



Renewable Energy Solutions

Geothermal Energy

1. General Information

Geothermal energy systems work by using the Earth's constant temperature as a heating and cooling source. The biggest factor in utilizing geothermal energy is the availability of a lake, wells or digging into the earth to cool or heat the water used in heat pumps.



What are ground and groundwater heat pump systems?

The ground is a very good store of heat energy, and this heat can be harnessed and used to heat or cool hotel buildings. The ground has a high thermal mass, and because of this the earth in Europe ground stays at a constant 11-12°C at a depth of 1-2m. Geothermal heat pumps are systems able to draw the heat contained in the underground so that it can be used to heat your hotel building and/or to produce domestic hot water. When they are 'reversible', they can also be used to draw heat from the building and put it back into the ground/groundwater, therefore cooling the hotel. Aerothermal or air source heat pumps also exist. They draw the heat from the outside air or from the inside air that is vented out by the ventilation system.

How does a geothermal heat pump system work?

The principle of a heat pump is exactly the same as the principle of a refrigerator: a refrigerating fluid is expanded, heated by the ground/ground water (or outside air), then is compressed and gives its heat to the hotel building, before being expanded again. Whereas the refrigerator takes the heat from the inside of the appliance to the

outside, a heat pump in heating mode takes the heat from the ground/ground water (or outside air) to the inside of the hotel. In cooling mode, the heat pump acts as a refrigerator.

What are the basic components of a geothermal heat pump system?

All heat pumps comprise three parts: the circuit that takes the heat from the ground/ground water (or air) through heat exchangers, the heat pump itself that compresses the refrigerant fluid, and the distribution system that delivers the heat to the indoor spaces.

The heat from the ground/ground water (or air) is absorbed by the refrigerating fluid through heat exchangers or heat collectors. In geothermal heat pumps, the heat collectors are pipes that are buried in the ground. Depending on the location of the hotel, those pipes can either be installed horizontally (in that case lengths of pipe are laid in rows about 1 m deep) or vertically (the so-called 'borehole heat exchangers' are a pipe in U shape that go up to 80 m deep in the ground). When the heat source is ground water, it is possible to pump it and bring it directly to the heat pump heat exchanger, then re-inject it further into the groundwater body.





Is a geothermal heat pump system suitable for my hotel?

To install a geothermal heat pump with horizontal collector pipes, it is necessary to have a sufficient area of ground. To install a geothermal heat pump with vertical collectors, it is necessary to check with the municipal authorities if the underground structure is compatible. To install a groundwater heat pump, a groundwater body with sufficient flow all over the year must be present near or under the hotel. The choice of the heat source and heat collectors will depend on the situation of the hotel. If sufficient outdoor area is available, a geothermal heat pump with horizontal collectors is a good choice. For smaller available areas, vertical collectors are more expensive but will allow heating a larger floor area.

How much maintenance does a geothermal heat pump system need?

A heat pump system requires little maintenance by the hotelier but needs to be inspected by a professional yearly.

Will I need any permits or inspections to install a geothermal heat pump system?

For geothermal heat pumps with vertical collectors or groundwater wells, you may need a permit before drilling. Check this with your local authority.

How can I finance a geothermal heat pump system?

You may fund your geothermal heat pump system in several ways. Many financial incentives which can benefit your hotel are available for example. However, these have not been used to their maximum potential. Incentives can save you in some cases more than 50% of the cost of your geothermal heat pump system. Check for national incentives and don't forget that your local utility company or other local organization may also provide additional support. There also banks promoting the use of geothermal heat pump

system by granting long-term, low interest loans.

Visit: www.iea.org/country/index.asp under 'related country and regional information' for more information about available incentives in your country (available for IEA member countries only).



Should my hotel receive an energy audit?

Definitively yes. Doing an energy audit before investing in a geothermal heat pump system is in your best interest, because it will help make the existing energy consumption as efficient as possible and will lower your energy consumption and monthly energy bills. By reducing your energy consumption you will need to pay much less for a geothermal heat pump system that's capable of meeting your lowered-new energy demand.

Who can install a geothermal heat pump system for my hotel?

Installation of a geothermal heat pump system is a complex operation that should be handled by qualified professionals only. In particular, drilling requires very specific precautions and is regulated in many countries. A qualified installer or an Energy Service Company (ESCO) will estimate the overall cost, and will also inform your hotel about rebates and incentives for which you may qualify.

What is an ESCO?

An Energy Service Company (ESCO) reduce the hotel energy costs, by taking care of the investments involved of installing a geothermal heat pump system and sharing the resulting future cost savings with you by letting the ESCO install the geothermal heat pump system in your hotel.





Who can help me with the paperwork for applying to receive financial incentives?

Installation companies are more and more taking over of the application paperwork to receive an incentive. Local energy agencies may also help you. Follow the next steps to make your geothermal heat pump system a reality:

- Learn as much as you can about geothermal heat pump systems before you make a decision
- Schedule an on-site energy audit
- Call an installer and obtain estimates
- Check zoning, permit and utility requirements, insurance, and other legalities
- Look for financing options
- Install and learn how to safely maintain your system
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Enjoy saving energy and money!



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① If you want more detailed information about the Geothermal system please click here!

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