Gas Furnaces

If you are in the market for a natural gas or propane furnace, don't overlook residential furnaces. Even though these products are designed for a different market, they have a lot to offer commercial buildings. For example:

- Residential furnaces are manufactured in much larger quantities than commercial furnaces. That makes them relatively inexpensive and readily available with a wide variety of options.
- Because they are available in relatively small sizes, they can accommodate nearly any zoning scheme.
- The most efficient residential furnaces are far more efficient than their commercial market counterparts.

For these reasons, residential furnaces (**Figure 1**) are frequently superior to commercial furnaces for many commercial building applications.

Figure 1: Residential gas furnace

The Lennox SLP 98, shown here, has a variable-capacity gas valve and a variable-speed blower.

Courtesy: Lennox

WHAT ARE THE OPTIONS?

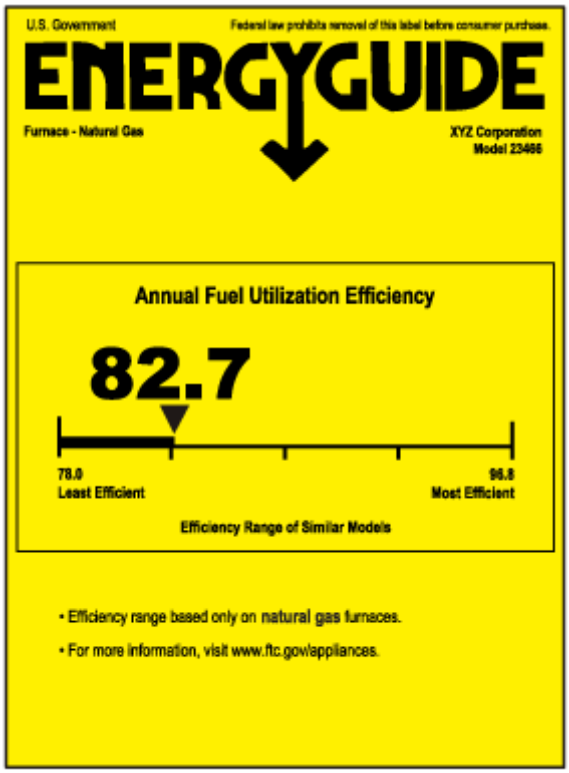
this section

Size. The size, or heating capacity, of a residential furnace is quantified in terms of British thermal units per hour (Btu/h) of gas input. A Btu is equal to the amount of energy it takes to raise 1 degree of water 1 degree Fahrenheit, but to put it in more practical terms, it is about the amount of heat given off by completely burning a single kitchen match. With a few exceptions, residential furnaces are available with inputs that range from 40,000 Btu/h to 150,000 Btu/h.

Efficiency. The efficiency of residential furnaces is expressed as annual fuel utilization efficiency (AFUE), which accounts for actual operating conditions. In addition to steady state efficiency, this factor also includes on-and-off cycling, the energy embodied in combustion air, and jacket losses. The minimum AFUE available is set by federal law for most furnace types at 78 percent. The highest AFUE units available are slightly less than 98 percent efficient. To obtain the AFUE of any given furnace, look at the yellow-and-black "EnergyGuide" label on the furnace (**Figure 2**), check the Directory of Certified Product Performance from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), or consult the manufacturer's literature.

Figure 2: Furnace efficiency label

The U.S. Federal Trade Commission requires that gas furnaces listed by the Gas Appliance Manufacturers Association carry this label. In addition to showing the unit's annual fuel utilization efficiency (AFUE), it also shows how that furnace compares to other brands in the same input range.



Source: U.S. Federal Trade Commission

Combustion air source. Furnaces may draw the air they require for combustion from either inside the heated space or directly from outside. Drawing air directly from outside, typically through a plastic pipe that protrudes through an outside wall, is both more efficient and safer. Sometimes this method is referred to as sealed combustion, because the gas is burned in a chamber that is closed to occupied space. This arrangement virtually eliminates any risk that combustion gasses could leak into occupied space. It does, however, require some complicated installation techniques, so check the manufacturer's installation instructions carefully.

