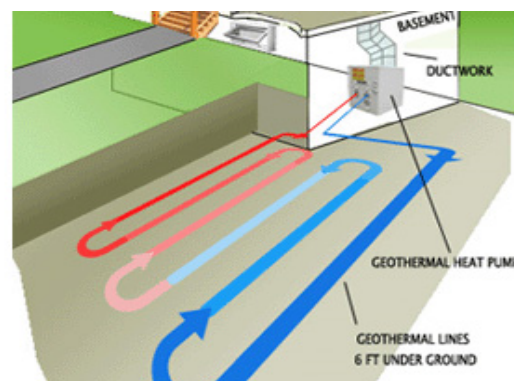




How can we help you today? Call 1-800-360-1569 for assistance or send an email to [sales@ingramswaterandair.com](mailto:sales@ingramswaterandair.com)

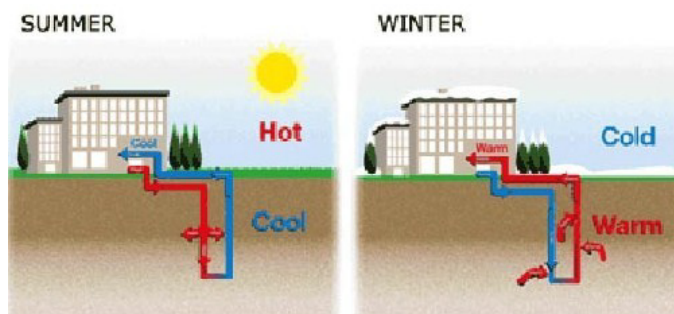
I've heard about geothermal systems and I'd like to install one in my home, but where do I start?



Using the earth's warmth to heat and cool your home is an idea that's been around for years, but for most consumers these systems were too difficult and too expensive to install. The good news is that times have changed and homeowners can now both afford these systems and install them their selves. Additionally, there are more incentives than ever before to help you pay for your system. Federal tax credits, electric company incentives and more await homeowners who are willing to **go green** and reduce their monthly electric bills by installing a geothermal heating and cooling system. Federal incentives alone can **cover 30% of the total cost**, including equipment and installation!

We have prepared this pamphlet to help you get started and to answer basic questions about installing a system. If there is anything else we can do to help you plan out your system just give us a call or send us an email. Our friendly staff offers free technical support and we're always ready to help at Ingram's Water & Air Equipment.

## Question Number 1 - How does a geothermal heating and cooling system work?



"Geothermal systems produce three to four units of energy for every unit of electricity used to power the system."

The basic concept of geothermal heating and cooling is very simple. Because the earth absorbs about 47% of all the heat energy from the sun that reaches the surface, your ground temperature stays moderate year round. Geothermal equipment utilizes this moderate year round temperature to provide you with heated or cooled air depending on the season.

A water-based fluid is circulated between the ground and your equipment to transfer this heat energy. The refrigeration system removes heat from the air and warms the water for air conditioning. In heating mode the refrigeration system reverses to remove heat from the water in order to warm the house.

A entire closed loop kit will usually include hose kits, manifolds, piping, and a pump to push the fluid through the pipe. The size and amount of pipe, type of pump, and unit will vary depending on the individual installation. All equipment is designed to be installed inside the home except for the piping itself.

Most systems have one loop per ton of capacity.

## Question Number 2 - Which type of geothermal system is right for me?

Picking which geothermal system is right for you depends on the variables of your individual installation and usually the advice of an expert. To start off you need to find out what kind of a ground loop suits your needs the best. In this image you can see 4 of the 5 most common methods for installing a ground loop.

