Double Glaze Matters

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SUCCESS!

The Government has withdrawn its $100 million subsidy to the planned coal fired power station in Yallourn.

Hopefully it will now die a quick death

Montmorency Food Swap

Sun 5th Aug, 10:00—11:30

Montmorency Primary School

Bring your home grown produce to swap.

My Solar Heat Box

For a long time I have wanted to build a solar air heater on my roof to collect hot air and pump it into the house. Finally I have got beyond thinking to actually building it!

The idea is quite simple. You build a box on the roof which has a transparent top and a black base. The sun's heat passes through to the black base and heats it up. You then pump air from the house, through the box and back into the house.

Internet figures suggest that in winter time in Melbourne there is around 3 KWH of heat per day per square metre. I was looking at a collector which is 3 metres x 4 metres, or 36 KWH per day. I use around 50 KWH of gas a day, so if everything was perfect, I could halve my gas bill.

Of course things aren't perfect. My design is to have air entering the bottom at 16 degrees and exiting the top at 26 degrees.

Roof Angle. The daily heat assumes the unit is at right angles to the sun, or around 55 degrees. The roof is actually at 16 degrees. But that only loses me 15% of my energy. So I decided on the easy solution. Keep it flat on the roof.

Fan speed. It is important that the fan speed matches the box size. If it is too slow, the box will get too hot and be inefficient. If it is too fast the air coming out the top will not be hot enough. I have a fan that moves a maximum of 800 cub metres of air per hour. It will probably be 400 with all my ducts etc. 400 Cubic metres of air weighs around 400 Kg. The heat capacity of air is around 1 KWH per tonne per degree.

My collector will receive around 8 KWH per hour. Assuming I collect 4 KWH per hour the temperature difference would

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Franciscus Henri's contribution to the Carbon Tax Debate

My Solar Heat Box (continued)

need to be 10 degrees. This is more than I would like, but it is around the right area. I can always upgrade the fan if it gets too hot.

Is there sufficient air flow to cool the collector? This is harder to check, but I placed a collector in direct sun and it heated to 27 degrees - 10 degrees above room temperature. My box will have a higher air flow which suggests I can keep the collector at a maximum temperature of 36 degrees (10 degrees above my exit air temperature).

Will it respond quick enough. If the sun comes out, you want it to start pumping hot air within 10 minutes. You don't want it so heavy that it is 30 minutes before it heats, by which time the sun has disappeared. I decided to put a layer of bubble wrap on the bottom to act as insulation from the box, so that it responds quicker to the sun and loses less heat out the bototm.

Collector design. Ideally you would use something like aluminium with fins on it so that there was a large area to transfer heat to the air. I settled on a cheaper option which is a sheet of black plastic suspended half way down the box. The sun hits it and heats it, giving two hot surfaces that the air can pass over.

Ducting. I wrestled with designing 2 ducts from the unit to the house. One to bring out air to be heated, the other to return the heated air. I decided to go for a cheaper solution. Draw air from outside into the unit then pump it into the house. Much simpler to design, but not quite as efficient. The outside air is probably 15 degrees, whereas air drawn from the house is nearer 20. But is not quite as bad as it sounds. If there is a wind, normally air enters one side of the house (say 500 cub metres/hour) and exits the opposite side (500 cub metres/hour). If I pump 400 cubic metres/hr into the house, it creates a back pressure and less enters the house, giving around 300 entering on one side and 700 exiting the other.

Cover for the unit. Glass would work better, but it is much more expensive than plastic roofing. Probably $800 compared to $200. Fortunately I had lots of glass that I had removed from other houses through my double glazing, so I went with glass.

Heat loss. Assuming an average 8 degree temperature difference across the glass, and a U value of 6, heat loss across the glass will be 576 watts. Less than 10%. Radiant heat loss is harder. It is around 50 watts/sq metre at 28 degrees. That's another 600 watts, giving a total heat loss of 20%.

So the final design is shown below. Will it work? I'm not sure, but it will be fun trying. If I can capture 20% of the heat (8 kwh per day) I would be pretty happy.

One thing that annoys me is that it works best in Summer, when the heat is no use. Would it be worth using the high heat outputs in March to heat the ground under the house? This will then return to heat the house in winter, or perhaps more precisely, "not cool it so much" in winter. Over the next month I will try to work out if it is feasible, or will the heat just dissipate before winter arrives?