An Introduction to Ground Source Heating/Cooling & Ground Collectors

31st October 2017
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Introduction

• B.A. Hydro Solutions
• What is Ground Source Heating & Cooling (GSH&C) & Why?
• Heat Pump Technology
• Sources of Heat From the Ground
• What Might Work for Me?
• How to.....
• Case Studies & Costs
BA Hydro Solutions

• Independent Hydrogeological & Thermogeological Consultancy
• Public & Private Water Supply with associated services
• Ground Source Heating & Cooling, feasibility/design to commissioning
• In house laboratory for testing water, soil and rock
• Extensive range of field services & testing
• One of the largest specialist team of its type in the UK
What is GSH&C?

• Utilisation of low grade [solar thermal] heat from the ground which can be accumulated to provide:
  • Heating
  • Hot water
  • Pool heating,
  • etc

• Temporary storage of surplus heat within the ground

• Convenient sink for surplus heat when cooling spaces/processes
Why? Why GSH&C?

- Financial savings
- Practical necessity
- Independence
- Planning requirements
- Suits modern buildings
- Combined system
- User needs
- Ease of maintenance
- Incentive schemes
- Environmental awareness

Why?
Sources of Heat

- **CLOSED LOOP**
  - HORIZONTAL
  - BOREHOLES
  - WATER BODY
  - LARGE DIAMETER PILES
  - MICRO PILES
  - RETAINING WALLS

- **OPEN LOOP**
  - SURFACE WATER
  - GROUNDWATER

- **STANDING COLUMN**
  - CLOSED
  - OPEN
Closed Loop
Open Loop
Standing Column
Heat Pump Technology
What Will Work for Me?

- Do you have space for horizontal?
- An aquifer beneath?
- A pond or stream?

1 hectare can sustain approximately a 130 kW heat pump

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- Average house needs ~12kW = an area ~30x30m

- Potentially large volumes of groundwater can be abstracted and reinjected to the ground

- Average house needs ~12kW = a flow of 0.4 l/s

- Each square metre of pond (~2 m deep) can sustain 9 watts

- Average house needs ~12kW = an area ~37x37m, or 0.8l/s from a stream

- Closed Loop Horizontal

- Open Loop

- Closed loop in a pond, or

- Open loop from a stream

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Design of Ground Collector

- Critical you are able to recover sufficient heat on demand
- Ensure ground loops match the heat pump & projected loads
- Avoid under or over sizing
- Avoid high losses (pressure & energy)
- Avoid unnecessary operating costs (pumps)
- Build to a specification and revise as needed
- Save money by getting accurate quotes
How to Progress

• Seek advice on the best heat source for you
  • Speak to BAHS or equivalent (£385+VAT)
• Discuss proposal with more than one heat pump installer
  • All should be MSC accredited installer
• Quantify your heating, hot water and any other requirements
  • Either by the MSC accredited installer or an independent company such as BBH Energy
• Ground collector must be accurately designed
  • By either BAHS/thermogeologist or trained MSC accredited installer (up to 20 kW= £385+VAT)
• Cost up the heat pump, internal works and ground collector
• Engage heat pump installer,
  • External work may be by heat pump installer,
    • Direct with specialist contractor, or
      • By/through a company such as BAHS
Who Uses GSH&C?
An Average Bungalow

2no 185 metre deep closed loop boreholes 15 kW heat pump
Drilling & ground works £16,128 Heat pump installation £11,760 Total cost £27,888
RHI £6,840/year over 7 years = £47,880!
Baileys Lane Farm

- 14.4 kW heating load
- Horizontal closed loop collector pipes
- 800 metres of 32mm pipe
- In-situ thermal measurements of the ground
- Final design based on measured thermal values
- Ground collectors, heat pump & cylinder
  ~£18,000
    - RHI payments £2,937.60

Over 7 years
£20,563.20
Housing Associations

• Retrofit heat pumps to social housing using different models:
  • Individual heat sources & heat pumps (HP)
  • Shared heat sources with
    • Low temperature district main & HP, or
    • High temperature district main & shared HP with central heat store

• Drilling in tight spaces
• Need to maintain access
• Need to avoid damage
Nursing Homes

• B. A. Hydro Solutions Ltd have designed and drilled systems for >30 nursing homes in last 5 years
• Heating levels are perfect for elderly
• Helps with building management
• Steady loads for the ground
• Normally enough space in car parks
• Quiet
• Cost effective to install when building
• Cheaper to run & maintain
• RHI

Installation cost, including drilling £168,000
Commercial RHI per year £ 12,240
Total over 21 years £257,040
Earnings £  89,040
SUMBURGH HEAD LIGHTHOUSE
-SHETLAND

- Light house converted to a hotel
- Steady heating load
- Expose position
- Headland setting high above sea level
- Difficult drilling and testing
- Deep boreholes
- High thermal values
Ground Source Heating & Cooling

- Ground Source Heating & Cooling feasibility studies
- Thermogeological characterisation of sites
- Site investigation & testing
- Ground Source Heating & Cooling Design
- Thermal & hydraulic modelling
  Project & contract management
- Project supervision
Any Questions?

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