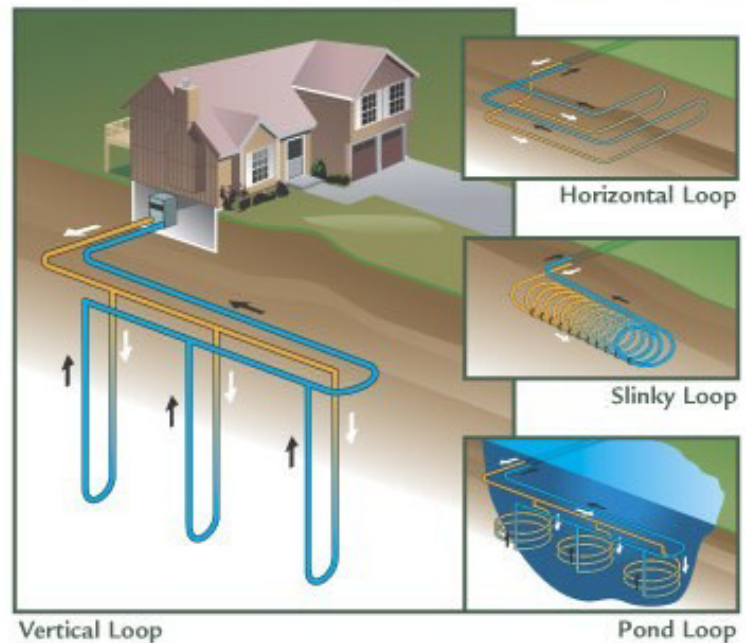
A vertical loop system is popular for homeowners who don't have enough room for long trenches. Depending on the size of the systems, and how deep wells can be dug, wells would be drilled 6 inches wide to depths between 150-255 feet deep. A special "u-bend" attached to the two pipes is then inserted in the well and the well is filled around the pipe with a non-setting grout. This system type can be expensive because of the cost of drilling wells, which sometimes can be over \$1200 per well depending on the composition of your land.

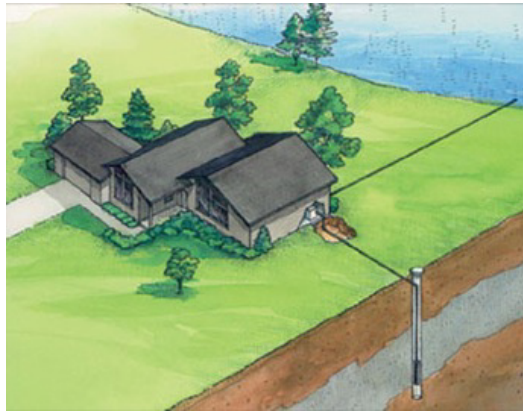
A horizontal loop system is often the choice homeowners make, because digging trenches is relatively cheap and easy to do. If you have an acre of land or more, this system might be for you. As mentioned before, the number of loops required will vary depending on your individual system, but the layout is usually consistent. For a horizontal system, trenches can be laid out 6-10 feet apart, and 6-8 feet deep. A traditional system will have individual trenches about 250 feet long in a type of double handled pitch fork layout.

If customers prefer a horizontal loop system, but don't have room for long trenches, a slinky loop system is often designed. With a sheet of plywood, two 2 x 4's, and zip ties you can make your own slinky loop. These are usually 3 feet wide, and how long the trench is depends on how far you space out your loops. It is important to remember though that the closer you space your loops together, the less efficient the system will be. Regardless of which horizontal loop trench setup you choose, our kit gives the homeowner 500 feet of good thermal transfer contact with the ground for each loop, and about 50 feet on each end of piping to connect out of and back into the home. Good surface contact with piping is extremely important, so make sure whatever fill you use will give you good heat transfer.

Pond loops are similar to horizontal loops, except some sections of pipe go into a lake, river or pond, not the ground. It's important to understand that a pond loop must be installed at least 4 feet under the freeze line year round, usually 8 feet deep. Equipment for this type of setup can vary, but the pond section usually consists of pipe coils with spacers to allow water to freely flow around the piping sunk in the water.

