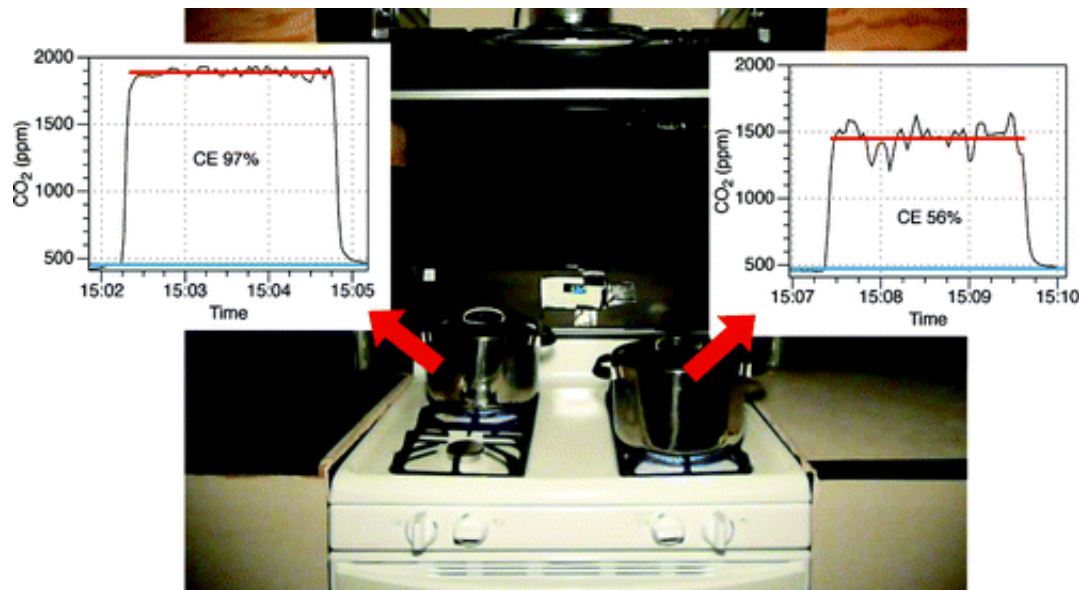


Kitchen exhaust fans vary in effectiveness in reducing indoor air pollution

May 31 2012



(Phys.org) -- Cooking exhaust hoods designed for home kitchens vary widely in their ability to capture and vent away the air pollutants generated by the gas burners on cook stoves, according to a study by two Lawrence Berkeley National Laboratory (Berkeley Lab) scientists. Of seven representative devices they tested, the capture efficiency varied from less than 15 percent to more than 98 percent.

The study, by Woody Delp and Brett Singer of Berkeley Lab's Environmental Energy Technologies Division, measured their pollutant

capture efficiency, sound level generated by their fans, and airflow. Cooking exhaust hoods vent such pollutants as carbon monoxide, nitrogen oxides, formaldehyde, and fine particulates such as soot generated during cooking.

While the exhaust hoods they tested varied widely in performance, they found that all exhaust hoods do a better job of capturing pollutants generated by the two back burners of a four-burner stove than its front burners.

“Even a moderately effective exhaust hood can reduce a stove user’s exposure to pollutants,” says Delp, “and using the back burners preferentially over the front burners helps reduce exposure even more.” However, their research suggests that design improvements can increase the ability of hoods to capture pollutants and reduce their noisiness without increasing their energy use.

The study addresses the pollutants emitted by burners on the stove, but the process of cooking foods, for example by frying or stir frying, also generates pollutants. The research team has not confirmed that their results are applicable to cooking foods, but they believe their results are applicable to cooking, and they have funding for a follow-up study to confirm that the test method is applicable to assessing the capture of pollutants from the cooking process. They are also working on developing test standards that would allow for products to be rated for their performance in capturing pollutants.

Seven representative models tested

Pollutant capture efficiency is the percentage of pollutants at the cooking surface captured by the exhaust hood. Delp and Singer selected models that are representative of the different types of undercabinet exhaust hoods available in the retail marketplace in the U.S. Several

hoods covered only part of the two-front burners of the gas stove. The coverage of one hood, a premium model, extended out beyond the front burners. Some of the models had grease screens, or metal covering their bottoms, and some were open underneath. Two were ENERGY STAR-rated. The seven ranged in price from \$40 for an economy model to \$650, with most falling in the \$250 to \$350 range.

ENERGY STAR ratings for exhaust hoods only consider a hood's energy use and noise level, not its efficiency at capturing exhaust.

Their results showed that exhaust hoods varied widely in their performance, and while most of the hoods performed relatively well at venting exhaust gases, most do not do everything well—some hoods had high capture efficiencies, some were very quiet, and some were energy-efficient, but rarely were all three qualities captured in a single exhaust hood.

The hoods did better at capturing pollutants from the two back burners of the stove than from its front burners. Hoods that achieved airflows recommended by the Home Ventilating Institute's HV1 standard showed capture efficiencies of about 80 percent or greater for back burners but only 60 percent or greater for the oven and 50 percent or greater for front burners. Open hoods had higher capture efficiency than those with grease screen- and metal-covered bottoms.

The hood with the highest capture efficiency, exceeding 80 percent for front burners, was a model with a large, open hood that covered most of the front burners, but it generated sound levels too high for normal conversation. The capture efficiency of hoods meeting ENERGY STAR criteria was less than 30 percent for front and oven burners.

“These results suggest ways that manufacturers can improve the performance of their products,” says Singer. “Improving the geometry of

the hoods—by making them deeper front to back and using methods such as recessed grease traps, blower entries up inside the hood, and better fans and motors will improve their capture efficiency.”

This research was funded by the California Energy Commission, the U.S. Department of Energy, the U.S. Department of Housing and Urban Development, and the U.S. Environmental Protection Agency.

More information: Performance Assessment of U.S. Residential Cooking Exhaust Hoods, *Environ. Sci. Technol.*, Article ASAP. [DOI: 10.1021/es3001079](https://doi.org/10.1021/es3001079)

Abstract

This study assessed the performance of seven new residential cooking exhaust hoods representing common U.S. designs. Laboratory tests were conducted to determine fan curves relating airflow to duct static pressure, sound levels, and exhaust gas capture efficiency for front and back cooktop burners and the oven. Airflow rate sensitivity to duct flow resistance was higher for axial fan devices than for centrifugal fan devices. Pollutant capture efficiency (CE) ranged from 98%, varying across hoods and with airflow and burner position for each hood. CE was higher for back burners relative to front burners, presumably because most hoods covered only part of the front burners. Open hoods had higher CE than those with grease screen and metal-covered bottoms. The device with the highest CE – exceeding 80% for oven and front burners – had a large, open hood that covered most of the front burners. The airflow rate for this hood surpassed the industry-recommended level of 118 L·s⁻¹ (250 cfm) and produced sound levels too high for normal conversation. For hoods meeting the sound and fan efficacy criteria for Energy Star, CE was

Citation: Kitchen exhaust fans vary in effectiveness in reducing indoor air pollution (2012, May

31) retrieved 27 April 2024 from <https://phys.org/news/2012-05-kitchen-exhaust-fans-vary-effectiveness.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.