Geothermal hot water heating systems

Types of Geothermal Heat Pump Systems

Geothermal heat pumps are one of the most efficient ways to heat and cool your home. Is it the right HVAC system for you?

Heat pumps are some of the most energy efficient heating systems available today. They’re also eco-friendly HVAC options because they don’t burn gas or oil to operation and they use far less electricity than other systems. The main downside is that they can be expensive to install, but with significant rebates and tax incentives available, combined with the cost savings they offer over the years, it’s an increasing popular option for homes to buy a heat pump.

A geothermal heat pump draws heat from the ground and releases it in your home. They’re vastly more efficient than conventional heating systems because a heat pump doesn"t burn fuel to create warmth; it simply moves existing heat from one place to another. And because temperatures underground remain a relatively constant 50 degrees F year round, the system requires a lot less energy to cool your home than conventional air conditioning systems or air-source heat pumps, which use outside air as a transfer medium.

Air-source heat pumps are the most common, and they’re also the most affordable to install. Water-source heat pumps are also available.

It works a little like a refrigerator which removes heat from its interior and transfers it to your kitchen. A geothermal heat pump uses the same principle, but it transfers heat from the ground to your house (or vice versa). It does this through long loops of underground pipes filled with liquid (water or an antifreeze solution). The loops are hooked up to a geothermal heat pump in your home, which acts as a furnace and an air conditioner.

During the heating season, the liquid pulls heat from the ground and delivers it to the geothermal heating and cooling unit and then to refrigerant coils, where the heat is distributed through a forced-air or hydronic system. During the cooling season, the process runs in reverse. The pump removes heat from your house and transfers it to the earth. Many units can provide domestic hot water as well.

The three closed-loop systems shown below are the most common. There is also a less common open-loop system that circulates surface water or water from a well through the system and returns it to the ground through a discharge pipe.

The best system, loop length and design for a particular home depend on factors such as climate, soil conditions, available land, required heating and cooling load, and local installation costs at the site.

Layered coils or straight runs of polyethylene pipe are placed in six-foot-deep trenches. This is the ch

eapest underground option, but it requires a lot of open space. A 2,000-sq.-ft. house requires 400 ft. of two-foot-wide trenches.

A vertical system is used when space is limited. Four-inch-diameter holes are drilled about 15 ft. apart and 100 to 400 ft. deep. Two pipes are inserted and connect at the bottom.