

Indoor Air Quality, Global Warming and Energy Efficiency



HEVAC: The Indoor Air Quality Initiative

The HEVAC Association forms the Building Services Division of the Federation of Environmental Trade Associations (FETA).

When we think about good quality indoor air we think of breathing a fresh, healthy, invigorating atmosphere that makes us feel alert and well. When we are indoors, at home, in a factory, shopping mall, cinema, hospital or any other environment - we should feel as comfortable about the air we breathe as if we were in a meadow. In some ways we should feel better, particularly if the air is maintained at the proper temperature, filtered and suitably humidified.

HEVAC's (Heating, Ventilating and Air Conditioning Manufacturers Association) Indoor Air Quality (IAQ) Initiative has been formed specifically to promote the benefits of good quality indoor air. The initiative is evaluating research on the benefits of good IAQ and on how poor IAQ can be improved. The findings of its research are available to everyone with an interest in IAQ. The initiative's aim is to create a wider understanding of the conditions and constituents of good quality indoor air by underlining the problems that can be encountered if key elements are not employed.

Good Indoor Air Quality is a significant factor for both our health and for our general well being so it is important that places of work and leisure as well as the home have an adequate supply of fresh, clean and temperate air. It is also important to consider the effect that heating, ventilation and air conditioning requirements can have on the environment. The methods that we use to provide good IAQ can have an impact on the environment and in particular on global warming.

Q : What causes global warming?

A : Global warming is caused by the 'greenhouse' effect of atmospheric gases, mainly carbon dioxide, methane and nitrous oxide, which trap heat in the atmosphere. The greenhouse analogy stems from these gases allowing heat to penetrate the atmosphere while preventing heat loss from the Earth.

Q : What effects does it have?

A : The effects will be changes in the Earth's climate through increases in the average surface air temperature. Deserts will become hotter and expand, extreme rainfalls and flooding will occur in some areas and the rise in sea level will cause loss of coastal area.

Q : Isn't climate change a natural occurrence?

A : The greenhouse effect is a natural physical phenomenon without which the Earth's average temperature would be about 33°C lower. However, nine out of ten of the hottest years on record have occurred since 1983 and there has been a steady increase in recorded levels of carbon dioxide in the global atmosphere since the Industrial Revolution. It seems likely that part of this global warming is connected with human activity.

Q : What can be done?

A : The United Nations Framework Convention on Climate Change was adopted at the Rio Earth Summit in 1992 and has now been signed by more than 160 countries. Under the Convention, developed countries are committed to taking measures aimed at returning emissions of greenhouse gases to 1990 levels by 2000.

Ministers and other senior officials from some 150 countries met in Kyoto in November 1997 to take part in a conference aimed at accelerating the pace of international action on global warming. Amongst the proposals was a call from the European Union for reductions in the three major greenhouse gases of 7.5% by the year 2005 and 15% by 2010.

We can contribute towards this aim through effective design, operation and maintenance of energy systems. We also need to reduce requirements for energy by using energy efficient systems and appropriate new technologies. This includes use of low emission energy sources and environmentally friendly systems. A further important action in improving the environment is to reverse deforestation as forestry helps to remove carbon dioxide from the air.

Climate change is likely to have far reaching consequences for us all including flooding and loss of coastal area due to rises in sea level.

ENERGY EFFICIENCY

Q : How does this relate to energy efficiency?

A : Growing environmental concerns, particularly over global warming, have led to an increased awareness of the need for use of energy efficient means of maintaining Indoor Air Quality (IAQ). The main strategies that can be employed in ensuring that energy for heating, ventilation and air conditioning is used in the most efficient manner are in the design, operation and maintenance of those systems.

