



Geothermal Concept



THE GEOTHERMAL CONCEPT

THE GLOBAL LEADER

For more than fifty years ClimateMaster has serviced the needs of the commercial and residential construction industry worldwide with the most comprehensive line of water source and geothermal heat pumps available anywhere.

ClimateMaster's state-of-the-art facilities in Oklahoma City, Oklahoma reflects the Company's commitment to its customers, employees, and products. The company stresses quality in its modern 610,000 square foot facilities through extensive quality control programs.

A total commitment to excellence is why ClimateMaster is the world's leader in design and manufacture of water source and geothermal heat pumps. We build quality heat pumps for life... the life of buildings and the people who use them.

Visit us at climatemaster.com to learn more about geothermal heating and cooling systems.

THE GEOTHERMAL CONCEPT

Building owners across North America are searching for better ways to get more out of their energy dollar. Many have found that the geothermal heat pump can help. Geothermal energy not only costs less to operate than any other heating and cooling system, but it also helps preserve our natural resources and lessens our dependency on fossil fuels.

This brochure has been developed as a guide to introduce you to geothermal technology. Using a question and answer format, we've tried to provide you with the most popular topics requested by engineers.

WHAT IS A GEOTHERMAL HEAT PUMP?

Q: What is a geothermal heat pump?

A: A geothermal or "ground-source" heat pump is an electrically powered device that uses the natural heat storage ability of the earth and/or the earth's groundwater to heat and cool the occupied space.

Q: How does it work?

A: Like any type of heat pump, it simply moves heat energy from one place to another. A refrigerator works using the same scientific principle. (See "How is a geothermal heat pump like a refrigerator?" on page 3.) By using refrigeration, the geothermal heat pump removes heat energy stored in the earth and/or the earth's groundwater and transfers it to the building.

Q: How is heat transferred between the earth and the building?

A: The earth has the ability to absorb and store heat energy. To use that stored energy, heat is extracted from the earth through a liquid medium (water or an environmentally safe antifreeze solution) and is pumped to the heat pump heat exchanger. There, the heat is used to heat the building. In summer the process is reversed, and indoor heat is extracted from the building and transferred to the earth through the liquid.

Q: You mentioned heating and cooling. Does it do both?

A: One of the things that make a heat pump so versatile is its ability to be a heating and cooling system in one. The unit will change from one mode to another based on the room setpoint or building management system. Throughout the day, heat can be transferred from the earth to the building, or heat can be transferred from one part of the building to another part of the building. Plus, a geothermal heat pump can assist in heating hot water year-round.

Q: Do I need separate ground loops for heating and cooling?

A: No. The same loop works for both. When changing from heating to cooling, or vice versa, the flow of refrigerant is reversed inside the unit allowing one unit and one ground loop to heat and cool the space.

THE GEOTHERMAL CONCEPT

Q: What types of loops are available?

A: There are two main types: open and closed. Both of these loops will be addressed later in the brochure.

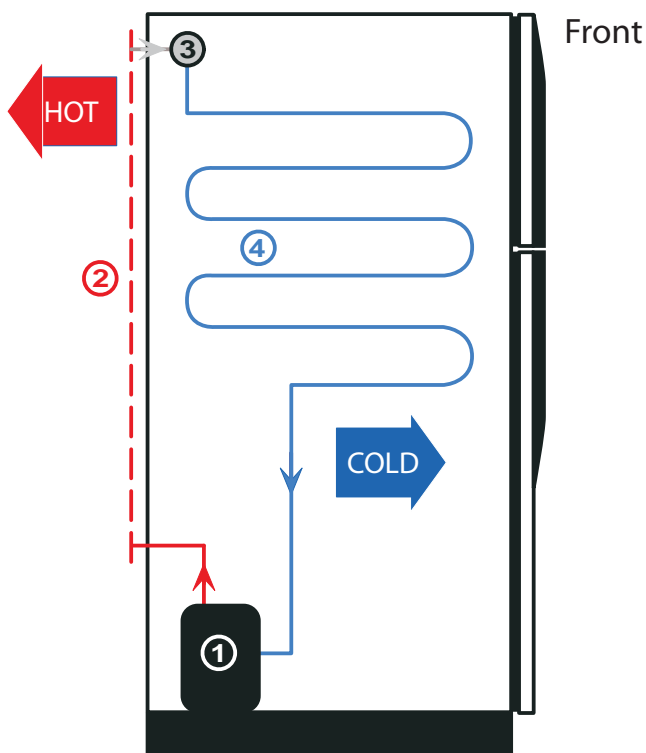
Q: Does the underground pipe system really work?

