

WHY DOES SOLAR 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 under a roof.

Understanding the Dynamics of the roof

Compounding heat gain defined is: The separate processes of Convection, Conduction, and Radiation, interacting with each other in any kind of a suitably restrictive environment that will allow these processes to begin their interworking relationship. It is this interworking process that is "Compounding Heat" and this condition is a result of dynamics that can be changed once the dynamics are understood. Open the hatch of your attic at 4:00 in the afternoon; can you feel that blast of Hot air? It's very much like a convection oven, that heat is saturating the surfaces of everything in your attic, but most specifically the insulation blanket on the floor of your attic. Most think that insulation was there to protect you and your home from heat's bombardment. Wrong, its primary purpose is to hold heat, which is essential in winter, but in the dead of summer 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. Inside an attic, the roofing radiates and that radiation overwhelms the air-space, and the inadequate ventilation it's confined by, and the air inside begins to convect (expand) and the heated air then conducts into whatever surface it comes in contact with, 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 than 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 wet night-air is now being pushed wherever hotter 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/will eventually gain a foothold. It's a fact; Mother Nature has been doing this to our homes every morning since we decided to use 2 x4's and insulation.

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 construction issue by anybody. Except for a study done years ago where ma thermostatically controlled 110 volt fan was looked at, and then dismissed. The fan had a thermostatic control, and because of its reactive operation it was decided a higher CFM motor had to be used to get around the preemptive compounding, and the results we're dismal on many different levels. Enough so, that the whole concept of mechanical ventilation was



considered impractical and then was abandoned. This is truly an unknown science, even the HVAC industry has tried to address these issues, but by nature their approach has always had to be reactive. That is: Too much heat? Refrigerate. Too much humidity Dry it out. Too cold? Warm it up. The thought of altering the dynamics by which these conditions might come to exist has never been an option. Our construction practices have always been far too reactive in scope. We believe the solutions don't lie in treating the symptoms. It is simply not possible to fortify enough against the compounding powers of nature. The solutions lie in defining the causes, altering them enough to let Mother Nature "correct" herself. That is what the right solar powered ventilator can do.

Understanding the dynamics of the Fan

We discerned some 19 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. 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

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



Solar Dynamics

*Super Cyclone
Solar Powered Attic Fans*

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.