Design considerations

The recommended strategies for designing new buildings and refurbishing existing buildings taking both IAQ and energy into account are

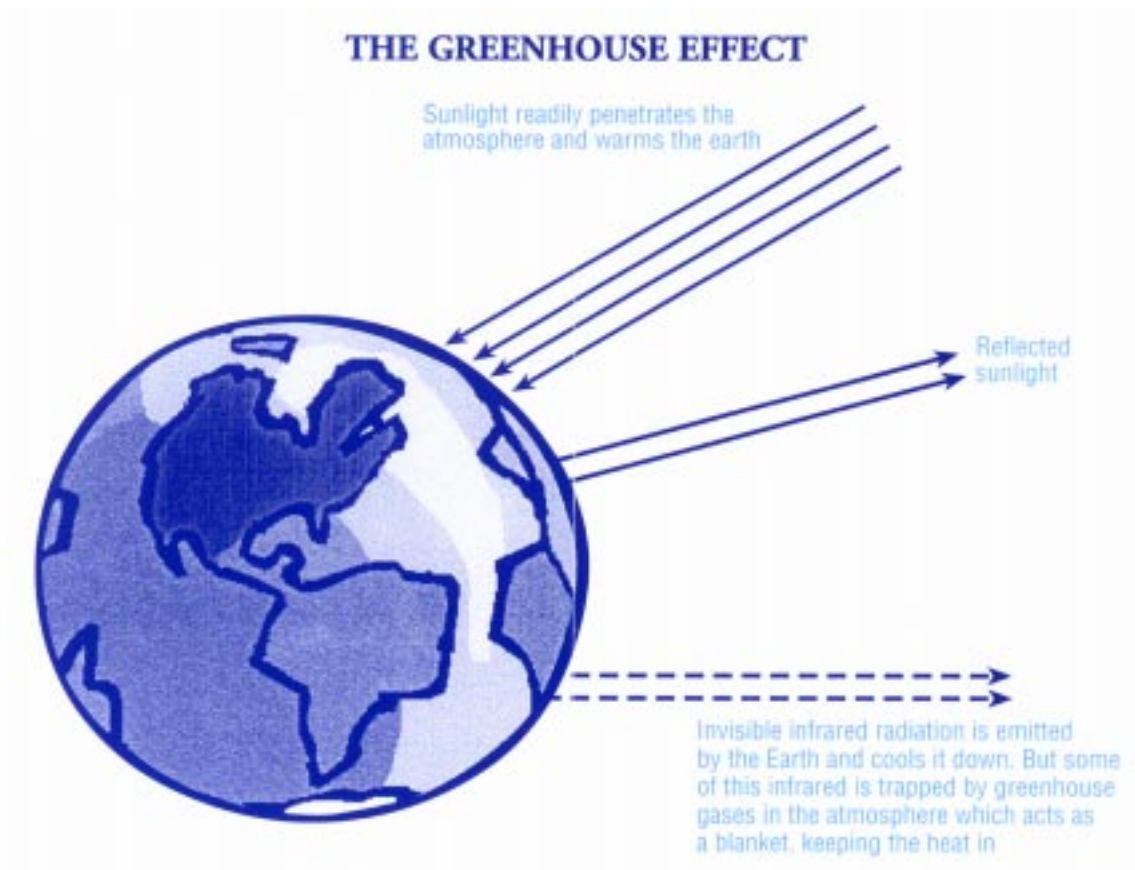
- Control sources of pollution
- Determine ventilation strategy and design ventilation systems using energy efficient and passive technologies where appropriate
- Base the design of energy systems on the required ventilation rate
- Design systems for IAQ (including controls) to match the needs of the occupants and users
- Design systems for easy commissioning, maintenance and control
- Make use of appropriate new technologies and energy conservation systems e.g. heat pumps, waste heat recovery, solar power, etc.
- For energy conservation, air exchange between a building and the outdoors needs to be sufficient to maintain IAQ but should not be excessive.
- Often improving IAQ is associated with the use of air conditioning but natural ventilation is now being regarded as factor in providing a healthy environment. As almost all offices will, at some time require comfort heating or cooling, the use of mechanical means of controlling IAQ will continue to be important but the most effective and energy efficient solutions will probably be achieved using a combination of natural and mechanical ventilation.