A: The buried pipe, or “ground loop”, is the biggest technical advancement in heat pump technology to date. The idea to bury pipe in the ground to gather heat energy began in the 1940s. But it’s only been in the last twenty-five years that new heat pump designs and improved pipe materials have been combined to make geothermal heat pumps the most efficient heating and cooling systems available.

HOW IS A GEOTHERMAL HEAT PUMP LIKE A REFRIGERATOR?

Like a refrigerator, a geothermal heat pump simply transfers heat from one place to another. When a refrigerator is operating, heat is being carried away from the inside food storage area to the outside. Therefore, cooling is not being added to the inside; heat is being taken out.

To understand the operation of a geothermal heat pump, it helps to understand how a refrigerator works. A refrigerator uses a refrigeration circuit with four



main components, a compressor (1), a condenser (2), an expansion device (3), and an evaporator (4). Refrigerant is pumped through the circuit to transfer heat from the inside of the refrigerator to the outside. The compressor (1) is the pump; it moves and pressurizes the refrigerant gas. Since temperature and pressure are directly related, as the pressure increases, the temperature increases. The high temperature/high pressure gas flows from the compressor to the condenser (2). The cooler air outside the refrigerator (relative to the temperature of the refrigerant, 150 to 180°F) causes the refrigerant to condense into a liquid. When two surfaces at different temperatures touch (or are very near – separated only by tubing), the hotter surface cools and the cooler surface warms. This is a law of physics called the second law of thermodynamics. The condenser therefore releases heat to the outside.

The next step in the process involves the expansion device (3). The expansion device is a small orifice that the refrigerant is forced through. The small hole creates a pressure differential between the two sides of the device. Think of an expansion device like a dam on a river with a hole in the dam. The water leaking through the hole is at a low pressure on the downstream side; the water on the other side (being held back by the dam) is at a high pressure. Once again, the pressure/temperature relationship (lower pressure/ lower temperature) creates a cold, low pressure liquid refrigerant that gets fed to the evaporator (4).

As warm air inside the refrigerator (relative to the very cold temperature of the refrigerant) passes through the evaporator coil (4), the hotter surface (air inside the refrigerator) gets cooler, and the cooler surface (refrigerant in the evaporator (4) tubing) gets warmer. The liquid refrigerant evaporates back into gas form, and the cycle starts over again as the refrigerant enters the compressor (1). The evaporator therefore absorbs heat from the inside of the refrigerator, which keeps the food cold.

An air conditioner or refrigerator transfers heat in only one direction. A heat pump can transfer heat in two directions, thereby heating or cooling the space. Most heat pumps heat or cool the air. Some heat pumps heat

THE GEOTHERMAL CONCEPT

or chill water. An additional component, a reversing valve, is added to a heat pump, which allows the refrigerant to change direction, allowing the space that was being cooled to be heated.

