



GEOKOAX[®]
geothermal systems

New construction with 22 partially air-conditioned residential units

in an area with drilling depth
restrictions (88kW)

Heating capacity: 88 kW, Cooling capacity: 69 kW

As of March 2015



The drilling depth restriction of 23 meters and the small size of the property did not allow to switch to geothermal energy using conventional duplex probes.

Ecological heating and cooling with geothermal energy was one of the builder's prerequisite for this construction project with 22 residential units realized in 2014. The construction plans were initially designed with duplex probes. The first drilling, however, hit a separating layer at 23 meters and the water authority declared a drilling depth restriction. This ruled out a geothermal development with the conventional duplex system: the additional boreholes required to meet the heating and cooling capacity could not be realized due to the small size of the property.

Instead, GEOKOAX high-performance probes were deployed, saving 60% of probe meters.

Background

A Thermal-Response-Test (TRT: calculation of the location-specific thermal conductivity of the subsurface) and a subsequent calculation of the probe field with Earth-Energy-Designer (EED) yielded 1.704 meters of duplex probes to be deployed. Since the official drilling permission forbid drilling through the clay stratum at 23 meters, realization of the geothermal project with duplex probes failed prematurely. Due to the limited size of the property and the drilling depth restriction, the maximum number of boreholes would not have been sufficient to provide the required amount of energy using duplex probes. Furthermore, in order to cool the building during the summer, installation of additional cooling units would have been necessary. Only the planning and design with GEOKOAX facilitated the move away from fossil fuels towards clean and cost-saving geothermal energy.

Planning

New calculations based on the efficiency of the GEOKOAX probe technology allowed a reduction of more than **1 km of probe length**. The associated savings in material, time and investment costs, made it easy for the builder to rely on the volume probe.

Realization

Owing to the small size of the property, the probe field was placed underneath the building. 34 holes à 23 meters were drilled, but only 30 of the 34 probes were connected to the system. The remaining 4 probes serve as a backup, which was never needed. A Coefficient of Performance (COP) of approx. 4.5 over the years proves this.

690 meters of GEOKOAX probes and approx. 10,000 liters of brine provide the energy for monovalent heating and cooling. Despite the 60% saving in probe meters, the GEOKOAX installation features 150% more brine than a duplex probe. This brine functions as a storage medium and enables, in the heating as well as in the cooling mode, the high efficiency of the probe.

The builder was able to save about 45% of investment costs.



Installation of the GEOKOAX probe underneath the building.

Performance tuning with monitoring data

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. 1,000 meters in drilling depth and probe length, a stable Coefficient of Performance (COP) of 4.5 was measured in the period from 2008 to 2014 along with constant brine temperatures. 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	23 m	
Area to be heated in m ²	2,500	
Heat output in kW	88 kW	
Cooling output in kW	69 kW	
Basic Parameters		
	geoKOAX	duplex probe
Length of all probes in meters	690	1,704
No. of boreholes x depth in meters	30 x 23	74 x 23
Volume of brine fluid in liters	10,000	4,000
	monovalent	bivalent

60% less probe meters
45% 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.

Participating companies:

Geothermal Volume Probes:

GEOKOAX GmbH, Am Kirchenhölzl 13, 82166 Gräfelfing, Germany, Phone: +49 (0) 89-45 20 947-0, info@geokoax.com

Construction Management:

Bayer Ingenieure

Independent Expert / Thermal Response Test:

tewag Technologie – Erdwärmeanlagen – Umweltschutz GmbH

Contact:

Jörg zu Dohna
GEOKOAX GmbH
Am Kirchenhölzl 13
82166 Gräfelfing
Germany
Phone: +49 (0) 89-45 20 947-0