

## FOCUS

# Is natural ventilation the new wind of change?

LANDMARK BUILDINGS THROUGHOUT THE UK ARE TURNING TO INNOVATIVE NATURAL-VENTILATION SOLUTIONS TO PROVIDE LEVELS OF FRESHNESS AND ENERGY EFFICIENCY THAT CANNOT BE ACHIEVED BY MECHANICAL VENTILATION AND AIR CONDITIONING. **ALLAN HURDLE** TRACES PROGRESS.

It is perhaps hard to believe that it is nearly 15 years since 'green issues' became the buzz phrase for those with an over-developed social conscience eager to leap on the next emotionally charged environmental bandwagon.

## CENTRAL LINK

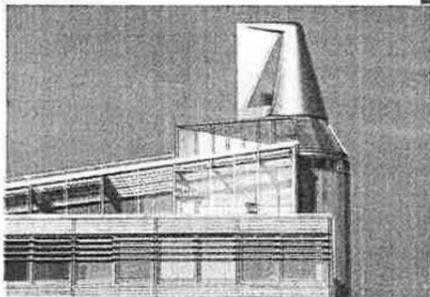
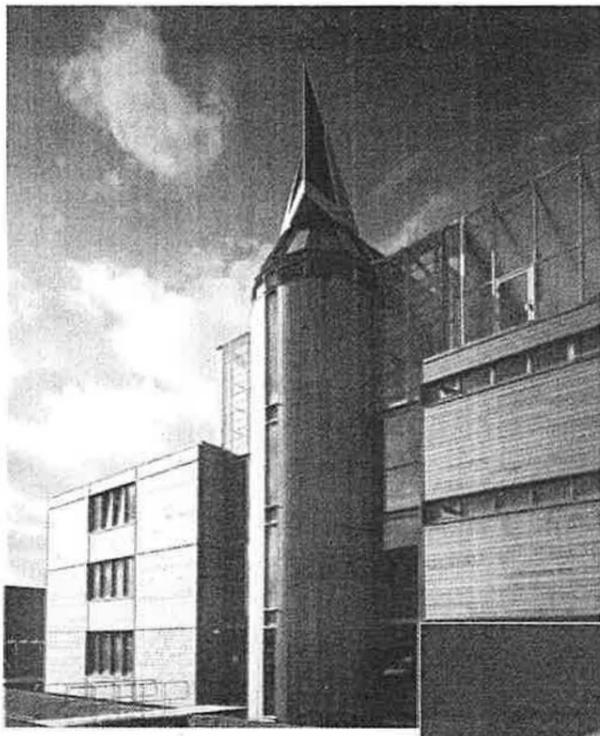
The intervening time has provided us with a whirl of incident and image with The Environment as the central link — from John Major jetting off to the earth summit in Rio, to Swampy clinging to a tree at Newbury, from Greenpeace's *Rainbow Warrior* being sunk in the South Seas to widespread hysteria over global warming.

**"EXPERTS WORKING IN THE VENTILATION SECTOR ARE CURRENTLY DEVELOPING COST-EFFECTIVE AND USER-FRIENDLY METHODS OF VENTILATING AND LIGHTING OUR SHOPS AND CIVIC BUILDINGS"**

Green issues are still very much to the fore in the new millennium, but the environmental movement appears to be gathering a certain maturity and, more importantly, focus and direction.

## MAJOR ROLE

Targeted action has replaced panicked reaction, and the Government is at



Revolving cowls on the Jubilee Campus at Nottingham University use the wind to extract exhaust air from the buildings (Photo. Martine Hamilton Knight).

the centre of a number of green initiatives. Companies in the heating and ventilating industry have realised the importance of these initiatives and are now playing

a major role in these consultations.

One of these initiatives is a Westminster-led call for providers of power to treble the total UK electricity sup-

ply derived from renewable sources and in October Prime Minister Tony Blair made his first speech on the environment for four years. The environment has risen up the political agenda as the electorate now realises what devastating personal consequences the effects of climate change can have, as recent floods have shown.