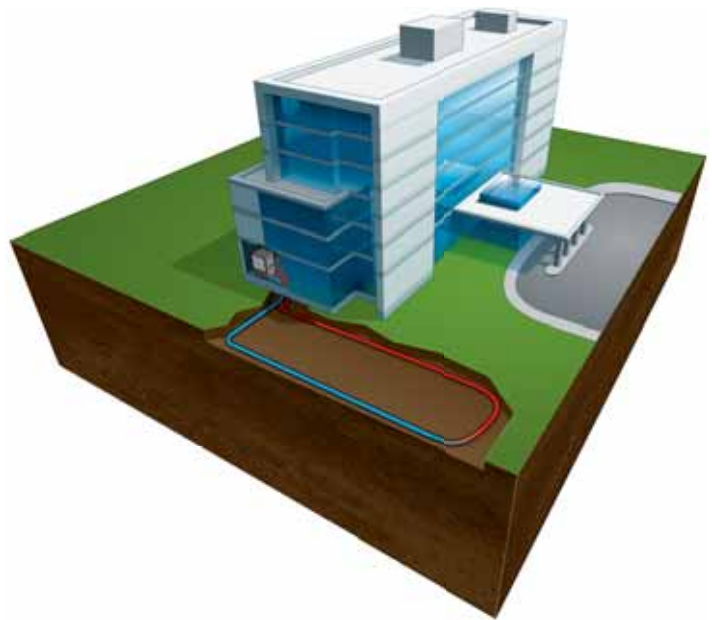
A geothermal heat pump has a compressor, a condenser, an expansion device, and an evaporator like a refrigerator, but also includes a reversing valve to allow both heating and cooling. The big difference between a refrigerator or traditional air conditioner and a geothermal heat pump is the way heat is transferred. A geothermal heat pump transfers heat between the refrigerant circuit and the ground instead of between the refrigerant circuit and the air. The ground is a much milder heat source, since the temperature changes very little over the course of the year. The outside air temperature, however, varies significantly over the year, making a geothermal heat pump much more energy efficient than a traditional air conditioner or heat pump. A geothermal heat pump compressor also operates at lower pressures because of the milder heat source/heat sink (the ground), helping provide longer life expectancies.

A geothermal heat pump is like a refrigerator in many ways. The simplicity of refrigerator technology coupled with the stable temperature of the Earth provides quiet, reliable, and energy efficient heating and cooling systems for even the most complex buildings.

GEOTHERMAL HEAT PUMPS: CLOSED-LOOP SYSTEMS

Q: What is a closed-loop system?

A: The term “closed-loop” is used to describe a geothermal heat pump system that uses a continuous loop of buried High Density Polyethylene (HDPE) pipe as a heat exchanger. The pipe is connected to the indoor heat pump to form a sealed, underground loop through which water or an antifreeze solution - depending on geographical location - is circulated. Unlike an open-loop system that consumes water from a well, a closed-loop system recirculates its heat transferring solution in pressurized pipe.



Q: Where can this loop be located?

A: That depends on land availability and terrain. Many times, the loops can be installed vertically using a drill rig, much like a water well installation. If adequate space is available, the closed-loops can be trenched horizontally in an area adjacent to the building.

Q: How deep and long will the horizontal trenches be?

A: Trenches are normally four to six feet deep. One of the advantages of a horizontal loop system is being able to lay the trenches according to the shape of the land. As a rule of thumb, 125 - 300 feet of trench are required per ton of heat pump capacity. Unless there is a high water table, on larger commercial projects, a vertical bore field will typically perform better due to large amount of heat rejection into the earth. Your design engineer can determine your exact needs based on your geography and soil conditions.

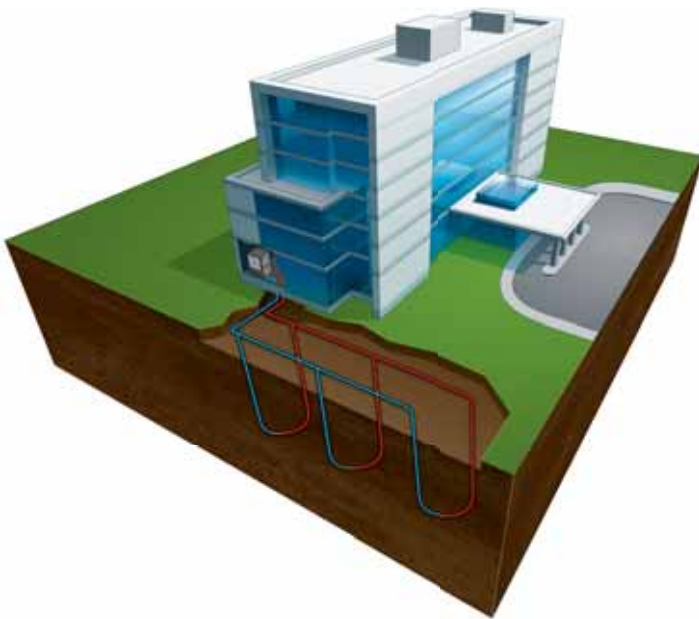
Q: How deep are the bore holes for a vertical loop?

