Ground Source Heat Pump Association Webinar Series 2020

28th May - How to Ensure your Heat Pump is Smart Grid ready
Dave Jones, Hafod Renewables

4th June - Design of closed loop borehole systems 1: Why 600m doesn't = 600m
Chris Davidson, Genius Energy Lab

11th June – Design of closed loop borehole systems 2: hydraulic design
Robin Curtis, GeoScience Ltd

18th June - Design of closed loop borehole systems 3: finishing & construction
John Findlay, Carbon Zero Consulting

25th June - Design of closed loop borehole systems 4: geology & soil conditions
Tim Baker, BA Hydro

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The Value of High Quality Engineering Design

21st May 2020

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Engineering Design

- Manufacturing industry has strong design principles
- Rolls Royce, Bombardier, Babcock, Toyota, etc
- Six Sigma, process design, Lean, RM, Change Control, Design Review, Tech Readiness Levels
- Building services industry not so strong
- Rules of thumb, experience, always done it this way…..

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- A relatively small amount of money spent on design saves a huge amount of money later on…

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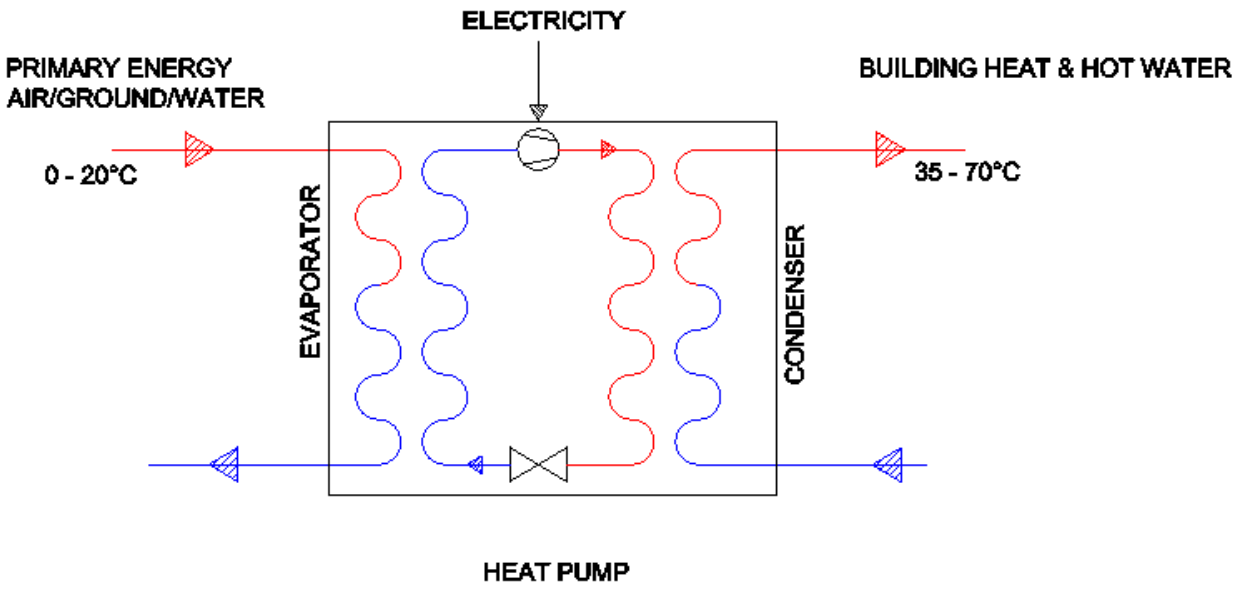
What's Special About a Heat Pump?



- COP = how much electricity needed vs how much free energy from source
- COP can be maximised by increasing primary temperature and reducing building temperature
- Worst case is 0°C primary and 70° building
- Best case is 10°C primary and 40°C to building
- Standard heat pumps cannot generate temps above 65°C

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What can go wrong? A Client Perspective

"Heat pumps don't work"

"Heat pumps only work in new buildings"

"Heat pumps cost too much to run"

"The building is cold"

"Not enough hot water"

"I didn't get the RHI/payback I was expecting"

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What can go wrong?

- Huge electricity bills
- Freezing the ground
- Heat emitters no longer work as expected (thermal comfort affected)
- Not enough hot water
- Legionella
- Heat pump too big/too small
- Project paybacks are affected
- Minimum flow rates are not maintained
- System integration not correct
- Controls don’t work; systems don’t ‘talk’ to each other
- Fixed flow temperatures from heat pump (low COP, high bills)
- Heat pumps don’t fit in plant room/energy centre
- Maintenance difficult or impossible due to squeezing components in
- Flow meters not recording heat generation correctly or in the wrong place
- No drawings or documents to refer back to

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Case Study 1 – Multiple Domestic Heat Pumps

- Heat pumps replaced oil boilers/storage heaters in several tenant owned properties
- Should have saved tenants money on oil bills
- In fact, costs have increased by 20 – 50%
- Very unhappy tenants
- No drawings or design work carried out
- No metering
- No consideration given to tariffs, controls, location of equipment
- Money now to be spent on metering and plant corrections

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Case Study 2 – Yorkshire Church Centre

- Heat pump for new build parish centre
- 5 x 30m boreholes – 2 capped off for leakage (90m)
- Driveway suddenly acquired speed bumps!
- Heat pump stopped working

- Borehole field too small – ground was freezing
- 3 x 80m boreholes needed (240m)
- Brand new heat pump and new borehole field to be installed
- Client could then get commercial RHI

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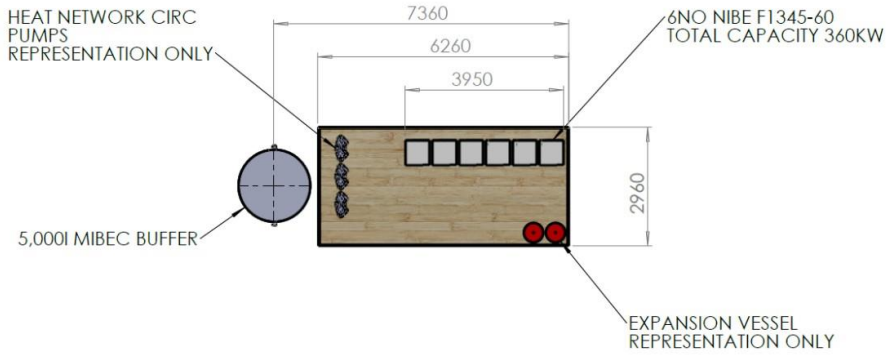
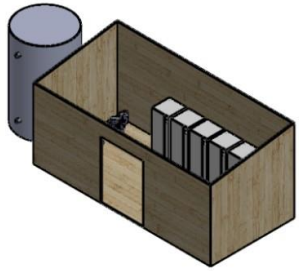
Case Study 3 – Scottish Leisure Centre

- 360kW GSHP supplementing oil boilers
- Small plant room, poor layout, access very difficult
- Heat pumps switched off – COP <2.0 so too expensive to run
- Leaking brine pipework – no drainage
- Expansion undersized – PU out on fault
- No RHI possible

Designing a plant room is relatively straightforward and avoids this…





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Avoidance!

- Employ a qualified engineer to design the system and have sign off/review process
  - Architect needed for a building; same for a large heating/cooling/power system
- Utilise trade bodies such as GSHPA to ensure good quality engineers
- Don’t expect an installer to ‘design’ a system
- Request drawings and specifications before installation starts
- Request independent reviewer on larger jobs

- Fail to Plan – Plan to Fail

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Questions…..

and thank you

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