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Consumers Guide

HEATING, REFRIGERATION and AIR CONDITIONING INSTITUTE of CANADA

Home Heating Options

Consumers Guide to Heating Options

When considering a new heating system, it is important to take your time and research the options in order to find the best system for your home. After all, choosing the right heating system is probably the most important factor in determining the comfort of your home and, as well, your heating system accounts for about 60 percent of the energy use in your home.

Types of Heating Systems

There are two major types of heating systems that are commonly used in Canadian homes: hot air or hot water heating systems.

The vast majority of homes built since the 1950s have forced-air systems which heat using gas, oil, or a propane furnace. Forced air systems work by distributing heated air throughout the home via the ductwork. In addition to providing reliable and comfortable heating, one of the advantages of forced air systems it is very easy to add air conditioning capabilities to them by mounting the air conditioning coil into the plenum above the furnace.

Many homes built prior to the 1950's feature hot water or hydronic heating systems, which typically use a boiler to supply hot water to cast iron radiators.

Hot water heating, which is widely used in Europe, is making a comeback in North America as it provides reliable comfortable heat. However, air conditioning must be added as a separate system.

Energy Sources

Before we look at the different equipment available, it's worthwhile to

take a look at the different fuels used to heat a home. Your cost of heating will vary with the region you live in and the fuel that is used to heat your home. Natural gas is the most widely used heating fuel in Canada, but it is not available in many rural areas and much of the Maritimes.

Heating oil is used in those areas and propane is also available Canada wide. However, many homes in Manitoba and Quebec are heated with electricity because it is relatively inexpensive in those provinces.

In the past, when replacing a boiler or furnace, sometimes it made sense to change to a different energy source to save money. Natural gas used to be the least expensive fuel, followed by oil, propane and then electricity. However, wide fluctuations in fuel costs have largely put an end to this practice. As a result, when one considers the cost of making a switch, it often makes monetary sense to stay with the same fuel but purchase the most efficient equipment available.

Energy Efficiency

Today's forced air furnaces and heating boilers are considerably more efficient than those of the past. If you are

replacing a furnace or boiler that is 15 or more years old, you will see a savings in heating costs.

Fuel burning heating appliances are rated by AFUE or annual fuel utilization efficiency. AFUE is a measure of how efficient the appliance is in using conventional fossil fuels (oil and gas) or electricity over the course of a year. In Canada, as of December 31, 2009, the minimum efficiency for natural gas-burning furnaces is 90 percent AFUE. The minimum efficiency for gas-fired hot water boilers is 82 percent AFUE with gas-fired steam boilers coming in at 80 percent.

Oil furnaces must achieve an AFUE of 78 percent, although most models today are typically in the low to- Mid 80s.

Oil-fired hot water boilers must achieve an AFUE of 84 percent while their steam fuelled counterparts must achieve 82 percent. It is important to keep in mind that these are minimum efficiencies – the best natural gas heating equipment achieves efficiencies in the 95-98 percentile range.

The seasonal efficiency is an important value in determining how much it is going to cost to heat your home. If a furnace or boiler has an AFUE of 90 percent, it means that 90 percent of the

heat energy in the fuel is being used and the other 10 percent is lost.

As well, with furnaces, specifying that you have a furnace with an ECM (electronically commutated motor) can save considerable electrical energy.

EnerGuide

The Government of Canada and the Heating Refrigeration and Air Conditioning Institute of Canada (HRAI) have established an industry managed energy-efficiency rating system for residential gas and propane forced-air furnaces and oil furnaces to help consumers identify the energy efficiency of different models. The label has a rating scale showing a range of efficiencies for the models that are available for sale in Canada. The higher the rating, the more efficient the model. For more information please visit <http://www.hrai.ca/energuide.html> and <http://www.hrai.ca/PDFs/energuideestar-1.pdf>

Right-sizing the System

A qualified heating contractor will help you choose the correct size heating appliance for your home. This is not as easy as it sounds. Since today's heating equipment is more efficient and because homeowners have often added insulation and upgraded windows and doors, the replacement furnace or boiler will likely be of less capacity than the one it replaces. If the home previously had a 100,000 Btu/h furnace, it is quite common to replace it with an 80,000 Btu/h model. Your contractor will do a heat/loss calculation on your home to determine the correct size. For more information visit:

<http://www.hrai.ca/PDFs/factsheets/ChosetheRightSize.pdf>

Forced-Air Furnaces

A forced-air furnace basically consists of a fan powered by an electric motor, a burner and a control system. The fan blows hot air from the burner through

ducts that are designed to distribute the heat evenly though the home. When installing a new heating system, your contractor will balance the ducts to ensure even heating.

Today's 90 percent AFUE or higher forced air furnaces are efficient, quiet and offer a high level of comfort. Virtually every component of the furnace has been designed with these goals. Add to that are sophisticated programmable controls and accessories like humidifiers and zone dampers that allow different levels of heat in different parts of the home, and forced air furnaces providing a very high level of comfort.