A: Closed-loop systems using vertical holes are bored to about 150 - 400 feet per ton of heat pump capacity. U-shaped loops of pipe are inserted in the holes. The holes are then back-filled with a sealing solution (grouting material).

THE GEOTHERMAL CONCEPT

Q: How long will the loop pipe last?

A: Closed-loop systems should only be installed using the appropriate high-density polyethylene (HDPE) pipe. Properly installed, these pipes will last over 50 years (the material is guaranteed for 50 years by the manufacturer). PVC pipe should never be used for a ground loop under any circumstances.



Q: How are the buried pipe sections of the loop joined?

A: The only acceptable method to connect pipe sections is by thermal fusion. Pipe connections are heated and fused together to form a joint stronger than the original pipe. Mechanical joining of underground pipe for an earth loop is never an accepted practice. The use of barbed fittings, clamps and glued joints is certain to result in loop failure due to leaks.

Q: Will an earth loop affect the surrounding landscape?

A: No. Research has proven that loops have no adverse effect on grass, trees, or shrubs. Most horizontal loop installations use trenches about 3 feet or less wide. This, of course, will leave temporary bare areas that can be restored with grass seed or sod. Vertical loops require even less

space and result in minimal damage to landscaping. Once the drilling is complete, the disturbed area is repaired and the landscaping is replaced.

Q: If the loop falls below freezing, will it hurt the system?

A: No. The antifreeze solution used in loops that operate at low temperatures will keep it from freezing down to about 15°F fluid temperature. In the U.S. and Canada, three types of antifreeze solutions are acceptable: propylene glycol, methyl alcohol, and ethyl alcohol. Some states/provinces may require one type over another.

Q: I have a pond near my building. Can I put a loop in it?

A: Yes, if it's deep enough and large enough. A minimum of 15 - 20 feet in depth at its lowest level during the year is needed for a pond to be considered. In pond loops, polyethylene pipe or a plate-frame heat exchanger must be used. Generally, a minimum of 0.01 acre per ton is required to provide adequate surface area for heat transfer. Your design engineer can determine the required size for your exact needs based on your building layout, geography, and pond size.



THE GEOTHERMAL CONCEPT

GEOTHERMAL HEAT PUMPS: OPEN-LOOP SYSTEMS

Q: What is an open-loop system?

A: The term “open-Loop” is commonly used to describe a geothermal heat pump system that uses groundwater from a conventional well as a heat source in winter and a heat sink in summer. The groundwater is pumped through the heat pump where heat is extracted (in winter) or rejected (in summer) then the water is disposed of in an appropriate manner. Since groundwater is at a relatively constant temperature year-round, it is an excellent heat source/heat sink. Groundwater is often pumped through a cleanable heat exchanger first, and then an additional pump pushes water from the other side of the heat exchanger to all water-source heat pumps so the water-source heat pump loop remains a closed system.



Q: What do I do with the discharge water?

