

INDOOR AIR QUALITY

The environment in many buildings today does not always come up to expectations. That is when the techniques in which the ventilation engineer is skilled are required, as this feature demonstrates.

Fan power

Masures to improve air quality through increased ventilation and better filtration are putting greater demands on fans. Bill Cory considers the issues involved.

In this last decade of the twentieth century, a number of issues have been highlighted for public debate.

Not the least of these has been the whole question of the need for air conditioning and mechanical ventilation in temperate climates, such as that of the United Kingdom.

Coupled with the perceived reasons for occupant concern there

has been a 'green' approach to the use of unnecessary energy. To these concerns has been added the worry of ozone depletion in the upper atmosphere arising from CFCs in refrigeration systems and other sources.

Different emphasis

It may come as a surprise to note that in North America and mainland Europe, the debate has had a somewhat different emphasis, and that the whole question of indoor-air quality has been of prime importance.

No-one today can be in any doubt that the environment of offices, factories and even domestic buildings may

constitute a real health hazard. 'Sick building syndrome' is a diagnosis of exclusion and a 'catch-all' where less than desirable conditions may be said to result in health problems to occupants. It is essential that buildings are not only properly designed but also that they are constructed to acceptable quality standards. Perhaps of equal or even greater importance is that they should be properly maintained and cleaned.

"What is actually contained in the atmosphere is a function of the level and effectiveness of the extract ventilation and the amount of clean supply air provided to the building"

Indoor air contains a mixture of both organic and inorganic chemical compounds coming from the outdoor air and soil, from materials used in the construction of the building and from occupant activities such as smoking, cooking, cleaning, defecating, etc. What is actually contained in the atmosphere is a function of the level and effectiveness of the extract ventilation and the amount of clean supply air provided to the building.

Health risks

Nitrogen dioxide from unvented cooking stoves and other gas-fired appliances may cause health risks even at low levels.

Environmental tobacco smoke has been noted by many as a possible danger.

Volatile organic compounds are the major source of odour and irritation, and microbial growth may lead to respiratory difficulties in buildings suffering from condensation.

Perhaps the most important single organic



Closer matching of fan performance to system requirements is a necessity for the future. It is a task that is made easier by computerised aids, such as the electronic catalogue that supports Woods' JM Aerofoil fan range.

compound to cause concern is formaldehyde. Often it is found in poor quality finishing and partitioning board materials.

Apart from tobacco smoke, most of the respirable particle mass is likely to come from household dust, diesel exhaust and the combustion of heavy oil.

Ventilation

For these and many other pollutants, ventilation is still the only known and acceptable form of control. Whilst poor ventilation is often blamed as a source of problems, it is rather the inadequacy of many systems which needs to be tackled.

There are many studies which have shown that complaints and 'sick building' symptoms are much more common in buildings where the ventilation rates are lower than recommended.

Coupled with improved air cleaning to control the contaminant sources, improved ventilation is the most appropriate strategy for the future.

Another issue needs to be addressed. Undoubtedly, where external conditions permit, natural ventilation is possible and should be encouraged. This may, however, require new designs of buildings, with all rooms having direct access to opening windows, and far less economical in the use of space. It should also be recognised that wind direction and speed

becomes of importance, and that the size and orientation of such windows may determine the usage of working space. Outdoor noise may even negate such solutions.

What effect will this have on fan and system

designers? Certainly a higher efficiency (and therefore lower power consumption) in a specific installation will address the 'green' issue. System designers can assist by minimising the pressure loss of ducting, but more efficient filtration usually means higher losses, so that fans which have a greater pressure reserve will also be demanded.

Controlled

Better distribution of fresh air and collection of contaminated air will obviate the need for excess capacity. Efficient variation of the fan flowrate, allied with demand-controlled ventilation, is also a strategy which needs to be developed.

Carbon-dioxide levels can be used as an indicator where people are the major source of the pollutants, whilst carbon-monoxide monitors can be used in garages and humidity monitors in bathrooms.

Mixed-gas sensors can recognise most of the

Circular ductwork enables even faster installation

Extremely fast assembling and dismantling are features of a new system of ductwork from Lindab. Called LindabTransfer, it is supplied with clips in diameters from 80 to 500 mm and flanges from 560 to 900 mm. It is compatible with any circular ductwork.

The new system can be applied where some form of temporary ductwork is needed, and may be very effective when used with standard circular systems.

The simple clip assembly and the provision of telescopic

sections provide easy access for operations such as resetting fire dampers, especially in small-bore installations.

