

# DESIGN AND FABRICATION OF ADVANCED SOLAR WATER HEATER

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**Abstract** - The goal is to layout & expand the excessive green sun strength collector. Passive device is used wherein the water flows obviously in tubes because of density distinction. Aluminum fabric is used for sun flat plate collector. Double publicity device is applied in order that the flat plate sun collector is uncovered to the solar from each the aspect with the assist of mirrors. This double exposing device allows to growth the heating fee of water in tubes. Due to that, the glide fee of water in tubes additionally will increase. The monitoring device is used to song the solar motion and replicate the sun radiation on any other aspect of the sun plate with the assist of mirror. Evacuated flat plate sun collector is applied due to its excessive performance. The usual performance of the sun water heater will increase because of double publicity device so the time required to warmth water is decreases to a few extents. The most temperature of water withinside the garage tank observed to be 72°C at 30° tilt attitude with vacuum and monitoring device.

**Key Words:** - Solar Energy, Solar collector, Double exposure system, Evacuated system, Tracking system.

## 1. INTRODUCTION

Solar strength is the number one strength supply for our planet. Heating of water is the maximum not unusual place software of sun strength withinside the world. Using the solar strength to warmth water isn't a brand-new idea. While sun water heater tool has been round for even a hundred years. SWH device is used to warmth the water for home, business and commercial needs. In SWH device evacuated tube is maximum green device than different device like flat plate collector. SWH device is eco-pleasant, renovation much less, good value and green device. More than 20000 home devices are being mounted each all around the country. SWH structures are typically quite simple the use of best daylight to warmth water.

### Literature survey:

#### 1.1 Mr. Kishan Patel, Mrs. Pragna Patel, Mr. Jatin Patel, Patel et al. (1)

Present, Solar water heating structures are mounted with unique configurations and arrangements. The fundamental generation concrete of those structures is studied and its miles observed that there's a want to paintings at the generated layout technique to select, deplumation and reveal the sun water heating device as consistent with the provision

of sun radiation and neighborhood geographical circumstance.

#### 1.2 A. E. Kabeel, A. Khalil, S. S. Elsaye, A. M. Alatyar et al. (2)

The intention of this paper is to introduce a technique for simulating the absorbed sun radiation and warmth transfer technique in water-in-glass evacuated tube sun collector. The technique is evolved to calculate the everyday applied sun strength and outlet collector temperature for unique tilt angles, collector azimuth angles and geometric parameters without requirement for any experimental aspect determination.

#### 1.3 M. A. Sabiha, R. Saidur, Saad Mekhilef, Omid Mahian et al. (3)

Solar strength is the maximum available, environmental pleasant strength supply and renewable to preserve the developing strength demand. Solar strength is captured via way of means of sun creditors and an evacuated sun collector is the maximum green and handy collector amongst diverse varieties of sun creditors. In this paper, a complete literature on why evacuated collector is preferable, forms of evacuated creditors, their structure, programs and demanding situations had been reviewed.

#### 1.4 Johane Bracamonte, Jose Parada, Jesus Dimas, Miguel Baritto et al. (4)

It became observed that the lean attitude has sizeable impact on every day sun strength advantage, glide styles in the garage tank and stratification. Nevertheless, it become observed little effect at the thermal performance because of the low importance of the warmth losses thru the vacuum tubes. Also, 10° tilt attitude permit attaining sizeable better temperatures and thermal stratification, at the side of a thermal inactive region at the lowest of the tank. Conversely, the content material of the garage tank for the 45° tilt attitude is absolutely combined on the stop of the heating technique. This took place in particular because of the relative role of the tubes beginning in the tank and the integration impact at the convective water glide. A non-dimensional wide variety to quantify the stratification impact is proposed and it became observed an exponential dependence on the lean attitude. Some issues concerning the usage of WGET-SWHs on subtropical areas are made.

### 1.5 Hossein Mousazadeh, Alireza Keyhani, Hossein Mobli, Ahmad Sharifi et al. (5)

In this paper unique forms of solar-monitoring structures are reviewed and their cons and execs are discussed. The maximum green and famous solar-monitoring tool become observed to be withinside the shape of polar- axis and azimuth/elevation types. However, it isn't encouraged to apply monitoring device for small sun panels due to excessive strength losses withinside the riding structures. It is observed that the energy intake via way of means of monitoring tool is 2-3% of the accelerated strength. The task in changing daylight to strength thru photovoltaic sun cells is dramatically reducing \$/watt of added sun strength.

