In every aspect of today’s restaurant industry, there is a strong emphasis on going green. Architects, engineers, and foodservice designers are challenged with creating designs that meet their clients’ expectations, while at the same time, being conscious of energy use, the environment, and sustainability. Restaurant owners facing economic recession, fierce competition, and elevated food and energy prices, are examining all aspects of cost control and operational efficiency in order to stay competitive and drive higher profits.

The first step for many operators who are striving to go green both environmentally and in the form of bottom-line profit dollars, is to focus on cooking appliances and refrigeration systems - witness the increased purchases of Energy Star rated appliances. But where else can we look to cut costs and reduce energy waste?

When taking a closer look at energy usage in restaurants, roughly one third of the total energy is attributed to the heating, ventilating and air conditioning (HVAC) system, of which the kitchen exhaust is a major component.

The commercial kitchen ventilation system (CKV) is just that - a system - of a subset of the overall building, and represents a significant portion of the total HVAC cost. Optimizing the hood design, reducing exhaust and makeup airflows and proper integration and commissioning with the HVAC system are critical for robust performance, as well as energy efficiency.

Normally, restaurants will turn on the kitchen ventilation system at the beginning of the day and the fans will run at 100% speed for the entire period the kitchen remains operational. To optimize energy efficiency, some operators are converting their standard single-speed exhaust system designs to demand ventilation controls that automatically adjust both the exhaust and makeup airflow rates in direct relation to the cooking load. The control strategy is based on the energy and effluent output from
cooking appliances (i.e. the more heat, smoke and cooking vapors generated, the more ventilation needed.) Modulation of the fan speeds equates to energy savings and lower operational costs, while at the same time, maintaining complete capture and containment of convective heat and cooking effluents.

Other benefits include quieter operation during slow periods, easier fan balancing and startup, as well as reduced ‘wear and tear’ on fan motors, belts, and pulleys.

Demand ventilation controls also satisfy the International Mechanical Code (IMC) requirement for automatic exhaust fan activation, section 507.2.1.1: “Type I hood systems shall be designed and installed to automatically activate the exhaust fan whenever cooking operations occur. The activation of the exhaust fan shall occur through and interlock with the cooking appliances by means of heat sensors, or other approved methods.

How To Catch A Thief

The primary function of demand ventilation control systems is to capture and contain the effluent being emitted and conserve the energy being robbed by less than ideal CKV systems. Several manufacturers have launched demand ventilation control systems which operate based upon the heat and effluent output from the cooking process. These systems vary in terms of cost, complexity, installation, and return on investment (ROI), providing restaurant operators with options to decide which control system is best for their application. Typically, restaurant owners are looking for simple, reliable, and effective systems that will provide a quick payback.

Demand ventilation controls feature a temperature sensor located at the exhaust hood duct connection that works in conjunction with variable frequency drivers to modulate fan speeds. There is a very close correlation between the temperature detected and the convective heat and effluent output from the cooking process. Some systems are equipped with manual override or additional sensors (i.e. optic or infrared) that will send the system to full speed as needed.

Demand ventilation control systems have the ability to reduce fan speeds by 20% or more. This energy saving can add up quickly; a 20% reduction in fan speeds equates to a 48% reduction in fan energy costs. Additional savings are realized through reduced makeup air heating and cooling.

Meeting Your Demands

When determining ventilation rates for a given application, it is important to determine the ‘correct’ exhaust rate based on the size and type of the cooking operation; it must be sufficient for robust capture and containment but not reduce fan speed too much which may cause convective heat and effluent to spill from the hood. Excessive exhaust rates waste energy. Insufficient capture and containment performance will make the kitchen hot and uncomfortable, and increase the heat load to the air conditioning system. A good recommendation is to start with the correct exhaust rate for full cooking conditions, then reduce by 20% for idle conditions, based on the ASTM Standard F-1704 Test Method for Capture and Containment Performance.

Payback Time

A field study was conducted incorporating CaptiveAire’s Demand Ventilation Controls (referred to as EMS, Energy Management System) into a Buffalo Wild Wings franchise store in Fort Gratiot, MI. At the end of the test period, the results showed that by adding the demand ventilation controls, the average energy cost savings was 33%, and provided the restaurant a payback of only 1.2 years for the cost of the controls and balancing of the hood system.

The franchisee and General Manager both stated that they are extremely happy about the system’s performance and how quiet the EMS is. They have since made CaptiveAire’s Demand Ventilation Controls standard for all new and renovated stores.

To learn about other energy and money saving ideas, visit www.gfen.com. For more information on CaptiveAire’s Demand Ventilation Control Systems visit, www.captiveaire.com