Energy Efficient Technology for UC and CSU Campuses

Sponsored by the California Energy Commission's PIER Buildings Program in support of the UC/CSU/IOU 2006-2008 Energy Efficiency Partnership Program

Fact Sheet: Variable Speed Control for Food Service Exhaust Hood Fans

Reduce HVAC Energy Costs in Commercial Kitchens Using Demand-Controlled Ventilation

At a Glance Overview

Technology	Variable Speed Control for Food Service Exhaust Hood Fans.
Description	Controls for commercial kitchen ventilation exhaust hood fans and make-up air fans that optimize hood ventilation performance and energy efficiency. They can reduce energy costs by up to 70% during slow cooking periods.
Campus Applications	Ideal for all commercial kitchens, including food preparation in dormitories, student unions, dining halls, and banquet facilities.
Benefits	Energy savings, improved indoor air quality, optimum kitchen comfort, and improved fire safety.
Sample Cost	$5,000 to $10,000 in new construction, and $10,000 to $15,000 as a retrofit.
Retrofit Savings	Simple paybacks from 2 to 6 years where electricity costs $0.15 per kWh, based on fan energy savings.
Remodel and New Construction Savings	Simple paybacks of 1 to 4 years where electricity costs $0.15 per kWh, based on fan energy savings.
Manufacturer	Melink Corporation http://www.melinkcorp.com/intellihood.htm
For More Information Contact	Mr. Karl Johnson, CIEE/UCOP Karl.Johnson@ucop.edu (650) 255-6867 or (510) 587-6221
Information and Case Studies on the Web	http://www.fishnick.com/publications/reportlist/special/mark_hopkins_melink_report.pdf

Description

Most commercial kitchen hoods operate at 100% capacity all day long, even during idle (non-cooking periods) when ventilation rates can be safely reduced. The cost of wasted energy every year can be thousands of dollars per hood. An effective way to reduce energy consumption and costs is to control the speed of kitchen ventilation fans based on the demand for ventilation created by cooking. A properly implemented demand-controlled ventilation strategy will minimize the energy burden associated with commercial kitchen ventilation, while maximizing the ability of the hood to capture and contain cooking effluent.

The Melink Intelli-Hood

The first step is to minimize the full-speed exhaust rate (and associated make-up air load). For existing systems, this may mean a hood "tune-up" to improve hood performance while achieving capture and containment with reduced exhaust rates. The next step is to integrate the exhaust and make-up air systems with the general HVAC system, utilizing the outdoor air that is being supplied to the dining room as a component of the make-up air requirement.

Once the hood system is optimized, the next step is to implement a variable-speed control strategy for the exhaust and make-up air fans. This can be accomplished using an energy management system designed, installed, and commissioned for this purpose, or by purchasing a stand-alone system specifically designed for this task, such as Intelli-Hood® Controls from Melink Corporation. Intelli-Hood Controls use sensors and a microprocessor to determine when little or no cooking is being done, then they reduce fan speed during idle periods to save both fan energy and to reduce the energy needed to condition incoming make-up air.

The Melink Intelli-Hood Controls can be installed in any commercial kitchen on campus, including food preparation in dormitories, student unions, dining halls, and banquet facilities. Components of the system include optic sensors to monitor smoke and vapors, temperature sensors to monitor exhaust air temperature, variable frequency drives for exhaust and make-up air fans, a microprocessor to control the system, and a keypad to control and program the system. Remote access over a telephone line is an optional feature.

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Demand-Controlled Ventilation Applications

- Ideal for most institutional kitchens on campus.

Specific Savings and Benefits

Reduced Energy Costs – The Intelli-Hood® Controls optimize energy efficiency by reducing the exhaust and make-up fan speeds during idle periods. Typical annual operating savings are $1,500 to $10,000 per hood retrofitted with a payback of 2 to 5 years. In new Construction/Remodel projects the paybacks are only 1 to 3 years.

Improved Indoor Air Quality – The Intelli-Hood Controls can also improve indoor air quality inside a building by monitoring the CO2 levels in the dining area. The exhaust and outside air quantities can be increased to 100% if the level exceeds a certain threshold.

Reduced Noise Level – The noise level in the kitchen will be reduced when the fans are operating at slower speeds.

Optimum Kitchen Comfort – The controls reduce the supply of hot and humid make-up air during idle cooking periods. They can also act as an economizer when indoor and outdoor conditions are right for free cooling. Finally, the controls reduce hood noise in the kitchen by up to 90 percent when the fans slow down.

Improved Fire Safety – The controls can improve fire safety by monitoring the exhaust air temperature. If the temperature approaches the fusible link rating of the fire suppression system, an alarm can sound and/or the cooking appliances can be shut down.

Campus Demonstrations

Demonstrations of this technology and detailed monitoring are being conducted at UC Berkeley. This Fact Sheet provides preliminary information about the cost and performance of this technology. Data analysis will be done and a more definitive Case Study will be created in 2006.

Cost, Savings, and Payback for the Intelli-Hood Controls

The cost and savings of the Intelli-Hood Controls will depend on many factors, including the condition of the existing equipment, the type of cooking that is done, the number of hours per day that cooking is performed, and other factors. The information in the table below is representative of the costs and savings that can be expected in cooking facilities on college campuses in California. Expected energy savings (kWh) for individual hoods can be calculated by assuming that the Intelli-Hood Controls will save at least 25% of the exhaust fan nameplate horsepower multiplied

	Equipment Cost	Annual Savings	Simple Payback
Retrofit	$10,000 to $15,000	$1,500 to $10,000	2 to 6 years
New Construction/Remodel	$5,000 to $8,000	$1,500 to $5,000	1 to 3 years

Expected energy savings (kWh) for individual exhaust hoods can be estimated by assuming that the Intelli-Hood Controls will save at least 25% of the fan exhaust power (kW) multiplied by the annual hours of fan operation. Additional savings will be created by reducing the volume of make-up, leading to less energy needed to heat and cool the make-up air. The amount of these savings will be more in very hot and very cold climates, compared to mild climates.

The Technology Fact Sheets for UC and CSU Campuses provide information to facility managers and operators about new PIER-supported energy efficient technologies that should be considered for installation using UC/CSU/IOU 2006-2008 Energy Efficiency Partnership funding.

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