

ANALYSIS OF SOLAR PARABOLIC TROUGH USING DIFFERENT TYPES OF MATERIALS

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ABSTRACT

In this thesis the parabolic trough solar system use for electricity production or steam generation for industrial processes. An experimental setup has been developed to investigate the performance of the parabolic trough. Measurements of total direct radiation on the plane of the collector, ambient temperature, wind speed, water flow rate, and inlet and outlet temperatures of the water inside the absorber tube are collected and studying the performance of the parabolic trough. The material used is stainless steel sheet as a reflector and plywood material as a sub frame; The Different type of pipe use for water circulation that is stainless steel pipe, iron pipe, Mild steel pipe, Aluminium pipe that is covered with glass tube and also comparers which of the efficiency High in all the materials use in this.

Keywords: Stainless steel pipe, iron pipe, mild steel pipe, aluminium pipe, stainless steel reflector.

INTRODUCTION

Now a days energy is primary demand for human culture. The country within which a lot of energy produce is a lot of developed than alternative. That is classified into 2 groups; renewable and non-renewable. Renewable energy comes by natural processes which are resupply constantly. In its numerous forms, it derives directly from the sun.

Energy generated from solar, wind, ocean, tidal, hydropower, biomass, energy resources, bio fuels and hydrogen is renewable resources. Non-renewable energy is energy sources that can't resupply within the close to future like coal, oil, oil and gas. Renewable and non-renewable energy sources are accustomed produce secondary energy sources as electricity.

Energy is one among the crucial inputs for socio-economic development the rate at which energy is being consumed by a nation typically reflects the amount of prosperity that it might come through and total energy consumption has enhanced along with economic and population growth and, at a similar

time, varied environmental issues related to human activities became more and more serious.

Additionally to a rise in value of fuel product and resources are going to be exhausted in an exceedingly comparatively short amount of your time. This high cost of fuel resources square measure poignant economic and social development worldwide. The impact of energy crises is especially felt in less developed countries where a high percentage of national budgets for development should be pleased to the purchase of fuel product. To reduce the dependency on foreign fuels with high worth, most countries have initiated programs to develop energy sources supported domestic renewable resources.

Solar thermal power plants square measure one among the foremost promising choices for renewable electric power production not like traditional power plants, concentrating solar energy systems offer an environmentally friendly supply of energy, produce nearly no emissions, and consume no fuel other than sunlight. The goal of this project is to identify general strategies and specific design ideas for achieving increased collector efficiency.

. Firstly, the system dynamic model was established and valid by the important in operation information in typical summer and spring days in references. Secondly, the alteration characteristics of much radiation, recess water temperature and rate of flow are analysed and compared with the standard operating condition. The model use for learning, system design, and much understanding of the performance of parabolic trough systems. Efficiency of parabolic trough done with the help of

$$Q_u = m \cdot c (T_{out} - T_{in}) + L \cdot m$$

Research Objective

The general objective of this research is to design, manufacture and by experimentation investigate the performance of the model parabolic trough solar energy generation system. The experimental investigation determines the temperature variations of the current fluid, the solar energy absorption rate, the temperature variations of the ambient temperature

and therefore the instant efficiency of the system as a perform of time.

The specific objectives of the project are:-

- Design and modelling of Parabolic Trough solar energy Generation System victimization acceptable software system.
- Experimental investigation of the system considering totally different parameters.

Methodology

•Manufacturing prototype: After the design process is completed, the prototype is manufactured. Based on the design parameters and design materials, the prototype of the parabolic trough is manufactured in the Mechanical Engineering Department workshop.

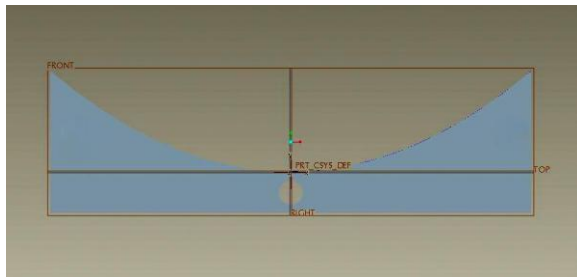
• Installation of Prototype: The prototype of the parabolic trough is installed at the site very close to the Mechanical Engineering Department.

