International Journal of Emerging Technology and Advanced Engineering
Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 7, Issue 3, March 2017)

Invistigation on Heat Losses from a Solar Cavity Receiver: Review

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***Abstract*—this study examines experimentally the heat losses from a model solar cavity receiver. cavity receiver of solar concentrator is made up of copper tubing material. To analyse the different heat losses such as conduction ,convection and radiation. as the convective loss play major role in the heat loss analysis of cavity receiver. the experimental setup mainly consist of parabolic cavity receiver which is insulated with glass wool insulation to reduced heat losses from outside surface.**

The numerical analysis is carried out by using CFD software and the result are compared with the experimental result and the result shows that convective loss increase with decrees in cavity inclination angle and decrease with decrease in mean cavity receiver temperature .maximum losses are obtained at 0^0 inclination angle and the minimum losses are obtained at 90^0 inclination angle of cavity.the analysis also carried out to study the effect of wind speed and wind direction on convective heat losses.the design of central cavity receiver is analysed and a new design of cascade solar cavity receiver is proposed to reduced heat losses by using computer software.

***Keywords*—solar collector, cavity receiver, losses.**

I. INTRODUCTION

The energy has become most important factor in the growth of nation also there a shortage of oil .And increasing there cost continuously. Growing energy demand reasons to look for effective utilisation of thermal energy and renewable energy sources .solar energy is one of the better form of the renewable energy. Renewable energy sources offer the option of harvesting nature's glory, deposit growing market condition and developing infrastructure.

Any lack of energy will hamper the economic growth an the progress of the country. India also has to utilise its natural resources' to the maximum extent possible and it has to find new and efficient ways to produce energy and power .

Method to utilise concentrated solar energy have been develop to achieve higher operating temperature and efficiency in solar thermal system. the technology used to achieve the higher working temperature is concentrating solar power in cavity shape receiver . the cavity receiver are positioned at the focus of the dish, allowing the collection of concentrated solar rays.

II. WHAT IS SOLAR COLLECTOR

The solar collector collect heat by absorbing sun light. A collector is a device for capturing solar radiation. solar radiation is nothing but the energy in form of electromagnetic radiation from to the infrared to the ultraviolet wavelength. the quantity of solar striking the Earth surface (solar constant) average about 1000 watt per squre meter under clear skies, depending upon weather conditions, locations and orientation.

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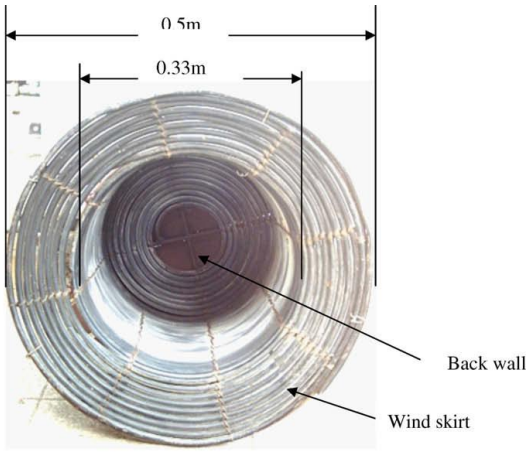
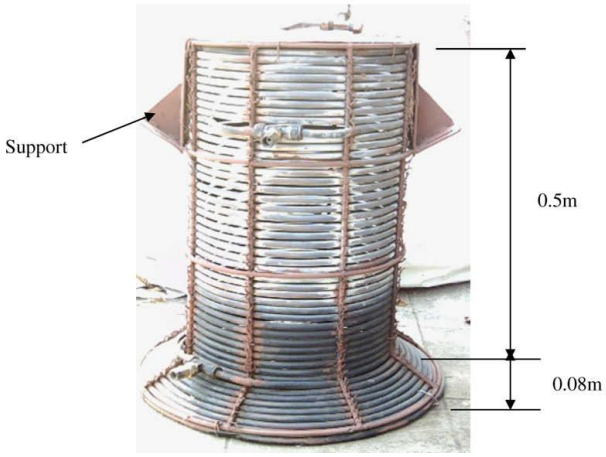
Types Of Solar Collectors

1. Flat plate collector
2. Parabolic collector
3. Compound collector
4. Hyperbolic collector
5. Fresnel colle

Reciever

It is helical copper tube of diameter of 0.33 m.and height 0.5m there are 39 turns along the height of the reciver And 9 turns each of back wall wind skirt. The copper Tube has a dia of 0.009m the spacing between coil turns is of 0.003-0.004m the coils are coated with a reciever in the solar thermal system is to intercept and absorb the is similar to parabolic disc collector the purpose of reciever polyurethane coating temp 350 c the particular shape of reciever is similar to parabolic disc collector.the purpose of reciever in the solar thermal system is to intercept and absorbe concentrated solar radiation and convert it usabale energy.