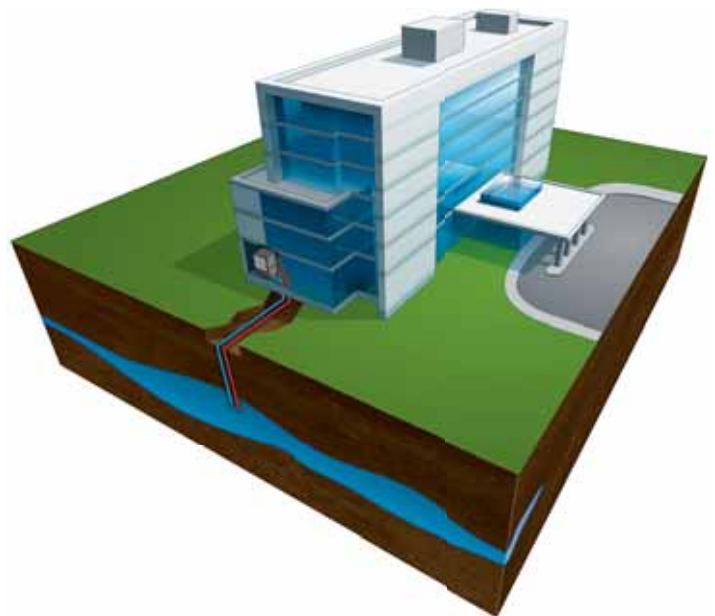
A: There are a number of ways to dispose of water after it has passed through the heat pump. The open discharge method is the easiest and least expensive. Open discharge simply involves releasing the water into a stream, river, lake, pond, ditch, or drainage tile. Obviously, one of these alternatives must be readily available and must possess the capacity to accept the amount of water

used by the heat pump before open discharge is feasible. Check with local authorities to determine if any restrictions apply in your area.

A second means of water discharge is the return well. A return well is a second well bore that returns the water to the ground aquifer. A return well must have enough capacity to dispose of the water passed through the heat pump. A new return well should be installed by a qualified well driller. Likewise, a professional should test the capacity of an existing well before it is used as a return.

Q: How much groundwater does an open-loop system need?

A: Geothermal heat pumps used in open-loop systems need differing amounts of water depending on the total size of the heating and cooling system. The water requirement of a specific model is usually expressed in gallons per minute and is listed in the specifications for each unit. Your design engineer can determine the required flow rate for your exact needs based on your building layout, geography, and soil conditions.



The well and pump combination should be large enough to supply the water needed by the heat

THE GEOTHERMAL CONCEPT

pump in addition to the buildings domestic water requirements. Your design engineer should verify or modify the building plumbing to supply adequate water to the heat pump.

Q: What problems can be caused by poor water quality?

A: Poor water quality can cause serious problems in open-loop systems. Your water should be tested for hardness, acidity, and iron content before a heat pump is installed. Your contractor can tell you what level of water quality is acceptable.

Mineral deposits can build up inside the heat pump's heat exchanger. Sometimes a periodic cleaning with a mild acid solution is all that's needed to remove the build-up.

Impurities, particularly iron, can eventually clog a return well. If your water has high iron content you should be sure that the discharge water is not aerated before it's injected into a return well.

Finally, you should opt against using water from a spring, pond, lake, or river as a source for your heat pump system unless it's proven to be free of excessive particles and organic matter. They can clog a heat pump system and make it inoperable in a short time.

If water quality is a concern, a closed-loop system should be used.

Q: Does an open-loop system cause environmental damage?

A: No. They are pollution free. The heat pump merely removes heat from or adds heat to the water. No pollutants are added whatsoever. The only change in the water returned to the environment is a slight increase or decrease in temperature.

Q: Are there any laws that apply to open-loop installations?

A: In some localities, all or parts of the installation may be subject to local ordinances, codes, covenants or

licensing requirements. Check with local authorities to determine if any restrictions apply in your area.

GEOTHERMAL HEAT PUMPS: PARTS OF THE SYSTEM

Q: What are the components of a geothermal heat pump system?

A: The three main parts are the heat pump unit, the liquid heat exchange medium (open or close loop), and the air delivery system (ductwork).

Q: Are all geothermal heat pumps alike?

A: No. There are different kinds of geothermal heat pumps designed for specific applications. Many geothermal heat pumps, for example, are intended for use only with higher temperature ground water encountered in open-loop systems. Others will operate at entering water temperatures as low as 20°F which may be required for closed-loop systems.