Operational considerations

In large buildings, the operator or manager has a key role to play ensuring the building operates as originally intended. Energy demands should be kept to a minimum while maintaining a satisfactory indoor climate which satisfies the users.

This can be achieved by ensuring that

- latest guidance about pollutant sources and technical facilities are available through technological advances
- the siting and sizing of activities and equipment which generates pollution is carefully considered
- a non smoking policy is implemented or separate smoking areas are designated
- HEVAC systems are operated as intended and demand controlled.
- condensation of moisture is controlled by a correct balance between thermal insulation, ventilation and heating/cooling
- the operator regularly checks to make sure there are no problems with the comfort or health of building occupants attributable to indoor air quality



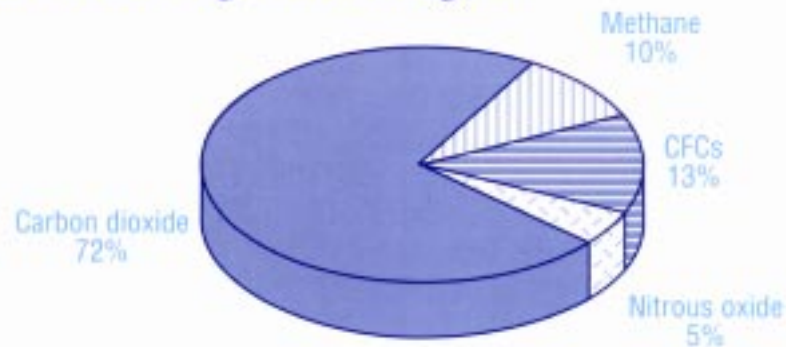
Maintenance

The importance of occupants should be recognised, particularly their role in ensuring that energy and IAQ systems operate correctly, their ability to act appropriately in the event of failure and their need for individual control.

Building maintenance is also important and requires that

- there is regular maintenance and cleaning of the energy and air quality systems with particular attention given to filters and drain pans
- The use of HEVAC systems is discouraged if adequate maintenance cannot be guaranteed. Both the rational use of energy and the provision of good IAQ are important aspects of building design and refurbishment. There are potential conflicts between these requirements. The impact of possible energy saving measures on IAQ should always be assessed before their eventual adoption. The importance of occupants should be recognised, particularly their role in ensuring that:
 - energy and IAQ systems operate correctly,
 - their ability to act appropriately in the event of failure, and
 - their need for individual control.
- good design, good system maintenance and good housekeeping = good IAQ = improved efficiency and happy people.

Relative direct contribution to global warming from 1990 emissions of greenhouse gases



Other Fact Sheets in the series:

Fact Sheet 1
Indoor Air Quality and Productivity in the Workplace.

Fact Sheet 2
Indoor Air Quality and Health and the Indoor Environment.

Fact Sheet 3
Indoor Air Quality and Asthma.

Fact Sheet 5
Selecting HEVAC Equipment with Indoor Quality in mind.

Fact Sheet 6
Sick Building Syndrome and the importance of maintaining IAQ equipment correctly.

Further Reading

Third Conference of Parties to the UN Climate Change Convention, Kyoto, Dec. 1997.

Global Warming, Sir John Houghton. Building Services Journal. July 1997.

Indoor Air Quality and the Use of Energy in Buildings. Report No. 17. European Commission Joint Research Centre - Environment Institute, EUR 16367, 1996.

Web Sites:

Dept Environment, Transport & Regions, www.detr.gov.uk

US Environmental Protection Agency, www.epa.gov/oppeoel/

Official Web site of the Kyoto Conference. www.cop3.org

Further information on HEVAC and Indoor air quality issues can be found on the FETA/HEVAC Internet: www.feta.co.uk/

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