No special tools are needed, and the clips are fitted with inlaid seals or gaskets. The telescopic sections also enable a system to be adapted when a standard length is not sufficient.

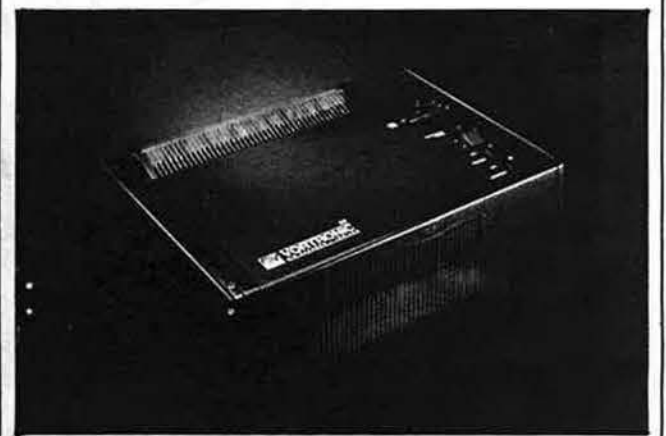
LindabTransfer is made from galvanised steel. There is a full range of fittings, including bends from 15 to 90°, end pieces and silencers. Transition pieces link up with the LindabSafe double-gasketing ductwork.

Reader Reply No. 110



Fast assembly and dismantling - LindabTransfer circular ductwork features a simple clip method of assembly and is compatible with any circular ductwork.

The big clean up



Capable of reducing air pollution caused by dust, smoke and bacteria by 90% is the Vortronic air-quality enhancement system.

Said to be effective against a wide range of pollutants is the Vortronic air-quality enhancement system.

These units can remove tobacco smoke, dust, pollen and bacteria. They can also eliminate odours quickly and permanently.

Developed by Vortice, the Vortronic design combines an efficient multi-stage filter system, an ioniser and a quiet-running centrifugal fan.

Air entering the unit is first mechanically filtered to remove large impurities. Electrostatic filtration then traps smoke and other small particles.

Activated carbon then eliminates odours. Finally, the air is revitalised by an ioniser before being recirculated into the room.

Three models cover rooms up to 150 m³.

Tests at the University of Milan demonstrated that in only 20 minutes a correctly sized unit reduced atmospheric dust by 65%, tobacco smoke by 43% and bacteria by 84%. Further operation reduced levels of most pollutants by over 90% in an hour, and that continuous operation maintained these lower levels.

Reader Reply No. 114

volatile organic compounds, although they need to be improved in terms of drift and their sensitivity to changes in temperature and humidity. Possible energy savings from such systems could be as much as a third.

We must therefore ask ourselves if equipment and systems produced in the 1980s will be suitable

for the future! Certainly, closer matching of the fan performance to the system requirement is a necessity.

All these needs have been recognised in the new Woods JM metric Aerofoil fans, where these attributes have been part of the design brief.

Additional intermediate sizes, an improvement of about 5% in fan total efficiency and up to 25%

more peak pressure than our competitors are all features of this new range. Future developments over the next 12 months will emphasise our commitment to continuously improving our product range. □

Bill Cory is technical director with Woods of Colchester Ltd, Tufnell Way, Colchester, Essex CO4 5AR.

At the air face

Ian Stones considers the special problems of introducing air to occupied spaces.

A good air-distribution system is simply one that maximises comfort for a building's occupants. The overall performance of a system is measured across three key parameters.

Stagnation

The first is distribution of air movement. This should be uniform throughout the space to prevent air stagnation, though without creating draughts. Ideally, air velocities should be in the range 0.1 to 0.25 m/s. Higher speeds cause draughts, and lower speeds lead to stuffiness and stale air.

Distribution of temperature is the second key parameter. Variation throughout the occupied zone should be within 1 K of the design temperature. Greater fluctuations lead to occupier discomfort.

Finally, the noise level should be acceptable, which generally means NR30 to NR40 for standard office



The importance of installing the correct air-distribution equipment is vital, despite the fact that the products themselves are often the least-expensive components within a system.

accommodation.

Consultants and specifiers are increasingly aware that no matter how accurately room heat gains are calculated and how well the air-conditioning plant has been selected, the specification of an inappropriate air-distribution system will negate overall system accuracy and effectiveness. The importance of

installing the correct air-distribution equipment is vital, despite the fact that the products are often the least-expensive components in a system.

Once the designs for supply and extract diffusers have been agreed, the location of them becomes of critical importance. Four points require consideration.

