're just not used to this sort of thing. We've been spoiled by the 40-year petroleum era. When the cost of oil heat was low, extra power was cheap and radical oversizing became a conventional practice. But we're a dozen years away from 20-cent-per-gallon oil. Despite the "glut" of the last year, energy costs have gone from 15 percent of the mortgage payment to 25 or 30 percent, and energy conservation has become an important part of sensible construction.

Overall, building heating loads are down to one-third of their former levels. Two thousand square feet can be heated with 40,000 Btu per hour instead of 120,000. These smaller loads make wood burning attractive where wood is relatively inexpensive.

But wood burning takes a lot of work, so there is a temptation to integrate a wood system with a fueled system, and these systems are often a little complex and messy. They usually need a bit of work after they are installed to make them give comfortable heat.

One such integrated, multifuel design uses the furnace ductwork to distribute woodstove heat around the house. This requires a fan thermostat near the stove, and some extra controls and relays. It uses all of the heat from the woodstove to warm the house, and lets the oil burner cut in only when the wood burns down. The system requires a careful initial setup if it is to run properly.

A similar system integrates a water-jacketed woodstove with a gas-fired heater to provide heat and domestic hot water. It, too, is economical and effective and requires careful work in the design, installation, and setup of the controls.

There are really two problems involved:
1. Who is going to pay for the work?
2. What will make the job easier?
The first question suggests that someone must pick up the tab for the extra work. The second suggests that advance thinking can make the tune-up job a lot easier.

Who Pays?

There are really two problems involved in tuning up modern, integrated heating systems:

1. Who is going to pay for the work?
2. What will make the job easier?

The first question suggests that someone must pick up the tab for the extra work, but a lot of bad feelings are not necessary. The second suggests that some advance thinking can make the tune-up job a lot easier.

The owner must pay for the cost of the heating system. This is inescapable. In some manner, the owner pays for installation, tune-up, and fuel. The ideal designer or contractor gives the ideal owner the options and costs so that a careful decision can be made. In this ideal case, everything goes well, trouble spots are anticipated, and no one is surprised.

But when did this happen last? In a normal residential project, the plumber is asked to install an adequate heating system. The plumber takes the plans to a supply house or engineering service, which lays out the details. The major design criterion is the "silent bell"; the system is designed with enough power so that a plumber will never be called at night by a cold, angry owner. The plumber knows that calls about excessive heating bills are rare, but that *everybody* calls about too little heat.

Engineered systems can be much more trouble. While they are often far more economical to operate and occasionally even cheaper to install, they do need tuning up.

With an engineered system, the plumber often drops out of the design process and will only work "by the hour." The designer finishes the plans, explains them to the plumber, and expects the plumber to take the traditional responsibility for installing the system, without hinting that problems might arise. The general contractor takes the flak from the owner, and harasses both the plumber and designer. On the verge of successful completion, the whole project degenerates.

If all the parties expect a period of tuning up, then the owner accepts additional work and bills, the designer can expect a couple of extra trips to the site, the heating sub will talk to the designer and get familiar with the system and, finally, the general contractor knows that the problems will be solved and the bills will be paid.

Making the Tune-Up Easier

There is real work in tuning up a heating system—it is not simply a public-relations illusion. You can make the actual tune-up easier by following some procedures:

- Install short-circuit switches on all of the thermostat lines. These switches, close to the heating plant, switch on the various zones and simulate the call for heat. With a switch on, you can test the demand of a zone without wandering around the house turning up thermostats and waiting.
- Install indicator lights on all control lines. The lights show that power is actually applied to the lines, and that the thermostats and relays are functioning. Match the lamps to the correct circuit voltage: the control lines are at 24 volts and the machinery is at 115.
- Distribute a bunch of cheap thermometers around the house so that adjustments can be made accurately.
- Put thermometers at strategic points on the heating system. On a hot-water system, there should be a thermometer on the supply line just downstream from the furnace and on each of the zone return lines. A quick look at these temperatures will give some indication of the heat being sent to each of the zones; a large temperature difference between supply and return shows that a lot of heat is being extracted. With hot-air systems, use duct thermometers. A digital electronic thermometer with a selector switch to several thermocouples works well, if there are enough temperature points.
- If possible, concentrate the controls within a small area.
- Make sure that there are balancing valves and dampers on the heating lines, and that the settings are marked out.
- Keep a log of the work. Record dates and exterior and interior temperatures.

These suggestions are not a substitute for good sense and an intuitive feel for the work, but they might make the job easier. The extra instrumentation is not conventional (one contractor calls it Star Wars). But it is not costly, and can take the job from messy guesswork to something tangible and fast. ■

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