Q: Can a geothermal heat pump also heat water for my building?

A: Yes. Using what's called a Hot Water Generator (HWG), some types of geothermal heat pumps can save up to 50 percent on water heating costs by pre-heating tank water. Depending on the heat pump model chosen, the HWG may be a factory-installed option. In addition, special water-to-water geothermal units dedicated to water heating only are available.

Q: Is a geothermal heat pump system difficult to install?

A: Geothermal units are no more difficult to install than any other forced-air system. In many cases installation is easier due to the elimination of a fossil fuel furnace and thus, no need to vent exhaust gases.

Ductwork may be installed in a building without an existing air distribution system. The specific requirements of installing ductwork will vary and should be assessed by a contractor.

THE GEOTHERMAL CONCEPT

Q: Can existing ductwork be reused with a geothermal system?

A: In all probability, yes. Your engineer should be able to determine ductwork requirements and recommend any modifications, if needed.

Q: Do I need to increase the size of my electric service?

A: Geothermal heat pumps don't use large amounts of resistance heat, so your existing service may be adequate. Your design engineer can determine your exact electrical service needs.

GEOTHERMAL HEAT PUMPS: THE MAJOR BENEFITS

Q: How efficient is a geothermal heat pump?

A: Geothermal heat pumps are 3.5 - 5 times as efficient as the most efficient fossil fuel furnace. Instead of burning a combustible fuel to make heat, they simply move heat that already exists. By doing so, they provide 3.5 - 5 units of energy for every unit used to power the heat-pump system.

Q: What does a system like this cost?

A: A system for the typical building may cost more than if you bought a typical Variable Air Volume (VAV) or Roof-top air conditioning systems. But you wouldn't be comparing "apples to apples". To get an accurate comparison of costs you need to consider the following:

- Payback, or how long it takes to recover the difference in costs between the two systems using energy savings.
- Payback for most geothermal heat pump systems runs three to five years with tax incentives.
- Total operating savings from heating, cooling, and hot water must be combined to get an accurate picture of total energy savings.
- Energy costs and availability, both present and

future.

- Maintenance costs and system reliability.
- System lifespan.
- Energy analysis software such as eQuest® can calculate annual operating costs for geothermal systems and compare to other system technologies.

Q: What about comfort?

A: In winter, a geothermal heat pump system moves warm air (90° - 105°F) throughout the building via a standard duct system. Typically, a very even comfort level is found throughout each zone. This is because the warm air is moved in slightly higher volumes and, therefore, saturates each zone with warmth more evenly. This even helps out hot or cold spots, and eliminates the hot air blasts common with typical fossil fuel furnaces.

In summer, cool, dehumidified air is dispersed through the same duct network. It's also a great comfort to know that you've reduced your energy consumption while using an inexhaustible energy source - the earth.

Q: Can I get a tax credit for installing this system?

A: Yes. Geothermal systems are considered by the Department of Energy (D.O.E.) as a renewable energy source and Federal incentives are in place to encourage the use of such systems. Currently a tax credit of 10% of the total investment for all ground loop and geothermal heat pump installations is in place. Many individual states also offer incentives for the use of Geothermal. Visit www.dsireusa.org for a current listing of state incentives.

Q: Which system is best, open- or closed-loop?

A: The net results in operating cost and efficiency are virtually the same. Which system to choose depends mainly on whether you have an adequate groundwater supply and means of disposal. If you

THE GEOTHERMAL CONCEPT

do, an open loop can be used very effectively. If not, either a horizontal or vertical closed-loop system is your best choice.

Over a period of years, a closed-loop system will require less maintenance because it's sealed and pressurized, eliminating the possible build-up of minerals or iron deposits.

Q: Is a geothermal heat pump system expensive to maintain and operate?

A: No. A geothermal system is one of the lowest cost systems to maintain and operate. Year after year, geothermal heat pump systems offer the high efficiency necessary to keep operating costs down. In fact, they offer a lower operating cost than most comparably zoned systems. The difference lies in the system's ability to recover otherwise wasted energy and use it elsewhere in the facility. This dynamic, intelligent use of energy balances the needs of the entire facility while reducing operating costs.