### Geothermal Energy for the Home





## Open Loop, or "Pump and Dump" Setup Example

Remember, in each of these system types, each loop is completely independent of other loops from the time it leaves the first manifold, until the time it connects back into the house and the second manifold. Our kits do not require any special tools, cutting or fusing of piping. The piping connects to manifolds via compression fittings, and each section is delivered to the customer as its own individual loop. We recommend an anti-freeze called propylene glycol to mix in your pipe with water and it will both help protect against freezing and prevent corrosion. The exact mixture percentage will vary depending on your system, but we recommend 10-20%.

A complete system would consist of a geothermal unit connecting through a hose kit to a manifold, from there piping then leaves and goes out of the house in its own separate trench, and then is laid out depending on system type. Piping comes back into the home in a separate trench, connects to a second manifold, then to the flow center pump, and finally through a hose kit back into the geothermal unit completing the loop.

The last system option is an open loop system, often referred to as a "pump and dump." This system utilizes a ground water well for incoming water and then "dumps" the water into another well or water source. Open loop systems are often the most efficient because ground water is usually warmer in the winter and colder in the summer than loop water. This type of system is often the easiest and cheapest to install, however local codes sometimes prohibit them, so check with your local community before deciding on this type of system. If you do not have access to a well, a local contractor maybe able to dig one for you, but prices will vary on how deep the well has to go. Additionally, in order for the well to support a geothermal system, it has to be able to provide 2-3 gallons of water per minute for every ton of service required. Because water quality is important when considering open loop systems, a cupronickel coil is strongly recommended for corrosion resistance.

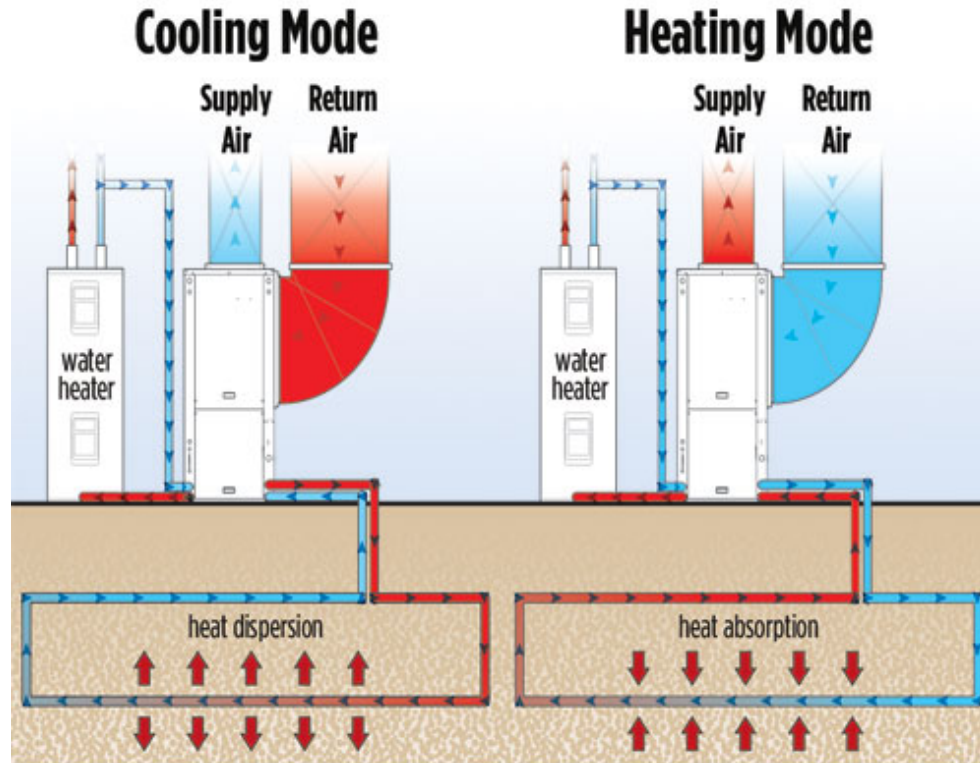
### Question Number 3 - How do I connect a geothermal system inside my home?

