

LEICESTER CITY COUNCIL

Leicester City Council Deploys New Sub 1.1 PUE3 Data Centre Infrastructure.



Leicester City Council is a unitary authority in the East Midlands. The council is responsible for local government services in Leicester and with a population of over 330,000, it is the largest city in the region, and the tenth largest city in the United Kingdom.

CLIENT SITUATION

Leicester City Council's legacy data centre was located within an obsolete 1960's concrete building, which was no longer fit for purpose and due for demolition during 2014. The council identified a surplus property within the city boundary which was ideal to support both the City Council ICT demands and also the capability for the council to offer shared resource services to local public sector organisations in the East Midlands.

Leicester City Council's ambition was to create a first class Data Centre combined with exceptional energy performance, to help provide a significant and meaningful contribution to the council's carbon reduction commitments.

As part of a rigorous tender process Workspace Technology demonstrated their expertise and leadership in energy efficient data centre design, build & management.

The council commented, "Workspace Technology's bid was outstanding, without a doubt they clearly demonstrated their understanding of the council's needs and it was obvious that Workspace Technology have extensive knowledge and expertise in low carbon data centre design".

THE ICT ESTATE

The city council had a data centre estate of around 55 racks of ICT equipment, including virtual servers, physical servers, and several racks of SANs.

Prior to decant, the city council project team rationalised its estate to a significant extent, through maximum virtualisation, rationalisation and decommissioning of legacy hardware. This notably reduced the power draw of the retained estate prior to decant.

The city council also invested in a new CISCO Data Centre network utilising the Cisco Nexus product range, with all the accompanying industry leading power management features associated with this product suite.

DESIGN OVERVIEW

The city council wished to deliver direct fresh air cooling with a closed loop backup to mitigate any local air quality issues. Energy efficiency was central to the data centre requirements. Not only was an annualised PUE3 of sub 1.1 demanded, but also the implementation of renewable energy technology and the utilisation of waste heat.

Summary Requirements

- Tier 3 data centre architecture
- Sub 1.1 annualised PUE3 performance
- Implementation of renewable energy.
- Waste heat recovery.
- 250kW I.T Load.

WORKSPACE TECHNOLOGY'S 'TOTAL CARBON COMMITMENT'

Workspace Technology's 'Total Carbon Commitment' delivers a unique holistic approach to data centre designs. By taking a much broader view when engaging in the design process, Workspace Technology ensures every aspect relating to the data centre efficiency is explored and not just those that directly relate to the data centre power and cooling.

The holistic approach encompasses:-

Measure: Measurement is the key to unlocking the understanding of energy consumption and energy utilisation.

Reduce: Reduction in demand through maximising 'useful work' per watt in turn reducing infrastructure overhead.

Design: Deployment of 'Best Practice' Data Centre Design reduces infrastructure overhead relative to the critical load.

Renew: Implementation of renewable energy sources lowers the carbon content of the energy profile.

Recovery: Heat recovery enables waste heat to be put to productive use reducing downstream energy costs.

FREECOOL®

Workspace Technology is an established industry leader in data centre direct fresh air cooling deployments. Freecool® was the technology of choice and the only technology on the market that could fulfil the PUE design requirements of the council.

Freecool® Evaporative Free Air Cooling by Workspace Technology delivers innovative low energy cooling for a range of applications including data centre environments. The implementation of the 'Cool Wall' module delivers mechanical backup or top up cooling for all modes of system operation.

Freecool® installations are designed and built from scalable standardised modules that can be interconnected in a





bespoke arrangement supporting 'real world' customer applications. The Leicester City Council project was no exception, the solution was designed to support a maximum critical load of 250kW N+1 with a deployment of nine 30kW Freecool® units.

Freecool® Design Features for Leicester City Council Included:

- **Double Filtration** delivered through a combination of G3 and G4 air intake filtration systems, eliminates data centre contamination.
- **'Atemperation™'** accurately mixes the percentage of hot exit air with cold intake air to produce a stable equipment intake temperature irrespective of external ambient conditions.
- **Dynamic Mode Temperature Control** allows cold aisle temperatures of 18°C for the vast majority of the operating period without any compromise in energy efficiency.
- **Reduced Fan Power** by carefully installing specialist energy efficiency EC fans that use significantly less energy than conventional fan technology.

