Geothermal Drilling Technology Learning from Scandinavia

21st Feb 2024

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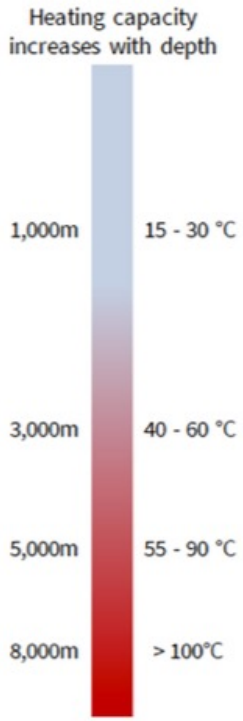
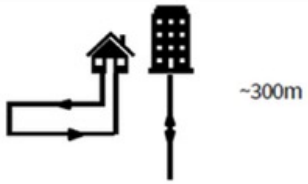
Overview

- Focus on quality drill string consumable products and intelligent rig solutions (Full Solution)
- UK & Ireland local operating market
- Providing support and products in export countries (South America, Middle East & Africa)
- Blast Hole, Well Drilling, Construction & HDD sectors
- Adding value to customers operations through knowledge and support
- Passionate about sharing our experience and technology from other regions into the local market



Traditional ground source heat pumps (GSHP)

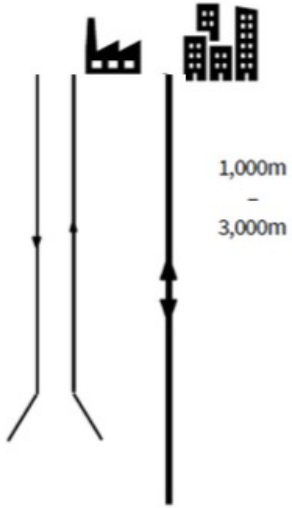


Traditional ground source heating system
now around 300m vertical as standard (Scandinavia)

Competitive solution if heating requirement is moderate
and ample space for several wells

Un-insulated closed single / double collector

Semi-Deep Geothermal Well (Medium Deep)

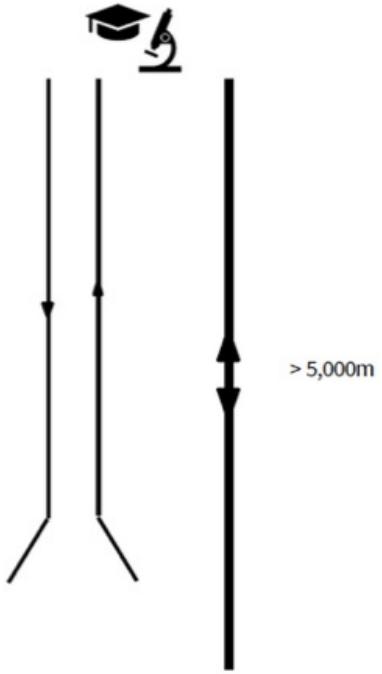


30 - 40 x Traditional 300m GSHP

Optimal for densely build areas with large heating need

Insulated co-axial collector or open loop

Deep Geothermal Well



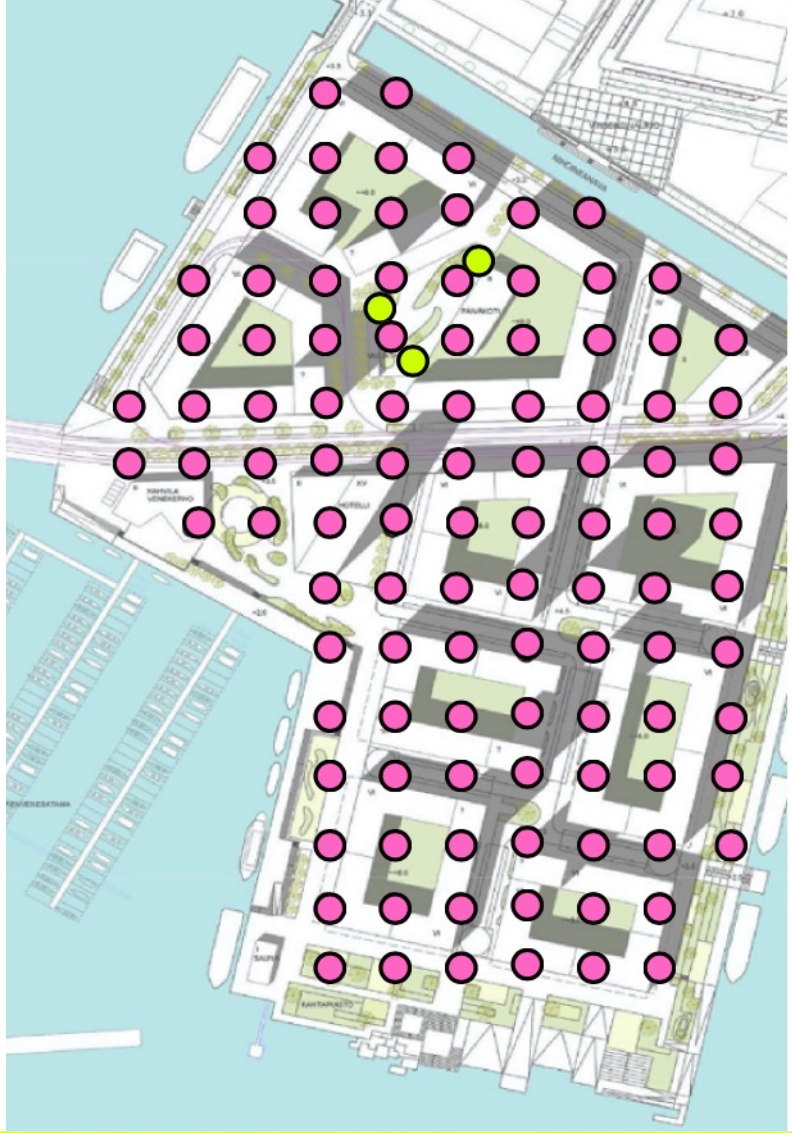
Majority of wells terminated or suspended due to technical issues
in drilling or geological conditions