Traditional System Comparison	Annual Maintenance Expense	Annual Operating Expense	Total Annual Cost	Installation Cost
Geothermal heat pump	\$0.07	\$0.62	\$0.69	\$10.00
Water loop heat pump	\$0.10	\$0.94	\$1.04	\$8.00
Variable air volume	\$0.14	\$0.94	\$1.40	\$9.00
fan coil, chiller/boiler 4-pipe	\$0.14	\$1.40	\$1.54	\$12.00

Cost per square foot of building space

GEOTHERMAL HEAT PUMPS: QUESTIONS YOU SHOULD ASK ABOUT A NEW HEATING AND COOLING SYSTEM

Regardless of the type of heating and cooling system you may be considering for your business, there are specific questions you should ask the design engineer. These questions deal with finding out the actual efficiency of the system, any operating limitations it may have, and the bottom line of operating costs. The

answers here are meant as a guide for what you should try to find out with your questions.

Q: What is the Btuh size of the geothermal heat pump or furnace that's being proposed?

A: Heating systems are designed to provide specific amounts of heat energy per hour. The term "Btuh" refers to how much heat can be produced by the unit. Before you can know what size system you'll need, you must have a heat loss/heat gain calculation done for your building. From that, an accurate determination can be made on the size of the heating/cooling system. Many fossil fuel furnaces are substantially oversized for actual heating requirements, resulting in increased operating costs.

Q: Is the efficiency rating actual or just a manufacturer's average?

A: All types of heating and cooling systems have a rated efficiency. Fossil fuel furnaces and boilers have a thermal percentage efficiency rating. Natural gas, propane, fuel oil furnaces, and boilers have efficiency ratings based on laboratory conditions. To get an accurate installed efficiency rating, factors such as flue gas heat losses, cycling losses caused by oversizing, blower fan electrical usage, etc., must be included.

Commercial air conditioners are normally rated using an Energy Efficiency Ratio (EER). Geothermal heat pumps, as well as all other types of heat pumps, have efficiencies rated according to their Coefficient of Performance or COP for heating and EER for cooling. It's a scientific way of determining how much energy the system produces versus how much it uses.

Most geothermal heat pumps systems have COPs of 3.5 - 5.0. That means for every one unit of energy used to power the system, 3.5 to 5 units are supplied as heat. Whereas a fossil fuel furnace may be 80-90 percent efficient, a geothermal heat pump is about 450 percent efficient. Some geothermal

THE GEOTHERMAL CONCEPT

heat pump manufacturers and electric utilities use software to accurately determine the operating efficiency of a system for your building. Software such as eQuest® allows comparisons in dollars to avoid the confusion of the various rating systems.

Q: Will the minimum entering water temperature have an effect on which heat pump I buy?

A: Yes. If you have an open-loop system, your entering water temperatures (EWTs) may range from the 70s°F in the southern United States to the 40s°F in Canada. All heat pumps can handle temperatures in the moderate to warm ranges. A closed-loop system, on the other hand, may encounter EWTs below freezing. Not all ground-source heat pumps will operate at those low temperatures. It's important for you to know what EWTs your heat pump will handle.

Q: Are the mechanical contractors and loop installers qualified?

A: Don't be afraid to ask for references from design engineers, International Ground Source Heat Pump Association (IGSHPA) and the local Better Business Bureau. A reputable mechanical contractor won't hesitate to give you names and numbers to call to confirm their capabilities. The same applies to the loop installer.

Q: Will open- or closed-loop be best for you?

A: That depends on several factors, as stated earlier. A mechanical contractor should be willing to install what's best for each building site, not what is easiest for him.

Q: Will the loop joints be heat fused?

A: The only acceptable method for joining buried sections of the HDPE pipe used for closed loop systems is heat fusion. Any other method will eventually result in the failure of the loop.

Q: How long is the payback period for a ground-source heat pump system?

