

Cheshire Data Centre

Capitoline LLP (www.capitoline.eu) has handed over the Cheshire Data centre to the client, Cheshire West and Chester Council.

This modern data centre features a 400 m² computer hall within a dedicated and purpose built 860 m² building on a secure 1700 m² plot.

The data centre can host over 130 server and communications racks and offers N+1 redundancy throughout by featuring two separate telecommunications entrance rooms, an N+1 UPS and a 750 kVA diesel standby generator. The computer room and other principal areas are protected by an aspirating smoke detection system linked to an ozone-friendly inert gas fire suppression system. The gas used is based on nitrogen and argon so it also has zero global warming potential unlike some of the halocarbon gasses also in common data centre use.

One outstanding feature of the new data centre is a cost effective air economiser system that uses outside air to subsidise a standard DX air conditioning system. The air economiser, designed by Capitoline and controlled by a sophisticated Building Management System, BMS, is expected to reduce electricity consumption on HVAC requirements by 35% over a year. This was just one of a range of green features incorporated by Capitoline into the design to give the new data centre one of the best Power Usage Effectiveness (PUE) figures in the industry.



The air economiser is a low cost innovation that can easily be used whenever the Computer Room Air Conditioning (CRAC) unit is placed against an outside wall. The normal mode of operation is for the CRAC unit to take in the warm computer room air through the top of the unit, filter, chill and condition it for correct humidity and then blow it out under the raised floor for delivery back to the air intakes of the IT equipment.

The addition of the air economiser consists of two motorised louvers that can decide to import external air when the outside air temperature falls below 21^o C. When this happens the hot air of the computer room is simply dumped outside and no energy is expended in cooling it. When the external temperature rises above 21^o C the outside louver shuts and the air conditioning functions as normal. If the external air temperature falls below 10^o C then the system goes into 'mix' mode i.e. it mixes cold external air with hot computer room air to maintain the input air at something ideally in the high teens. When the external air temperature goes below zero then the imported air would be reduced to a trickle to prevent extremely cold air entering the data centre. Sub zero air could lead to some unwanted freezing and especially condensation issues on the electronic equipment.

The CRAC units are also fitted with humidifiers and dehumidifiers to keep the relative humidity within an optimal range. Too low, say below 30%, then static discharges will easily damage IT equipment. Static build up can occur just through some one walking across the floor and touching an equipment rack or for very low humidity the static build up can occur simply from the passage of dry air over cables and power supplies. Too high, say above 70%, leads to mould growth and a long term failure mechanism within printed circuit boards due to slow take up of water molecules.

Maintaining very tight levels of humidity can also absorb great quantities of energy and many data centres go to great lengths to keep the humidity at 50%. Latest standards have relaxed these requirements and now give a much more energy efficient target range of around 35 to 60%. These wider tolerances have been programmed into the Cheshire data centre to give yet another energy saving process but while still protecting the working environment of the operation.

The CRAC units are providing all the motive power to push the air through the room and also provide the filtration and humidity control. A sophisticated BMS controls the operation of the louvers by measuring the external air temperature, the air temperature going into the top of the CRAC units and also reacting to various fire conditions. If, for instance, the fire alarm goes off declaring an imminent release of the gas suppression system then both louvers will shut to retain the fire integrity of the room and keep the suppressant gas confined in the room to do its job. After the fire event is over both louvers will be commanded to open and all extract fans will be turned on to purge the room of gas. As a final safety measure there is a smoke detector fitted into the external air intakes to prevent external smoke from setting off the gas suppression system in the computer room accidentally.



The air economiser (shown in these images) design by Capitoline helped give this Data Centre one of the best PUE in the industry,



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The air economiser approach will save electricity for 70% of the year in the cooler climates of northern Europe. If we take a subtropical example such as Dubai, then about 20% of the year is spent below 21° C. So even in a relatively hot country like the UAE an air economiser would greatly reduce HVAC electricity consumption for a fifth of the year.

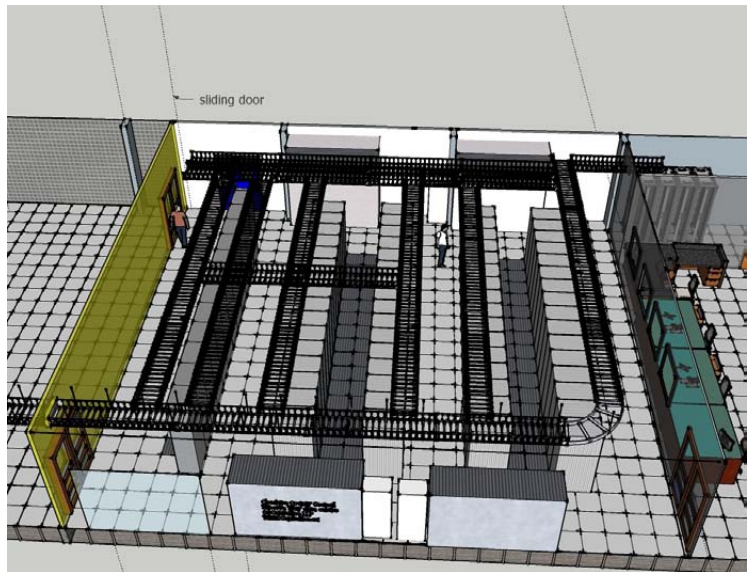
Other 'green' features of the data centre included a modular, transformerless UPS (Uninterruptable Power Supply) that provides around 6% more efficient use of electricity compared to the more common type of off-line, dual conversion systems.

The layout of the racks also helps with the efficient use of air conditioning by adopting the hot aisle/cold aisle format that delivers all the cold air to the front of the IT equipment without wasting any. The under floor area serves as the air delivery path and once again efficiency is raised by keeping this area clean and uncluttered so as not to impede the easy flow of the cold air.

Communications around the data centre is effected by a generic Category 6 cabling system with OM3 optical fibre going to each server rack from a series of local 'zones'. Each zone is then connected to a Main Distribution Area which then sends out duplicate cabling to the two Telecommunications Equipment Rooms. This approach gives a neat generic cabling overlay and means no further cabling needs to be added.

The Cheshire data centre meets all the requirements of the European Union document 'Code of Conducts' and 'Best Practices' which are voluntary codes published by the EU to encourage users to design and operate their data centres in a more efficient manner. The Code of Conduct recommends the use of air economisers, as designed by Capitoline, and also requires constant energy monitoring so that efficiency can be measured and demonstrated.

Capitoline was the performance and design consultant for the Council, interpreting an IT requirement into a physical N+1 design with an expected ten-year life span. Capitoline worked with the Client, the Client's architect and the various specialist fit-out companies to ensure the success of the project.



From the 3D model to the real thing

