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Dear Mr. Dixon.

I have been reading about the proposed Eco town on the web site: www.fordenterprisehub.com.

My background is in process control mainly for Oil and Gas refining and exploration. Part of my work is based on Thermodynamics and Fluid dynamics.

The specific area I am interested in is the Eco houses and offices, and I would like to forward an idea that could be quite advantageous.

I have worked in many offices designed by some great architects. The main problem we are faced with today is that the Eco offices (and most Eco homes) have a compromise to consider. This is because the ideal solar trap, using the greenhouse effect, comprises a south facing glass front to the building. This is an efficient way of harnessing the Sun's energy for heating purposes. However, in the hotter summer months, this advantage turns into a disadvantage.

The solution of course is to utilise air conditioning systems. However, this defeats the object in that it requires a considerable amount of energy to combat the greenhouse effect, where in this case, it would actually be preferable to offer a windowless wall to the Sun.

Architects have struggled with this compromise, and understanding that air conditioning uses up a vast amount of energy, have taken to other solutions that are not as effective as one is led to believe. One such solution is often called natural convection using the 'chimney effect' (very similar to the philosophy used in Ancient Roman Architecture). Where this works fairly well on windowless buildings, with stone walls (i.e. a Church), it is not effective for windowed wall buildings.

I have worked in offices with such concepts, and I can say that it's not that effective. Furthermore, it forces the architect to install open-able windows which have further problems of noise pollution, security breaches and of course, higher cost.

There is no doubt that air-conditioning for Eco houses and office buildings would be attractive for any owner/occupant. Cooler offices increase productivity and will attract many more businesses.

So, the burning question is how do we attain Low Carbon Footprint air-conditioning, realising that conventional air conditioning requires typically 3kW (equal to 50 x 60 Watt light bulbs left on all day) for every room with a glass front?

Equally, we need to maintain the south facing glass walls for the specific advantage of free heating AND lighting.

The solution is very simple – we have a fast running river nearby – the River Arun. Heat exchangers can be used to pump heat from the buildings to the river. Because the river is fast flowing, the heat exchanged into the water would be nearly adiabatic – meaning that the amount of energy pumped (for free) will not heat the river. To place some perspective on this – it takes 4 kW to heat 1 Litre of water by 1 C in 1 second.

So, for 1 cubic meter, passing a heat exchanger in 1 second (about 3.6km/hour, which is slow) – it would take 4 MegaWatts to raise it's temperature by 1 C. In a river measuring 6m x 2m – the cross sectional area is 12 m sq. So its capacity at 3.6 km/h would be 48 Mega Watts. Of course, the system is not 100% efficient. But at 50%, and to minimise the heating effect of the water by 0.25 C, then the useful power could be estimated at 6 MW. So, at 3kW/room, the energy could be used to cool **2,000 south facing rooms.**

The only energy required to power the system, is the energy required to pump the fluid around the system. This is significantly lower than the alternative conventional air conditioning system. To understand this, is must be considered that for a household heating system, it only takes about 50 Watts to pump the fluid around a building of say 6 rooms. So for 2,000 rooms, a 100 kW motor, or less, may be all that's required – and this could be driven by the river itself.

Conclusion

The figures are basic assumptions. To be more accurate, one will have to do a feasibility study. Furthermore, the flow of the river may be faster, and the volumetric flow rate may be much higher.

To consider that power stations often use rivers to cool and condense the steam in the system, places some idea on the cooling power a river has to offer.

The south facing glass walls are certainly effective for free heating in the colder months, and it can save an enormous amount of heating energy. So, the added energy required to run the cooling system is quite insignificant by comparison and therefore, it would allow the use of lower cost fixed window systems on south facing walls.

All this will add to the attractiveness of the home and office facilities and would present a very Eco friendly solution.

Lastly, the running and maintenance costs would be significantly low – however the cooling transfer could be charged for in order to pay for installation and upkeep. The cooling may also be extended to the housing thus making the houses extremely saleable and/or exclusive.

I hope that this may be of interest.
Yours sincerely,

R. B. Kitchener.