

Understanding Energy Star: Furnaces

By Stacey Hawkins

Many people know that buying an Energy Star® home will save them money on their utility bills and reduce the negative impact they have on the environment, but to understand why Energy Star homes are the way to go when purchasing a home, it's vital to understand what makes these homes truly more efficient.

Despite the popular myth that creating an Energy Star home is all about increasing a home's insulation, an Energy Star home is essentially a system, made up of many different components that work together to achieve not only energy efficiency, but a healthy, comfortable home.

Throughout the *Understanding Energy Star* series, Victor Fiume, general manager of The Durham Group and past president of the Ontario Home Builders' Association (OHBA) will explain the components that create an Energy Star Home, including Proper Sealing of the Outside Walls and Roof, Furnaces, Heat Recovery Ventilators (HRVs), Windows, Appliances, Below and Above Grade Insulation, Framing Techniques, Furnace Ducting and Return Air Systems, and Passive Solar Energy Techniques. Homeowners in the resale market can also reap the benefits of energy efficiency by incorporating some of the components into their homes.

This week, the focus is on furnaces and air conditioners, and the difference a properly sized furnace and air conditioner can make, not only on monthly bills, but on the quality of air in the home.

A furnace is sized according to how much the interior conditioned air is affected by the exterior temperature. This is commonly referred to as heat loss or gain and is affected not only by the outside temperature, but also by how well sealed your home is, how well it is insulated and how efficient your windows are. In effect the furnace or air conditioner needs to be sized according to how much energy is required to maintain the interior temperature.

There are many other variables which affect the heat gain or loss, all of which are measured and included in the calculations of sizing a furnace properly in an Energy Star home. Traditional homes have furnaces that are selected using a formula based on a small fraction of the variables that need to be taken into consideration. Therefore the furnaces in traditional homes tend to be oversized.

In an Energy Star home, a Blower Door Test is performed. All of the air is sucked out of the house, and the time it takes to replace the air is measured. The test results provide the builder with an exact figure, and they are able to determine the exact sized furnace required to heat the home. Air leakage is a major component to determining the size of a furnace. The same principles

apply to air conditioners. In traditional homes, the size is determined based on an estimate, but in an Energy Star home, the exact size is known.

Having a properly sized furnace and air conditioner can lead to substantial savings. For example, a home running a properly sized 60,000 BTU furnace saves more than \$300 a year compared to an oversized 80,000 BTU furnace. An oversized air conditioner cycles very quickly, and the motor uses a lot of electricity with the constant start up, much more than if it was running consistently.

AAA furnaces require a blower motor to distribute the air throughout the home; Energy Star homes have furnaces that use direct current (DC) motors, as opposed to the alternating current (AC) motors in traditional furnaces. A DC motor is variable speed, whereas an AC motor which has only two speeds; off and high. When a furnace equipped with an AC motor starts up, cold air is blown through the registers at first, because the heating chamber has not had ample time to warm up.

So essentially, the furnace uses gas and electricity to blow cold air into the home. A furnace using a DC motor picks up speed as the chamber heats up,



meaning it produces a constant yet slower stream of warm air from the start. Once the chamber is hot, the furnace ramps up to full speed, providing a more consistent heat. An AC motor costs approximately \$325 per year to run 24/7, compared to DC motor's cost of approximately \$60. A furnace with a DC motor will save a homeowner the most money on days where the temperature hovers around zero degrees, as it will stay on the low fire setting.

Many Energy Star homes have furnaces with Dual Stage gas burners; low fire and high fire. Much the same as your car, without a Dual Stage burner you are asking your furnace to gun it from stop sign to stop sign and then slamming on the breaks. Maintaining a steady speed achieves better efficiency.

"There's an immediate payback to Energy Star," says Victor. "It doesn't cost any more to live in a better home."

Next week: **Furnace Ducting and Return Air Systems**