How much work you will have to do to integrate a geothermal system with your existing system depends on your home. There are two basic types of geothermal applications, forced air and water to water. While there are combo's and variations of both, a forced air unit is usually going to connect directly into your existing ductwork, and a water to water unit would connect to some type of radiant floor piping system. Additional provisions will need to be made for units with the desuperheater option.

If you end up choosing a geothermal system with the desuperheater, or hot water option, you are going to need to make a connection to your hot water tank. The geothermal unit itself will come with two more water pipe connections, and you will connect traditional water piping materials to two different locations on your hot water tank. One connection will connect directly into the incoming cold water to your tank, and the other will connect the drain connection at the bottom of your tank. Don't worry; the water that is circulated is never mixed with any other solution. Inside the heat pump there is a water line around a refrigerant line that transfers heat between the two. From there the water circulates in and out of your hot water tank. This option is useful, saves energy and statistics show that **you can save 50-60% off of your electric water heating bill.**



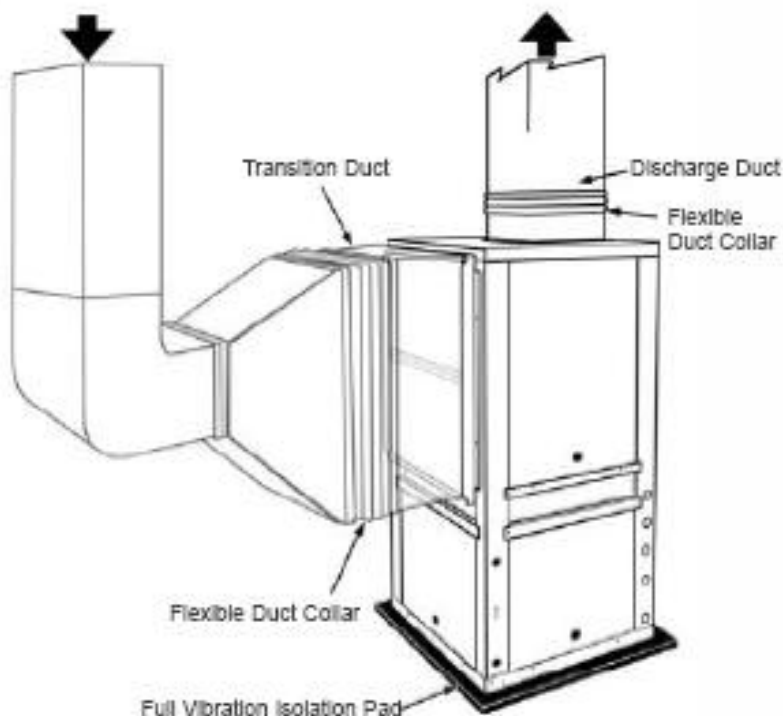
Our kits are specifically designed for Do-It-Yourselfers, with little outside help needed.



As you can see above, your geothermal unit has separate connections for your loop and desuperheater lines. When your unit is on and running hot refrigerant coming out of the compressor is used to heat the water line connecting to your tank, warming your water virtually for free.

For forced air applications there are a few different installation options. We recommend homeowners to install their units in a garage or basement where connecting to loop piping is the easiest. As shown to the left, most forced air units connect directly to your existing ductwork by replacing an existing air handler, but sometimes this can be a problem if you have an air handler in a small or hard to get to space.

Additionally you have to consider where your piping is going to be leaving and entering the home and it's not always easy to get your ductwork to that location. How your supply and return lines are set up can also cause problems. While most geothermal units can be customized to have left or right hand returns, as well as top or bottom discharges, make sure the equipment you purchase will work for you to make installation as smooth as possible.

