Green Gown Awards 2011
Highly Commended

Imperial College London

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Highly commended – Carbon Reduction

***"Continuous Optimisation of Plant and Services** – a partnership in sustainability by conserving carbon through energy reduction"*

Profile

- Founded 1907
- Consistently rated amongst the world's best universities, Imperial College London is a science-based institution with a reputation for excellence in teaching and research.
- 21,613 staff / student FTE
- 116 buildings on 7 sites
- 478,010 m^2 Gross Internal Area

Summary

Imperial College London is committed to provide a sustainable and operable estate, despite extensive refurbishment/new build and staff/student growth. We have implemented a strategy of re-commissioning building plant and services, "Continuous Optimisation", delivering:

- **Reduced carbon consumption**
- **Conserved energy**
- **Lower operational costs**

In partnership with the academic community our annual accumulative savings are: **£518,350 and 2,846 tonnes CO_2**

Project partners

- ABS Consulting – identifying potential opportunities and potential solutions validating savings
- Carbon Trust – provided some survey and trial funding
- Trilon – provides commissioning and engineering services

The problem

The university sector has invested heavily in new buildings/refurbishment, providing state-of-the-art research/teaching facilities. Research demands controlled environments, relying on plant/infrastructure non natural ventilation, to maintain operational parameters, preventing experimental contamination.

When new facilities are handed over, operational controls are set at parameters signed-off at design, plant/services continue in this condition, without considering changes in academic practice, occupation or the need for carbon reduction.

Working with consultants, contractors, maintenance and occupants, Facilities & Property Management, initiated a programme of optimisation through continuous commissioning (ConCom), targeting avoidable waste

The approach

'Continuous Optimisation' provides a strategy for managing buildings; reducing energy consumption, carbon emissions and operating costs, while delivering safe and productive business environments.

Using '**Variance Analysis**' we**:**

- Determine what's required of buildings/services, while meeting academic needs and minimising energy consumption (**Ideal**).
- Review consumption, obtaining an understanding of services/systems and maintenance/operation strategies utilised. (**Actual**)
- Implement strategies eliminating variance between Ideal/Actual, eradicating avoidable waste.

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Applying '**Continuous Optimisation**' we are:

- Ensuring plant operates in auto-mode not manual
- Reducing air volumes
- Setting-back AHU operation (temperature/time)
- Introducing efficient plant
- Adjusting pump delivery meeting flow demands
- Improving filter efficiencies
- Introducing occupancy controls e.g. CO2 sensors

Our goals

- Optimise the operation of our plant and services to meet academic demand while minimising energy consumption and costs.
- Obtain a better understanding of academic perception about internal environments, enabling us to prioritise resources to maximise improvements.
- Increase buy-in and support from our staff and service partners, developing energy minimisation practices into their normal operations.
- Embed a cultural change in the operation and delivery of building services through meaningful engagement with staff and students.

Obstacles and solutions

Obstacle/challenge	Solution
Academic reluctance to change air volumes, concern that it would impact adversely on their work.	Reduced volumes gradually over several nights, consuting with users each time, to gague adverse affects.
Concern that lower air change rates might impact on the safety of the laboratory.	Support from Health & Safety department, reviewing laboratory operations and reasuring safft and students that there is nothing to be concerned about
Lack of reliable or original commisioning data for plant and services	Re- commision the plant prior to making any changes.
Sufficient resource, particularly, in-house staff time, commisioning engineers familiar with our buildings and consultancy time, to progress the application	We are recruiting an aditional member to the Energy & Environmental team and have decided to tender a number of work packages, consisting of building groups, which will allow us to establish different teams working alongside each other.

Performance and results

Nil cost savings achieved include:

- SAF AHU schedule adjustments
  - saved **£22,077** and **128 tCO_2** / annum
- Commonwealth AHU schedule and FCU adjustments
  - saved **£11,803** and **99 tCO_2** / annum

Funded annual savings include:

- Heat recovery, SAF AHU's 21/22
  - Cost **£21,000**, saved **£20,000** and **89 tCO_2**
- SAF NMR suite plant/control modification
  - Cost **£138,133**, saved **£45,000** and **219 tCO_2**
- Flowers laboratories AHU 'Night and Volume Set-Backs'
  - Cost **£46,891**, saved **£48,158** and **315 tCO_2**

Our accumulative savings to date are **£518,350 and 2,846 tCO_2**, against a capital spend of **£429,951**

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Lessons learned

Applying a 'Continuous Optimisation' strategy to plant and services has the potential to save significant amounts of carbon within the higher education sector; this is particularly the case where controlled environments e.g. laboratories are operating.

Engagement with the academic community is essential to understand the actual environments they require. The technical skills needed often exist within in-house teams and maintenance service partners, inclusive engagement with them can save costs and embed carbon saving practices.

Once implemented, a progressive momentum results, as the academic community see the tangible benefits proven, without adverse impact on their teaching or research.

Further information

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We would like to acknowledge the Carbon Trust who funded some of our 'Continuous Commissioning' investigations and trials.