GeoTHERM
expo & congress

Donnerstag, 26. Februar 2026, 16.30 Uhr
Ortenauhalle Kongress 2
Oberflächennahe Geothermie

Thursday, 26 February 2026, 4.30 pm
Ortenauhalle Congress 2
Near-surface geothermal energy

The Best of Both Worlds: A Hybrid System Integrating Geothermal and Air-Source Heat Pumps – A Case Study from Hungary

Das Beste aus beiden Welten: Ein Hybridsystem, das Erdwärme- und Luftwärmepumpen integriert – Eine Fallstudie aus Ungarn

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This presentation would detail the life cycle (designing, implementing and operating) of a hybrid heat pump system through the concrete example of a realized project, the Melea – The Health Concept Hotel in Sárvár, Hungary. The building's original heating and cooling system was designed to rely on district heating and air-to-water heat pumps. However, due to changes in the economic environment, a complete redesign of the system was required to shift towards a purely renewable energy source solution, even while the construction of the building was already underway.

The presentation would guide the audience step-by-step through the project phases, highlighting the design and implementation process of the hybrid system, which combines geothermal heat pumps (GSHP) and air-to-water heat pumps (ASHP).

The initial step involved extensive consultation with mechanical engineers to clarify energy demands, followed by a thermal response thest (TRT) to understand the specific soil properties of the site. Subsequently, a borehole field modeling was used to optimize the system for a 25-year lifespan for 81 pieces of BHEs. The accurate coordinate accurate design of the probe field and the creation of a 3D model for the machine room were crucial for precise execution and minimizing on-site improvisation, thereby reducing investment costs. During drilling, electric drilling rigs were employed, which are quiet and compact and green.

Innovative elements of the system include a six-pipe unit. As Melea is a wellness hotel with both heating and cooling demands in winter and summer, this technology allows the heat generated during cooling to be directed into the heating system instead of being discharged into the ground, thereby nearly doubling the system's efficiency. The heart of the system is an advanced automation and data acquisition system, which operates in a coordinated manner, optimizing equipment performance for maximum efficiency and safety based on external and ground-side temperatures, as well as the building's specific demands. The collected data will contribute to more effective design and operation of future systems.

The advantages of the hybrid heat pump system include reliable and flexible operation, space efficiency (requiring fewer ground probes), and energy efficiency. Although the initial investment cost may be higher, it offers quick payback and lower operating costs. The presentation would also discuss how this technology can be applied to other similar projects, such as wellness facilities with simultaneous heating and cooling demands, urban environments with limited space, or cases with unique design requirements benefiting from 3D modeling.