COST EFFECTIVE HUMIDITY CONTROL

Humidity control is essential to maintaining a productive print environment and this needs to be achieved with minimum energy consumption. John Barker of Humidity Solutions discusses the benefits of high pressure humidification with adiabatic cooling.

It is well understood, and accepted, that effective humidity control is essential within any digital, litho or web print environment. At the same time, in a highly competitive environment where controlling overheads can make the difference between profit and loss, it is increasingly important that the humidity is controlled in the most energy efficient way to minimise overheads and carbon emissions. The choice of humidification system is therefore critical.

Humidity is one of the many environmental variables that can impact on the print process and the acceptable relative humidity (RH) range for commercial workplaces is 40 to 60% as this suits both human and machine occupants.

In print environments the most common problem is that the RH is too low and this can have a detrimental effect on paper stock as well as causing a build up of static electricity that hinders the print process and increases downtime. Low humidity can also have a negative impact on the health of the workforce, causing dehydration and drying out of respiratory surfaces so that people are more susceptible to infections.

Moreover, if the RH is too low (below 40%), people will feel colder than is justified by the actual temperature and will often turn the heating up to compensate – once again wasting energy. Ironically, raising the temperature also lowers the RH even further, thus exacerbating the problem.

Stabilising humidity at the optimum level, therefore, ensures that the product remains in prime condition and productivity is maintained, whilst also protecting the well being of the workforce.

SIGNIFICANT SAVINGS

As noted above, the type of humidification system selected will have a significant impact on energy costs and associated environmental impact. Traditionally, adding moisture to the air to raise humidity has involved heating water to produce steam. However, there is clearly an energy cost to heating water. As a rule of thumb, it takes 0.73 kW of heat to produce 1 kg of steam, though distribution and other losses might add as much as a further 20%.

A low energy alternative is to use adiabatic humidification, which sprays tiny droplets of water directly into the air to raise humidity, while also providing a cooling effect as the water evaporates. The latter phenomenon provides very cost effective cooling, with the ability to reduce room temperature by as much as 8°C for as little as 2 kW of electrical energy. This is clearly a significant saving compared to an air conditioning system, particularly as it is also providing effective humidity control.

However, 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. These systems use multi-directional fan assisted nozzles that atomise the water so that it is quickly absorbed into the air. They can also be easily retrofitted in existing facilities.

TAKING CONTROL

High pressure adiabatic systems are also capable of very precise control, with control tolerances as tight as +/–5% of the target humidity. For maximum flexibility they can also be configured in zones using dedicated sensors linked to a central control panel, so that each zone can be controlled individually with humidity levels aligned to the requirements of each space. The sensors also log temperature and humidity to provide documented recordings of environmental conditions.

Clearly these adiabatic systems are particularly cost effective when there is a need for cooling as well as humidity control. In situations where the cooling loads are particularly high there may be benefits to integrating the adiabatic humidification system with the ventilation system. This approach enables the use of free cooling using outside air, potentially providing the required cooling for around 90% year, with supplementary adiabatic cooling for the remaining 10%.

Of course, in other situations there may be parameters that dictate an alternative approach. As a company that supplies all types of humidity control we don't have a particular axe to grind. The important thing is to take account of all of the key criteria to arrive at the most appropriate solution. Where energy costs and environmental impact are important considerations the best solution will very often be a high pressure adiabatic humidification system. GP