



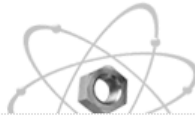
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Building Science

The nuts and bolts of building



Are Solar-Powered Attic Ventilators Green?

Fans that pull hot air out of attics can cause more problems than they solve

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POSTED ON FEB 26 2009 BY PETER YOST

At face value, attic exhaust fans make a lot of sense: if your attic is too hot, you force more air through it to cool it down. To be efficient, you use a solar-powered attic exhaust fan. When the sun is shining and heating up your attic, that's when the photovoltaic panel wired to the exhaust fan powers the fan. Pretty slick.



But there is a catch: why is your attic "too hot?" It is probably because living space under the attic is uncomfortable...from the less-than-well insulated and air sealed ceiling that separates the attic from those rooms. If you don't have a continuous air seal at the ceiling plane, then your solar-powered attic exhaust fan can pull conditioned air into the attic—now that will cool it down! It can be worse than that: if that attic fan is depressurizing living space that has atmospherically-vented gas appliances or a problem with radon, you may have moved from wasting energy to indoor air quality problems.

A case of misplaced effort. The solar panels built into the top of this attic exhaust fan mean energy-efficient cooling of a hot attic. But the fan can pull cool air from the house, cause back drafting, and introduce moisture problems.

Field research supports these scenarios. Work done in 1995 by John Tooley and Bruce Davis of Advanced Energy Corp (as reported in Home Energy, "Drawbacks of Powered Attic Ventilators ") revealed depressurization issues and associated energy, moisture and combustion safety problems. And field research done by the Florida Solar Energy Center (FSEC) specifically on solar-powered attic ventilation ("Performance Assessment of Photovoltaic Attic Ventilator Fans ") concluded that the approximately \$850 installed cost of the system yielded relatively modest cooling energy savings and an unfavorable payback over more than twenty years.

The bottom line? Proceed with caution. If you have a well-sealed and insulated attic floor and either no HVAC equipment in the attic or all of the HVAC equipment and ducts in the attic are well sealed, then you could install solar-powered attic ventilation with some cooling energy benefit and little potential for safety or indoor air quality problems. For far too many homes, this is a mighty big "if."

Joe Lstiburek of Building Science Corp. puts it this way:

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"In order for the fan to work the air needs to come from the outside and not be pulled from the house so this means that the attic ceiling needs to be airtight. If the attic ceiling is airtight you don't need the fan. Your money is better spent on something else."

For most homes, it will be "greener" to take the money you would have spent on the PV-powered attic ventilation and upgrade the air sealing and insulation in your attic and on your HVAC system.

TAGS: FANS, SOLAR POWER, VENTED ATTIC, VENTILATION, HOME PERFORMANCE & WEATHERIZATION, OTHER MECHANICAL SYSTEMS, COLD, DRY, HOT_HUMID, MARINE, MIXED_HUMID, POWERED ATTIC EXHAUST FANS

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1.
SAT,
07/18/2009 -
09:47

Solar attic fan and radiation by solar fan

Why is the attic too hot? Not because of heat from below, but because of solar heating of the uninsulated roof! Too bad none of the authors are physicists. They seem to discount the fact that heat travels by radiation as well as by convection. An attic is heated to a very high temperature by solar heating. This high temperature will result in heat radiation from the attic into the home below. Ventilators cool the attic convectively so that the temperature is lower and the heat transfer into the home by radiation is much lower.

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2.
SUN,
07/19/2009 -
03:21

Dear Solar Fan, by Martin Holladay, GBA Advisor

I'm not a physicist, but I know that powered attic ventilators cause more problems than they solve. I'm well aware that the sun can make some attics quite hot. Here's the basic solution: Be sure your ceiling is carefully air sealed, and include enough insulation to provide thermal separation between your living space and your attic.

If your hot attic is making you uncomfortable during the summer, I guarantee that either (a) someone forgot to include an adequate air barrier at the ceiling plane, or — more likely — (b) the attic floor is inadequately insulated.

I've said it before, and I'll say it again: as long as you keep HVAC equipment and ductwork out of your attic, it really doesn't matter how hot your attic gets.

Depressurizing your attic with an attic fan is asking for trouble. In most homes, a powered attic ventilator will suck conditioned air from your home, raising your energy bills.

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3.
MON,
07/20/2009 -
04:31

On not being a physicist by Peter Yost

Actually, the quote near the end of the article is from a physicist. We know our thermodynamics a bit. It's not that these fans are universally a bad idea; it's just that too often they are used

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About the Authors



Peter Yost is the Director of Residential Services for BuildingGreen, LLC in Brattleboro, Vermont. He has been building, researching, teaching, writing, and consulting on high performance homes for more than twenty years. Read more...



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John Straube, Ph.D., P.Eng., is a principal of Building Science Corporation and a professor of building science in the Civil Engineering Department and School of Architecture at the University of Waterloo, Canada. Dr. Straube has acted as an educator, researcher, consultant and expert witness on energy efficiency, durability and IAQ. Current interests include the optimal system design of buildings, sustainable buildings, and moisture problem avoidance.



Allison Bailes III has a PhD in physics. He is also a RESNET-accredited energy consultant, trainer, and the principal of Energy Vanguard, a consulting firm in Decatur, Georgia.



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