

LINEAR FLAT PLATE SOLAR COLLECTOR

**¹Mr. Ashok D. More, ²Chandrakant Shevate, ³Harshal Gaikwad,
⁴Prasad Patil, ⁵Dhananjay Sirsat**

¹Project Guide & HOD Mechanica, Sandip Polytechnic Nashik, Maharashtra, (India)

²³⁴⁵Student, Department Of Mechanical Engineering, Sandip Polytechnic Nashik, Maharashtra, (India)

ABSTRACT

This Project describes the latest technique being used in the field of electricity production i.e. the “THE SOLAR POWER”. With the help of ‘THE FRESNEL COLLECTORS ‘ and “THE PARABOLIC TROUGHS”. The Project Describes for types of collectors which are being used these days to concentrate the solar energy. out of this four we have noticed that the linear Fresnel collector are the once which are the most profitable and appropriate for our household appliances.

The report consists of the information regarding the topic Fresnel collectors ,parabolic troughs ,sola power tower, sterling dish or parabolic dish .The collectors are also classified as :

- Low temperature collectors: Low-temperature collectors are generally installed to heat swimming pools, although they can also be used for space heating .Collectors can use air or water as the medium to transfer the heat to there destination.*
- Medium temperature collector: These collector could be used to produce approximately 50% and more of the hot water needed for residential and commercial used in the united states.*
- High temperature collectors: where temperatures below about 95⁰c are sufficient, as for space heating, flat plate collectors of the no concentrating type are generally used .Because of the relatively high heat losses through the glazing ,flat plate collectors will not reach temperatures much above 200⁰C even when the heat transfer fluid is stagnant.*

Taking in consideration today’s needs of conservation of the energy . Linear Fresnel collectors have the potential to reduce level electricity cost (LEC) of solar thermal power plants and thus accelerate sustainable market penetration of CSP systems. It is expected that linear Fresnel collectors might have a cost advantage over conventional parabolic trough collectors.

Keywords: Copper Coil, Primary Reflector, Insulated Tank, Locking Mechanism.

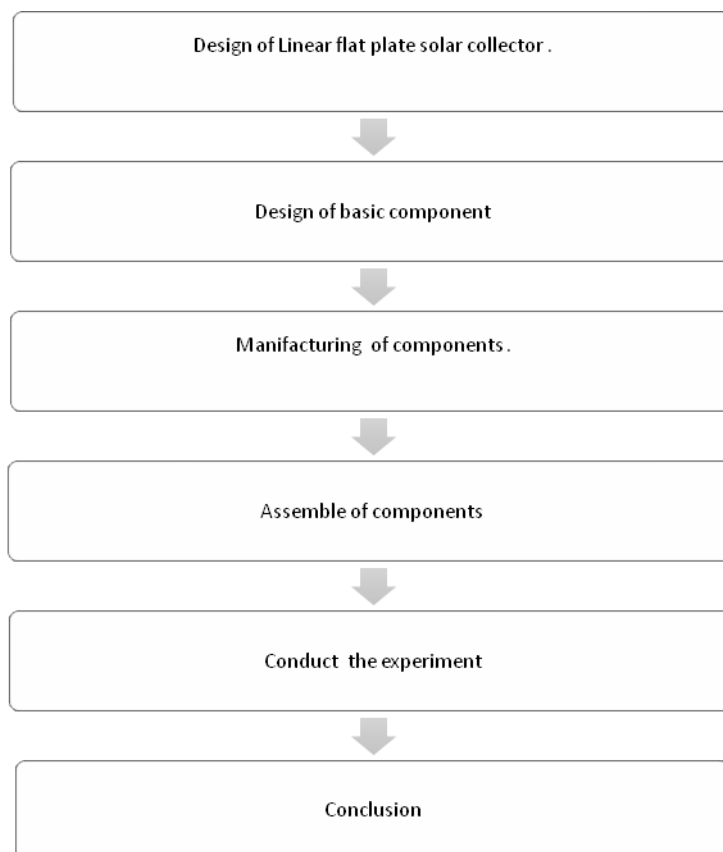
I.INTRODUCTION

Concentrated solar power (also called concentrating solar power and CSP) system use mirrors or lenses to concentrate a large area of sunlight , or solar thermal energy onto a small area .Electrical power is produced when the concentrated light is converted into heat, Which drives a heat engine (usually a steam turbine) connected to an electrical generator .

Concentrated sunlight has been used to perform useful task from time of ancient China. A legend has it that Archimedes used a “burning glass” to concentrate sunlight on the invading Roman fleet and repel them from Syracuse . CSP is not to be confused with concentrated photovoltaic (CPV). In CSP , the concentrated sunlight is converted to heat ,and then heat is converted into electricity. In CPV, the concentrated sunlight is converted directly to electricity. In CPV , the concentrated sunlight is directly converted via photovoltaic effect.

II.METHODOLOGY

Methodology used for whole processing of Linear flat plate solar collector is given below; this methodology gives way about how work is to be carried out in a systematic way. It is standard process of describing process, how it is done in simplest manner.