• Experimental Investigation: After the prototype is installed, experimental investigation were conducted by recording data.

• Analysis and Interpreting the Result: The test results are compiled and compared with the results obtained using a mathematical model to check the validity of the result & compare all the result.

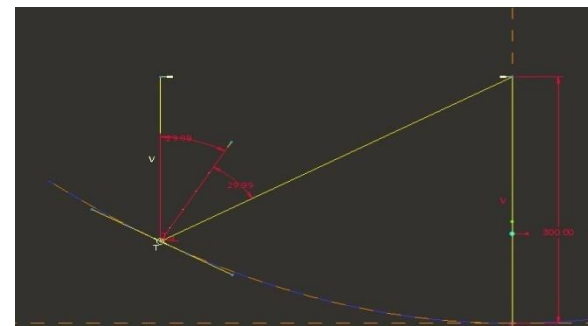
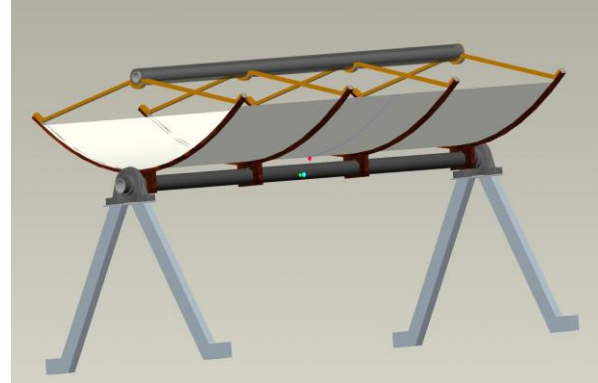
Dimensional modelling of the system.

The Parabolic concentrating collector assembly was modelled by using



Solar Parabolic Trough Collector Assembly

Individual components were designed in 3 D and then were assembled.



Angle verification

Ply-wood specimens were taken in order to create a base for parabolic trough.

Calculation when change in Flow rate of water

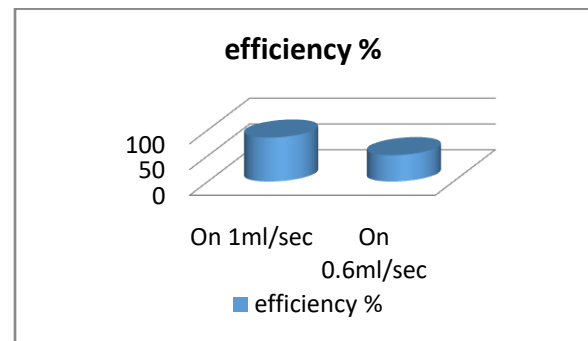


Figure For 51.09% & 85% efficiency calculation Useful Output

At flow rate of 0.6 ml/sec the efficiency of parabolic trough is collected to be 51.09% and at flow rate of 1ml/sec the high efficiency parabolic trough is collected to be 85.29% on comparing the above two we get to conclude that high flow rate is more

efficient Therefore, we take 1ml/sec for further reading.

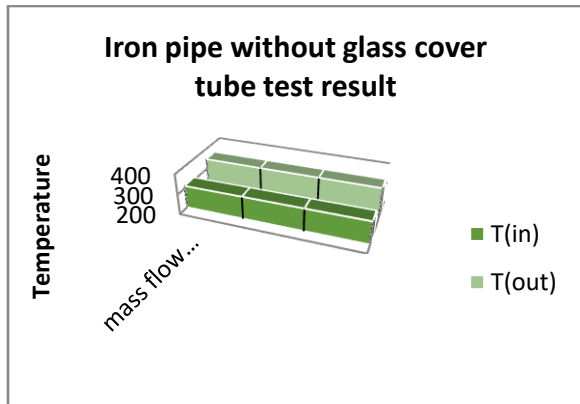
Absorber pipe:The absorber is design according to the limitation of the collector, with considering parameters like piping, working fluid velocity, fabrication and heat loss. Thereby, the absorber is fabricated by the seamless pipe, with the inner diameter of 24 mm, outer diameter 25 mm and 3680 mm in length.