#### Problem definition:

The present sun water warmers are time ingesting and having Heat loss. The running of sun energy heater is depending on abundance and the solar rays directly. The set-up of sun pannel could be very highly-priced and the setup is difficult in making. Not lots greater beneficial in wet days and foggy days however our initiatives are much less time ingesting and that they take minimal time for making warm water. Solar panel performance is low in comparison to different supply of strength and we required huge system to get max warmth. In the todays circumstance air pollutants is the maximum risky topic and additionally they have an effect on at the sun molecular due to those purpose we're determined to take an aluminium plate with update of sun panel. the modern sun water heater device is best reveal to the solar aspect. Due to at least one manner exposing device the heating fee of water withinside the modern sun water heater is sluggish. Due to sluggish heating fee of water the glide of water is likewise sluggish, so the temperature advantage via way of means of the water is low and it takes greater time to warmth water.

#### Objectives:

1. According to the requirement of warm water for business purpose, our primary goal is to warmth water in a green manner in minimal time.
2. To growing the heating fee of water via way of means of the use of monitoring device, which reasons growth in glide fee of water and growth in temperature of water in minimal time.
3. To growth the general performance of the sun water heater device.
4. To use green, renewable and pollutants much less strength and to store strength and LPG fueloline via way of means of changing the electrical geyser and LPG fueloline geyser.

5. The primary overall performance benefit of low-glide structures is because of sizable thermal stratification in sun garage. Solar garage layout and the layout and interplay with garage via way of means of warmth exchangers and auxiliary device can impact stratification. Therefore, all 3 of those additives are key additives in low-glide structures and they're regularly taken into consideration collectively as a sun garage device.

6. The Task 14 Advanced Solar DHW Working Group set an aim of a more than 15 percentage growth withinside the fee and overall performance of sun DHW structures over modern practice. This aim is interpreted as attaining designs which have a preliminary fee to annual strength added ratio improvement (dollars/GJ) more than 15 percentage.

#### Description of the proposed work:

Advance solar water heater in particular encompass 5 crucial elements and they're sun collector, evacuated glass container, adjustable body, evacuated tank and the monitoring device with mirrors. Here sun collector is made from the aluminium plate of go segment 400mm×800mm×2mm.

1. water heater, water is heated via way of means of the sun thermal strength absorbed via way of means of the creditors.

2. The warm water with decrease density pass upwards and bloodless water with better density movements down from the tank because of gravity head.

3. By the use of Aluminium sheet we get greater warmth And In having low fee.

4. Due to the use of Double publicity Glass the sunrays get Reflect on returned aspect of Aluminum sheet get Heated and Taking low time and greater green.

5. Due to the use of Double layer Tank we create vacuum in among them so no conduction took place.

6. By Using of Aluminum sheet and Aluminum sun cells in glass via way of means of growing vacuum so there can be no warmth loss occurs.

7. Due to Density distinction among bloodless and warm water warm water is going upward path and bloodless water comes downward path and cycle repeat entire days.

#### Flat Plate Collector:

We have designed aluminum sheet and tubes of internal diameter 6 mm and duration 900mm device from fabrication. We designed the plate in the sort of manner that the touch region of tube and plate is most.

Fig 2 shows the design of flat plate solar collector. dimensions of the aluminium solar collector 400mm×800mm\*2mm

**ALUMINIUM PLATE:**

**ALUMINIUM TUBES:**

- Length = 800 mm
- Width = 400 mm
- Thickness = 2 mm
- vertical blue tubes
- inner diameter = 6mm
- length of tubes = 900 mm
- No. of tubes = 5

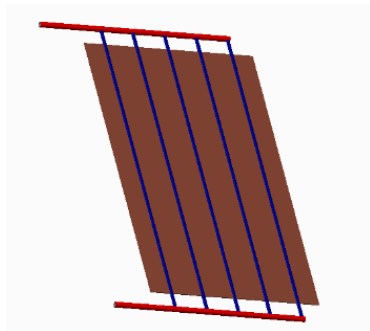


Fig 2: - “Designed Flat Plate Collector”

**Frame:**

The body is designed in the sort of manner that the lean attitude of the installed plate meeting may be alternate from zero o to 45°. This is furnished to locate at what diploma of tilt attitude the sun water heater is greater green.

