



SOLAR POWERED SOFFIT FANS LLC

CFM Comparisons

When comparing fans, one of the most common items compared is volume of air moved, measured in cubic feet per minute (CFM). The more they move, the better they must be, right? CFMs are, indeed, a key indicator of fan capability. But there is more to the story.

Air temperature. The hotter the attic air is, the thinner it is, and fans have less “bite”, and less efficiency, in hot, thin air at the top of the attic than in cooler, denser outside air. As a result, an attic fan or gable fan at the top of the attic will never be able to deliver the CFMs it is rated at from cooler testing conditions. Solar Powered Soffit Fans, located in the roof eaves at the bottom of the attic, blow cooler air that is at or near their rated testing temperatures. So they “bite” into cooler, denser air, and are relatively more efficient moving air CFMs than fans located in the hot air near the top of the attic.

Pressure (friction and resistance). Fan CFMs decrease as pressure, or resistance to the air the fan moves, increases. Rated CFMs are usually in “free air” with *no resistance* unless you ask for test data. Real attic fan CFMs will never be as high as the “free air” CFM value. Roof mounted attic fans resistances include slamming the air into the underside of a rain cap that reverses the air flow, fan outlet screens and soffit (or other) vent screens, and any partitions in the attic that obstruct direct air flow. Gable fans are similar, except the air is forced through the gable vent louvers instead of into a rain cap. Solar Powered Soffit Fan resistance is typically the soffit inlet and outlet screens, only, so they lose fewer CFMs and solar energy as a result.

Power. Conventional 120VAC fans are certainly more powerful than solar fans and can move a lot of CFMs, so they must be better than solar power? Wrong. 120VAC attic and gable fans typically use more electricity, at ever increasing costs, than they save, so their CFM power isn’t an advantage. They have also been found to pull air conditioning out of the house, and can cause safety risks from combustion back drafts. The extra power and CFMs of a conventional AC attic or gable fan is not necessarily a good thing. At the other extreme, CFM and fan power-wise, is solar power for fans. While solar power is free, solar panel efficiency is low (less than 15 percent for the best, less than 10% for many) and solar panel output depends on the angle of the sun. Lower efficiency and/or bigger angles means fewer CFMs. The ability to capture and use solar power efficiently and adjust the solar panel to the best angles for a specific location is critical to get the most CFMs. Solar Powered Soffit Fans’ mono-crystalline solar panels and Flex Mount do that.

Attic air changes. Conventional wisdom is that *all of the air in an attic, top to bottom*, has to be replaced 6-10 times per hour to be effective at cooling the attic and providing useful cooling to the living area below the ceiling insulation. That means that enough CFMs have to be provided by the fans(s) to change all of the air by *pulling it* out of the top of the attic. “Up to X square feet” typically means the numbers are based on simplified assumptions that may not have anything to do with the actual height, shape, insulation, roof color, existing ventilation, attic barriers, or other actual attic conditions. Unlike conventional attic and gable fans and solar attic and gable fans, Solar Powered Soffit Fans are not intended to change all of the air in the attic, top to bottom. Solar powered Soffit Fans *push* cool air into the bottom of the attic air space, just above the ceiling insulation, where *it counts!* Thermal

stratification of the attic air (cooler air at the bottom of the attic, hotter air at the top of the attic) and it's horizontal air flow across the attic, instead of vertical up to the roof, allows a soffit fan to be used to change out only the air at the bottom of the attic, e.g., the bottom 2 feet. Cooling the lower attic and creating a cool layer between the hot attic air above and the ceiling below allows Solar Powered Soffit Fans to do the job with fewer CFMs.

Where are the CFMs located?

Attic roof fan and gable fan CFMs are hot air exhaust (pull) CFMs concentrated near the top of the attic, drawing from vents throughout the attic, e.g., soffit vents, ridge vents, gable vents, roof vents, poorly sealed ceilings, and poorly sealed HVAC ducts. Much of the airflow from soffit vents follows the underside of the roof, and is aided by a chimney effect of air being heated and rising to the top of the attic and out through the fan(s). There is little or no airflow (CFMs) at the lower center of the attic, above most of the living area. Solar Powered Soffit Fan CFMs are cool air supply (push) CFMs distributed among 2 (or more) fans, blowing across the ceiling insulation in the lower attic above the living area. If there aren't any roof or ridge vents, the incoming air from the soffit fans heats as it crosses the lower attic and comes out of other soffit vents, with little or no airflow in the upper attic. If there are roof or ridge vents, or attic fans, the solar soffit fans improve their performance while pushing cooler outside air toward the lower center of the attic.

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