A REVIEW ONCFD SIMULATIONS ON CL-CSP SYSTEM

Palash Shrivastava[1], Sumit Chourasiya[1], Dr. Mukesh Pandey[2], Anurag Gour[3]
[1]School of Energy and Environment Management UTD, RGPV, Bhopal, 462033
[2]HOD, Energy Department, UTD, RGPV, Bhopal, 462033
[3]Assistant Professor, Energy Department, UTD, RGPV, Bhopal, 462033

A B S T R A C T

This research paper shows the proper usage of the Cl-CSP plant for utilizing the solar energy in the month of the summer as well as winters. We have increased the volume of consumption of the solar energy with the new usage of Technology i.e. Concentrating solar power plants. This paper also gives the overview on the LFR and Solar tower power plants. This paper also displays the type of the receivers by which the solar energy is captured and then send to the different type of generators for the use of solar energy. This paper finally concludes the applications of the CL-CSP technology.

Keywords: CL, CSP, LFR, Solar tower power plants

1. INTRODUCTION

The Concentrating solar power (CSP) is a technique which was not utilized in the previous year. for the concentration of the sun rays in the old times(history), Archimedes utilizes the usage of the mirror in 212BC[3]. In the present time, the CSP technique is utilized in 2017, which are related with the 4.815GW operating, and the 2.709GW is under manufacturing and 1.26GW kind of CSPs are under progress[4]. In accordance with the reference [5], related with the 17GW of the CSP concerned projects are still under improvement all over the world, and 8GW kind of CSP projects is leading in the United States. Spain is positioned on the second place related with the 4.46GW in the area of the expansion of solar systems, which is followed by the country of China with the 2.5GW.The system of the solar concentration such as plates which are parabolic in shape (PT), Fresnel which are linear shaped (LF) and receivers which are placed centrally (CR), usually have a major issue that the absorption of the solar power from the sunlight is lower in the season of the winter and having the higher latitude because of the lowering factor of the cosine[7, 8]. A new kind of solar concentration system, has been newly invented, namely, Cross Linear (CL) system for solving the problems related with the winter seasons.

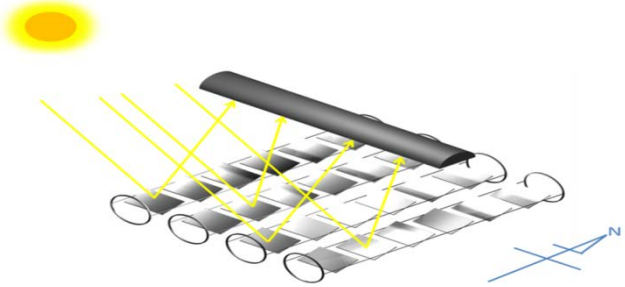

Figure 1.CL-CSP

The CL systems leads to the usage of the solar application systems for the utilization of the solar heating concerned with the extensive degree of heat whose range must be 300-800 degree C at the low production cost along with the existing variety of the concentration systems of solar power.

The authorization is given by MNRE for this project with the following mentioned objectives:

- •Demonstration of the high temperature (which should be >=600C) for the achievement from CL-CSP techniques.
- •To Optimize the utilization of the imitation of the CL-CSP techniques of solar energy.
- •For Utilizing and developing of the 1Mwe plant related with solar power.

The Features of CL-CSP Technology includes the following points:

- The trough, linear Fresnel and thermal efficiency has lower optical efficiency compared with the CL-CSP technology i.e. CL-CSP technology has high optical efficiency
- CL is two axial optical control as compared with Trough and linear Fresnel have one axial optical control
- For high concentration of sunlight related with low rate of the cost and lesser optical kind of losses CL technology can easily adjust direction of mirror with respect with the solar powers.

