

Optimized Heat Storage Tank for Water by Solar Heat Concentrator Tube

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Abstract: In this research work, this is done by using of vacuum tubes for optimization of solar water heating. In the using of vacuum tubes connected with a primary tank of water, and primary tank is connected through secondary tank of water. Studies were made to implementation which is primary and secondary water tank is connected with water pumping system, which gradually calculated and interchange primary to secondary tank with maximum heat water storage as in same time. At the temperature of 45°C our need for heating purpose is satisfied. Using of electronics simulation system in water pump with respect 9am-2pm. which drop the extremely heat water to nominal water using pump system. Productivity improved its efficiency in less time water tank. it works at operation temperature (around 70°C). Measurement of productivity in 1r where taken as 100 primary and 100 secondary tank. Productivity improved as same timing taken but efficiency improved by double percent on performing all modifications.

Keywords: Vacuum tubes, solar heat concentrator, pwm, heat storage tank, radiant heating.

1. Introduction

Due to the limitation of the conventional source of energy. It is required to overcome from these energy source and make use of the greener source which is found in huge amount and are environment eco-friendly. so, for this purpose we make use of solar energy by trapping its energy through vacuum tube.

Vacuum tube collectors are the most proficient collectors available. Each vacuum tube is similar to a thermos in principle. A metal or glass tube containing the water or heat transfer flowing is surrounded by a large glass tube. A space between them is a vacuum, so very few heat is missing from the fluid. [1] Vacuum tube collectors can be designed to increase water temperatures to as high as 177 °C(350 °F). They may use a mixture of configurations, but they are generally encased both the absorber surface and the tubes of heat transfer fluid in a vacuum sealed tubular glass for highly efficient insulation. Vacuum tube collectors are the most efficient collector type for cold climates with low level diffuse sunlight.[2] These solar collector tubes which inside the collector tubes, there is copper tube. inside the vacuum tube, heat pipes which are piece of copper tubing. In this tube, inside copper tube is covering through the aluminium heat fins are contact with the double glass tubes. In this whole arrangement upper tube transfer the heat into aluminium covers and then absorb to copper tube [3]

In vacuum tube collectors have insulated tubes and a pipe description to which the vacuum are connected. The pipe header is insulated and has a protective cover. A collector fluid tubes use in copper and usually black chrome is used as the some section absorber coating .[4]

2. Literature review

In previous terms, the performance of a solar water heater system using vacuum tubes was evaluated using a transient

simulation program with use of single water tank and using transient simulation program with use of experimental and techniques used as modelling for all components solar hot water system. In this system which is connected through 135-l water tank and using TRNSYS.[5] A vacuum tube solar water heater system, solar water heaters is better than that of flat plate collector. Its experimental show performance not varies with respect of angle inclination. And these aspect variation of inclination of vacuum tubes effect [2]

3. Experimental setup

The aim of the experimental is to study the performance of solar water heating system with using vacuum tubes in India. In the reason behind experimental system has designed to necessity which has saving the water. In this system shown in figure using vacuum tubes , its consists of 12 vacuum tubes and a two water tanks which is in 100-100ltrs and using water pump to connected both the tanks. The vacuum tubes overview shown,



Figure 1: Solar Water Heater Using Vacuum Tubes

In the using of vacuum tubes height is 1828.8mm, outer surface is 58mm, inner surface is 43 mm.

4. Working and Methodology

In this research the system evaluated consists water in tank .which is connected through vacuum tubes. which coupled of two water tank, first is primary water tank and connected through a secondary water. In both water tank is gradually connected through water pump. Which is work on using electronic simulation system. This experimental simulation shows to reduce the losses of evaporated water and using simulation its better technique to save water. and using pwm which is connected through motor and with the use water temperature device for measuring and help to the pwm simulation system using with explain the algorithm chart. Shown in fig4



