

COLUMN FOR MARCH 25, 2006.

HEADLINE; UNDERSTANDING HEAT PUMPS

Q; I am trying to read up on heating systems to improve our present heat costs. I read heat pumps are efficient, can you explain these systems and how they work?

A: In the drive to conserve energy, solar heat pump systems are currently getting a lot of press. The geo-thermal systems are also being looked at, especially in new home construction on larger lots or in the country. The catch is they are expensive. One installer I know told me a solar system for residential hot water alone can hit the 4-6000.00 mark. A solar-geothermal system for a new home can easily hit the 20,000.00 plus mark, they are not cheap and recovering this cost would mean the homeowner should plan on living in the home for a number of years.

I think the first thing to understand is the different type of heat pumps. The oldest type of heat pump used residentially is the air source heat pump. This is a system that runs on electricity that extracts heat from the air and transfers it thru the actual external pump to heat or cool the coils. The coils are filled with refrigerant that is altered from a liquid to a gas under pressure and circulated thru the compressor. Refrigerators and your air conditioner are heat pumps, operating in the cooling cycle only. Your refrigerator is an insulated box with series of evaporator coils inside the box, operated by a pump. They withdraw the heat from the box and transfer it to the condenser coils mounted on the back of your refrigerator. This heat must dissipate for the unit to work correctly. This is why refrigerator manufacturers recommend a space between the wall and the frig. An air source heat pump has basically the same function, only it has the ability to reverse its operation to both heat and cool your home. There is always some amount of heat in the air, no matter how cold it gets. During our Canadian Winters thought they reach a point where they are not efficient. This balance point as it is called is just below freezing. They were also not recommended for use in Northern Ontario, Quebec and most of the Prairies due to the seasonal heating calculations vs. their efficiency. Every home I have been in with one of these units has a back-up heat source. Usually an electric furnace was installed to supplement the heat pump although I have seen the odd fossil fuel furnace. These systems were popular back in the 80's when electricity was cheaper; today they have lost their popularity due to the cost of electricity. The other negative was their cost, one contractor I spoke to said that they run over 3000.00 today. They also have approximately the same life span as an air conditioner, between 15-20 years.

The next type of heat pump is called the geothermal or ground source heat pump. These systems extract the heat from the ground to heat or cool the home. A series of pipes are laid underground in a closed loop pattern. I have seen these done by trenching the ground, approximately 4-6 feet deep and the plastic lines laid in a closed loop. I have heard where they have drilled deep holes and installed these in a vertical fashion. These high-density plastic lines are then usually filled with an antifreeze solution that is considerably more efficient in collecting heat than water. There are some systems that are filled with water though. I have heard of a system called the Direct Expansion that uses a refrigerant instead of antifreeze. This liquid is then cycled to an indoor heat pump and then passes over the refrigerant-filled primary heat exchanger to create the heat or cooling required.

The other type of earth system is an open loop system that requires two wells to operate. Water is drawn from the first well and circulated thru the heat pump; it transfers this heat to the indoor coil. You will have a fan forced ducting system that this coil is mounted within and it distributes the heat through your home. As a rule of thumb, well water is approximately 5-10 degrees Celsius. The water is then discharged back into the other well. These wells are usually about 100 feet apart. The most important consideration with this system is the volume of water in the supply well. A couple of systems that I know of require a minimum of 12 gallons a minute to operate. Most of these systems that I see are in the country, often at lake or river front homes where the well supply is adequate.

The most recent system is the solar-geothermal system. These systems use a combination of roof top solar panels and ground source-looped tubing. A series of wells are drilled, three is most common and then they

install a closed loop tubing system. A heat absorbing liquid fills the tubing. This system then draws the cool from the ground in the summer and in the winter it draws the stored heat from the solar panels that has been stored in the ground. This system uses the heat generated from the heat pump and compressor to heat the hot water in the home. Recent technical information that I have seen on these systems estimate that a 2400 square foot home could reap a savings of over 2000.00 annually vs. a conventional heating & cooling system including the operational cost of a gas hot water heater. This is very new technology and base standards are just now being established. If you would like more info on this, go to geo-exchange.ca. I have a supply of booklets on Heat Pumps; if anyone would like a free copy, send me an e-mail with your land address.

Last week I asked what a drip board was. The answer was A) a wide trim board above a door lintel in a heritage doorframe. This week we test your old home knowledge again. Victorian Homes often had corner tower, what was the roof called? Was it; A) a Cone Roof B) a Funnel Roof C) a Conical Roof D) a Corbel Roof. The answer next week.

Cam Allen L.I.W. RHI is a former builder/contractor and now teaches Heritage Home Inspection. He can be reached at cam.allen@sympatico.ca