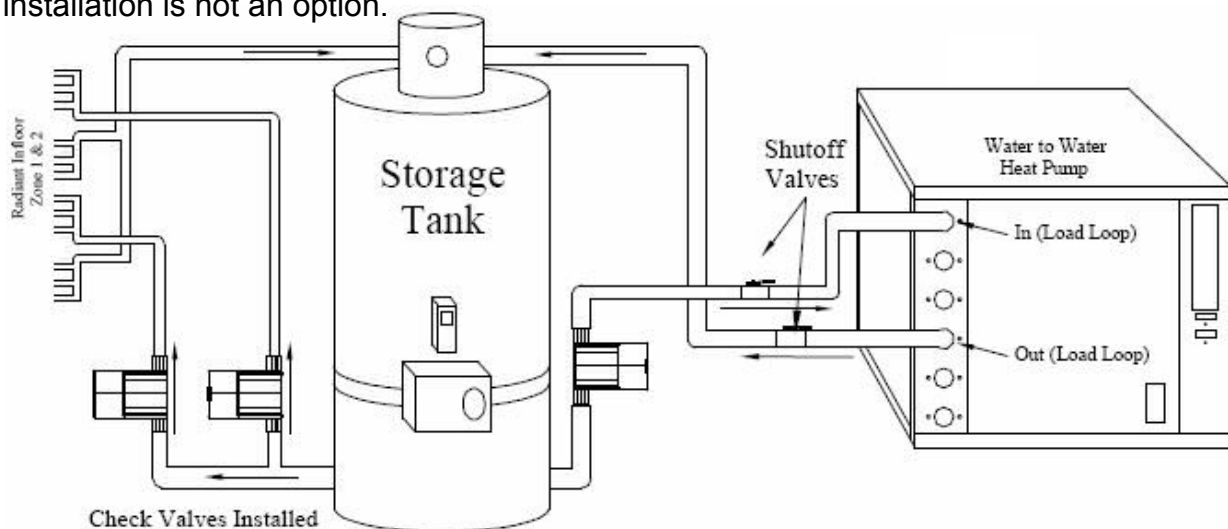




Radiant floor systems don't circulate dust or allergens and provide more consistent heating throughout the home.

If you are a homeowner with one of these problems, you might consider installing a split geothermal system. This is very similar to a traditional HVAC system as you have a lineset that runs from the geothermal unit to a traditional air handler elsewhere in the home. A certified HVAC technician would have to braze the refrigerant lines and adjust refrigerant and charge. Remember, geothermal systems are very efficient, so the air handler would have to have a high efficiency blower and coil.

The next type of application is a radiant floor system. Radiant floor heating usually has to be installed in a new home construction or addition, but additional equipment to complete the system can be added later. Piping is installed directly into the floor and when in heating mode hot water is pushed through this piping. This is a very effective heating method as it provides more consistent heating throughout the home. Radiant floor heating systems also concentrate heat near the floor where it provides the most comfort. These factors alone **can reduce heat loss by up to 25 percent** compared to traditional systems. Radiant floor heating is especially useful in workshops or buildings where ductwork installation is not an option.



Water to water units require a buffer tank to hold preheated water so that it's ready on demand.

Question Number 4 - Are some geothermal units better than others? What kind of options are there to choose between units?

Geothermal equipment is just like traditional HVAC equipment in many ways. There are going to be some brands that offer more options, both in layout and design as well as in efficiency options. Remember, you want to get the unit that is going to best suit your needs for your home and your wallet. Before you order equipment or start tearing up your land, you need to know exactly which unit you are going to choose. As far as layout and design are concerned, which unit is right for you comes down to what works best for your own home. Keep the spot where you want to install your geothermal unit in mind, and be prepared with information on any limits on dimensions that you might have.



While the overall price may go up when choosing certain options, the amount you save in the long run and in incentives can greatly increase.

When it comes to efficiency there are many different options that can influence your decision. While some units can be more efficient than others, it usually comes down to various options you can select for that individual unit. Three of the most popular options are choosing between a multi speed or variable speed fan, having a unit with or without the desuperheater option, and whether to purchase a single or two stage unit. While there are additional options, these three can have the greatest impact on your efficiency and monthly electric bill.

The first of these options, picking a multi speed or variable speed fan, is very easy to understand and to see the potential savings. Most homeowners have multispeed fans or blowers with their current HVAC equipment. Multispeed fans do have different speed settings, but they must be manually changed on the blower itself. With a variable speed fan the blower will ramp up and down depending on ductwork conditions. Because this blower is continuously sending the correct amount of CFM's through the home, you get better heating or cooling distribution and a higher efficiency overall.