Figure 2: Due to solar heating evaporation starts



Figure 3: Heat losses come through the surface

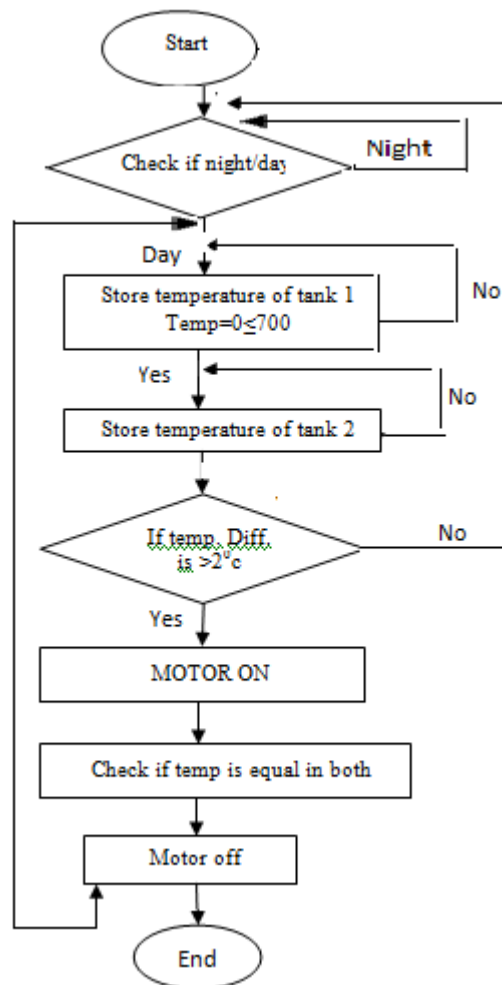


Figure 4: working methodology of this system

5. Results

In the results showing by using electronic simulation system it is depend upon a water using factor which dependent upon a solar heating temperature and radiation. If you are heating up 200 litres of water and we can increase the temperature of the water by 25.8°C above the ambient water temperature. In the term of using these method water wastage at up to 70° is minimize.

