



Dedicated Approach

Advancements in restaurant HVAC equipment address restaurant IAQ.

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An integrated equipment approach to kitchen HVAC addresses control of kitchen indoor air quality (IAQ) and moisture management. Unlike conventional kitchen ventilation systems that are comprised of separate make-up air and heating and cooling equipment, the integrated equipment is specifically designed to condition outdoor air at the source, preventing unwanted moisture and warm outdoor air from entering the kitchen. Conventional systems often introduce warm, moisture-laden outdoor air directly into the kitchen and then attempt to use conventional heating and cooling equipment to remove the unwanted heat and moisture by recirculating kitchen air to maintain kitchen comfort. Many HVAC-savvy restaurateurs have found it preferable, though, to prevent outdoor air moisture and humidity from entering the kitchen rather than dealing with it after it has entered the kitchen. The restaurant operators using an integrated equipment approach were able to focus on both outdoor air temperature and outdoor air humidity, as opposed to make-up air designs that center primarily on temperature and fail to address the impact of outdoor air moisture on kitchen comfort.

Examples of this were provided in two seminar presentations at a 2006 meeting of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) in Dallas. One presentation concentrated on a make-up air solution to kitchen ventilation and looked at kitchen temperature without regard to kitchen humidity or total kitchen com-

fort, while the other presentation dealt with a dedicated outdoor air solution to kitchen ventilation and analyzed kitchen comfort based on both temperature and humidity, providing a more comprehensive analysis of total kitchen comfort. It is extremely important when evaluating kitchen comfort to address and recognize the combined impact that both temperature and humidity have on that comfort.

The inability to control kitchen temperature and humidity can be a major cause of poor kitchen IAQ. Telltale signs of poor kitchen IAQ include: 1) excessive kitchen temperature; 2) humidity and; 3) unwanted moisture. The inability to control space temperature and humidity can cause uncomfortable and unsafe kitchen environments that lead to accidents, high employee turnover and reduced production. Damp, slippery floors are one example of an unsafe condition that can be created by the inability to control kitchen humidity. Physical damage to property, such as rusting HVAC diffusers and stained ceiling tiles and floor systems, result from the inability of the kitchen HVAC system to control moisture.

Use of a dedicated outdoor air unit in a kitchen ventilation application to replace separate make-up air and heating and cooling equipment was described in the *ASHRAE Journal* article titled "Keeping Cooks in the Kitchen — Solving the Make-Up Air Dilemma" (Van Straten — Brown June 2003). This article highlighted the advantages of an integrated unit that was designed to condition 100% of the outdoor air that was delivered to the


kitchen, provided kitchen heating and cooling and replaced the air exhausted through the hood.

Using a single dedicated outdoor unit in lieu of separate make-up air and kitchen HVAC units simplifies kitchen HVAC installation and air balance and eliminates the potential for simultaneous heating of the make-up air system and cooling of the kitchen HVAC unit during mild outdoor air conditions — a common cause of energy waste in systems that utilize separate make-up air units. In addition to the controls required for dedicated outdoor performance, additional functions that must be addressed include filtration, modulating heat and cooling. As the ASHRAE seminar demonstrated, the dedicated outdoor air unit consumed substantially less electricity and gas, while maintaining a more comfortable kitchen environment.

Regarding the aforementioned controls, properly configured dedicated outdoor air units include controls that primarily respond to outdoor air temperature and humidity. The units' function is then based upon the temperature and humidity, as well as what needs to be delivered to the kitchen to maintain temperature and humidity control. In other words, dedicated outdoor air units make operating decisions about when to ventilate, dehumidify, cool or heat based on outdoor air conditions, which prevents unwanted moisture and heat from entering the kitchen.

Personally, I consider this dedicated outdoor air equipment to be more

¹ Van Straten, G.S. and S. Brown. "Keeping Cooks in the Kitchen." *ASHRAE Journal* 45(6). June 2003. pp K4-K7.

advantageous than a traditional make-up air approach that introduces unwanted outdoor air temperature and humidity into the kitchen through the make-up air unit and then attempts to control comfort with a separate heating and cooling unit. As many restaurant operators have discovered, it is easier to control the kitchen environment when the removal of excessive temperature and humidity from the air takes place prior to that air entering the kitchen. 

Greg DuChane, who joined Trane in 1989, currently is a regional sales manager for Trane's National Accounts group. DuChane is also Trane's strategic relationships restaurant vertical market leader. He has written previous articles for *Restaurant Facility Business* describing the challenges that high volumes of outdoor air place on kitchen IAQ and moisture management.