GEOthermal Technology for economic Cooling and Heating

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- Drilling equipment
- Ground Heat Exchanger
- Heat Pump prototypes
- Plug and play energy management systems

Capital Costs

Innovative hybrid configurations and making use of alternative foundation heat exchange technology are further approaches to address capital costs and provide further opportunities for exploitation of geothermal heating and cooling.

Site Working Conditions

The disruptive nature of drilling operations introduces challenges to construction management and environmental risks. In shallow geothermal applications rotary straight flush drilling circulating water or mud is used most commonly in softer formations, and rotary straight flush using compressed air for hammering is used for harder formations.

CHALLENGE

Need for rapid development of shallow geothermal technology in the European market

Operational Complexity

Operating geothermal heating and cooling systems to achieve peak energy efficiency requires succes-sful control system integration

Design Complexity

Innovation in the design process and better management of design risks are required.

Construction Management Complexity

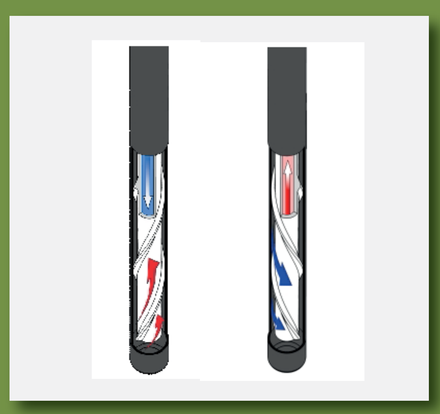
Vertical borehole heat exchangers are the most appropriate form of ground heat exchanger in approximately 80% of applications. Drilling technology, installation capacity, and expertise have been transferred from other industries, due to the market growth since the 1990s in geothermal heating and cooling.

Borehole drilling technology

Drilling concept based on dry auger methods will enable:

- compact equipment capable of working in restricted areas
- very low noise and pollutant emissions
- high stability borehole capable of drilling near foundations and structures
- low (clean) water usage

Vertical borehole heat exchangers



The innovative spiral co-axial vertical borehole heat exchanger technology will enable:

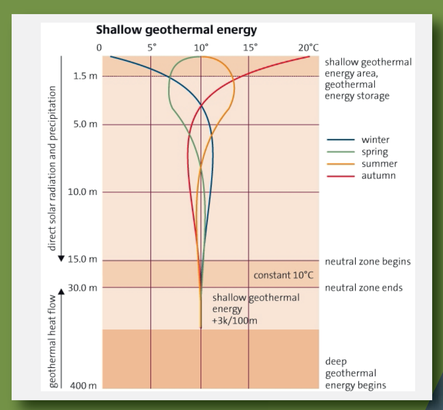
- improved thermal performance that allow designs to be delivered using shorter boreholes
- improved hydraulic performance and lower pump energy costs/emissions,
- improved short-timescale response and thermal storage capacity,
- complete integration with the innovative dry auger-based drilling technology

Foundation heat exchangers

Systematic development of foundation heat exchanger design, fabrication and integration methods result in:

- more accurate predictions of thermal behaviour
- design risk reduction and wider range of configurations
- higher levels of optimization with regard to structural stability/integrity and thermal performance
- economic optimization of fabrication and installation methods

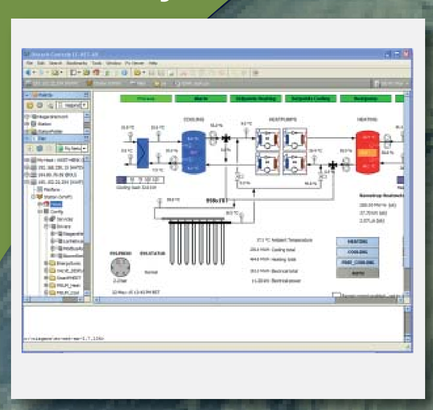
Dual source GSHP



Innovative dual source heat pump capable of making optimal use of ground or air environmental heat sources:

- hybrid approach to improve seasonal performance
- optimal use of ground and air heat sources according to operating and climate conditions

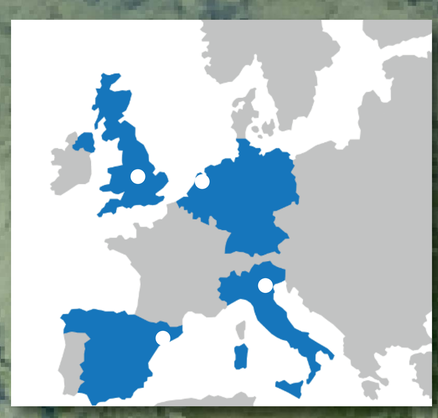
Building energy management and control systems



Whole system geothermal heating and cooling solutions management:

- foundation heat exchanger technology integration with other heating/cooling sources
- interactions between the building, the heat pumps, the ground heat exchangers and control systems.
- energy costs reduction maintaining the comfort conditions within given thresholds.

Demo Site



Validate the overall performance on different demonstration sites:

- Leicester small-scale house
- Barcelona large-scale tertiary building
- Amsterdam small-scale office building
- Padova small-scale office building

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