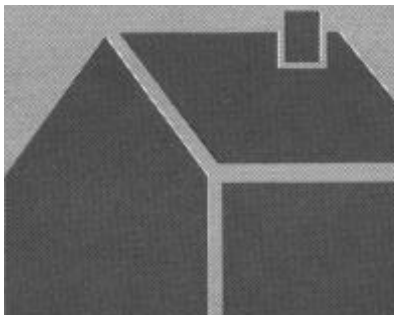
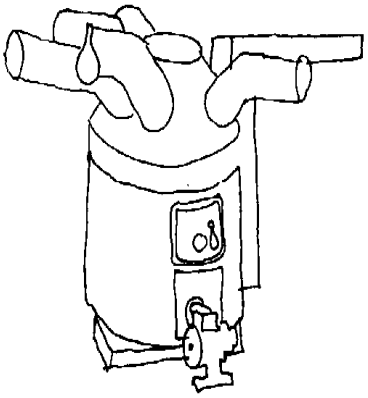


Older Home Heating Systems: Replace or Maintain?

Housing
Fact Sheets



That old heating system down in the basement has been groaning and clanking for the past couple heating seasons. You have thought about having it replaced, but it seems to work just fine. And the technician who services it annually says it is far from worn out. Still, you wonder if investing in a new, high efficiency heating system would pay you back in reduced heating bills quickly. This article will present information to help you make that determination.

It is common for heating systems to last 25 years, and some boilers[1] can last as long as 50 years. However, putting off the purchase of a new system does not necessarily mean you are saving money. In some cases investing in a new, highly efficient system to replace an old, inefficient, yet working, heating system could pay a better return on your money than investing in the stock market.

Heating System Efficiency

Combustion efficiency and annual fuel utilization efficiency (AFUE) are two different measures of a heating system's efficiency. Combustion efficiency refers to the system's efficiency when it is actually operating. Annual fuel utilization efficiency is a measure of how effectively a heating system converts heat released from burning fuel into heat you can use to warm your home, as averaged over the whole heating season. AFUE factors in such variables as heat loss due to start-up and cool-down, and heat escaping up the chimney with combustion gases.

> *Combustion efficiency is like the miles per gallon your car gets cruising along at 55 miles per hour on the highway*...(while)...*AFUE is like your car mileage between fill-ups, including both highway driving and stop and-go-traffic* (Wilson & Morril, 1996, p.58).

[1] The two most common types of home heating systems are boilers and furnaces. Boilers heat water that is distributed in a number of ways throughout the house. Furnaces heat air which is blown through ducts to registers located in each room of the house. Furnaces and boilers can burn a variety of fuels, including natural gas, propane, oil, etc.

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AFUE is a much more accurate indication than combustion efficiency of a heating system's over-all efficiency.

Determining Heating System Efficiency

Federal law requires that new heating appliances be labeled with specific energy efficiency information. This "energy efficiency guide" includes the AFUE of the appliance. Information contained in this label allows you to make informed comparisons between new heating appliances, and to help you decide if buying a new system to replace an older one is a good investment.

Heating appliances manufactured before the early 1980's were not required to have energy efficiency labels. So if your current heating appliance was manufactured before then, determining its AFUE may be a bit more involved than simply reading the information from a label.

However, by determining the combustion efficiency of your current furnace or boiler, you can easily estimate its AFUE. A combustion efficiency test is a relatively simple and inexpensive procedure that can be performed by most heating technicians. After you know the combustion efficiency of your current heating system, multiply that number by .85 to determine the approximate AFUE (Wilson & Morril, 1996). Then use the information provided in Table 1 to determine how much money you would save if you replaced your old system with a new, more efficient one.

Example: suppose that your current heating system is operating at an AFUE of 50% (not unusual for old coal furnaces that have been converted to run on natural gas), and you spend $1,500 annually to purchase gas for heating. In the first column of Table 1, locate current AFUE of 50%. Then look across that row and note the figure under 90%, **$44** in this case. So for each $100 spent annually on heating fuel, you would save $44. With the current total amount spent for heating fuel at $1,500, annual savings of about $660 would be realized by replacing the old, inefficient furnace with a new, highly efficient one.

Table 1: Savings per $100 of current fuel costs

Current AFUE	AFUE of New Heating System								
	55%	60%	65%	70%	75%	80%	85%	90%	95%
50%	$9	$16	$23	$38	$33	$37	$41	**$44**	$47
55%	----	$8	15	21	26	31	35	38	42
60%	----	----	$7	14	20	25	29	33	37
65%	----	----	----	$7	13	18	23	27	32
70%	----	----	----	----	$6	12	17	22	26
75%	----	----	----	----	----	$6	11	16	21
80%	----	----	----	----	----	----	$5	11	16
85%	----	----	----	----	----	----	----	$5	$11

Source: *Consumer Guide to Home Energy Savings*
(1996) Wilson & Morril, p 63.

So far we have discussed the amount of money you would save on fuel if you bought a new furnace with an AFUE of 90%. However, before you can realize these savings, you must invest money to purchase and install it. In our example, assume that the installed cost of this new system would be $3,000. To determine the return on investment (ROI) use the equation below.

$$ROI = \frac{\text{First year savings}}{\text{Installed cost}} \qquad \text{So:} \qquad ROI = \frac{600}{3{,}000} = .20$$

A 20% return on investment in the first year is much higher than most stock market investment's pay. It is also a tax-free, no-risk investment. Replacing your old heating system with a new, highly efficient one may also qualify you to receive a cash rebate or low interest loan through the ENERGY STAR® program, sponsored by the U. S. Environmental Protection Agency and the Department of Energy. To learn more about that program visit their web site at: www.energystar.gov.

If you want to seriously investigate buying a new heating system, it is best to work with a reputable heating contractor, who can help you determine the AFUE of your current heating system and provide pricing information for purchase and installation costs of a new, more efficient system[2].

References:

Morril, J. and Wilson, A. (1996). *Consumer Guide to Home Energy Savings.* Wash. DC & Berkeley, CA: American Council for an Energy-Efficient Economy.

[2] This Fact Sheet written by Mark Pierce, Extension Associate, Department of Design and Environmental Analysis, Cornell University. November 00.