

Case Study - Zero Energy Retail Building for Costa and Subway

Breathing Buildings worked in collaboration with emission zero (Design Consultants & Architects) and other members of the design and construction team to create the UK's first zero energy retail building



PROJECT	Costa and Subway eco-pods - retail space
LOCATION	Wrekin Retail Park, Telford
SECTOR	Retail
FEATURES	Design consultancy and implementation
HISTORY	Project began 2013 and completed spring 2015

Overview

Having previously worked with Hammerson on a number of high profile retail projects, Breathing Buildings were appointed to provide design consultancy for an exciting new development at Wrekin Retail Park, Telford.

The brief for what became the Costa and Subway "eco-pods" included design and implementation of a bespoke ventilation solution, integrating underfloor heating, space heating, natural ventilation and mechanical air conditioning in a single common control strategy.

A key feature of the design is intelligent communication between the natural ventilation system and other elements of the building services, such as the underfloor heating and VRF cooling systems - ensuring that all components work effectively together.

Hammerson's key objective for the project was to build the UK's first zero energy retail building.

The Challenge

Large, fully-glazed facades result in significant heat gains in summer and heat losses in winter. As with all retail buildings, customer footfall is key, resulting in frequent opening and closing of entry doors. Finally, high quality internal conditions are required to satisfy customer comfort throughout the year.

These factors need to be carefully taken into account and all systems need to work in partnership to ensure that air quality and thermal comfort is maintained year round with net zero energy consumption.

The Solution

The sophisticated control algorithm developed by Breathing Buildings monitors internal temperature, CO2 concentration, external air temperature and the temperature of mixed fresh air being delivered to the space.

Breathing Buildings' e-stack solution delivers energy savings in two ways:

1. In warm weather, natural upwards displacement ventilation eliminates the wasteful fan power consumption, typical of mechanical systems.
2. In colder weather, the e-stack system's innovative approach – bringing air in at high-level and mixing it with air in the room, rather than passing it over heating batteries – offers a second significant energy saving.

Further efficiency is achieved via intelligent communication between Breathing Buildings' systems and other elements. Ensuring the systems work together rather than in competition with each other.

The cumulative energy savings these elements present contribute to the overall goal of a zero energy building.

emission zero, **Architectural Director**, Simon Kirton:

“This is the first zero energy retail building in the UK and marks a significant achievement for Hammerson, the retail property specialist which owns Wrekin Retail Park, and all of the partners involved in developing this unique project.”

Natural Ventilation Delivered

As with all natural ventilation systems, the make or break for success is intelligent control.

The sophisticated control algorithm developed by Breathing Buildings monitors temperature and CO2 levels. The on-board controller ensures that internal air is kept fresh, whilst preventing cold draughts and ensuring thermal comfort.

Summer Strategy

In summer, when low-level openings can be used for ventilation, a natural upwards-displacement strategy is implemented. Air enters at low-level through louvred façade vents, flows through the space naturally due to buoyancy forces, and exits at high-level through the e-stack units and roof terminals. This is far more energy efficient than a mechanical ventilation strategy, in which high-powered fans are used to generate the air movement.

On hot, still summer days, the low-powered mixing fans within the e-stack unit (present primarily for winter mixing ventilation) can be run in “boost mode”, to augment the predominantly natural upwards displacement airflow.

Night Purge

If in any 24 hour period the internal temperature has exceeded 24°C, the system may automatically implement a night-time cooling strategy, whereby secure low- and high-level vents are opened to allow maximum airflow and, hence, cooling of the building’s thermal mass.

This ensures a cool, fresh environment at the start of each day, and is entirely automated, requiring no action from users.

Winter Strategy

In winter, Breathing Buildings’ e-stack system is unique. Rather than continuing with displacement ventilation (which requires pre-heating at low level to avoid cold draughts) the e-stack system brings air in at high level only, mixing the cold fresh air with already-warm air from within the room.

Because the cold fresh air is tempered through mixing rather than pre-heating, this strategy greatly reduces the heating requirement, when compared with a conventional upwards displacement system or purely mechanical ventilation.

As one can easily imagine, in a typical coffee or sandwich shop, the heat generated by occupants and equipment is often quite large. In the Breathing Buildings e-stack system, it is these unintentional heat gains which actually keep the space warm.

In a modern, well-insulated building, no additional heating is required until the external temperature falls below approximately 6°C.

Partnership

Shaun Fitzgerald, Chief Executive Officer of Breathing Buildings comments: “The key with this project is how all the different elements use an intelligent central control system to enable them to work together.

The underfloor heating/cooling system will control the temperature of the slab. When heat is being supplied to the underfloor system it will send a signal to the Breathing Buildings controller. The operation of air conditioning, when required on the very hottest days, is also controlled via Breathing Buildings’ software. The control panel issues signals to each of the systems based on internal and external temperatures, deciding which component is best placed to maintain the interior temperature and air quality.

For this type of control system to be installed it was critical that all the contractors worked closely together throughout the project to achieve seamless installation and optimal operative conditions. We are extremely proud to have played an important part in creating the UK’s first net zero energy retail building.”

Simon Kirton, Architectural Director, emission zero, commented: “This project has been designed as a zero energy building, which means that all the energy required for heating, lighting and cooling the building is provided from a roof mounted photovoltaic array. This is the first zero energy retail building in the UK and marks a significant achievement for Hammerson, the retail property specialist which owns Wrekin Retail Park, and all of the partners involved in developing this unique project.”

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