Carbon-dioxide emissions to the atmosphere must also be cut by the year 2010 under the Kyoto agreement, and the opportunity to obtain electricity from resources such as wind power, hydroelectric and solar power is already well established.

But it is not just the eco-weary householder that is on the receiving end of the latest power play to prick the

ly at the forefront of new-product development in the construction industry.

## USER FRIENDLY

Experts working in the ventilation sector are currently developing cost-effective and user-friendly methods of ventilating and lighting our shops and civic buildings.

My company and our spe-

**"WAYS OF INTRODUCING ENVIRONMENTALLY FRIENDLY METHODS OF SERVICING LANDMARK PUBLIC BUILDINGS ARE CURRENTLY AT THE FOREFRONT OF NEW-PRODUCT DEVELOPMENT IN THE CONSTRUCTION INDUSTRY"**

cialist consultants are leading the field with the 'Green Air' concept of providing natural ventilation, which is becoming ever more relevant as environmental issues and their consequences take an increasingly bigger hold.

Natural ventilation is by no means a new concept, but its significance in an environmental parlance is only just starting to be fully exploited.

Developers with plans to build, for example, a new indoor shopping mall increasingly want the ventilation system to be energy efficient with low running costs.

Systems which control the indoor environment by air conditioning and ventilation can prove costly to operate, both in high running costs and expensive maintenance.

Also, these systems are not eco-friendly but are often seen as the easy option.

## RECREATE

Natural ventilation still provides controlled airflow but aims to recreate the variability and freshness of the external climate by harnessing our natural resources minus the less favourable aspects like, rain and traffic pollution and airborne contaminants.

A good example of the way light and natural airflow are being innovatively introduced into a shopping mall is at the Touchwood Shopping Centre in Solihull.

## PREVAILING WIND

Natural ventilation at the mall relies entirely on elliptical roof ventilators to capture the prevailing wind over a 360° range and deliver it into the arcades below.

The design was developed by our team, led by general manager Kevin Root. It is based on the innovative concepts of consultant Bob Hudson.

The elliptical turrets are made up of individual controllable faceted panels using a high-performance weather louvre system. The panels have the additional feature of being damped to regulate the flow of air, without the external appearance

being altered when the units are fully open. The louvres modulate between the open and closed position to control air velocity into the building.

The turrets are internally divided into four sections with splitter plates, which allow the air to be drawn down through the ductwork preventing cross contamination of inlet and extract air.

The middle of this duct contains a highly reflective light tube that extends from the ceiling level inside the mall at Touchwood to the roof of the turret to provide natural daylight into the malls below.

The top of this tube terminates in a polycarbonate dome and allows natural daylight to shine into the shopping areas.

The result of using these specialised architectural louvre products together with innovative ventilation and lighting systems is a state-of-the-art town-centre shopping mall which relies entirely on natural ventilation and daylight.

This intelligent use of outside resources has created a fresh, natural and healthy environment for both shop staff and their customers without the unpredictability of Britain's changeable weather.

Touchwood can rightly claim to be the first contemporary shopping mall to utilise a completely naturally ventilated enclosed system, using both intake and extract via the pressure differentials within the same unit as well as introducing natural light. But its design evolved out of similar successfully completed projects elsewhere.

## BLUEWATER

Europe's biggest shopping centre at Bluewater in Kent also utilised our expertise under Bob Hudson's management in designing initial concepts for ventilators and seeing them through to practical completion.

The desire for a system that combined natural ventilation with low energy consumption led to us being commissioned to design and build the first omnidirectional wind tower for inlet-air purposes.

Bluewater was not only ground-breaking from a technical standpoint — it also attracted architectural plaudits because the wind towers mimicked the form of a traditional Kent oast house.

In the case of Bluewater, the design team wanted a tried and tested format that could easily be replicated and simple to produce.

The oast-house design was adopted because these landmarks scattered around the Kent countryside rely on external wind pressure to turn their pivoted tops away from the direction of the prevailing wind. This allows warmer indoor air to exhaust under negative pressure and offers a degree of weather protection. The oast house's movement is achieved by combining wind forces with the aerodynamic performance of the cowl.

