

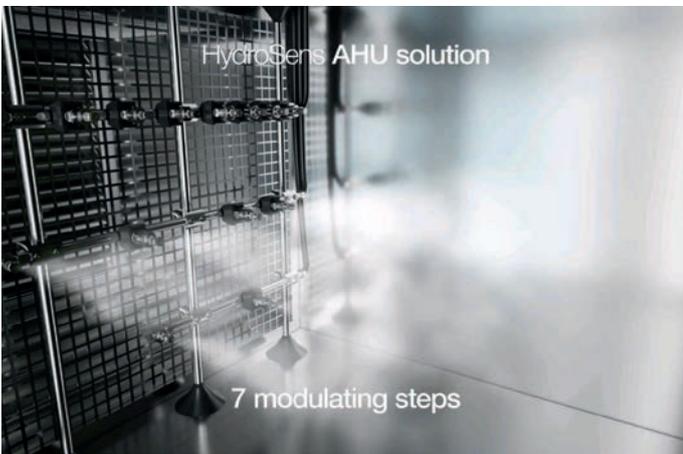


COOLING

With the UK facing some record-breaking temperatures this year, we turn to the topical issue of cooling. As always, the challenge is to ensure occupants are comfortable while balancing the growing need for energy efficiency.

Humidity's hidden impact

When specifying 'air conditioning' it's important to consider all aspects of thermal comfort, including humidity control. **John Barker** explains



The Airtech Hydrosens is an in-duct humidification system

The relationship between temperature and humidity is often overlooked, as is the contribution that humidity control makes to maintaining good indoor air quality (IAQ). This can lead to humidity control being omitted from the specification.

However, relative humidity (RH) has a vital role to play in occupant comfort and IAQ.

The acceptable relative humidity RH range for commercial workplaces is 40-60% and this suits both human and machine occupants. Above 60%, people will feel uncomfortable out of all proportion to the actual indoor temperature, with reduced capacity to focus on their work. If comfort cooling is installed, occupants will typically reduce the set point to alleviate discomfort, resulting in increased energy use.

At the other end of the spectrum, RH below 40% makes people feel colder than the actual temperature would suggest, so they turn up the heating, increasing energy consumption.

Raising the set point temperature also lowers the RH even further so the problem is exacerbated. Low RH may also cause a wide range of health problems and increase the rate of absenteeism.

With newer, relatively airtight buildings there is a dependence on mechanical ventilation to introduce fresh air from outside. This means the indoor RH is subject to the vagaries of outdoor humidity unless some form of humidity control is deployed to maintain the acceptable 40-60% RH range.

Similarly, older buildings are often quite 'leaky' and are therefore also subject to variations in RH depending on outdoor conditions.

Moreover, the RH is further impacted by use of heating and cooling systems. For example, outdoor air in cold weather is often low in moisture and, as noted above, heating it reduces the RH even further. Cooling warm air in summer also removes moisture.

As a result, the most common

problem in UK buildings is low RH - it's not uncommon for the RH in a heated building in winter to fall below 20%. The most common antidote is to install humidification - challenging in an existing building.

Humidification

At the risk of stating the obvious, humidification involves adding moisture to the air and this can be achieved in several ways. The traditional approach has been to heat water to produce steam; still the best solution for many projects.

There are several ways of generating steam for humidification and the optimum solution will depend on the project.

Clearly, in a carbon-conscious world there is an appetite for solutions that use less energy than steam-generating solutions. As a result, high pressure, low energy systems using cold water are becoming increasingly popular and are easily retrofitted to existing buildings.

These inject water into the air under pressure through multi-directional, fan-assisted nozzles. The pressure ensures the water is atomised and absorbed rapidly into the air - within 1.5m of the nozzle - and these systems can be used with ceiling heights as low as 2.4m.

The nozzle fan heads are about the same size as a CCTV camera, making the system very unobtrusive. The nozzles can be controlled in small groups within a zone, ensuring that the rate of humidification is precisely aligned to the requirements of each space, and multiple zones can be controlled from one central controller.



John Barker

A key benefit of this approach is that it uses cold water, so that no additional heat energy is required. The absorption into the air (adiabatic humidification) also has a free-cooling effect which reduces the load on comfort cooling systems. For each 500 litres of water that is evaporated such a system provides around 345kW of cooling for a power input of just 4kW.

At the heart of this issue is a true understanding of the term 'air conditioning', which has been defined by the Humidity Group of the Hevac Association as 'a process of altering the properties of air, primarily temperature and humidity, to more favourable conditions'.

This definition reinforces the importance of humidity control as an integral element in systems designed to provide thermal comfort. There are many ways to achieve this, and the best solution will vary from one project to another. The key is to ensure that humidity control is given the appropriate level of importance in the specification.

John Barker is managing director of Humidity Solutions