D I GB - Alle Vorträge werden simultan übersetzt
GB I D - All presentations will be simultaneously translated

GeoTHERM expo & congress

Freitag, 3. Juni 2022 / *Friday, 3 June 2022*
Kongress 2 - Oberflächennahe Geothermie / *congress 2 - Shallow Geothermal Energy*
14.40 - 15.05

GEOFIT - Easy-to-install, economical and enhanced geothermal systems for energy efficient building retrofitting

- Einfach zu installierende, wirtschaftliche und verbesserte geothermische Systeme zur energieeffizienten Gebäudesanierung

Dr. Henk Witte, Groenholland Geo-energiesystemen

GEOFIT is an EU-funded research project focussing on the use of shallow geothermal energy for heating and cooling of buildings. It specifically addresses retrofitting, therefore tackling the specific issues one has to face while designing, installing and operating a geothermal system in an existing building (Ground source Heat Exchanger – HEX, Heat Pump – HP, heating and cooling emission system).

GEOFIT aims to answer to the challenge by developing easy to install and efficient underground coupling systems, including historical buildings, to make geothermal energy a standard source of heat and cold in building renovation. Such systems take into account the difficulties in drilling in built environments. The project also develops improved, more cost-efficient and less environmental-impacting heat pumps to optimize the use of the energy generated by geothermal systems.

GEOFIT embraces the whole path of design-site survey-installation-operation. It particularly investigates coupling between GHEX and HP and between HP and heating/cooling emission systems, thus providing guidelines for planners to reduce errors and ensure high performance of the systems.

Five pilots are currently being installed within the project:
- A historic building in Italy (Perugia)
- A residential home in Ireland (Aran Islands)
- A public swimming pool in Ireland (Galway)
- A public elementary school in Spain (Sant Cugat)
- An office building in France (Bordeaux)

Across the five pilots, three different typologies of GHEX are showcased (vertical boreholes, slinky GHEX, earth baskets).

As for heat pumps, different kinds of technologies are used:
- Compression heat pumps in Aran and Galway
- High temperature compression heat pump in Sant Cugat
- Sorption heat pump in Perugia
- Hybrid heat pump in Bordeaux (compression + sorption)

Innovative medium Global Warming Potential (GWP) refrigerants are being tested on compression heat pumps, as a way to transition from high GWP to low GWP refrigerants.

Alongside the core technologies mentioned above, side technologies are also implemented and further developed in the framework of GEOFIT:
- Ground Penetrating Radars to detect underground utilities before drilling/excavating
- Unmanned Aerial Vehicles (UAV), accelerometers and GBInSAR radars to check the structural health of buildings during and after drilling/excavation (particularly relevant for historic buldings)
- Advanced Building Energy Management Systems capable to adapt the operational strategy considering also Demand Side Management approaches (e.g. incentives).

To aid the selection of different Ground Heat Exchanger technologies and support the design, an advanced integrated design toolkit is developed. This engineering toolkit allowes the engineer to design and compare the different GHEX (vertical, horizontal, slinky and spiral/earth basket type) in an integrated model framework.

The approach in the engineering toolkit is based on the well-known finite line source approach and implemets G-functions to speed calculation. New finite line source models have been developed and validated for spiral type heat exchangers. Other advances include detailed (temperature dependent) fluid properties correlations and inclusion of seasonally varying temperature gradients.

The finite line source model for spiral heat exchangers has been validated with sand-box experiments and CFD calculations.

The presentation will discuss the main improvements GEOFIT achieved in each of the above-mentioned technological areas. Most relevant lessons learnt from pilots will also be shared with the audience.