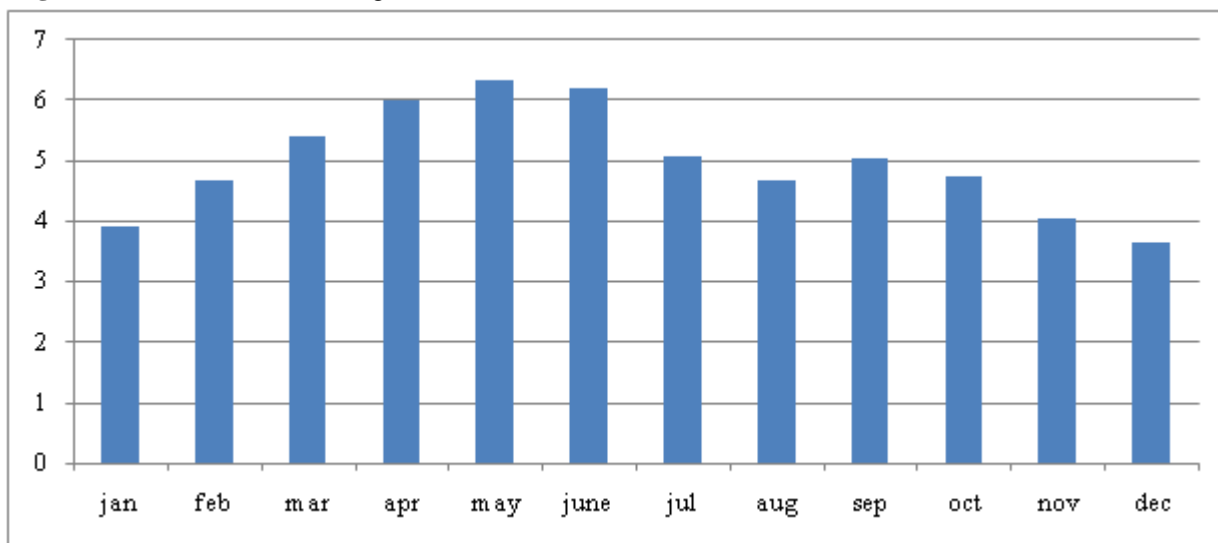


Figure 5: solar irradiance (Kwh/m²/day) onto a horizontal surface in jaipur

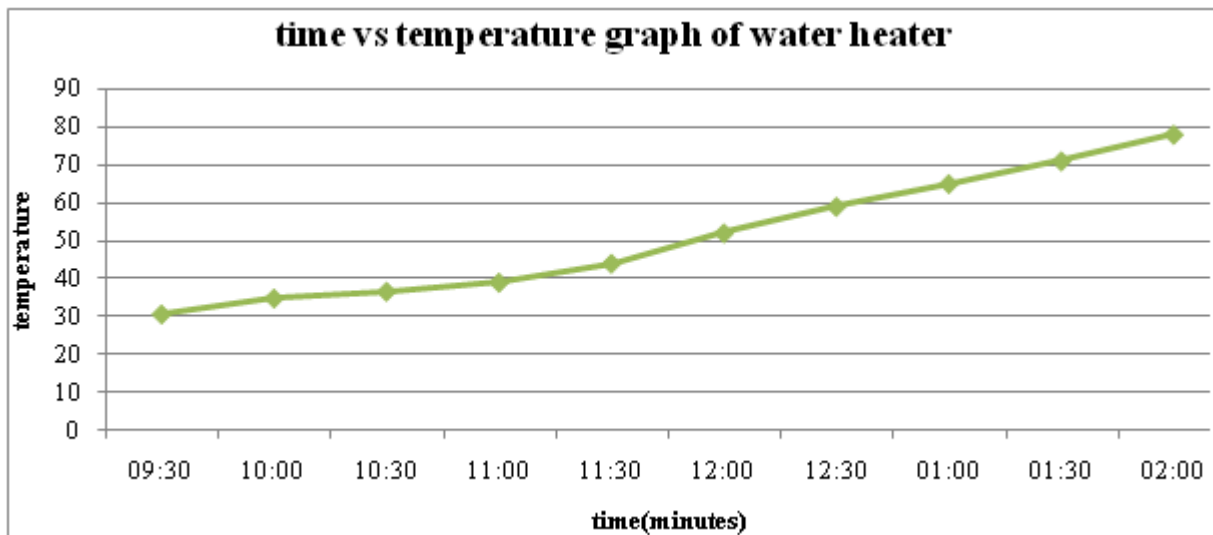


Figure 6: average graph of June month time vs. temp of water heater

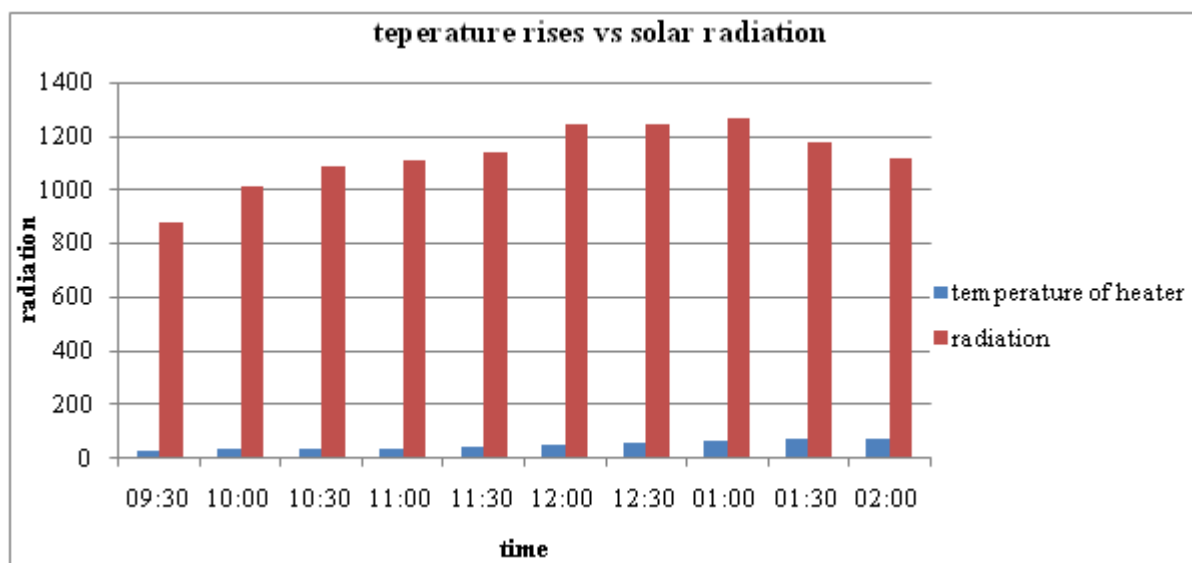


Figure 7: Average graph of June month temperature vs. solar radiance with respect to time.

6. Conclusion

In the system using more efficient in terms of wastage energy. In behalf of previous Terms, its gain hot water in 100 lit at (below 2pm) and then some water is evaporated. But in these Conditions secondary tank is helpful for wastage water by evaporation. It is more efficient than previous terms. In the term of using these methods minimizing the Water wastage.

7. Future Scope

In term of this system, future system implementation of this can be improved by varying the number of solar vacuum tubes and reliable materials. Whose solar radiation efficiency is high, can be used for the increasing the efficiency of the system. Water tank will increases with uses of optimum temperature gain. Insulated storage system will be more reliable to maintain the heat losses. To using at different purpose in industrial sector and working at all its component more efficiently.

Reference

- [1] Budihardjo, G.L. Morrison and M. Behnia, **Development of TRNSYS Models for Predicting the Performance of Water-in-Glass Evacuated Tube Solar Water Heaters in Australia Destination Renewable – ANZSES 2003**
- [2] P.Selvakumar, Dr.P.Somasundaram, Effect of Inclination Angle on Temperature Characteristics of Water in-Glass Evacuated Tubes of Domestic Solar Water Heater, **ISSN: 2277-3754**
- [3] AS4234 (1994) – Solar water heaters – Domestic and heat pump – Calculation of energy Consumption.
- [4] Bau H.H. and Torrance K.E., (1981)., *Transient and steady behaviour of an open, symmetrically heated, Free convection loop*. Int. J. Heat and Mass Transfer 24(4) – 597-609.
- [5] Chow S.P., Harding G.L, Window B. and Cathro K.J. (1984). *Effect of collector components on the collection efficiency of tubular evacuated collectors with diffuse reflectors*. Solar Energy 32(2)
- [6] L.J. Shah (2004), 'Vertical evacuated tubular-collectors utilizing solar radiation from all directions',

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