Blower speed control. Most furnace blowers operate at a constant speed. Although that speed may be adjusted by changing wiring configurations, during furnace operation the speed never varies. Premium-efficiency furnaces, however, feature blower motors that sense how much airflow is required at any given moment and modify fan speed

accordingly. Not only do these furnaces save electricity, but they are also much quieter than their constant-speed counterparts.

HOW TO MAKE THE BEST CHOICE

this section

Pick a size that's just right. Sometimes, heating contractors oversize furnaces so that they can quickly specify a model and be guaranteed that it will maintain comfort conditions. That's bad news for their customers, who have to live with those furnaces, because an oversized furnace is noisier, less efficient, and more expensive than an accurately sized one. To make the best selection, calculate the heat load served by the furnace following the procedure from the American Society of Heating, Refrigerating and Air Conditioning Engineers' Fundamentals Handbook. Alternatively, there are many software products available that can guide you through these calculations.

Visit the Web site of the Energy Star program, sponsored jointly by the U.S. Department of Energy and the Environmental Protection Agency. The Energy Star program includes a specification for residential furnaces and offers a list of qualifying products.

Compare the cost-effectiveness of different efficiency ratings. The optimum efficiency for any given furnace depends on how often it operates and the local cost of natural gas. Introduction to Certified Furnace Efficiency Ratings (PDF), published by AHRI as part of its Directory of Certified Product Performance, contains an easy-to-follow procedure to compare furnaces with varying efficiency levels to select the most cost-effective one. This procedure is based on residential heating patterns, so you'll probably have to modify the amount of heating load hours to account for a commercial application.

If your main concerns are noise and safety, consider a premium efficiency furnace. Premium efficiency furnaces feature both sealed combustion and variable-speed blowers. They cost more but, for you, they may be worth it.

Check the manufacturer's installation instructions. In order to achieve high efficiencies, many furnaces use venting systems that were virtually unknown a decade ago. These systems are also tricky to install properly. Furthermore, premium efficiency furnaces condense water out of combustion gasses, and that condensate stream must be properly disposed of. Before buying a furnace, check the manufacturer's instructions to make sure it can be correctly installed in your building.

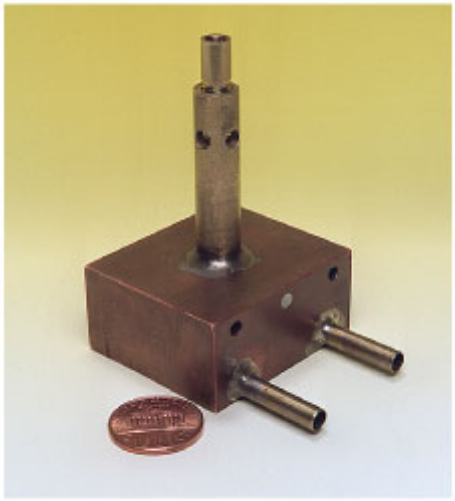
WHAT'S ON THE HORIZON?

this section

Instead of burning gas in a central location and distributing heated air throughout the building, heating systems in the future may consist of a multitude of distributed tiny gas heaters, each designed to heat just a small space. The Pacific Northwest National Laboratory has developed a MicroHeater (**Figure 3**) that is about the size of a pack of cards and is capable of combusting about 4,000 to 120,000 Btu of input gas per hour. These MicroHeaters could be incorporated into baseboard heaters and connected to gas supply mains with flexible tubing and quick-connect fittings. Such a system would effectively eliminate the thermal and electrical losses associated with furnaces, which can easily account for a quarter of their operating costs.

Figure 3: MicroHeater

The MicroHeater, developed by researchers at the DOE's Pacific Northwest National Laboratory, is 10 times smaller and lighter than conventional combustors. An array of modules can heat a house efficiently and could reduce ducting and zoning energy losses by 45 percent.



Source: Pacific Northwest National Laboratory

WHO ARE THE MANUFACTURERS?

this section

There are far more furnace manufacturers than we can list here. For a more complete list, search for furnaces in the Air Conditioning, Heating, and Refrigeration Institute's Directory of Certified Product Performance. Here are a few industry leaders:

- Lennox invented the forced air furnace and continues to put out some of the most innovative products in this market sector.
- The Carrier Corporation has an extensive product line and was first to combine premium efficiency with a variable-speed blower.
- Amana manufactures some of the most efficient residential furnaces.

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