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TWO IN ONE SOLAR HEATING SYSTEM

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***Abstract*— Mainly different types of solar cookers and solar water heaters are available in global market. But solar cooker and solar water heater are two different device. So, my team made Two in One Solar Heating System. In this system solar cooking and solar water heating this two facility available in one device. It produces a good temperature for water heating and also food cooking. The major problem with One Solar Heating System is that it has not yet been tested in all the seasons. Two in One Solar Heating System concentrates light to a larger surface, so it is slightly more tolerant for marginal errors of alignment.**

Index terms- **evacuated tube, insulation box, main frame, safety valve.**

I. INTRODUCTION

Many researches in the solar heating system have deemed the prospect of using solar energy for heating and cooling. It is a known fact that during the day. For the developing countries especially, cooking and water heating are one of the basic and dominant end use of energy. It is very desirable to develop alternative, convenient and affordable methods of cooking, based upon the renewable energy sources.

II. VARIOUS COMPONENTS

Following component and material are use in this system.

- Evacuated tubes
- Wooden strip
- Metal sheet
- Rubber bush
- Safety valve
- Pipes and its joints
- Glass wool
- Rubber strip
- M/Seal (Bond material)
- Insulation Box
- Stand
- Coting color and Brush
- Rubber Rings
- On/off water valve
- Aluminum cooking box
- Thermometer etc.

III. CONSTRUCTION AND WORKING

Firstly from the sheet, we made two rectangular with one side trapezoidal box which are concentric by means of welding process.

To avoid leakage M/seal is applied at welding joints. One side of box is inclined (Trapezoidal side) at an angle of 450 for effective heating.

On this side, there are two holes for fitting tubes. For tightening and leak-proof of tubes, rubber ring are provided.

And also valves and T-section piping joint are provided on the adjacent of inclined plane for pouring water inside and extracting the hot water outside. And both boxes are assembled together and between them glass wool is provided for heating resisting purpose (Maintain inside temperature).

Now, to make stand as per specification, no. of L-section channel are stick together by welding process. And last, the upper cover which is made with double glass and wooden frame is fixing with tightly.

Insulation is most importance in this device foe decreases the maximum heat losses. In two in one solar heating system, we are use the glass wool material for insulation and wood also.

Many types of insulation are available in the market but glass wool is best for the solar heating system, technically and cost wise also.

Safety valve use for the safety of the glass material of the system. Because the top side of insulation box is made with plane glass plate and also insulation box is assembled with the evacuated tubes.

At a time pressure of the insulation box is increasing the more then pressure limit.

IV. MATHEMATICAL CALCULATION OF EVACUATED TUBE

Latitude and longitude incident on a horizontal collectors for 'Rajkot city'.

Sr.no.	Month	Latitude & Longitude
1	January	6.5-7.0
2	February	7.0-7.5
3	March	7.0-7.5
4	April	7.0-7.5
5	May	7.5-8.0
6	June	4.5-5.0
7	July	2.0-2.5
8	August	2.0-2.5
9	September	5.5-6.0
10	October	6.5-7.0

Now, as solar radiation is incident on the outer layer of the borosilicate glass tube, a part of it is absorbed, part reflected back into the atmosphere and most of the radiation is transmitted to the next layer of glass tube. Since,

Transmitivity = 0.92

Absorptivity = (1- 0.92 - 0.04) =0.04

From the empirical relations, the insolation at Rajkot's latitude and longitude incident on a horizontal collectors is measured to be 7.5 KWh/m2 day. To obtain the peak value of insolation, it is required that this value is divided with an approximate number of bright sunshine hours. Assuming that May 15 is a clear day with no clouds and 8 h of bright sunshine, the radiation received/m2 at every incident would be = 7.5 /8 = 940 W /m2. The further calculations are based on this value of incidence solar radiation flux. It is further assume that the total incident energy available on the surface.

Total incident energy = G x Aperture area

= 940 x 0.1366

= 128.45 W.

The temperature of the outer tube is determined and it is therefore required to calculate the temperature of the inner glass tube. As the two tubes are separated by a vacuum and we have assumed that no convection and only transmission takes place from the top layer.

Energytrans = t x Energy Incident.

Energytrans = 0.92 x 128.45 W.

= 118.182 W.

Using the aforementioned equation:

118.182 x 0.12 = 3.14 x (0.058) x 1.5 x 0.04 x 5.669 x 10-8 x (T4 – 3084)

T = 1500°C.

V. ADVANTAGES

- This solar system is therefore ready for wide scale global dissemination.
- This device is eco-friendly
- They required little maintenance.
- Lifespan is more.

VI. DISADVANTAGES

- Evacuated tube is made from glass. So, handling is carefully.
- For this device, availability of sun is must require.
- In this device, heating is not constantly.

VII. APPLICATION

- For the cooking.
- For water heating.

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