

The Mighty Heat Pump

On average, ground-source heat pumps are 51 percent more efficient than traditional heating and cooling units.

by **Brenda Kleinjan**

WHEN SPEARFISH, S.D., BUILDER DONOVAN Lerew was looking for a heating system for a new development of affordable housing in the Reserve at Higgins Creek, inspiration was just across the street at the Spearfish office of his local electric cooperative.

"I wasn't really familiar with heat pumps before, but in talking with local heating and plumbing contractors, they said they're the highest efficiency," said Lerew, who then turned to Butte Electric Cooperative, which has a branch office in Spearfish, for more information.

After learning more about the efficiency of the systems, Lerew realized it would be a good fit for the project's goal: to build starter homes that people could afford to live in.

Heat pumps move heat from place to place rather than creating it. An air-source heat pump moves heat inside or outside the home through a compression and refrigeration system.

"We thought it would be the most affordable option," said Lerew of the heat pumps.

Lerew had teamed up with South Dakota Real Estate and Housing Development, Inc., a nonprofit housing developer in Rapid City, on the

project to build 17 homes all with a price tag of \$132,000 to \$137,500. Homeowners could choose upgrade options, such as the heat pumps, flooring upgrades and so on, but the total cost would not exceed \$160,000.

"Our goal was to build affordable housing," said Jennifer Oberg, housing coordinator for South Dakota Real Estate and Housing

"This was our first experience with heat pumps. It snowballed into making the homes all-electric. We hadn't previously done heat pumps," said Oberg. "From here on out, we'll make the recommendation to use them."

The heat pump choice was a win for the homeowners, too, Oberg said.

"They felt they were making a really wise choice in being more conservative on their heating," said Oberg. The heat pump was an optional upgrade to the houses. All 17 of the homeowners chose the option.

All 17 homes in the Spearfish development were sold in an eight-month period in 2008.

Lerew's experience with the systems is one he's building on, literally.

"I'm building my own house now and I'm going



all electric,” said Lerew.

While Lerew used air-to-air heat pumps in the project, ground-source – or geothermal – heat pumps also provide even greater savings, but may have more upfront costs.

A geothermal heat pump is an electric heat pump that draws heat from or discharges heat to the ground or ground water, instead of air. The concept works because the temperature of ground 10 to 12 feet below the Earth’s surface stays a relatively constant 55 degrees Fahrenheit. In a closed-loop system, a fluid is pushed through an underground piping system which receives heat from or discharges heat to the Earth.

According to the Cooperative Research Network, an ENERGY STAR® labeled geothermal heat pump uses 40 percent to 60 percent less energy than a standard air-source heat pump. CRN also noted that a ground-source heat pump can yield annual energy savings between 31 percent and 71 percent, compared to conventional systems. On average, they are 51 percent more efficient than traditional heating and cooling units.

The increased investments for a geothermal heat pump may be recouped in two to 10 years, according to Department of Energy information cited by CRN.

According to the federal Energy Information Administration, more than 63,500 geothermal heat pumps were shipped in the United States in 2006, the most recent year statistics were available for. In April, figures for 2007 will be released.

In eastern South Dakota and western Minnesota, cooperative members installed a record 1,595 heat pump systems – both air-source and ground-source – in 2008, a 39 percent increase from previous years.

Your local electric cooperative has a wealth of knowledge about the advantages of heat pumps and may also offer incentives or special electric heat rates to qualified systems.

Federal and state tax incentives or loans may also be available to help homeowners install the efficient heat pumps.

The federal Emergency Economic Stabilization Act of 2008 included a number of tax credits for energy efficient installations. Among the credits is for any homeowner who installed a geothermal system after Jan. 1, 2008. If the unit meets ENERGY STAR criteria, the homeowner may qualify for an income tax credit of 30 percent of the cost, up to \$2,000. (For more information, go to www.energystar.gov.)

Additionally, state incentives are also available for heat pumps. In South Dakota, homeowners and commercial properties can qualify for a property tax exemption for

the installation of renewable energy systems, including geothermal heat pumps. For more information, visit <http://puc.sd.gov/energyefficiency/default.aspx>. In Minnesota, geothermal installations in residential systems may be eligible for a loan program through the Minnesota Housing and Finance Agency. For more information, visit www.thenec.org/energy_financing/index.php?strWebAction=article_detail&intArticleID=222 or call 651-221-4462.

Operating and Maintaining Your Heat Pump

Proper operation of your heat pump will save energy. Do not set back the heat pump’s thermostat if it causes the backup heating to come on; backup heating systems are usually more expensive to operate. Continuous indoor fan operation can degrade heat pump performance unless a high-efficiency, variable-speed fan motor is used. Operate the system on the “auto” fan setting on the thermostat.

Like all heating and cooling systems, proper maintenance is key to efficient operation. The difference between the energy consumption of a well-maintained heat pump and a severely neglected one ranges from 10 percent to 25 percent.

Clean or change filters once a month or as needed and maintain the system according to manufacturer’s instructions. Dirty filters, coils and fans reduce airflow through the system. Reduced airflow decreases system performance and can damage your system’s compressor. Clean outdoor coils whenever they appear dirty. Occasionally, turn off power to the fan and clean it; remove vegetation and clutter from around the outdoor unit. Clean the supply and return registers within your home and straighten their fins if bent.

You should also have a professional technician service your heat pump at least every year. The technician can do the following:

- Inspect ducts, filters, blower and indoor coil for dirt and other obstructions
- Diagnose and seal duct leakage
- Verify adequate airflow by measurement
- Verify correct refrigerant charge by measurement
- Check for refrigerant leaks
- Inspect electric terminals and if necessary, clean and tighten connections and apply nonconductive coating
- Lubricate motors and inspect belts for tightness and wear
- Verify correct electric control, making sure that heating is locked out when the thermostat calls for cooling and vice versa
- Verify correct thermostat operation

http://apps1.eere.energy.gov/consumer/your_home/space_heating_cooling/index.cfm/mytopic=12690

Left: Heat pumps offer energy-efficient alternatives for homeowners’ heating and cooling needs. Photo Courtesy of Bryant Heating and Cooling Systems