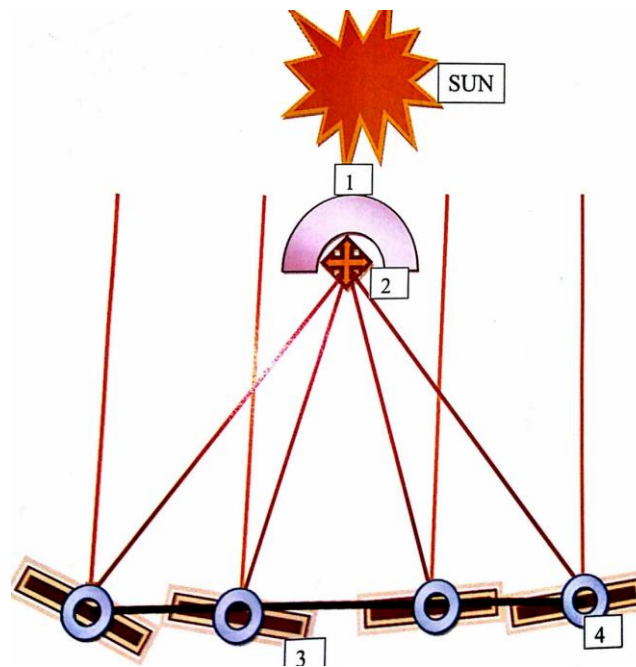


III.WORKING

Mirrors are adjusted According to Sun Rays on frame by using locking mechanism and which are tilted towards the dome. The sun rays coming from sun are falling on mirror, The concentrated light by using mirrors with tracking

system to focus large area of sunlight on to a small area. The concentrated light is used as heat or As heat source For A conventional power plant (Solar Thermal Electricity),But we used heat Energy For Heating the Copper Coil, Which is consist of water. The Solar Concentrated Energy which often also be used to heating the water. The solar concentrated light in system can often also be used to provide industrial process heating or cooling such as in solar air condition.

IV. FUNCTIONAL BLOCK DIAGRAM



4.1 System Component Design:

Our system mainly comprises of following components:

1. Frame
2. Mirror(primary Reflector)
3. Aluminum Dome (Secondary Reflector)
4. Copper Coils
5. Insulated Tank.
6. Base
7. Footstep Bearing
8. Locking Mechanism

1. Frame:

It is made up of M.S Rectangular pipe Of 2' x 1'. The frame is used to support the whole system in terms of strength. The frame mainly supports the secondary reflectors, primary reflectors, footstep bearing.

2. Mirror (Primary Reflector):

The primary reflectors act as the main concentrator of sun's rays. The rays fall upon the mirror and are reflected back to the parabola. The way the heat efficiency is increased. We have used the mirrors of 5x feet in dimension with 4mm thickness. Four number of mirrors are used of MODIGUARD.

3. Aluminium Dome (Secondary reflector):

The dome acts as the main concentrator of the heat. The sun rays which are concentrated on the parabola by the mirrors are again concentrated at the copper wire which is present at the focal point of the parabola. The parabola is made of aluminum sheet and is again covered by aluminum foil to increase the reflectivity.

4. Copper Coils:

The copper coil we have used is used to allow the flow of water through the focus of parabola. The copper coil has outer diameter of 6 mm & inner diameter of 4 mm.

5. Insulaed Tank:

The insulated tank is a tank used to store the heated water which is being heated by the sun's heat and rays. The tank is manufactured by the brand SUNLIGHT.

6. Base:

The base is a frame used to hold the mirrors and connect them to the main frame. This is achieved by using a frame of L angle – 20 X 20 mm & 3 mm thickness. The frame has a tolerance with the dimensions of the mirrors. A round pipe 0.25 inch Diameter is used to connect the L-frame with footstep bearing.

7. Footstep Bearing:

Foot step bearing of 1602 are used to connect the round pipe with main frame for a better and safe rotary and angular motion of mirrors with respect to the sun's position.

8. Locking Mechanism:

The locking mechanism is used to hold the mirrors at constant position after the angle with respect to sun is attained. A simple wire nut-screw mechanism is used for this purpose.

V. ADVANTAGES

- Good weight spread.
- The cost of Fresnel collectors is quite less compared to the cost of other collectors.
- The efficiency is quite well, which is around 400°C.
- It is not affected by the wind load so there is no extra power required to control the wind.

VI. DISADVANTAGES

- The availability of sun only during day time.
- Cost of setup is high
- Higher maintenance cost.

- Heat loss is high.

VII. CONCLUSION

The conclusion which we get from report is that the solar power is so useful to use and can be applied in our lives for so many purposes like from water boiling , making steam , generating electricity, and so many. This steam can also be used for air conditioning through absorption chillers. The steam is used to heat the lithium bromide which is a compound which absorbs the heat in the air making it cooler.

This project has also reduce the cost as compare to other solar appliances.

VIII. FUTURE SCOPE

In future we can make automatic movement of mirrors by using sun tracking system. The movement of the mirror by using the stepper motor. The heat energy collected in dome which also be used for the industrial process heating or Cooling Such as Solar Air Conditioning.

REFERENCES

- [1] Thermal Engineering by R.K.Rajput..
- [2] Branke, R., Heimsath, A., Raytrace3F-Power Tower- a Novel optical model for central receiver systems. Solar PACES 2010.
- [3] “System designs for industrial solar heat application” by W.weiss.
- [4] www.soalrpaces.org.
- [5] “Linear Fresnel Reflector “prepared By IT Power India Under UNDP-GEF in December 2015.
- [6] “RENEWABLE ENERGY SOURCES & MANAGEMENT” by Ganesh B.Mali , Prakash B.Patil.