2. OVERVIEW OF LINEAR FRESNEL REFLECTORS AND SOLAR TOWER SYSTEM

Linear Fresnel Reflectors (Line Focus, Fixed Receiver)

The Fresnel reflectors which are linear in shape usually, estimates the parabolic in shapes of the troughs (type of plates) with the usage of rows with flats or vaguely mirrors which are curved to reflect the rays of the sun on the downward facing direction in relation with the linear way, which are in fixed receiver. The new technology which are used recently in the field of solar system is known as compact linear Fresnel reflectors (CLFRs), whose framework is built with the two parallels receiversconnected with each row of the mirrors and therefore leads to the less usage of the land in comparison with the troughs which are parabolic in shape for the production of the particular output. The major benefit of the LFR system is that the framework of the simplest designing factor with the flexible mirrors with the bent as well as the fixed point receivers which leads to the lower investment with relation with costs and it facilitates the direct steam generation (DSG).

Solar Tower (Point Focus, Fixed Receiver)

Solar towers which Uses the hundreds and thousands of variety of small reflectors(which are known as heliostats) for concentrating each ray of the sun on a central placed receivers which is connected on the top on a fixed tower are also known as central receiver systems (CRS). Number of tower plants are operating the usage of the DSG in relation with the receivers, others usually uses the molten type of salts as well as the transfer of heat in addition with the medium of storage. Extreme high degree of the heat is usually achieved by the concentrating power of the tower, by this means, the efficiency is increasing by the side of which heat is transformed into electricity in addition with the reduction in the cost related with the thermal storage. The structure of the solar tower is mostly high level of flexible, where designers can easily choose heliostats from a wide variety of numbers, including the receivers, in addition with the transfer liquids as well as the block with power. Gradually, one power block can be easily feed by thelittle towers which have several number of towers.

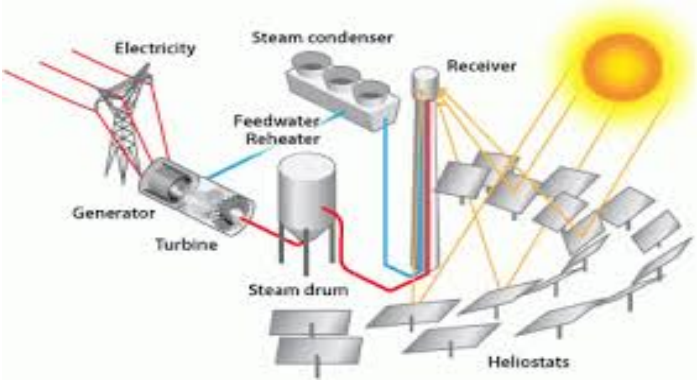

Figure 2.A power tower CSP plant.

3. TYPES OF RECIEVERS

1. Cavity receivers

The limited convective degree of heat is the reason of the low capability of the solar flux in the design of the receivers, which are taken as a major challenge in the field of solar cavities. For making sure the satisfactory effectiveness, the receivers generally is located/placed in the cavity. The heat losses which are transferred by the insulated material(which is cavity walls) will be going to decrease by increased level of the insulated thickness of the material. The degree of heat utilized and loosed by the radiation as well as the convection level of the motion usually depends powerfully on the area of the aperture, including the inclination receivers as well as the receiver temperatures. The cavity receivers are generally expected to have the reduced level of convection as well as the radiation of the heat loss in the direction of atmosphere in comparison to volumetric receivers due to the lower viewing factors of the ambiance. By increasing the usual size of the cavity, the receivers temperatures can be decreased as the flux circulation leads to the homogenous as well as the density also reduced wholly in relation with the flux.

2. Volumetric receivers

The receivers which are utilized in air as the procedure of HTF are prepared with the wire which are composed of the porous mesh or else of metallic/ ceramic kind of foams. The framework of the solar radiations influence on the receivers of volumetric type which is captivated by the whole receivers.

