

Strandstrasse, Kiel, Germany

Five newly built residential Multi-Family buildings, with collective hot water distribution, in combination with solar thermal energy and implemented using heat contracting.

Key facts

Building

Location	<i>Kiel, Germany</i>
Construction	<i>December 2009</i>
Heat distribution	<i>in building</i>
Heated area	<i>1054 m² living</i>
Level of insulation	<i>....</i>

Heat pump and source

Number of heat pumps	5
Installed capacity	52 kW + kW
Operation mode	<i>monoenergetic</i>
Heat source	56 geothermal probes, 13 m each
Brand and type:	Glen Dimplex SI 50TE
Refrigerant	R404A, 8,6 kg
Sound level	57 dB

Heating system

Heat demand	52 kW
Heating temperature	35°C panel heating

Domestic hot water

Type of system	
Max. Temperature	65 °C
Circulation system	
Legionella measures	thermal
Storage size	2 x 500 litres
Number of storage tanks	2 per building
Storage losses	
Temperature control	

Other information

Electric energy	
Consumption year	kWh
Investments costs	
Energy Source	€60.000, Heat Pumps €40.000
PV installation	
Solar thermal	

Source

[Bundesbaublatt](#)

Five residential buildings, each with 9 luxury apartments, were built on a former Bundeswehr site in northwest Kiel, situated directly on the Firth of Kiel. The heat is supplied by five brine/water 50 Kw's heat pumps in combination with solar thermal energy and was implemented using heat contracting.

The houses on the funding terraces had to be built on piles because they are on the excavation of the Kiel Canal. Since the bank location on the Kiel Fjord boosts the temperature increase the foundation piles are used both statically and thermally as probes. The 14 m piles each contain 50 m long hoses made from rot-free polyethylene (PE) and thus also serve as energy piles. Since the probe capacity of the piles was insufficient, additional depth probes were required. For each building, the ground is connected to the heat pump system in the technical rooms via 56 concrete piles and four double U probes, each 100 m long.

Passive cooling means that the building is cooled without the use of compressors. In the summer, the ground temperature is significantly cooler than the ambient temperature. A plate heat exchanger installed in the brine circuit transfers the heat to be discharged from the building through the brine circuit and into the ground. The use of this system means that no electrical energy is required for the compressors. The sole energy requirement for cooling the building is the small amount of energy that is required to run the brine circulating pump.

The investment costs for the heat pump systems amounted to approx. 120,000 euros per house and each consist of a heat pump with accessories, the geothermal probe fields and the energy piles. The heat pump itself - including storage and accessories - only accounts for a third of the total costs. The energy source via geothermal probes and energy piles weighs around 65,000 euros, the remaining costs are caused by the solar system and passive cooling.



Strandstrasse, Kiel, Germany, Technical details



Technology room with 3 domestic hot water cylinders



Technology room in one of the buildings



Description of the technical concept

Technical data

- Operating mode: monovalent
- Heat source / heat sink 1: 4 double U pipes of 100 m each
- Heat source / heat sink 2: 56 geothermal probes, 13 m each
- Abstraction capacity from the ground: 44 KW
- Heat output: 50 KW
- Brine volume flow: 12.8 m³
- Heating volume flow: 4.8 m³
- Number of compressors: 2
- COP in heating operation (at B0/W35): 4,5
- Buffer tank: 500 litres
- 2 x 500 litre domestic hot water cylinder (connected in parallel)

CO2 savings per year: 89,400 kg

Basis of the calculation:

- Information is rounded to the next hundred kg
- Saving based on all five buildings
- Number of hours at full load of heat pump system: 2,000 per year

CO2 emissions per kWh of electricity: 0.6 kg (based on the power mix in Germany)

Comparable conventional system: Oil heating boiler with 80 %

During the construction phase, however, the builder decided against tilted collectors on the flat roofs for acoustic and optical reasons. Due to the direct conveying position and the strong coastal wind, the wind current in the top apartment was clearly audible when the tube collectors were installed. So the decision was made to install the collectors flat on the roof. However, the missing angle of inclination of the collectors leads to significantly less solar yield. For this reason, the solar collectors could only subsequently be used for hot water support and not as planned for hot water and heating support.

In addition, a buffer tank with a capacity of 500 l and two hot water tanks with 500 l each connected in parallel are available in each house. To optimize efficiency, the heat pump systems and the solar collectors are hybrid. This means that the heat pump only starts supplying when the solar systems can no longer provide the energy required for hot water supply on their own.

An energy trading contract has been signed by the property owners and the system's manufacturer. The investment costs for the heat pump system do not apply for the homeowner. The building is provided with heating and cooling energy as a service, and energy consumption is invoiced according to the amount of heat energy actually used. The contractor provides cooling energy as a free service.