A: To figure this accurately, you must know how much per year you'll save in energy costs with a ground-source system, and the difference between it and a traditional heating system and central air conditioner. As an example: if you'll save \$2,000 per year with a ground-source system and the costs difference is \$5,500, your payback would be less than three years.

Q: Can I use a heat pump for radiant floor heating (warm floors)?

A: Yes. Water-to-Water heat pumps heat water instead of air. The principle is the same as far as loop piping is concerned. Warm water is circulated through the floor to heat the building space.

Q: If I want to know more about geothermal heat pumps, whom should I contact?

A: Visting climatemaster.com or speaking with the mechanical contractor or ClimateMaster representative who provided this brochure can give you a wealth of additional information about geothermal heat pumps.

One of the many resources provided at climatemaster.com is a Commercial Sales Representative locator to find the nearest ClimateMaster representative. Your ClimateMaster representative can put you in touch with qualified installers in your area. Go to climatemaster.com to find a ClimateMaster representative near you.

GLOSSARY:

Closed-loop heat pump system: A heat pump system that uses a loop of buried High Density Polyethylene (HDPE) pipe as a heat exchanger. Loops can be horizontal or vertical.

COP (Coefficient of Performance): The ratio of heating provided by a heat pump (or other refrigeration machine) to the energy consumed by the system under designated operating conditions. The higher the COP, the more efficient the system.

THE GEOTHERMAL CONCEPT

Compressor: The central part of a heat pump system. The compressor increases the pressure and temperature of the refrigerant and simultaneously reduces the volume while causing the refrigerant to move through the system.

Cycling losses: The actual efficiency of a heating or cooling system is reduced due to start-up and shut-down losses. Over sizing a heating or cooling system increases cycling losses.

EER (Energy Efficiency Ratio): The ratio of cooling provided by a heat pump (or other refrigeration machine) to the energy consumed by the system under designated operating conditions. The higher the EER, the more efficient the system.

Fossil fuel: Any of several types of combustible fuels formed from the decomposition of organic matter. Examples are natural gas, propane, fuel oil, and coal.

Geothermal heat pump: A heat pump that uses the earth as a heat source and heat sink.

Heat exchanger: A device designed to transfer heat between two physically separated fluids or mediums of different temperatures.

Heat pump: A mechanical device used for heating and cooling which operates by moving heat from one location to another. Heat pumps can extract heat from air, water, or the earth. They are classified as either air-source or ground-source (geothermal) units.

Heat sink: The medium - air, water, or earth - which receives heat rejected from a heat pump.

Heat source: The medium - air, water, or earth - from which heat is extracted by a heat pump.

Hot Water Generator: A device for recovering superheat from the compressor discharge gas of a heat pump or central air conditioner for use in heating or preheating potable water.

Open-loop heat pump system: A heat pump system that uses groundwater from a well. The water is returned to the environment.

Payback: A method of calculating how long it will take to recover the difference in costs of two different heating and cooling systems by using the energy and maintenance cost savings from the more efficient system.

Supplemental heating: A heating system used during extremely cold weather when additional heat is needed to moderate indoor temperatures. May be in the form of electric resistance or fossil fuel.

ELIGIBILITY:

- Building must be located in the U.S.
- Original use begins with a taxpaying entity
- Installed between 10/3/2008 and 12/31/2016

For more information, go to climatemaster.com.

THE RIGHT CHOICE

ClimateMaster is the world's largest and most progressive manufacturer of geothermal heat pumps. We are committed to innovation and dedicated to environmentally clean, economically sound, and superbly comfortable home and business environments. Each ClimateMaster product is produced in our state-of-the-art facility. We strive for the highest product quality and service after the sale to give you peace of mind.

ClimateMaster has been designing and building equipment that enhances environments we live and work in every day for more than 50 years. In addition to geothermal heat pumps, ClimateMaster offers the most extensive product line of water-source heat pumps for use in a wide variety of applications.

ClimateMaster products are built in the U.S.A.



ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time for order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products.



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