The structure of the Volumetric receivers are more significant as well as flexible in nature as compared with the tube receivers, it is just because of the functionality in addition with the three-dimensional design (volumetric type) which is further than compared to the quasi-two- dimensional tube [8].The determined solar energy usually heats the material within the volume. At the similar instance, the functioning liquid passing through the volume as well as is heated up by the forced convection, including the transformation of the solar radiations into thermal energy power [9].Volumetric receivers can be broadly classified into two types; Open Volumetric receiver as well as the Pressurized or closed volumetric receivers.

2.1. Open volumetric receivers

When the moving air is sucked through the absorbent receiver where the moving air gets heated up by concentrated energy of solar power is known as the Open Volumetric receivers. The external surface of the receiver determine a lower level of temperature as compared to the interior of the receiver because of the air which is coming from outside the ambient cools the surface area of the receiver as well as avoids the damage which is made to the material. Figure 3.2 shows open volumetric receiver

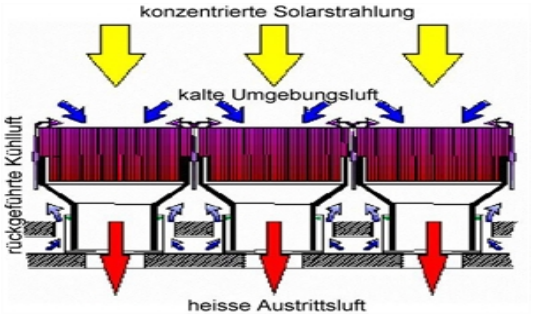

Figure 3.open volumetric receivers.

2.2. Pressurized volumetric receivers

When the HTF (usually the moving air) is automatically by any kind of the receiver considered with a blower and in addition with the receiver aperture which is sealed by a transparent kind of window is termed as the pressurized volumetric receivers, which are also known as the Closed volumetric receivers. The major function of this type of window is usually to detach the cavity receivers from the ambient type of air and which enables operations related with higher degree of pressure, including the minimizing reflection, in addition with the re-radiation as well as the convection losses

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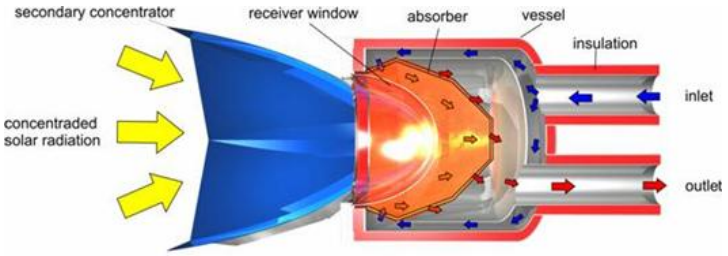

Figure 4.Pressurised volumetric recievers

4. APPLICATION OF CL-SCP TECHNOLOGY

1. For Replacing of the ongoing Thermal Power Plants related with the coal during the day Time.

2. The structure of the CL-CSP implementations will replace Fossil Fuels which areused in Factories/industries.

3. It is implemented in the fields of Hybrid Technology for CSP Plants.

4. CL-CSP applications are usually Utilized in the solar steam for recuperating the arid type of land into the fertile type of land.

5. CL-CSP Technology leads to a Great Fit for Desalination in the solar power plants.

6. CL-CSP Technology has the significant capability to generate the level of the temperatures within excess of 650^0C, hence it has utilized in the extensive implementations in replacing the expensive Coal which are used by Thermal plants.

Figure 5. CL-CSP site view (Position of Heliostat and receiver)

5. CONCLUSION

The study is conducted only in two countries i.e. Japan(Tokyo) and In India(Bhopal) at RGPV college. By the use of this CL-CSP plant we can consume more solar energy which can be further used in the generation of electricity and other forms. It is a new technology which still needs to be researched and studied in depth, so that more and more scopes can be identified in the CL-CSP systems.Analytical based approach can also be implemented and woking parameters can be studied and analyzed using software tools.

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