International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 13 (2018) pp. 11208-11211
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A Study on Solar Vapor Absorption Refrigeration Opportunities in Tropical Wet and Dry Climate

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Abstract

Vapor absorption solar refrigeration advantages in tropical wet and dry climate region of Bhopal city as a is analyzed.The average tempreture of the earth are risens by 2°C over the past century, and is hope for to rises another 2 to 10°F over the next hundred years. The dangerous problems in the climate are can be leads to the Small deviations in the temperature of the planets. Thus it is necessary to keep a control over the amount of greenhouse gases by adopting the alternative and safe methods of saving the planet. Solar energy is considered as one of the best alternatives regarding this. The efficiency of such systems varies largely depending on the nature of material used in solar collectors. The same is discussed here in detail.

INTRODUCTION

The solar power refrigeration system is a refrigerator which are run of energyis directly provided bu sun and many included sloar thermal energy and photovoltaic energy.Solar power refrigerations system is allwed to keep the easily spoilt goods such as meats and dairy products are cooled in vary hotest climates. Solar power refrigerations system are regularly used in not connected to the main electricity grid locations where advantage provided that AC power are not availables.This can be done between solar thermal energy transfaer, photovoltaic chaning and passive solar energy. Now a days in the solar refrigerator system are using hydrofluorocarbon(HFCs) as a refrigerants own serious inference on environments.In this study of solar power vapour absorption system which are used HFCs as arefrigerant an probability to protects the environments by dominant dangers of the hydro fluorocarbon. In summer the consumptoin of electricity are vary high. Thus has a vary critical problems, social and ecnomical but not only environment. Solar energy are available as many form of energy on the earth surface. The earth surface are recievesed a daily solar amount of 10E+8 KW/Hr. Air conditioning and refrigeration system on the electric energy consumption are used mostely. Solar air conditioning power are participate in an increasing capacity in zero-energy and energy plus buildings designs. In case of vapour compression cycle of air condition system C.F.C and H.C.F.S gases are used as arefrigerant. Its takes vary high ozone deplection potential (ODP) and high global warming potential (GWP). So vapour absorption refrigeration of air conditioning system as H2O-LiBr and H2O-NH3 are used to remedied effects of the C.F.C and H.C.F.S vapour compression system. Chloroflouro carbon (CFC) gases reacts with ozone (O3) with the upper level of atmosphere and produced oxygen as by product.

The equation given by

_ CCL2F2(R-12) =CCLF2+CL ,CL+O3=CLO+O2.

Ozone layer act as protectives shield for ultraviolet rays given by the sun. Thus protective shield of ozone layer from ultraviolet rayes are removed. This (O3) ozone layer are decompose to the O2. Ultraviolet rays are prodigious health hazard as askin cancer and many diseases to enter the earth. For this reason its become critically to remove the C.F.C refrigerants from uses in the refrigeration and air conditioning industries. Opertiob of solar vapour absorption system are used with H2O-LiBr and NH3-H2O as a refrigerant-absorbent solution. A futher vary important effects(GWP) global warming potential. Thermal power plants are produced CO and CO2 (which are generated electricity produces as a layer over the earth environment. So global warming are producing from reflected sunlight from CO and CO2 layers. The thermal power plant capacity are decreases by reducing the production of CO and CO2. Vapour absorption system are uses vary low amounts of the electricity. Thus decreasing (GWP) global warming potential to alarge extent.

SOLAR ELECTRIC REFRIGERATION

A solar electric refrigeration system is contained mostly of electrical refrigeration device and an photovolaic panels. Solar cells are generally semiconductors its cost and efficences are widely be dependent on the materials and the manufacturing technique and these are made from nearly all of the solar cells commerically available in the market are build of silicon as the shown on fig.(1)

From Eq. (1), efficiency of the panel is defined as the ratio of power to the products of direct irradiation of solar beams I_p (kW/m^2) and the panel surface area A_s (m^2) and.

Ip = 1 KW/m^2 are mainly repeatedly used for the calculation of nominal efficiency

$$\textbf{(solar-power)} = \frac{w}{I_P \times A_S} = \frac{W}{Q_S} \qquad \textbf{(1)}$$

