Case Study - Low Energy Ventilation and Cooling

- **Location:** Cambridge
- **Contact:** Andy Lefley, Assistant Director Building Services
- **Systems:** Cool-phase® system
- **Sector:** Education

Bryant Building Computer Room

In January 2013 a computer room used by the Faculty of Science and Technology at Anglia Ruskin University in Cambridge had its aging air conditioning system replaced with two Cool-phase low energy cooling and ventilation systems. The units were fitted discreetly within the existing ceiling void.

'I am very excited by this technology and the opportunity to improve student comfort without increasing the energy burden to Anglia Ruskin', said **Andy Lefley, Assistant Director of Building Services, Estates & Facilities.**

The Bryant Building, Anglia Ruskin University

Scenario

In an effort to reduce their energy consumption, Anglia Ruskin University were keen to explore low energy alternatives to conventional air conditioning technologies. Two Monodraught Cool-phase systems were specified to serve the Science & Technology classroom, replacing the existing end of life air conditioning system that provided comfort cooling but no ventilation. **The Cool-phase system provides intelligently controlled ventilation and naturally cools the area through the use of phase change material housed in thermal battery modules. The systems maintain thermally comfortable conditions and good air quality levels throughout the year.**

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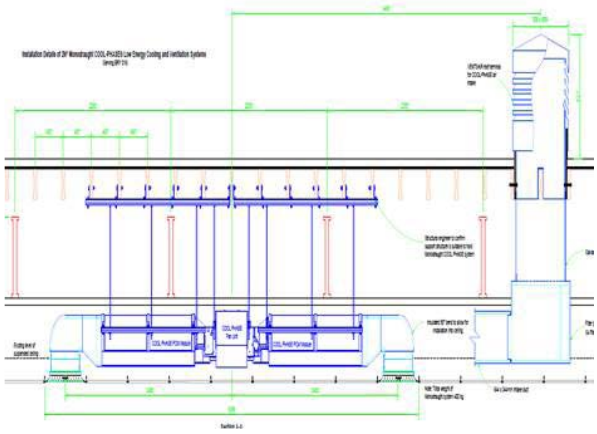
Design

Monodraught's design engineers carried out dynamic thermal modelling, the results of which determined that 2N° 8 KWhr Cool-phase systems were required to ventilate and cool the space.

As is often the case with retrofit projects, the installation was rather challenging. At the Anglia Ruskin site the conventional wall louvre assembly for supply and exhaust air had to be reconfigured due to the existing building construction. The design team engineered a solution that utilised a roof mounted supply and exhaust system to serve the two Cool-phase units.



The fresh air supply route to the Cool-phase systems

The installation was carried out by Monodraught's installation team in January 2013 to prevent disruption to teaching commitments.

Installation of Monodraught's Cool-phase systems

Clients' Comments

'I am grateful to the department for allowing us to trial this equipment in Bryant. We will be monitoring it closely to see if it has the impact we hope it will. If the trial is successful, the Estates & Facilities team will consider a range of further applications across the Cambridge and Peterborough campuses.'

Results

Each Cool-phase system continually monitors and records temperature, CO_2 concentration and energy usage. The results displayed below are based on data collected by the units installed in Room 016 from 25th January 2013 to 2nd September 2013.

Internal Temperature

Table 1 shows the average daily temperatures for the Science & Technology computer room. The readings clearly demonstrate that the Cool-phase systems have consistently maintained the internal temperature within a comfortable band.

Table 1 : Daily Temperatures (°C) 25/01/13 - 01/09/13

Average	Min Average	Max Average
22.7 °C	20.9 °C	23.8 °C

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Table 2 shows the percentage of time that the internal temperature has exceeded 25°C, 28°C and 32°C during the data logging period.

Table 2: Max Temperatures (%) 25/01/13 - 01/09/13		
>25°C	>28°C	>32°C
3%	0%	0%

The Cool-phase systems have maintained an ideal temperature within the room of less than 25°C for 97% of the occupied hours across the thirty one week period. At no point has the room exceeded either 28°C or 32°C. This level of performance far exceeds the target overheating criteria stipulated by both CIBSE Guide A and BB101.

CO_2 Levels

The typical background or atmospheric CO_2 concentration is recognized as approximately 400 parts per million (ppm). In education facilities CO_2 levels should ideally remain below 1500 ppm, with levels above 1500 ppm considered high.

Table 3: CO_2 Levels 25th Jan 13 to 2nd Sep 13		
> 1000 ppm	> 1200 ppm	> 1500 ppm
11%	3%	0%

Table 3 shows that the CO_2 concentration in Room 016 where the two Cool-phase units are installed is consistently maintained below the threshold level.

Energy Consumption

Table 4 shows the energy consumption of the two Cool-phase units installed in the Bryant building. The combined usage was 197.6 KWh of electricity across the thirty one week data logging period. Assuming a standard electricity tariff of 0.11£/KWh, that amounts to **total energy costs of £21.74**, or just **70 p a week for the two Cool-phase units.**

Table 4: Energy Used 25th Jan 13 to 2nd Sep 13	
Master Unit	100.2 KWhs
Slave Unit	97.4 KWhs
Combined Units	197.6 KWhs
Cost in £'s (Assumed 0.11£/KWh)	£21.74

Conclusion

Monodraught has demonstrated that the Cool-phase systems meet the design criteria and specification that the client requested, that being the requirement for comfort cooling to maintain internal temperatures within an acceptable temperature band, and for the provision of fresh air such that CO_2 levels remain within acceptable boundaries. The results displayed in this case study show that the solution has complied with the overheating and air quality criteria, keeping temperatures and CO_2 concentrations within acceptable levels. This has been achieved with very low energy usage and equally low running and maintenance costs.

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