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III. HEAT LOSSES

Heat to be losses by convective and radiative way,heat losses in solar cavity receiver is to be minimized or reduced by the modify the cavity receiver.the convective heat losses are greatly influenced by receiver inclination

A. Convective losses

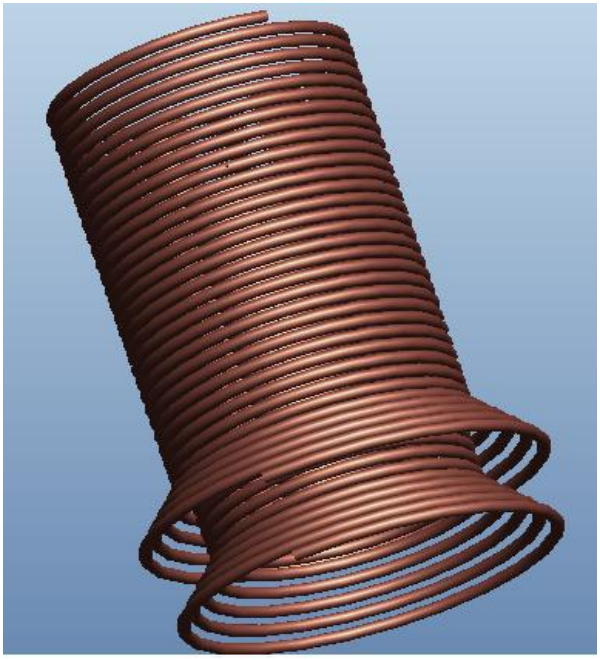
Convective heat loss from the cavity receiver of different shape have been investigated under wind condition.some of the cavity receiver shape used such as cylindrical, conical,cone –cylindrical ,dome cylindrical and hedro conical.there are three wind direction such as head on ,side on back on.the ratio of convection losses occurring under wind and no wind condition to be shows minimum value and to be increases with cavity inclination. Some time convective heat loss under wind condition higher than no wind condition. The convective heat loses are higher for heat on wind conditions is higher than for shapes in range 1 to 5 m/sof wind speed Between the the different shapes under study, conical cavity yields the lowest convective with and without mouth blockage.

Under the wind condition, convection losses to be minimize with mouth blockage, from 36% to 64% in this way to reduced the convective losses from moth blockage. The mouth blockage should be more effective for conical cavity where that time reduction in convection loss is 7 to 16% respective . at that time wind speed of 1 to5 m/s as compare to fully open conical cavity.

The highest conical heat loss observed with wind blowing directly on the cavity in head on condition. Prakash et al[1]carried out experimental investigation on downward facing cylindrical cavity receiver with wind skirt for two different wind speed and two direction head on side on.they have report to that the head on wind causes higher convective loss than the side on wind.in the review paper by shuang-ying wc et al[2].it is desired that carried out under similar geometrical and operating condition to establish it's effect on convective heat loss from cavity receiver.

IV. PROJECT WORK

We are doing the computational fluid dynamic (CFD) analysis of double tube cavity receiver. The purpose of double tubing is to reduce convective heat losses & study the temp. distribution profile. We are try to recover 2% to 3% convective heat losses and increases the efficiency of the plant.



V. CONCLUSION

From CFD Analysis of double tubing cavity receiver we conclude that :

1. Convective heat losses are get minimize.
2. Determine the stagnation and convective zone in the receiver.
3. Determine the spacing between 2 tubes in such way that outer tube absorbs max. heat from inner tube.
4. Convection loss are maximum in solar cavity receiver which depend on wind speed.
5. Finally increases the efficiency of the system.

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