Cost of deep geothermal well rises significantly

Open / closed loop

Benefits of semi-deep Geothermal

- Figure shows a typical residential area which can be heated / cooled with 3 x 2000m deep geothermal wells or 105 x traditional wells
- 3 heat wells can be located centrally with good serviceability
- Ideal for areas where there is no space to drill tens of traditional wells
- 97% less land use
- The only real solution for larger commercial and residential buildings along with district heating
- Same concept has been used to store heat in the ground from a waste-to-energy plant storing excess heat through summer months to be used during winter months



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Traditional GSHP Spec

- Qmatec 510 TS – Most commonly used rig in Scandinavia for wells 150m – 300m
- Machine weight 13T, Pullback 10T
- Remotely operated control (2 person crew)
- 1 x 300m well completed within same day as mobilization to site
- Air drilling (DTH) most common process
  - 140mm diameter casing 10 -15m deep
  - 116mm diameter open hole to 300m
  - 35 bar compressor
- Full rig / compressor package around 600K EUR
- Transport to site – 1 x truck

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qmatec

Semi-Deep Well Spec

- Geomachine GM2000 – Specifically designed for 2000m Geothermal wells in
- Machine weight 45T, Pullback 60T
- Remotely operated control, data logging, automated drilling, automated rod handling (3 person crew)
- Air drilling (DTH) most common process
  - 235mm diameter casing 500m deep
  - 190mm diameter open hole at 2000m
  - 35 bar compressor x 3 Booster x 1
- Full rig / compressor package around 3M EUR
- Transport to site – 7 x trucks (Drill Pipe on single load)

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Geomachine

Case Finnoo
Geothermal district heating
2GWh/a

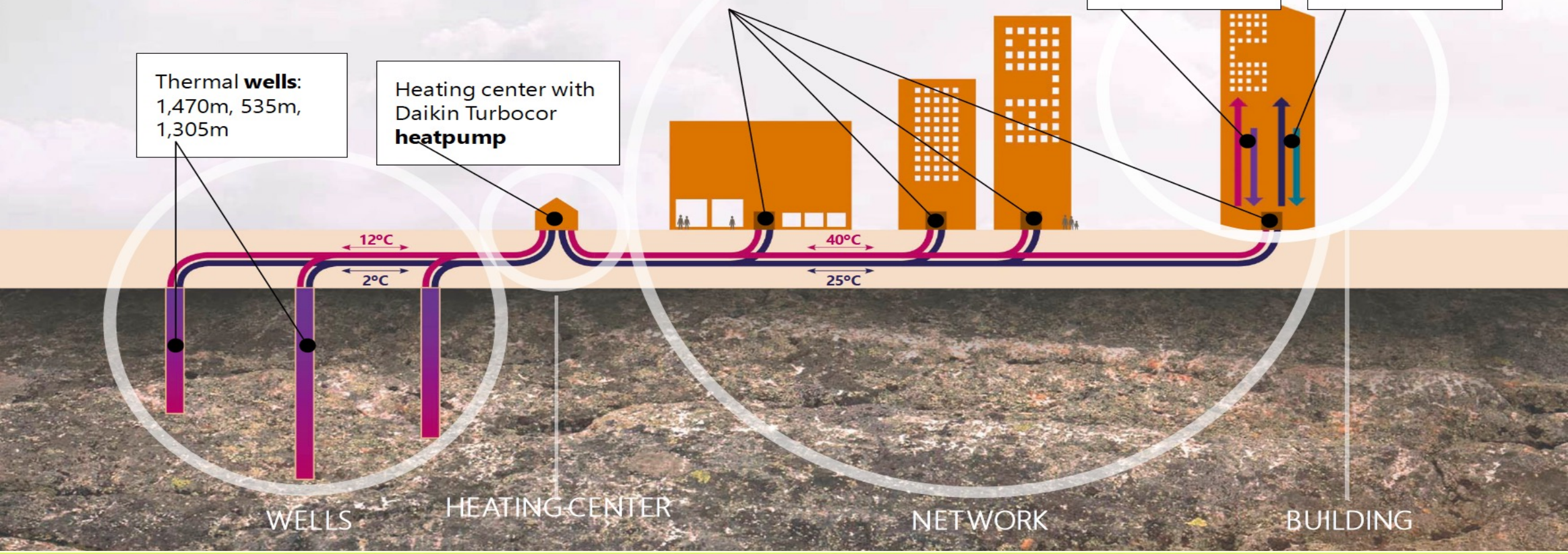
Each building has a **heat pump** that can produce hot domestic water and cooling at the same time