One thing that consumers will notice about today's furnaces is that they will run almost continuously on the coldest days of the year. But thanks to efficient burners, motors and controls, they use significantly less energy than older furnaces.

Variable Speed Motors

A Natural gas furnace requires electricity to power the blower motor. Many of today's furnaces are available with ECM (electronically commutated motor) motors. They are quieter and considerably more energy efficient than the traditional PSC (permanent split capacitor) furnace motors.

One of the best ways to reduce energy use and improve comfort levels is to specify a furnace with a variable speed motor. While both types of motors can operate at different speeds, the PSC motor operates at its peak efficiency at maximum speed and is considerably less efficient at lower speeds. ECM motors are ideally suited to variable speed operation because they operate efficiently regardless of the speed. A slower speed means less electricity consumption.

This is important, because maximum heating capacity is only needed on the very coldest days of they year. A two-stage furnace will operate on the lower stage for much of the winter, saving

considerable energy and providing a steady even heat.

It's important to note that today's furnace systems can provide not only heating, but also ventilation and cooling functions for the home. Each of these functions requires a different motor speed so that the blower can deliver the right amount of air. A variable speed motor efficiently provides these functions as follows:

Heating – requires one or two medium speeds

Cooling – requires the highest speed to deliver the heavier, cool air

Ventilation – requires the lowest speed to provide continuous circulation

In the heating mode, variable speed motors can be programmed to start slowly and then speed up as the furnace comes up to temperature, preventing an initial uncomfortable blast of cool air. The variable speed feature will also provide for better temperature control throughout the house.

In the ventilation mode, the airflow can be adjusted to ensure that the volume of air being circulated is comfortable for home occupants of the home. Too great an airflow through the ducts creates excessive noise and discomfort; this discourages the use of a traditional single-stage furnace for ventilation.

Boilers

A boiler, as opposed to a forced air system, heats using water which is distributed by pipes throughout the home to radiators or piping in the floor.

Hot water or "hydronic" heating has been making a comeback in the past 20 years. Many systems with cast iron radiators are still providing excellent service with upgraded boilers. Newer homes typically use radiant floor heating – tubing buried in the floor – or modern wall or baseboard mounted radiators to distribute the heat.

Today's boilers are more efficient than ever, with some condensing models operating in the mid 90 percent AFUE

range. As well they are more compact, with some models mounted to the wall.

And because they provide a ready supply of hot water, many homes with hydronic heating use the boiler to heat domestic hot water as well through an indirect storage tank.

Zoned Systems

Sometimes it is necessary to provide different levels of heat in different areas of the home. This is called zoning. It has been around for some time, but seldom used in homes due to the added cost and complexity.

However, new controls and better equipment have made it relatively easy to create separate heating zones with either forced air or hydronic systems.

A system that provided different zones for each room would be complex; this is more often done on a floor-by-floor basis, providing additional heat to the basement if it is too cold or less to an upper floor that can be too hot. Each floor or zone has its own thermostat.

Combined Systems

Some homes combine forced air and hydronic heating systems; typically these replace the furnace with an air handler, which like a furnace has a blower and motor, but not a burner.

Heat is provided by a boiler through a heating coil in the air handler, which distributes the warm air through ducts. Some of these homes have radiant floor tubing installed in the basement floor slab, which keeps the basement warm but the remainder of the home is, effectively, a forced air system.

This allows the installation of an air conditioning coil in the air handler, just as it would be in a conventional forced air furnace.

Venting

Many of today's high efficiency furnaces and boilers don't require a conventional chimney for venting. Instead, they are vented through a plastic pipe

conveniently located on the sidewall of the home. Since the exhaust of a condensing appliance is quite low temperature, manufacturers and contractors have used a number of different types of plastic pipe over the years. ABS, PVC and CPVC being the most commonly used.

However, since 2007, all plastic piping used for residential furnace and boiler venting must conform to the ULC S636 (standard), or in other words, it must have been specifically tested and approved for venting gas burning appliances.

Programmable Thermostats

The homeowner can save considerably on fuel costs and improve the comfort of their home by having a contractor install a programmable thermostat. This allows the homeowner to keep the home cooler during the evening or when it is unoccupied: in addition to automatically bringing the temperature up to a comfortable level when the residents are at home and active.

Draft Proofing and Insulation

Be sure to look at where you can draft proof and insulate your home prior to having your heating system upgraded or changed. Insulating, caulking and weather stripping will reduce the amount of heat needed to keep your home comfortable; additionally it will help your home to stay cooler during the summer months.

Installation Considerations

A qualified contractor will guide you in the purchase of the best equipment for your home and your budget. And his qualified technicians will ensure that the installation is done properly, safely and meets all code requirements.

Consider consulting a member of the Contractors Division of the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI).

HRAI contractors are required to carry relevant trade, fuel safety and municipal

licenses as well as workers compensation and liability insurance. They must adhere to a code of ethics, including developing and maintaining an understanding of proper equipment selection.

A Contractor Locator on the HRAI website at www.hrai.ca will guide you to a list to qualified contractors in your area. If you do not have web access, call 1-800-267-2231, ext. 233, for a list.