Reflector

Stainless steel: To obtain the desired parabolic trough stainless steel sheet is used.

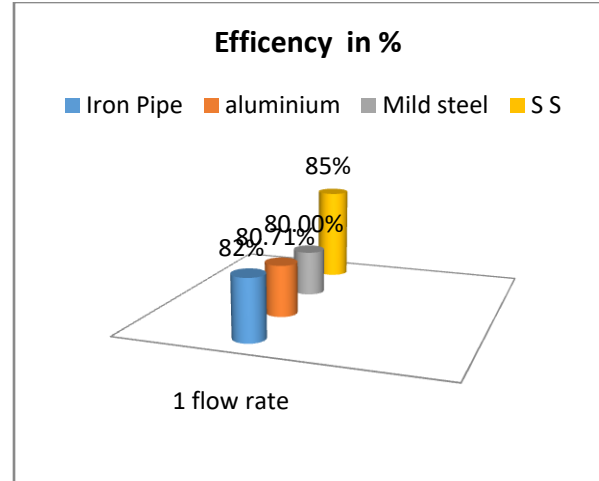
In parabolic trough the most costly part is reflector. The life of reflector should be long and handling should be easy so that the maintenance cost and the system cost can be reduced. Stainless steel has a long life and low handling as compare to glass.

Iron pipe without glass cover tube test result when flow rate 0.6ml/sec



The graph above shows that inlet temperature for the experiment is 311K and outlet temp. 349K at the flow rate 0.6ml/sec.

Comparison between Stainless steel pipe & Iron pipe, Aluminium Pipe ,Mild steel pipe with glass cover tube test result



we use different material like Stainless steel iron, mild steel, aluminium and getting the different efficiency And comparing the output for getting the efficiency. The efficiency of the parabolic trough where use absorber of stainless steel highest efficiency 87%. This is efficiency for Stainless steel absorber pipe use its improvement is also expected from parabolic troughs covered with glass or transparent material. This increases the efficiency of the parabolic trough by reducing convection heat loss from the absorber tube and prevents the reflector from dust particle. On the same setup we use different material aluminium there we getting highest efficiency 80.71% also covered with glass or transparent material for increases the efficiency of the parabolic trough. Also use same setup for the Mild steel and get the highest efficiency in this 80% also covered with glass or transparent material for increases the efficiency of the parabolic trough. And the last we use the material Iron in form of absorber pipe and cover with glass tube get the efficiency 81.78%. Compare to all the materials use in absorber pipe we get the highest efficiency in the stainless steel pipe 85.29%.

Conclusion

The efficiency of the parabolic trough where use absorber of stainless steel highest efficiency 87%. This is efficiency for Stainless steel absorber pipe use its improvement is also expected from parabolic troughs covered with glass or transparent material. This increases the efficiency of the parabolic trough by reducing convection heat loss from the absorber tube and prevents the reflector from dust particle on the same setup we use different material aluminium there we getting highest efficiency 80.71% also covered with glass or transparent material for

increases the efficiency of the parabolic trough. Also use same setup for the Mild steel and get the highest efficiency in this 81.578% at time 12:30 also covered with glass or transparent material for increases the efficiency of the parabolic trough and the last we use the material Iron in form of absorber pipe and cover with glass tube get the efficiency 81% compare to all the materials use in absorber pipe we get the highest efficiency in the stainless steel pipe 87% from the result we can observed that the parabolic trough is very efficient generating high temperature water if we use the Stainless steel observer pipe getting high efficiency compare to other material of absorber pipes

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