Hot domestic water
60°C 50°C

Cooling
7°C 12°C

Thermal **wells**: 1,470m, 535m, 1,305m

Heating center with Daikin Turbocor **heatpump**



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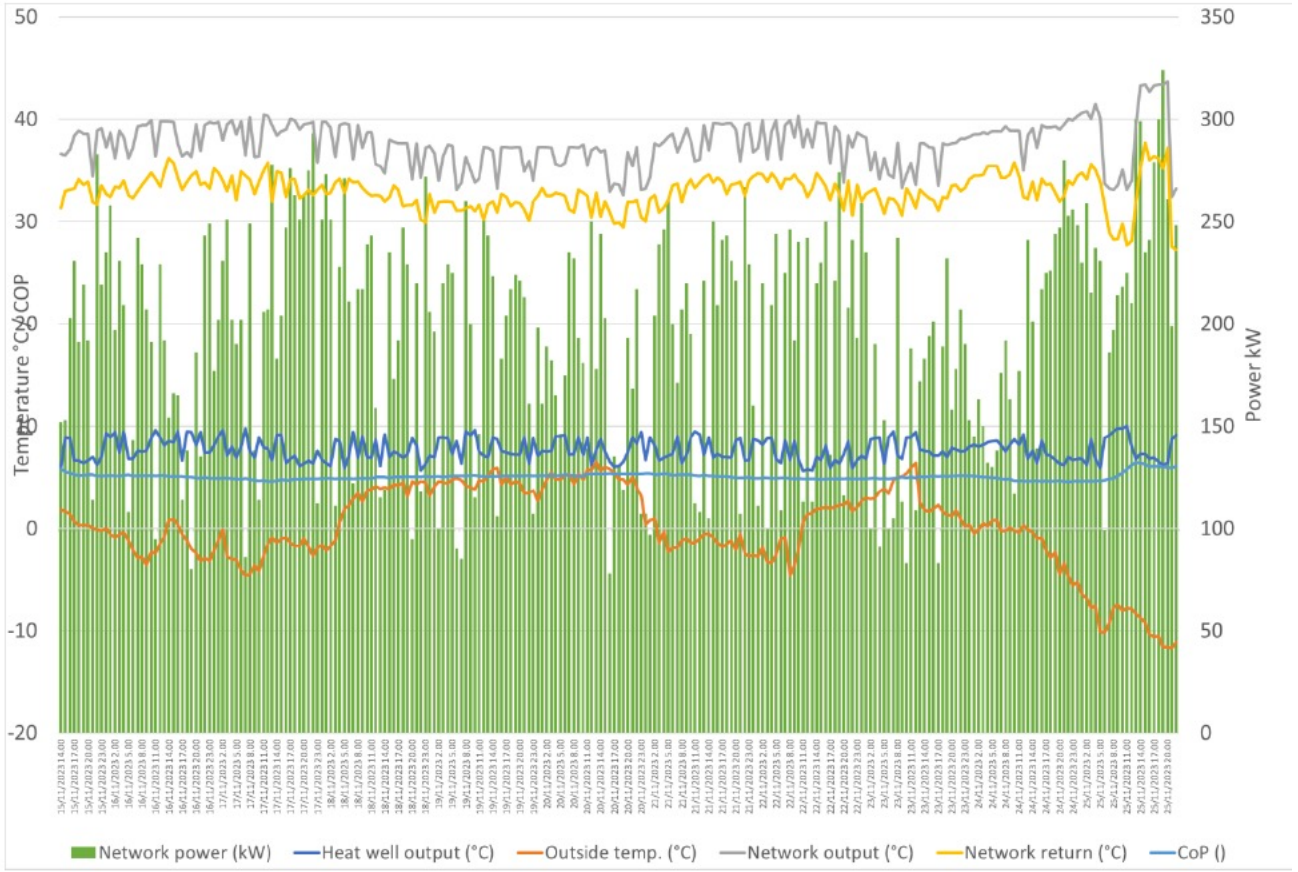
Case Finnoo – operational data from cold period

