350 Euston Road: Improving building performances and carbon footprint with innovative HVAC solutions – Phil Draper ACIBSE, Senior Technical and Sustainability Manager
Introduction and Objective

- Responsible for Energy projects for over 8 years in various types of organisations and roles
  - Current Role is Senior Technical and Sustainability Manager for Broadgate Estates
    - Adopted an Engineered approach to sustainability
      - Aim to share where my Innovation’s through technology have created some ‘big’ wins

Please ask questions as we go along
7 storey building, 1,488 sq.metres each:

- 3 boilers for heating (total capacity 1,380 kW)
- 2 air-cooled chillers (total capacity 2,180 kW)
- 2 AHU (total air flow 30,000 m3/h)
- Hydronic Terminals fan coils
Key Achievement’s

- Replacement of base building ‘Building management system’ BMS
  - Allowed changes to be made by on site team

- Installation of intelligent metering system
  - Made visible the low hanging fruits of savings
  - Assisted in determining the efficiencies in the HVAC plant

- Engagement with Occupiers
  - Through regular meetings and sharing of data, implementing changes became easier

- Implementation of Air Source Heat Pump and associated plant
  - Replacing an existing chiller with a ASHP and changing another with a Turbo-cor and reviews of system Hydronic’s resulted in single largest saving
Benefits of a controllable BMS and Suitable Metering

- Back to basic’s approach allowed the introduce of innovation for the BMS
  - Each system was reviewed to determine how it’s controls could be done, rather then just a simple replace like for like
    - Vary water network set points depending on load
      - Site team able to adjust the system to match demand when a out of the ‘norm’ occurred

- Installation of intelligent metering system
  - By identifying the quick win’s through conflicts and over running implemented a belief
    - The data showed where plant was over sized in the HVAC plant
Previous Heating and cooling generation on site
TO AN INTEGRATED HEATING AND COOLING SYSTEM - based on smart heat pumps

- Higher energy efficiency
- Renewable source
- Reduced CO2 emissions
- No fossil fuel consumption
- Reduced footprint
- Reduced installation costs
Solutions for the hydraulic plants

Depending on the thermal loads, different solutions can be applied:

**TRADITIONAL SOLUTION**

Two different systems, one for the cooling load and one for the thermal load.
Solutions for the hydraulic plants

Design of the hydraulic plant
Depending on the thermal loads, different solutions can be applied:

SMART SOLUTION

A single system using the Carnot Cycle thermal loads
Units for a 4 pipe system

Hydraulic circuit
40 °C → 45 °C

Hydraulic circuit
12 °C → 7 °C
In all cases in which ASHP simultaneously produces hot water and chilled water, the real efficiency of the unit is the sum of the hot and cold performances.

\[
\text{TER} = \frac{\text{Cooling capacity} + \text{Thermal capacity}}{\text{Power input}}
\]

TER reaches its maximum value in a condition of load balancing.
Units for a 4 pipe system
Predicted Saving opportunities

Energy balance [kWh]
- Heating energy
- Cooling energy
- Absorbed energy

Total Efficiency Ratio
- TER

Graphs showing energy balance and total efficiency ratio over months.
Actual Final solution

Retained 2 boilers

ASHP

Turbo-Cor

Heating load

Cooling load

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

[kW]
Chilled Water Savings to Date

- November 2012/2013: 32,000
- December 2012/2013: 20,000
- January 2013/2014: 18,000
- February 2013/2014: 20,000
- November 2013/2014: 30,000
- December 2013/2014: 20,000
- January 2014/2015: 18,000
- February 2014/2015: 20,000
Year on Year Savings to Date

85% gas saving to date

2013/2014
2014/2015
Any Questions?
BROADGATE
ESTATES

Special Thank You to
British Land
Climaveneta
Cavendish Engineering
Studio Planning

April 2015