geoKOAX®
geothermal systems

Terraced housing estate

in an area with drilling depth restrictions

Heating capacity: 7.3 kW

As of March 2015

63 meters (3 x 21 m) of geoKOAX volume probes provide the energy for heating and hot water.

This new construction from the year 2008 is one of the first geoKOAX projects. 63 meters of geoKOAX volume probe and a 7.3 kW Junkers heat pump provide the required energy for heating and hot water.
The unit was equipped with a precise monitoring tool: since 2008 the geothermal system achieves an average Coefficient of Performance (COP) of 4.6 at constant brine temperatures and is therefore exceptionally efficient.

Background

The town house with a living space of 259 m2 was built on behalf of a housing association in 2008. The Energy Conservation Certificate documents an annual primary energy consumption of 67.5 kWh/m2a. This corresponds to the standard of a low-energy house and according to the Energy Saving Regulations (EnEV) 2014 is assigned to the energy efficiency class B.

At an early stage, the builder opted for a regenerative, geothermal energy system. Appreciation in value, financial savings and CO2 savings were the decisive criteria. However, the moderate heat conductivity of the subsurface of 33 W/(Meter x K) in addition to the small size of the property turned out to be problematic for conventional probe systems which would have required larger drilling depths and higher drilling costs. Furthermore, there is a drilling depth restriction of 25 meters because of brown coal inclusions.

Planning

According to geological calculations, a total of 175 meters of duplex probes would have to be deployed to cover the required energy demand. Since a maximum of only 3 boreholes could be placed on the property, each one not exceeding 25 meters, conventional duplex probes had to be discarded.

Owing to its high performance capabilities and the associated high property efficiency, the builder opted for the deployment of geoKOAX volume probes. Instead of 175 meters of duplex probes, 63 meters geoKOAX were sufficient (-64%). Thereby, investment costs were reduced by 48%.

Realization

3 boreholes with 21 meters geoKOAX each were installed and connected to a Junkers heat pump with 7.3 kW. It provides the residential building with energy for heating and hot water. Since 2008, the power consumption of the heat pump remained broadly stable at about 3.200 kWh/year. In warmer winters, however, power consumption was a little lower at about 3.000 kWh/year. Energy suppliers usually have special power rates for heat pumps. In this case, the builder paid in 2014 an average of 49€ net/month for the operation of the heat pump and hence for the total heat output.

Performance tuning and monitoring

To oversee the operation of the unit, the system was equipped with a precise monitoring tool. Integrated sensors collect data on the operation and send these to the control unit for evaluation. Even from remote locations, important characteristics such as temperature profiles, flow rates, power consumption, CO2 savings or financial savings can be controlled and calculated. In addition, the monitoring tool provides information on optimization opportunities. Real-time monitoring thus ensures a constant optimal operation of the system.

Despite a saving of approx. 110 meters in drilling depth and probe length, in the period from 2008 to 2014 an excellent Coefficient of Performance (COP) of 4.6 was measured along with constant brine temperatures. The monitoring also shows, that there is no cooling off of the ground, but a complete regeneration of the soil during inactive phases of the heat pump.

Summary

General Conditions		
Drilling-depth restriction in meters	25 m	
Area to be heated in qm	259	
Heat output in kW	7.3 kW	
Parameter	**geoKOAX**	**duplex probe**
Length of all probes in meters	63	175
No. of boreholes x depth in meters	3 x 21	7 x 25
Volume of brine fluid in liters	900	400

64% less probe meters
48% less investment costs

The geoKOAX company:

geoKOAX GmbH, which is headquartered in Munich/Germany, is an innovative, international company with a branch office in Cologne/Germany and distribution partners in Serbia, Poland and in South Carolina/USA. geoKOAX GmbH offers patented geothermal technology made in Germany. Using a highly qualified team consisting of business management graduates, chemists, planners, project managers and heating engineers, geoKOAX offers complete solutions for close-to-surface geothermal energy. From site surveys to planning, testing, implementation and subsequent monitoring – the expert team of geoKOAX has experience gained from more than 1,000 projects implemented in Germany, the Netherlands, Switzerland, Serbia and the Czech Republic.

The geoKOAX geothermal volume probe:

The geoKOAX volume probe, as the highest performing geothermal probe system, enables reliable solutions for heating and cooling of residential and commercial properties. Everywhere, even in areas with drilling depth restrictions. Also on smaller properties with high energy demands, such as usage-intensive multi-story buildings in urban areas, geoKOAX enables reliable planning and a safe implementation of projects that could not be developed with conventional systems. Its high level of performance and up to 60% less drilling meters predestine the geoKOAX geothermal volume probe for large construction projects or demanding, complex EnEV 2014 building renovations.

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