



Why Does Solar Powered Ventilation Work?

The concept of compounding heat is NOT something most of us will spend more than about three minutes contemplating over the course of a lifetime, and yet it's over all impact on our homes is possibly the most catastrophic and easily the most expensive. Compounding heat gain is responsible for high heat, high humidity, mold, residual off gassing and just about every other negative you can associate with living in the box you call home.

Compounding heat gain defined is: The separate processes of Convection, Conduction, and Radiation, interworking with each other in any kind of a suitable environment that will allow these processes to begin their interworking relationship. It is this interworking process that allows heat to begin its compounding process. It is this compounding process that creates the dramatic impact on the home. Open the hatch of your attic at 4:00 in the afternoon, can you feel that blast of Hot air?. Very much like a convection oven, that heat is saturating the surfaces of everything in your attic, but most specifically the insulation blanket which you thought was there to protect you and your home from heats bombardment. Wrong, it's now being overwhelmed with heat gain, and has become part of the problem. Check your attic temperatures at 2:00 am in the morning and then measure the temperature of your insulation blanket, and I'm sure it will be an eye opener. That's why your AC may be still be running in the middle of the night.

But this is only half of the battle when you consider the whole dynamic of what else is happening up there throughout the course of a typical 24 hour period. When the sun comes up, its rays strike the roof surface, and immediately molecules begin to move and the friction between them creates heat, this is conduction. When the surface is sufficiently heated to the point of saturation and then the surface begins to radiate. In an attic, the radiation overwhelms the air-space, and the inadequate ventilation it's confined by, and the air inside begins to convect (expand). And all day long, this is compounded heat gain and it's actually turning your ceiling into a giant radiator.

OK, so that's the day's impact, but what happens at night? When the sun goes down all of that heat lingers, but eventually gives way to the cooler, wetter air of the evening. Typically, night air can be up to 60% more humid then the air of the day. And generally by 4:00 AM the house has exchanged almost all of the air of the day before. The air in your attic is now wet with the dew of the coming dawn, just in time to take the full brunt of the morning sun. Well, with that coming "convection", all of that night air is now being pushed wherever hot air isn't, and that's generally into your insulation blanket, and eventually down into your walls and that's where mold and mildew can gain a foothold. Mother Nature has been doing this to our homes every morning since we decided to use 2 x4's.

So, this is the Thermal Inversion Dynamic, it happens every morning at dawn and every evening at dusk, and surprisingly, this has never been addressed as a real issue by anybody. Except for a single study done years ago where the concept of a thermostatically controlled 110 volt fan, was tried. Because of the reactive nature for thermostatic control, it was decided a higher CFM motor had to be used to get around the compounding, and the results we're dismal on many different levels. As a result the concept was abandoned, and even the he HVAC industry has tried to address these issues, but by nature their



Why Does Solar Powered Ventilation Work? - 2

approach has always had to be reactive, Too much heat, make it cold, too much water, dry it out and with the compounding attributes of these dynamics, true success has always a bit of a stretch. The solutions to these issues don't lie in treating the symptoms. It is simply not possible to fortify against the compounding powers of nature. The solutions lie in defining the causes and letting Mother Nature correct herself. That is what the right solar powered ventilator can do.

We discerned some 14 years ago that because all homes of the day were all being built with Uniform Building Code (U.B.C.) soffit and gable ventilation (IE; 100 cubic inches of ventilation for every 300 cubic feet of Attic space) a correlation for heat gain could be arrived at. After a considerable period of trial and error, we concluded that any air flow exchanging air at a rate of no less than 1150 CFM, BEFORE the act of convection could begin should be able to keep the convective process of heat gain abated for a period of 14 hours of daylight exposure, for 1000 square feet of Attic. Conversely, we also concluded that any airflow over 1560 CFM would compromise the soffit/gable ventilation, resulting in enough negative pressurization to vacuum AC from the home. Our fan moves 1275 CFM under load and in doing so; we pretty much proactively eliminate all the issues because we change the dynamic necessary to allow compounding to start in the first place. Convection can never catch us. It really is that simple. We're on before the day hits, doing just enough. Think of it this way, on a 110 degree day we all look for the shade of a tree, why? Because it won't be 110 there under that tree, the canopy of that tree will: absorb, deflect and allow for the heat to dispel and the resulting cooler air will fall to the ground where we would be. Hot air rises and expands cool air, falls and contracts, in affect that's the principle we're working with, by eliminating the convection leg of heat gain we sort of short circuit the whole process.

Solar Dynamics does not build different size fans for residential applications because of a significant difference in design engineering. We did once, we stopped. Smaller capacity fans simply don't work, and larger capacity fans run a significant risk of compromising a home's AC. All of our components are proprietary, our specs. are engineered and our power requirements for them are matched. This means we can fully expect full power output from our panels for 25 years or even longer. This is significant, according to a report from CANSIA, there is NO regulation on power performance for any 25 watt or less PV panels, and this is why solar powered ventilation has never been mainstreamed. Their erratic performance makes it impossible to give any kind of performance guarantee. We have 14 years of empirical data that allow us to make claims no other fan can;

- We can keep an attic of 1600 square feet at or very near whatever the ambient air temperature of day is
- We can keep a home some 12-15 degrees cooler
- Save up to 35% in energy costs
- Literally eliminate the potential for long range mold and mildew issues



Why Does Solar Powered Ventilation Work? - 3

It is inconceivable that something as simple as a solar fan could impact the temperature of a home as much as 15 degrees, but it does. In fact in Hawaii, because of their existing trade winds, we can all but eliminate the need for AC altogether, even with the terrible natural ventilation design of new housing. It's this lack of understanding and the naïve' construction practices of the day that perpetuates these problems in the first place. Temperature Inversion Ventilation is a missed construction science and solar powered ventilation is really just a band aid on a much bigger problem. Solar power is just one aspect of a new way of thinking concerning Alternative Energy that's just in its infancy. We need to be willing to re-examine every aspect of our energy usages. This particular application should be applied to the 7 billion sick homes we all live in now. It could dramatically impact power consumption, but Nature heats and cools every day with nothing more apparent to us than the dynamics of dawn and dusk. Every day. These dynamics have no cost, they pollute nothing, and yet they arrive every day and they manage to feed all of us, wash all of us and keep the planet running with a power none of us could produce, much less afford. Why can we not look at the dynamics behind this force and learn and work to make it work for us, Maybe...like a simple solar fan.

Submitted by,

Ron Buckner

Solar Dynamics LLC