Tilt angle= 10°-40° Length = 1700 mm Width = 500 mm

Front = 500 mm Rear = 1010 mm

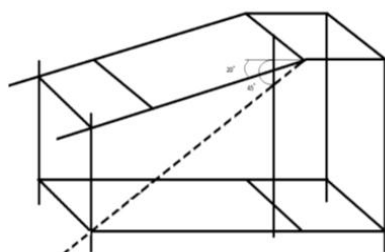


Fig 3: - “Frame”

**Storage Tank:**

Two tanks are used here, the smaller tank is enclosed withinside the larger tank having a few holes in among them. Vacuum is created in among them to reduce the convectional warmth loss. Input and output water pipeline meeting are installed on one aspect of the tank. A vacuum gauge is installed on pipe that is connected to the outer to degree the

vacuum among the 2 tanks. The primary tank is of 275mm diameter and the opposite tank is of 375 mm diameter. The capability of the primary tank is 70 liters.

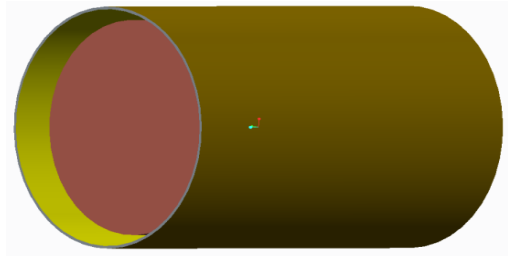


Fig 4: - “Designed Storage Tank”

**Tracking system: -**

The monitoring device has been designed in the sort of manner that the sun collector may be exposes to solar from each the sides. On monitoring device mirrors are installed in order that the sun radiation may be pondered closer to the flat plate from returned aspect.

No. Of mirrors = 2

Length = 800 mm

Width = 400 mm

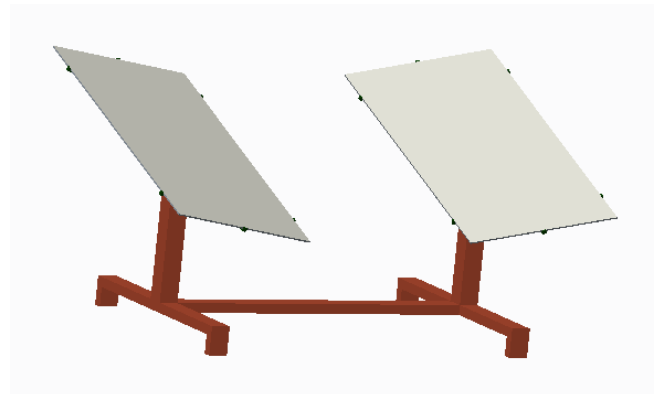


Fig 5: - “Designed tracking System with mirrors”

**Glass:** We have designed eight mm thick glass to make a square go segment container wherein the flat plate collector is enclosed. A hollow is made on one aspect of a pitcher to restoration a pipe in it. The pipe is used to evacuate the glass.

Thickness = 8 mm

1. Top and bottom glasses

Length = 1000 mm

Width = 500 mm

## 2. Left and Right-side glasses

Length = 1000 mm

Width = 100 mm

## 3. Remaining side glasses

Length = 500 mm

Width = 100 mm

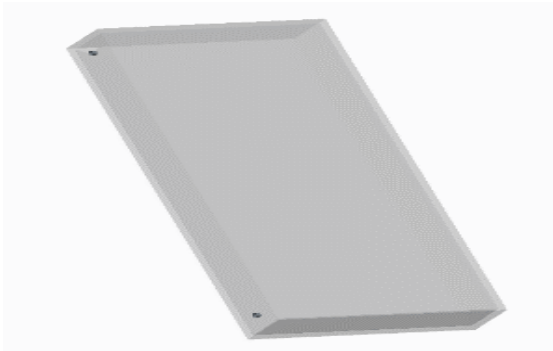


Fig 6: - "Designed Glass Box"

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**CONCLUSIONS:**

As we see the modern present sun water heater having a few errors, so to triumph over we're making aspect venture which having excessive performance at low time. It is observed that the 30o tilt attitude is greater green as evaluate to 20o & 45o. It is found that the very best temperature of water withinside the garage tank this is 72oC advantage at 30o tilt attitude with vacuum and monitoring device. It is observed that, the temperature of water will increase via way of means of 8o C in a single hour "with vacuum and with monitoring device" and the temperature of water will increase via way of means of 5o C in a single hour "with vacuum and without monitoring device". The heating fee will increase via way of means of 37.50%. Due to the evacuated garage tank, the warmth loss is decreases via way of means of 4oC and warm water has been saved for longer time. The remaining intention is to elevate the temperature of water in minimal time has been correctly obtained.

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