COOL WALL

As part of the deployment, Workspace Technology implemented the Cool Wall module which consists of a series of high efficiency chilled water coils, positioned within the Freecool® Mixing Box, combined with an external mechanical cooler and buffer tank. The Cool Wall module is designed to deliver an independent back up cooling circuit. Cool Wall activation is based on a range of configurable environmental conditions including fire, air quality, temperature and humidity.

FlexAisle® Vendor Neutral Aisle Containment

As part of the managed airflow architecture and to help maximise temperature control and minimise fan energy consumption Workspace Technology deployed 'FlexAisle®', their multivendor aisle containment system, as part of the data centre solution.

A combined cold and hot aisle return plenum 'HARP' was deployed for the Council. The complete arrangement was self-supporting allowing the simple installation and removal of equipment racks without the need to dismantle aisle containment systems.

RENEWABLE TECHNOLOGY DELIVERS TRUE CARBON NEUTRAL COOLING

Photovoltaic (PV) technology delivering up to 35kW of power was installed as part of the project (55 Individual roof panels). The PV based kWh power contribution exceeds that of the Freecool® kWh power consumption. As a direct result, the Council's data centre facility can truly describe it's cooling as carbon neutral. This is one of the first of its kind in the UK and it is hoped that this model will act as the template for future data centre deployments.

HEAT RECOVERY

The project team took every opportunity to further reduce energy consumption. The use of free air cooling for the UPS equipment is standard design for many plant rooms today. This was no exception for the councils new data centre, but this was taken one step further by using waste heat from the UPS room to maintain temperature for the battery room during cooler periods thus eliminating the need for mechanical heating.

The use of heat recovery will reduce the energy costs associated with maintaining UPS battery temperatures by us much as 80%.

COMPLETE ELECTRICAL DESIGN

Workspace Technology's in house Data Centre Solutions Division designed and installed a complete end to end electrical installation including HV power feeds, transformers, LV Switchgear, critical and mechanical power distribution.

High quality Form 4 Type 6 Schneider Electric switchgear was deployed throughout including Mains Intake, UPSLVP and Generator panels.

In-Row CPDU Workspace Technology cleverly deployed rack based in row Critical Power Distribution Units. Using Schneider Electric Acti9 sub pan assemblies mounted with APC Netshelter SX racks, these delivered the ideal configuration for overhead power distribution. As with conventional perimeter PDU's breakers these are pre-wired to a terminal field to allow for safe and easy connectivity of distribution cabling.

Schneider Electric PM750 meters were deployed throughout enabling power monitoring through the StruxureWare Power Management Expert energy management software.

TECHNICAL INFRASTRUCTURE

As part of the installation Workspace Technology deployed 60 x Schneider Electric APC NetShelter SX multivendor equipment racks, intelligent metered rack PDUs and Belden Cat6A I/O rack to rack cabling links.

TECHNICAL CHALLENGES

As floor space was at a premium, Workspace Technology's team cleverly created an external freecool mixing box and plant room area which ensured all of the floor space was available for equipment racks.

Detailed space planning within the power plant area also ensured that the data centre could be expanded to support the council's ambition to develop a local public sector shared resources ICT facility.

PUE AND FINAL OUTCOMES

PUE is the ratio of total amount of energy used by a computer data center facility to the energy delivered to computing equipment, and is the industry recognised measure of Data Centre energy efficiency.

The New Data Centre provided a PUE of 1.07 when loaded to 100% of design capacity, and 1.08 at 75% capacity. This level of performance is world class and is comparable to recent state of the art Data Centre installations by global organisations. This is a truly outstanding outcome in the field of data centre design and efficiency.

Furthermore, since occupying the Data Centre in early July, the council has seen its power draw reduce to around 40% of the typical July draw at the old facility, despite much of that time needing to cool with 30 degree outside temperatures. This outstanding outcome is partly through the upfront rationalisation work, but mainly through the leading edge facility design, and this demonstrates a tremendously successful project delivered through a superb project partnership between the city council and workspace technology limited.

