

The role of humidity in IAQ

Humidity control plays an essential role in maintaining indoor air quality and supporting a healthy workplace. John Barker of Humidity Solutions explains. Possibly the only subject that is creating as much debate as Brexit, but similarly not reaching a commonly agreed conclusion, is what the standard should be for indoor air quality (IAQ).

We all know that it is a good idea to have a standard that will provide a healthy environment in which to work, rest and play but with so many interested parties and applications it is difficult to arrive at a standard that will suit all. What can be agreed is that humidity control is a vital component of this aspiration for good IAQ, ensuring that the spaces we occupy are comfortable, healthy and ensure wellbeing.

Although there is no universally agreed standard for relative humidity (RH), many organisations recommend maintaining an RH of 40-60% in commercial workplaces. These include the Humidity Group of the Federation of Environmental Trade Associations (FETA), the World Health Organisation and the National Association of Optometrists. This is also the range recommended by BS EN 29241 as the optimum for visual display terminals.

The Humidity Group has produced a white paper giving details, reasons and arguments on why these figures are the correct ones, entitled 'Humidity and its impact on Human comfort and wellbeing in occupied buildings', which draws from a wide range of sources, including the CIBSE knowledge series on Humidification KS19.

The need for humidity control

Above 60% RH, people will feel uncomfortable out of all proportion to the actual indoor temperature, with reduced capacity to focus on their work. High humidity also encourages mould growth and consequent damage to the building's fabric and fittings. It may also result in condensation on cold surfaces, potentially causing damage or creating a slip hazard.

Low RH, below 40%, which is more common in the UK, may also cause a wide range of health problems, such as drying out the mucous membranes in the respiratory system that help protect against infection. Low RH can also cause problems with static electricity on office machines.

There is also a close relationship between RH and the spread of infectious diseases by airborne pathogens such as bacteria and viruses. For instance, low RH (<40%) enables these pathogens to remain suspended in the air for long periods, so they can travel further and spread infection across a wider area.

Viruses such as influenza and norovirus (the 'vomiting bug') survive longer at an RH of 20-30%, whilst a mid-range RH between 40% and 70% will minimise their survival rate. Also, tests indicate the infectivity of the influenza virus is increased by both low and very high RH, with minimum infectivity at 50% RH.

RH has been shown to have a similar effect on airborne bacteria, with intermediate RH levels increasing the mortality rate of airborne pneumococci, streptococci and staphylococci.

Energy efficiency

Energy efficiency is also a concern and one to which, again, humidity control can offer a solution. The human body reduces its temperature by sweating, allowing moisture to evaporate from our skin. This transition from liquid to gas requires energy which is taken in the form of heat from the blood vessels just under the skin.

The greater the differential between the humidity of the air and the body the greater the cooling effect. So, in a dry atmosphere the evaporation process becomes highly efficient and make us feel cooler (adiabatic cooling). In the winter this means that when the humidity is low the heating is increased to help us feel warm, thereby using more energy than would be required to just humidify the air.

Similarly, when the RH is too high (>60%) people feel hotter than the actual indoor temperature would indicate. Invariably, this means that if comfort cooling is installed, occupants will reduce the temperature set point to alleviate that discomfort, resulting in increased energy costs. Thus, effective humidity control helps to reduce the energy consumed for heating and cooling.

Urgent attention

Given that most of us spend up to 90% of our time indoors, a significant proportion of which is in the workplace, this is clearly a topic that merits urgent attention.

Much emphasis has been placed on schools and any move to maintain good IAQ for our children is to be welcomed but let's not forget about the 32 million adults currently in employment – many of them working in buildings.

This brings the focus back to what we do with outside air as we pull it into buildings. Firstly, we need to ensure that pollutants are removed by applying effective filtration as dictated by appropriate IAQ regulations. Secondly, in addition to tempering incoming air to either raise or lower the temperature, we need to control the RH to ensure it contributes positively to thermal comfort and IAQ.

I believe the main barrier to properly addressing these IAQ issues is commercial. We seem to be shying away from setting coordinated regulated standards to ensure excellent IAQ as this would result in extra investment in plant and slightly higher running costs due to higher maintenance requirements. What we should be considering as an industry, employers, employees and society as a whole, is whether improving IAQ to underpin improved health and wellbeing is worth that investment. I believe it is.



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