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The major difficulty the design team faced in using the oast house concept as a basis for the wind towers on Bluewater's roof was getting it to turn into the wind to provide an intake ventilator.

Tests using cardboard models led to the conclusion that attaching a specially designed paddle to the rear of the cowl could reverse the movement of an oast house in the wind.

**SCIENTIFIC TESTS**

The University of Bristol carried out more detailed scientific tests which established that exhaust ventilators were most effective without rudders while intake units depended on the rudder design — a balancing act between technical perfection and visual impact.

Prototypes to test bearing systems were developed and modified, and the architectural concept team of Bluewater's developers Lend Lease, determined that all the ventilators should look the same and rotate into the same orientation at roof level.

To achieve this, all 39 ventilators on the Bluewater roof were constructed as air intakes, which significantly increase the air-change rates available — meaning longer trading hours for which passive ventilation can achieve comfortable conditions in the centre.

Consulting engineers Roberts & Partners added a control schedule related to the external wind speed, which regulates how many ventilators can open — preventing over-ventilation of the centre.

**NOT LIMITED**

But the use of natural air-flow in public buildings via natural ventilation systems is not limited to shopping malls.

The most technologically advanced and environmentally friendly university campus in the country uses eight

rotating extract cowls to ensure a healthy environment for study.

It is at the award-winning Jubilee Campus at the University of Nottingham where the system is married to photo-voltaic power to ensure the yearly energy consumption of fans is met from a clean renewable source.

The new campus comprises eight buildings, including a block of postgraduate accommodation, three faculty buildings, a central teaching block, library and two undergraduate halls.

Architect Michael Hopkins & Partners designed all but the two halls. Structural and services engineering were by Ove Arup & Partners, and Bovis Europe was appointed as main contract manager.

The campus is naturally

**“TOUCHWOOD CAN RIGHTLY LAY CLAIM TO BEING THE FIRST CONTEMPORARY SHOPPING MALL TO UTILISE A COMPLETELY NATURALLY VENTILATED ENCLOSED SYSTEM”**

ventilated using eight purpose-built air-handling units located at the top of the stairwells of each faculty building.

Although each unit looks the same, internally the sizes of components differ according to the volume of air required to serve the spaces, which proved a highly economical method of manufacture.

**CUSTOM DESIGNED**

Revolving omni-directional cowls sit above the units using the wind to extract exhaust air. These were custom designed and manufactured and turn in the wind so that the exhaust vents

always face downwind.

Again our design team had to be as conscious of the aesthetic aspects of their product which are just as important as its technical characteristics.

The cowls act as attractive lids for the stairwells, and one of the main purposes of the system has been to raise awareness of environmentally friendly issues by use of a prominent architectural feature on a seat of learning.

**MORE EXPOSIVE**

It is clear that green issues are no longer regarded as strictly the domain of the revolutionary crank. This can only have long-term benefits as challenges facing the environment gain more exposure.

The consequences for

providers of ventilation systems are wide-ranging and mean tougher challenges for designers. It is no longer enough to ventilate public buildings by simply installing a standard mechanical system.

**IMAGE-CONSCIOUS**

Companies specified for major projects have to be aware of the desire of image-conscious site owners to be seen to be actively promoting environmental issues via the construction of their building.

Use of daylight and natural ventilation are both factors likely to help schemes win the support of both the general public and the local planning authority.

The creation of an 'outdoors feel inside' itself

results in each project requiring a unique approach — and the need for the ventilation equipment to be pleasing to the eye doubles the challenge.

But the industry deserves credit for taking the initiative and developing an increasing portfolio of innovative designs which are already operable in some of Britain's critically acclaimed new buildings.

The next major challenge is to expand and develop the new generation of omni-directional ventilation systems for the domestic, commercial and industrial markets. The latest generation devised by Ove Arup & Partners and developed by our team will be included in the Earth Centre in Doncaster and Beddington ZED (Zero Energy

Development) project.