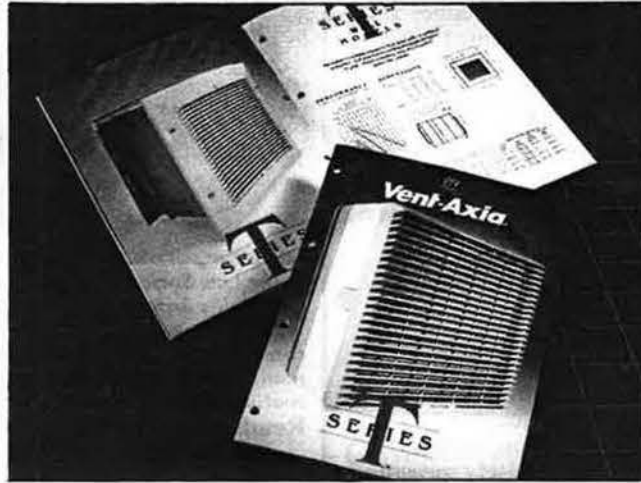
Continued on page 20

Vent-Axia shows its fan power

Following its recent launch of the Super-T range of intake/extract fans for commercial applications, Vent-Axia has produced a product-information brochure. It gives details of the entire range — including window, roof, panel, wall, in-line and darkroom variants.

These fans are available in 6, 7, 9 and 12 in units and as 355, 400, 450 and 500 mm-diameter Super-T models.

The brochure also includes details of the specially developed accessories which contribute directly to the simplicity of installation — matching grilles, louvres and ducting. There are also specially designed spigot plates for multi-duct systems.



The complete story on Vent-Axia's T Series of fans for commercial applications is given in a new product information brochure.

Controls and sensors ensure a healthy environment, while minimising electrical consumption and the extraction of warm air.

There is a wide selection of automatic timers and sensors for humidity, temperature and air quality and proximity. **Reader Reply No. 115**

HOVAL LHW A compact unit for Ventilation Heating and Heat Recovery

The Hoval LHW unit provides high quality ventilation for large halls such as factories, hypermarkets, sports halls etc. by means of three operating modes.

Ventilation with controlled heat recovery and heating

The extract air passes through the plate heat exchanger and is exhausted. Filtered fresh air enters the plate heat exchanger retrieving up to 75% of the extract heat without cross contamination.

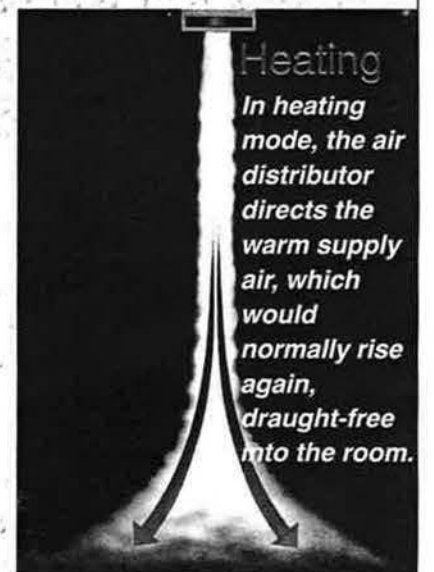
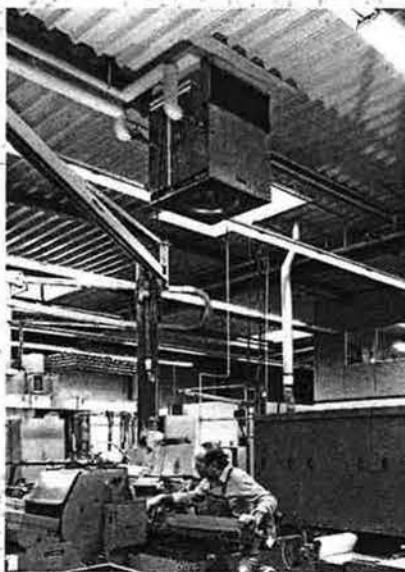
Ventilation without heat recovery

In the summer, cool fresh air is filtered and supplied to the room without heating. The exhaust air bypasses the plate heat exchanger. Chilled water coils are available as an option.

Re-circulation with controlled heating

When the room air falls below a preset temperature, air is drawn from the room, filtered and, via the heating coil, passed back into the room.

Extremely flexible under any conditions, in new and existing buildings



For further details on the Hoval Ventilation and Heat Recovery range, please contact:

Hoval

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