

Air conditioning inspection reports – Case Studies

Case study 1: Tower of London – A historical landmark requiring a number of AHUs for conditioning various buildings and areas within the site.

In all there were 11 AHU's, the main requirement for air conditioning was on the ground, first floor and basement archive stores. All plant was estimated to have been installed around the last 25-30 years and for the first 15-20 years underwent refurbishment once. Planned Preventative Maintenance (PPM) was introduced by its current Facilities Management (FM) team but realised that further improvements could be achieved.

Following an air conditioning inspection, the report identified a series of low cost measures or 'quick wins' which enabled the increase of energy efficient running of the plant. Lagging of ductwork/pipework, replacement of door catches, and the cleaning and/or replacement of filters and blocked coils were the main issues reported by the inspector. Though simple to change or resolve, these measures would have likely averted more serious problems such as the burn out of pumps and motors caused from blocked coils and blocked filters which were not picked up by the PPM or other means. The measures were estimated to produce a 22% energy savings or 37% savings in running costs and approximately a reduction of 236tCO₂ annually with all payback under a year.

By having the ACR, the FM team were able to be implemented the recommendations immediately to take advantage of the benefits recommended in the report.

(Figures and details from this case study previously published in fmworld www.fm-world.co.uk edition 12/03/09)

Case study 2: Eland House – Office building housing the headquarters of CLG

Eland house has 2 Chillers, 11 AHU's, a Building Management System (BMS), 2 Direct Expansion (DX) units and a number of terminal units such as chilled beams. The building itself is relatively new and has only been in use since 1998. The inefficiencies of this building was highlighted by the difference in the EPC and DEC ratings. The EPC demonstrated a good modern building was given a reasonable C rating, whereas the DEC showed that there were issues with high energy usage in the building and rated the building at F. To demonstrate and test the use of ACI's, CLG invited inspectors to look at their air conditioning systems and plant to find out how they could reduce the energy use and improve on the DEC rating.

The recommendations were a mixed selection of high capital cost changes to the plant in addition to utilising the cost effective 'quick wins'. The quick wins focussed mainly on controls issues and the correct operation of equipment, these included; setting correct BMS set points for the heating and cooling, control valve testing for heating and cooling coils ('hunting' was common in several AHU's due to valves allowing both heating and chilled water flow when either only heating or only cooling was required), incorrect room humidity settings and incorrect refrigerant levels in chillers were

resulting in inefficiencies, some AHU dampers were ineffective and recirculated either too little or too much outside air and overall there was a lack of pipework and ductwork lagging.

The total energy savings for these measures was just under 550,000kWh or a 9.9% reduction of the building energy load. This equated to 238tCO₂ and a cost saving of £32,642 per annum. The implementation cost of these measures were £8,200 which gave a payback of 3 months and gives the equivalent cost of £34/tCO₂ saved. Even including the cost of the air conditioning survey (£3,744) the payback works out under 5 months.

The result was an improvement of the DEC rating to an E, but it was proposed that further higher capital cost measures such as sub-metering equipment, data reading equipment for chillers and some plant upgrades could improve the rating further.

(Case study based on original article from the CIBSE Journal)

Case Study 3: London Fire Brigade (LFB) HQ

The LFB HQ building was built in the early 1900's and spans 15000m² over 5 floors. The cooling was via 4 chillers and provided 1100kW of comfort cooling.

An ACI and report was completed and issued in July 2009. The majority of the recommendations were low or nil cost. The following recommendations from the report were actioned immediately after the report was submitted to the LFB.

The system temperature set points were changed to more suitable values, as were the timings, damaged and missing insulation was replaced and reinstated and modifications to the controls were made to prevent the operation of the plant outside the required cooling season.

On completion of implementing these measures the electricity consumption was monitored for the duration of four months between December 09 – February 10 and compared with the same duration the previous year. It was reported that 59,000 kWh of electricity was saved, giving £6000 saving and payback in 3 months. The CO₂ saved is estimated to be approximately 32,000 kgCO₂ or a reduction of 12.6%.

(Case study produced with the assistance of David Cocking of Arrow Energy Solutions Ltd and Ian Shaw of the London Fire Brigade)