- Time period 15.11. – 25.11.2023
- Outside temperatures between 6,5 °C and -11,7 °C -> high heat demand
- Heat pump COP 4,6 – 6,4
- The heating plant's energy coverage is 100%, meaning the peak production electric boiler was not used during the period
- The system has operated beyond set point of capacity, which gives 98% coverage of energy
- Emission reduction 350,460 $kgCO_2$/year



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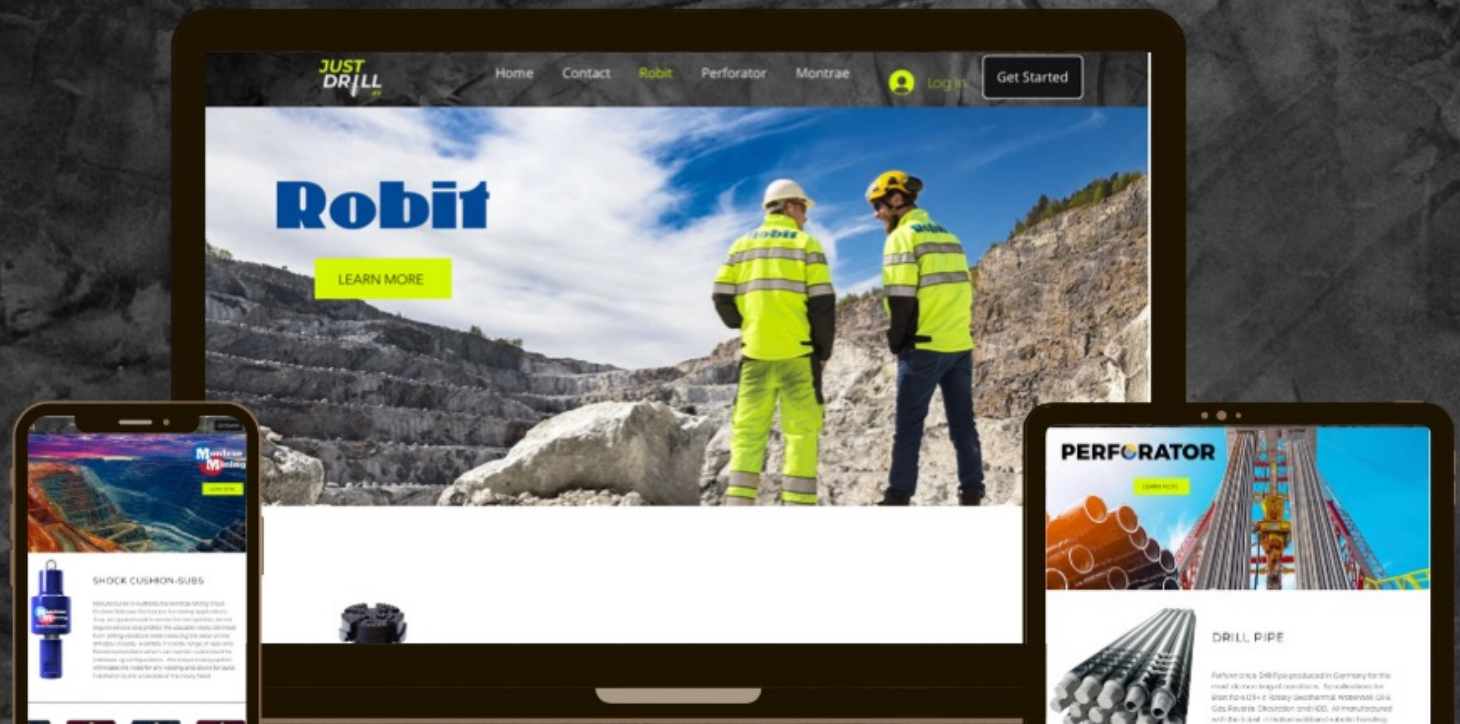

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