The next option is choosing whether or not to have a unit with the desuperheater. We've already discussed this a bit, but the basic breakdown is this reduces your electric water heating bill. This particular option usually adds or subtracts around \$250 from the total bill, but it will definitely pay for itself in the long run.

The last option is whether to pick a single or two stage compressor. Some homeowners might be familiar with this if they have had a high efficiency traditional HVAC system before. A two stage compressor enables the HVAC system to switch between a full and partial load depending on weather conditions. Most often you will see a unit run in partial load when maintaining a small temperature difference, but switch to full load when heating or cooling more thoroughly. Most thermostats come standard from the manufacturer to run heating/cooling units in partial load with a 1 degree temperature difference, and into full load should the temperature continue to rise or fall by more than 1 degree. More advanced thermostats may allow you to customize this within 1-4 degrees. Because there are many different brands, series, and other efficiency options, it's difficult to give you an exact figure for the difference in efficiency between single stage and two stage systems, but this chart can give you a general idea.

### Ground Loop Heat Pump

Model	Capacity	Heating		Cooling	
		Btu/hr	COP	Btu/hr	EER
GT024	Full Load	22,200	3.7	29,000	16.0
	Part Load	16,500	4.2	21,500	20.0
GT036	Full Load	31,400	3.6	39,400	18.0
	Part Load	20,900	4.5	26,300	24.0
GT048	Full Load	45,600	3.5	57,200	17.6
	Part Load	30,300	4.3	37,900	23.8
GT060	Full Load	52,200	3.5	65,400	17.4
	Part Load	36,500	4.3	45,700	23.6
GT072	Full Load	59,700	3.6	72,000	14.1
	Part Load	46,600	3.5	57,500	19.1





Federal tax credits can cover 30% of the total installation cost with no maximum cap.

## Question Number 5 - What kind of incentives are there for installing a geothermal system? How much will my electric bill go down?

When making a decision to purchase a geothermal heating and cooling system homeowners should make sure that they get the best incentives possible. Depending on the location of installation there are often many different programs that homeowners can qualify for. Federal incentives have received lots of publicity lately, but many homeowners miss out on state or local incentives simply because they don't spend the time to check. Call your local accountant or your local court house and find out if your community encourages geothermal installations. Additionally, local electric companies can offer some of the best incentives outside of federal tax credits and it is important to find out what the requirements are for these benefits in advance. Nobody wants to spend the money to have a geothermal system installed and then find out they don't qualify. If you are looking for more information the Department of Energy offers a good source for researching federal, state and local incentives and you can visit their site at <http://www.dsireusa.org>.

Federal incentives were recently revisited and improved in October of 2008 and February of 2009. As federal incentives currently stand in August of 2009, homeowners who install a geothermal heating and cooling system that is "placed in service" by December 31st of 2016 qualify for a **federal tax credit of 30% of equipment and installation cost** with no maximum cap. What this means for you is that if you install a qualified geothermal heating and cooling system you can get 30 percent of your total installation and equipment costs off of any federal taxes you owe at the end of the year. Unfortunately at this time water to water systems do not qualify for these tax credits. According to [www.energystar.gov](http://www.energystar.gov), all energy star certified geothermal heat pumps qualify for this tax credit. Actual specifications say that Closed Loop Systems must have an cooling EER $\geq$ 14.1 and a heating COP $\geq$ 3.3. Open Loop Systems must have a cooling EER $\geq$ 16.2 and a heating COP $\geq$ 3.6.

When checking into benefits and incentives it's important to remember that most incentives for installing a geothermal system are determined by the equipments efficiency rating as tested by federal standards, not necessarily the actual application in your own home. What this means is that just because a system has a EER rating of 22, that doesn't mean that's what you'll actually get in your own home. There are too many variables to know in advance exactly what your own efficiency rating will be, but for most homeowners it's a vast improvement over existing systems. Just make sure that the system you end up purchasing qualifies with the necessary standards so that you get the best deal you can.



