Demand Controlled Ventilation for Kitchens

KITCHEN VENTILATION OVERVIEW

In commercial kitchens, exhaust hoods are used to remove the smoke, heat, and odours generated from cooking. To maintain a suitable pressure in the kitchen space, makeup air is typically brought in from the outside to replace the air removed by the exhaust hood. Most kitchen exhaust and makeup fans are interlocked and run at a fixed speed regardless of the level of cooking activity, often 24 hours a day. As such, a large amount of energy is required to condition (heat or cool) this outdoor makeup air flow.

TECHNICAL SPECIFICATION

Kitchen ventilation systems can be optimized through demand control ventilation (DCV), a system that varies the exhaust and makeup fan speeds based on the level of cooking activity taking place, while maintaining sufficient capture and containment of smoke and fumes from the cooking process.

DCV systems measure cooking activity in several ways, including:

1. a temperature sensor in the exhaust hood collar,
2. an optical sensor that measures smoke levels,
3. a combination of both methods.

Feedback from these sensors is processed by a controller, which then adjusts the exhaust and makeup fan speeds based on demand. This allows the exhaust system to run at the lowest possible speed while still performing the required function. To set-up demand control ventilation systems, variable speed drives are required on both exhaust and makeup fans and must be retrofitted for existing installations. Typically a minimum fan speed setting will also be applied. It is important that consideration is given to pressure differentials between the kitchen and adjacent spaces. A slight negative pressure in the kitchen is desired to eliminate the migration of cooking odours. Local fire regulations must also be met with any DCV kitchen systems, including maintaining a minimum duct velocity while the kitchen is in use.

Fuel savings result from minimizing the volume of outdoor makeup air that requires heating and electrical savings result from a reduction in average fan speed. As an additional benefit, these systems also reduce noise levels both inside and outside the kitchen.

APPLICATION

Nearly all commercial kitchens can benefit from installing demand controlled ventilation systems. Applications with highly variable cooking loads, such as colleges, universities, and hospitals, are well suited for this technology because cooking activity tends to fluctuate between minimum and intense periods of activity throughout the day.

MAINTENANCE

Demand controlled ventilation systems require minimal maintenance. Both types of sensors require cleaning on a scheduled basis, and should be calibrated annually. Variable speed drives, heat sinks and fans should also be cleaned of any dust build up on a scheduled basis.

INCENTIVES

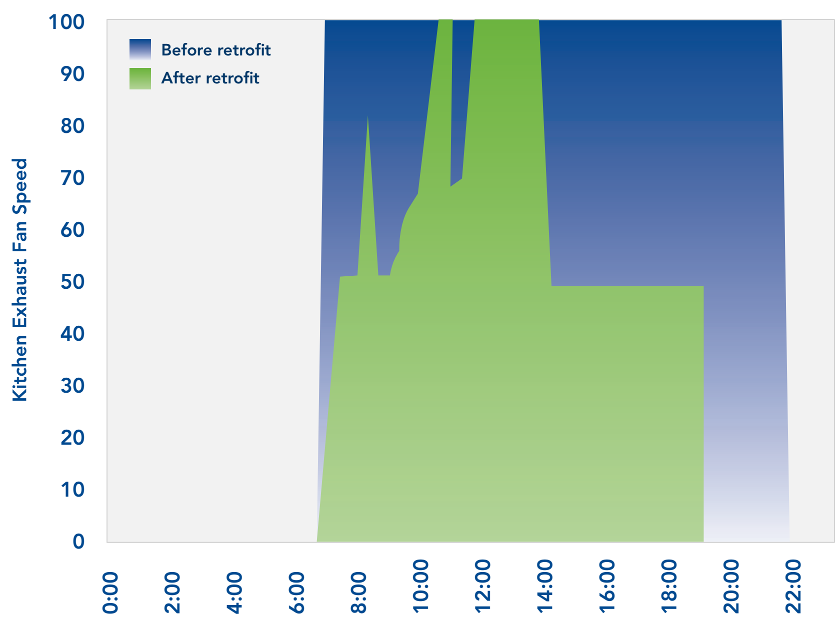
For retrofits, BC Hydro has an incentive program for kitchen DCV through the Product Incentive Program (PIP), Power Smart Partners Express (PSPX), and custom applications. For integration of the technology in new construction projects, this would be eligible for consideration under BC Hydro's New Construction Program, which is co-funded by Fortis BC. Confirm with Fortis BC regarding the potential for funding under custom programs.

CASE STUDY

In 2012 The University of the Fraser Valley (UFV) in Abbotsford, BC, installed a demand controlled ventilation system on the kitchen hood serving the main z. Prior to the retrofit the kitchen hood exhaust fan ran at constant speed for 16 hours per day, 6 days per week, regardless of cooking activity levels. While operating, the 7.5 hp exhaust fan exhausted 6,600 cfm of air from the kitchen, which had to be made up via the 100% outdoor air makeup air unit with hot water heating coil fed from a central boiler plant.

After the installation of a demand controlled ventilation system, the kitchen exhaust fan now operates at reduced speeds when cooking activity limited. The energy savings from this retrofit are estimated at $4,200 per year, with a reduction in greenhouse gas emissions of 22 tonnes of eCO_2 per year. The cost of the system, excluding engineering, was $20,000, giving a simple payback of approximately 4.8 years. An incentive was also obtained from the local utility provider, BC Hydro, for this project under the PSPX program. This further reduced the payback period to 3.6 years.

Measured Daily Profile of Kitchen Exhaust Fan Speed



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