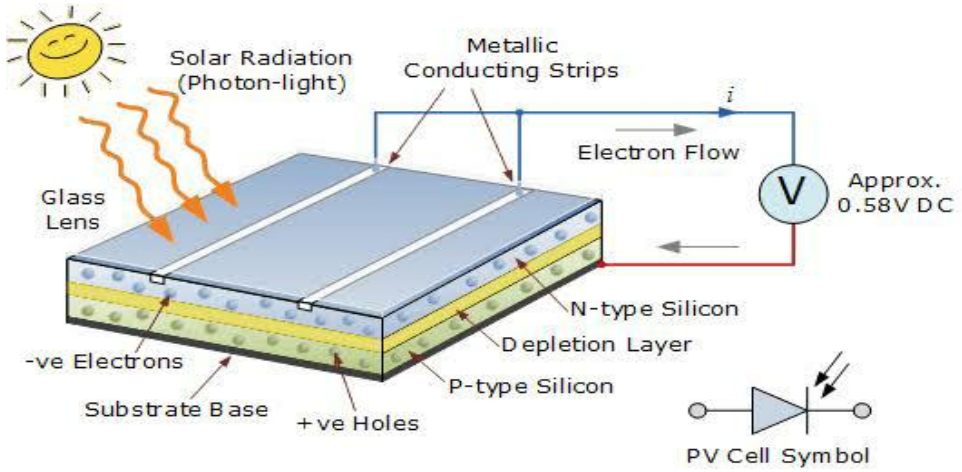


Figure 1. The dramatic figure of solar electric refrigeration system

The biggest benefit is their simple construction and overall a good efficiency. On combining with a traditional vapor compression system. The dramatic of a electric refrigeration system given in Fig. 2. In Fig. 2, the effort W are invest by the mechanicly compressor in order to produced the cooling power Q_e.

Refrigeration machine efficiency are defined as the producing cooling power Q_e divided by the input work done W

$$\textbf{(solar-power)} = \frac{Q_E}{W} \qquad \textbf{(2)}$$

The biggest Problem in reference to the perspective of the paper is the use of HFCs in solar electric refrigeration system. Although the electricity consumption part is prohibited by the use of solar energy which in turn prevent the emission of CO_2 if the electricity is generated from thermal power plants by combustion of fuels.

SOLAR THERMAL REFRIGERATION

This system uses solar heat instead of solar electricity to produced the cooling results. The flat -plate solar collectors are the commonly variety consisting of a metallic absorbers. It also consists of an insulated casing covered at the top with glass plate(s). Evacuated collectors perform better at high temperatures because of much reduced heat loss. The metallic absorber are move out the glass tube, to resists the pressure difference between atmosphere and the vaccuum. These have been represented diagrammatically in fig 2.

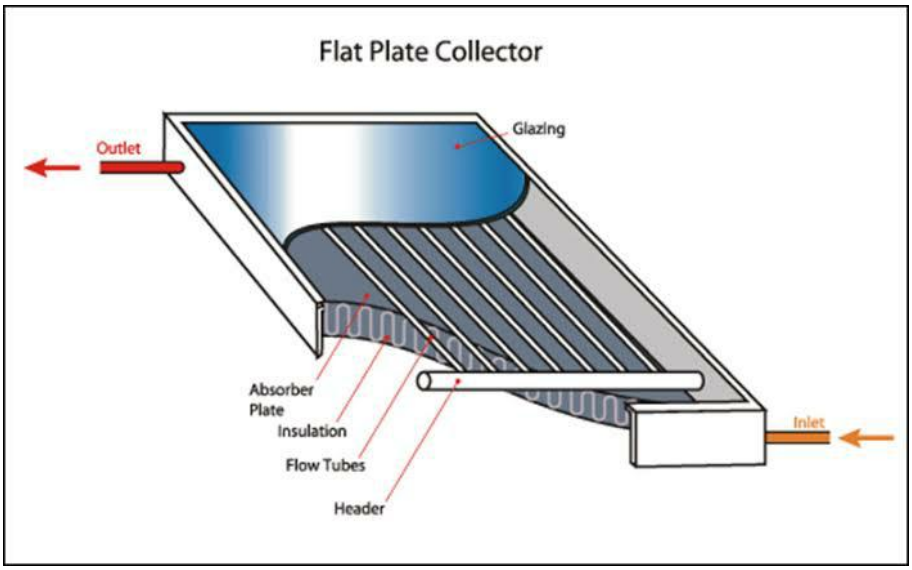


Figure 2. The dramatic figure of non-concentrating solar collector. flat-plate types

The solar collector are supply either a thermal compressor and heat engine in such a refrigeration. Solar collector efficiency are essentiolly is calculated by its working tempreture. In the working tempreture is higher, the losses of soler collectoe, more heat to be moving and the delivered heat is vary low. Any other way the thermal compressor and heat engine are normally works on higher effiency with a higher tempreture.

Vapor absorption solar refrigeration-

A vapor absorption solar refrigeration system are uses chemical and physical attractiveness in the middle a set of substances to manufacturing refrigeration reaction. Vapour absorption system has a individual ability of converted thermal energy by a direct into colling power. The pair of substances , the lower boiling tempreture of substance are called absorbate and 2nd one is called absorbent. The roll of refrigerant are plays the absorbate as shown in Fig. 3. shows a block absorption system. The consituents where absorption occurred in the absorber and another desortion arise in the generator. The generator to be given heat Qg from the solar collector to regenerate the sorbent that has absorbed the refrigerant in the absorber. The refrigerant vapor are produced by the condenses in the condenser turn down the condensation heat Qc to ambient. The regenerated absorbent from the generator are forward other side to the absorber, where the absorbent absorbs the refrigerant vapor to the refused by the absorption heat Qa to the ambient evaporator.