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"Homeowners typically experience an annual savings of 30 to 70% when compared to ordinary systems."

Many customers ask about how much their electric bills will decrease or exactly how much electricity their new geothermal systems will use. These are great questions, but unfortunately very difficult to answer. There is no exact formula to tell customers an exact answer to each of these questions, because there are simply too many variables. What the weather is like outside at any given time and even how many people are in the home can change this answer. Typically though homeowners will see 30 to 70% savings over traditional HVAC systems and most systems will pay for themselves within 4 - 5 years. There are no traditional systems that can give you these kinds of savings.

## Question Number 6 - How do I know what size unit I need for my house?

One of the most important steps of a geothermal installation is accurately sizing your home. Our technicians can give you a rough idea, but there is simply no way to know for sure until a heat loss calculation is performed, and it's one of the first things we will recommend for you to do when considering a system. Local HVAC technicians, contractors or thermal engineers in your area should be able to provide the service, and in some communities it's actually required. With variables like how many windows you have, how high your ceilings are, how many floors you have and a hundred more, all we can do is give you an educated guess. The math we use is simple and usually works out to somewhere around one ton of service for every 500 square feet of home. Remember, this is just a ballpark figure, so have your home sized the right way by a certified technician.

Aside from sizing your home through a heat loss calculation, additional steps may need to be taken to confirm your needs. With radiant floor systems, homeowners sometimes install systems to zone different areas, heat a pool, or even melt snow. Because of these different applications, a consultation with a specialist for those specific areas of the home might be required. Additionally, zoning areas of your home might require some kind of damper system being installed in your ductwork. There could also be the possibility that your older ductwork is not large enough for a new high efficiency system. It's important to have all of these variables checked in advance so you don't order the wrong equipment or end up with last minute problems that delay your installation or even worse, cost you additional funds you weren't planning on spending.

## Question Number 7 - What other benefits to geothermal systems offer?

Geothermal units do a lot to reduce your electric bills and more adequately heat and cool your home. Aside from that, they're great for the environment, and they save resources. These units do not use fossil fuels that burn and are bad for the environment. With a geothermal system, there are no worries to have about flames, fumes, odors, or carbon monoxide. Geothermal units are more efficient than regular HVAC systems, and are the most environmentally-safe, cost effective heating and cooling systems available. "Installing a geothermal system is equivalent to planting 750 trees or taking 2 cars off the road." Geothermal units are quiet and use the same principles that operate refrigerators and freezers. Finally, geothermal systems typically last more than 20 years with proper maintenance.





Geothermal systems  
are good for the  
environment and for  
your wallet.

## Question Number 8 - What does a geothermal unit cost?

Pricing for geothermal units will vary on different brands and different options but we offer some of the lowest prices on the market and nobody has Do-It-Yourself kits like we do. Our geothermal units start as low as \$3000 and our complete closed loop kits start at just over \$6000. Our systems do not require special equipment or costly system design consultation fees. With Ingram's Water & Air Equipment you don't have to worry about hours of waiting on hold for technical help. We offer free technical support and we are more than happy to help you design your system and answer any questions.

Our friendly staff can help you customize your system and help you decide which unit is best for you. The equipment in our kits are manufactured by companies inside the United States and have excellent warranties. Remember that our systems are designed for easy installation and include 95% of everything you'll need. Call us today and find out how simple cutting your electricity bill can be when choosing a geothermal heating and cooling system with Ingram's Water & Air Equipment at 1-800-360-1569, or email us at james@ingramswaterandair.com.

*Receive 30% Tax Credit*  
*No Maximum Cap*  
*Geothermal Packaged Heat Pump*  
*with install kit*

*30 % Tax Credit*

ENERGY STAR

If you would like our staff to contact you about any questions you have about our geothermal kits or packages, you may submit your name and phone number and we will respond to you within the next business day.



Name

Phone Number