John Barker is sales director at **Humidity Solutions Ltd**

Two birds with one stone

As both the financial and environmental costs of refrigerant-based cooling come under close scrutiny there are very good reasons for considering alternative technologies, says *John Barker*

The cooling effects of evaporating water have been known for thousands of years and used to good effect in a wide range of applications. In more recent decades this 'low-tech' approach has been superseded by refrigerant-based cooling, bringing with it a considerable increase in energy consumption - plus the additional environmental impact of using refrigerants.

Now, however, evaporative cooling is not only making a comeback but it has also gone 'high-tech' in the form of modern adiabatic humidifiers.

All forms of adiabatic humidification use less energy than steam humidifiers, though there is quite a lot of variation within the adiabatic category. For instance, low-pressure nozzles use pressurised air to atomise the water so energy is consumed by the air compressor. High-pressure nozzles, on the other hand, take the energy for atomisation from high pressure water, so here the high-pressure pump is the main energy consumer. Ultrasonic humidifiers have low energy consumption but also very low outputs.

Nor is the need to reduce energy consumption the only reason for this. In recent years there has been growing awareness of the importance of relative humidity in maintaining indoor air quality in workplaces. Humidity control is also essential to a wide range of production processes.

Where there is also a need for cooling it therefore makes sense to combine the two by using an adiabatic humidifier to provide low-energy cooling at the same time as humidification. This is usually achieved, in both new and existing buildings, by either integrating the humidifier with the ventilation system or introducing water vapour directly into the space.

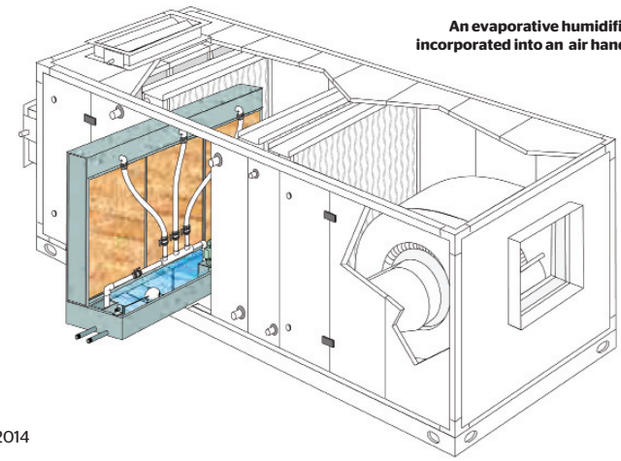
Where adiabatic humidification is integrated with the ventilation system this also facilitates the use of free cooling using outside air. This arrangement has proven to be very effective in meeting very high cooling loads, such as those found in data centres.

In some situations the most suitable option is to retrofit an evaporative humidifier into an existing air duct system, assuming that the key design criteria can be satisfied. For example, it is important to ensure a very short evaporative distance from the humidifier to avoid condensation or wetting in the air handling unit and the ductwork.

Inject water vapour

In other situations it may be more practical and cost-effective to inject water vapour directly into the space. This can be achieved in several ways but some of these options have limitations that need to be taken into account. For example, ultrasonic humidifiers and atmospheric steam generators within the space are unsightly and occupy wall space, while wetted media above the ceiling require extra ductwork and diffusers.

In our experience the most effective solution in such cases is usually a pressurised water system using multi-directional fan-assisted nozzles that atomise the water so it is rapidly absorbed into the air to provide both cooling and humidification. These systems use cold water so there is no energy consumption in boiling the water, as is the case with some humidifiers. Atomising heads are designed for office or factory installations.



An evaporative humidifier can be incorporated into an air handling unit

The combined cooling and humidification action of adiabatic humidifiers was clearly illustrated at a recent project with an injection moulding company in the east of England. Here, a key requirement of the project was to ensure close control of humidity and temperature to maintain the right conditions for injection moulding of plastic drink bottles and pad printing onto the bottles. A further requirement was minimum energy consumption.

The solution proved to be a high pressure water atomising system, configured in eight zones, to deliver moisture to the 103,000m^3 factory space. The moisture is delivered through a range of fan-assisted nozzle heads, each configured to suit the area being served and to ensure effective humidification without risk of wetting or condensation on machines and products.

In parallel, the system provides adiabatic cooling which removes excess heat generated by the injection moulding machines without need for additional mechanical cooling. For each 500 litres of water that is evaporated the system provides 345kW of cooling for a power input of just 4kW.

The fact that the humidity is controlled very precisely ensures there is no condensation on the cooled moulds. Control tolerances are very tight, at 50 per cent RH +/-10 per cent. In fact, since the system was installed it has consistently delivered humidity control to +/- 5 per cent of the 50 per cent RH target.

Each of the eight zones is fitted with dedicated sensors linked to a central control panel, enabling each zone to be controlled individually and aligned to the requirements of each space. The sensors also log temperature and humidity to provide documented recordings of environmental conditions.

This example clearly had very precise requirements but the general principles apply to every project - namely that the key to delivering the optimum solution is to be clear about what needs to be achieved.