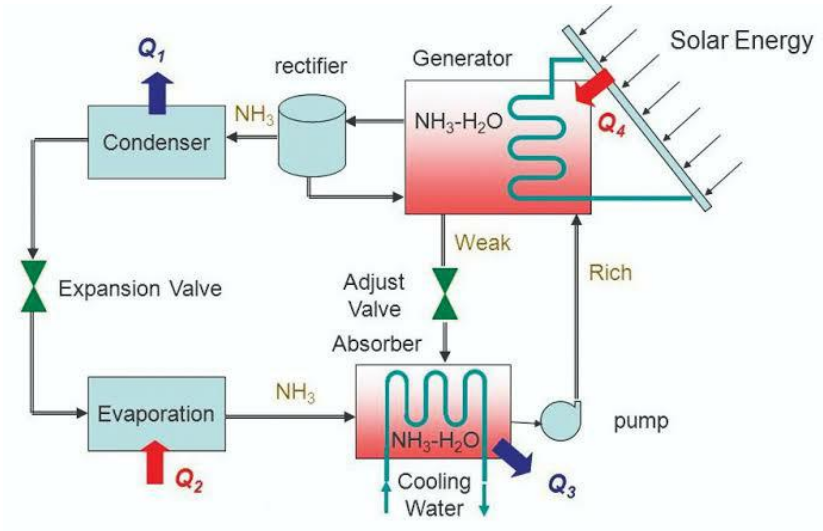
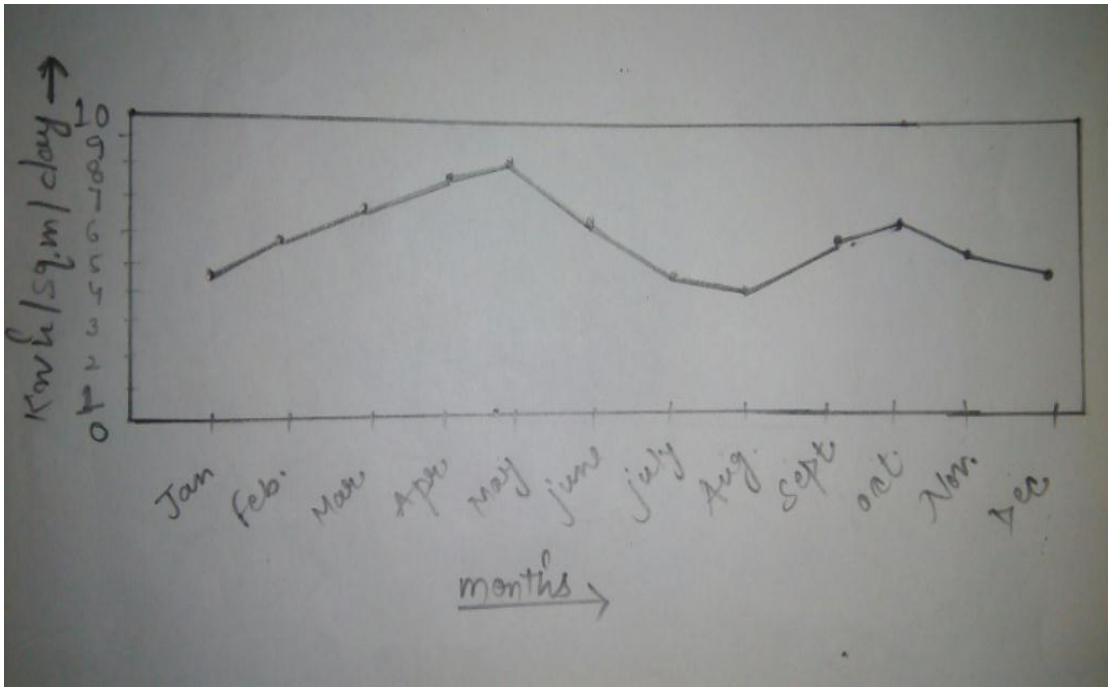


Figure 3. Solar power vapor absorption system

Solar radiation in Bhopal	
Annual average – 5.68(kWh/m^2/day)	
Monthly	Average (kWh/m^2/day)
January	4.89
February	5.82
March	6.71
April	7.32
May	7.53
June	6.14
July	4.71
August	4.33
September	5.34
October	5.88
November	5.09
December	4.61



Plot-1 Variation of Solar Radiation in Bhopal

CONCLUSION

Number of options are there to convert solar energy into refrigeration effect. The main disadvantage of solar electrical system is the use of HFCs as a refrigerant. The solar VAR system completely eliminates the use of ozone depleting agents. In Bhopal having annual average Solar Radiation of about 5.68(kWh/m^2/day) it is feasible to adapt solar Vapor absorption refrigeration system in commercial use but the initial installation cost and cost per kilowatt cooling is very high.

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