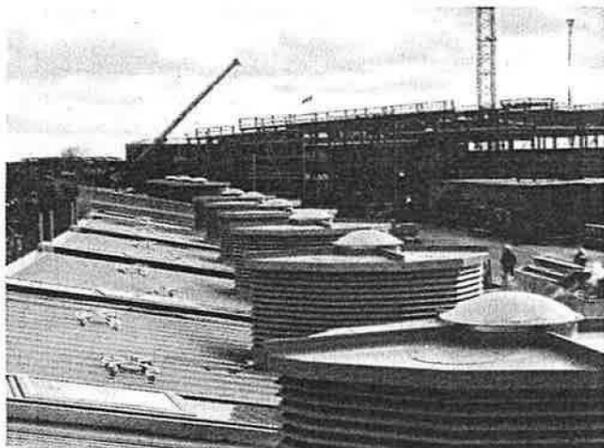
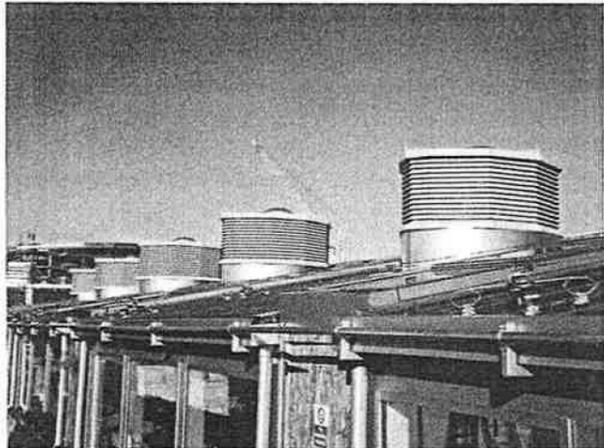
The Earth Centre architects Bill Dunster Architects — will feature the world's first rotating combined inlet and extract natural ventilator and will incorporate a heat-recovery system.

**TURNING POINTS**

These new and innovative designs will be seen in years to come as one of the major turning points in the design of natural-ventilation systems.

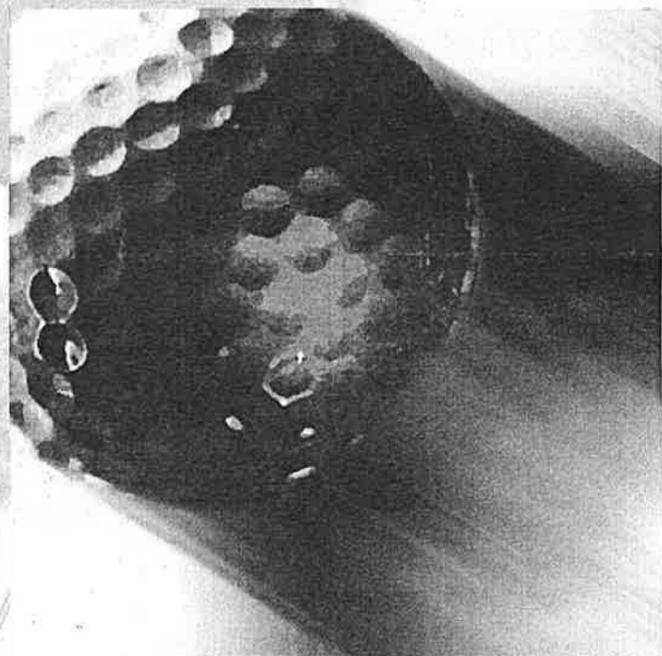
Suddenly the efforts of Swampy and Greenpeace may not be in vain as the commercial world wakes up to the concept of eco-friendly energy as a mass consumer market.

Allan Hurdle is managing director of Gill Air Ltd, Artex House, Rustington, West Sussex BN16 3LN.



These elliptical turrets at Touchwood Shopping Centre in Solihull bring in fresh air and exhaust stale air, without cross contamination.

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