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Heating of air with the help of the solar evacuated tube

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ABSTRACT

A solar powered air heating system using one ended evacuated tubes. A solar air heater containing evacuated tubes is used for heating purpose. With the increased attention the efficiency of solar heating facilities and the performance of additional equipment are becoming increasingly important. In the present study, thinking is giving on the heat transfer characteristics of solar air heater with some modifications in design to increase air travel length. Performance ofsolar air dryer would be checked with and without air heater. Effect of climate conditions would also be studied on its performance.

Keywords: Evacuated tube, Thermocouple, Air blower.

1. INTRODUCTION

1.1 Problem statement

We are experiencing the time of vitality emergency. It is because of the drawn out utilization of power which is created by fills like coal, gas, diesel and so forth these powers' side-effects influence our condition seriously bringing about a dangerous atmospheric devotion, ozone layer exhaustion, and corrosive rain. It isn't useful for human life.

They examine each framework and part regarding favorable circumstances and drawbacks. The fundamental inconvenience of coated level plate gatherers is moderately low productivity when contrasted and vacuum authorities. Further, you require more rooftop space and a weight-supporting installation for level rooftop mounting. Gatherers, which include various associated tubes connected by an authority box, are more costly yet have a lower yield when the sun is low.

1.2 Objectives

- The primary target of this task is to spare the vitality and make more yield at least cost.
- As we realize that radiator requires more power this will expand cost of the system.So, this venture causes us to decrease the cost and contamination.
- Operation of this framework is eco-accommodating.
- It can be utilized as putting away gadget.

1.3 Basic principles

The electric exhaust fan and the temperature indicator are connected to the power supply. The electric fan sucks atmospheric air and passes it to the evacuated tube. This evacuated tube acts as an absorber and absorbs all the solar radiations falling on it. As this tube is placed at the focal line of the designed parabolic collector, it absorbs all the reflected radiations too. This increases the temperature of the air. Two thermocouple wires are used to measure the temperature of inlet and outlet air. These thermocouple wires are connected to digital temperature indicator that indicates the temperature sensed.

2. LITERATURE REVIEW

Comparing Evacuated Tubes with Flat plate collectors [1]

Both the Flat plate and Evacuated tube collectors play a major role in heating operations using solar energy. However, many researchers have proved that evacuated tube solar collector is a better substitute to flat plate collectors when high temperature is concerned. Ayompe*et al* monitored year round energy performance of solar water heaters with 4 m 2 flat plate and 3 m 2 heat pipe evacuated tube collectors under same operating conditions. The annual collector efficiency observed were 46.1% and 60.7% for the flat plate collector and evacuated tube collector respectively with system efficiencies of 37.9% and 50.3% for the same systems. Economic analysis showed that both solar water heating systems were not economically viable because of their very low net present

worth and their simple payback periods varied between 13 years and 48.5 years of flat plate collector and evacuated pipe collector respectively.

An Experimental Study on Evacuated Tube Solar Collector for Heating of Air [2]

A solar powered air heating system using one ended evacuated tubes is experimentally investigated. A solar air heater containing forty evacuated tubes is used for heating purpose. The collector surface area is about 4.44 m^2. The length and outer diameters of the outer glass tube and absorber tube are 1500, 47 and 37 mm, respectively. In this experimental setup, we have a header (heat exchanger) of square shape (190 mm x 190 mm). The length of header is 1500 mm. The header consists of a hollow pipe in the center whose diameter is 60 mm through which the air is made to flow. The experimental setup contains approximately 108 liters of water. Water is working as heat collecting medium which collects the solar heat falling on the tubes. This heat is delivered to the air flowing through the header pipe. This heat flow is due to natural convection and conduction. The outlet air temperature depends upon several factors along with air flow rate and solar radiation intensity. The study has been done for both up-flow and down-flow of air in header in similar weather conditions, at different flow rates. In the present investigations the study has been made to find the effect of intensity of solar radiations and flow rate of air on the out let temperature of the air with time and which flow is more efficient. The obtained results show that the system is highly effective for the heating in this region. Moreover, it has been observed that system is highly efficient for the particular flow rate of air.

Experimental Investigation of the Performance of Tubular Solar Dryer [3]

Drying experiments for Himalayan fig was conducted, after a preliminary stage of the investigation which included measurements for the determination of the collector efficiency. These results showed that the warm outlet air of the collector attains temperature levels suitable for drying of agricultural products without the need of preheating. Pick up efficiency decrease with decreasing moisture content in the product and increasing the temperature of the drying air will increase the drying rate at a constant air velocity range from 0.3 m/s – 3 m/s.

Experimental study of a tubular solar still with phase change material [4]

The proposed correlation has been validated with the experimental results .The regression coefficient approaches to unity and the correlation may be perfect positive with least error .Energy and exergy efficiency of a system were calculated .It is observed that productivity of solar still increase by 20% when energy storage medium is used. Experiments were carried out on a tubular solar still integrated with stearic acid as energy storage material in Allahabad climatic condition. Some important conclusions were drawn:

- Daily energy efficiency of 21.87 % is obtained.
- Instantaneous exergy efficiency varies between 0.05 and 6.59.
- Daily exergy efficiency of 0.857 % is obtained.

Performance analysis for flat plate collector with and without porous media [5]

A theoretical study to investigate the effect of mass flow rate, flow channel depth and collector length on the system thermal performance and pressure drop through the collector with and without porous medium. The solution procedure is performed for flat plate collector in single and double flow mode. The analysis of the results at the same configuration and parameters shows that the system thermal efficiency increases by 10-12% in double flow mode than single flow due to the increased of heat removal, and increase by 8% after using porous medium in the lower channel as a result of the increase of heat transfer area.

3. CONCLUSION

In morning, when the sun rises, the radiations are low and thus the yield so got isn't acceptable. As the Sun rises and comes at the best, vast measure of sun oriented radiations fall on the explanatory plate and a large portion of them are assimilated. This gives the normal effectiveness. The proficiency is greatest at 1 pm and then it starts to diminish as the Sun moves toward the west. Utilization of this setup gives a high temperature increment.

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