

A Review on Flat Plate Collector with Various Absorber

Md Parwez Kalam¹, Dr. Sohail Bux²

M. tech scholar¹, HOD & Principal², Thermal engineering, RKDF University
Agnos College Of Technology, RKDF University Bhopal (M.P.)

parwezmd655@gmail.com

buxsohail@gmail.com

Abstract— Solar thermal collectors are the most common type of sun-oriented energy application. The sun-powered authority is a kind of heat exchanger where heat trade happens between a far-off source and a heat move liquid moving in the gatherer. Contingent upon their plan, sun-powered authorities can be separated into concentrated and non-concentrated. This article provides an overview of the plate collector and describes the performance analysis of the parabolic collector. And the flat plate collector has the simple surface pattern, typical flat plate collector.

Keywords — Parabolic Trough Collector, carbon dioxide, solar system, CPSC.

I. INTRODUCTION

Many countries have started using of the renewable energy due to increase of the energy needs and a lack of the non-renewable energy are used for cooling, air and water heating, large and small industry, desalination and energy production. Furthermore, the demand for fresh water will increase due to climate change, population growth and improved living standards. Solar energy is the most available and abundant energy source on earth for home lighting, thermal power generation, and industrial heating applications. Many countries with high levels of solar radiation such as Egypt, India, Mexico, Morocco and the United States depend on solar energy to generate electricity. In the 1980s, 9 PTC systems were built in the Mojave Desert (California, USA) [1]. The fuel used in the desalination process is limited, expensive and air pollution is on the rise. Fresh water distillation using a solar distillation system is one of the best practical technologies used in several countries [2].

A solar collector can absorb solar radiation and transform it into thermal energy, which converts it into thermal energy in a work environment, which can be water, air or oil. Heat energy from the workplace can be used directly for a variety of applications. Solar collectors are available in different types such as parabolic collectors (PTC), flat collectors and composite parabolic collectors (CPC). Flat collectors are generally used for water heating due to there are the temperature range of

about 120-140°C. The temp. the PTC receiver tube can reach up to 350-400°C [3]; It can therefore be used as a steam generator for power plants and for the desalination process. A typical power plant typically requires huge fossil fuels, resulting in significant carbon dioxide (CO₂) emissions. Therefore, the use of available renewable energies will help to reduce the consumption of non-renewable energies and environmental pollution. Due to the efficiency of the parabolic solar collector, which is highly dependent on the concentration ratio (C) [ratio between the aperture area (A_α) and the receiver area (A_r)], as well as the heat absorption more high PTC compared to that of the flat collector, this article focuses on the high PTC temperature range and concentration ratio.

II. LITERATURE REVIEW

P. K. Pathak et al. [4] solar energy is the best of all renewable energy sources due to its low cost-effective and the environmentally nature. In this study, the head and riser design is examined using an absorbent plate and the leaving water temperature of a corrugated sheet solar collector. The CPSC is influenced by various operating parameters, such as: B. atmospheric temperature, entering and leaving water temperature, solar radiation, and wind speed. Two mass flow rates were used in this work (0.0167 kg / s and 0.025 kg / s). Leaving water temperatures up to 56 ° or 48.5 ° could easily be achieved with CPSC at mass flow rates of 0.0167 kg / s or 0.025 kg / s. In this work, heat transfer and flow analyzes in a CPSC with experimental models and CFD-ANSYS 17.2 were presented. It has been shown that the experimental and numerical results of fluid dynamics (CFD) give good correspondences.

K. Anirudh et al. [5] the authorization for loss of burden should be articulated in such cases. when the quantity of permeable squares is insignificant with a lower tallness. The worth is considerably higher than that of a channel loaded up with a persistent permeable layer of various thickness. For lower penetrability esteems, where permeable protections have a more prominent abundance, the aftereffects of the Darcy-Brinkman model differ extensively contrasted with the all-inclusive Darcy-Brinkman-Forchheimer model. The composition offers impulse

to additional trial work looking into it viable and assists with contemplating improved execution in a FPSC channel by presenting the permeable medium.

M. R. Saffarian et al. [6] the approval for loss of load should be articulated in such cases. the improve qualities of FPSC channel while the quantity of permeable squares is insignificant with a lower stature. The worth is significantly higher than that of a channel loaded up with a ceaseless permeable layer of various thickness. For lower penetrability esteems, where permeable protections have a more noteworthy adequacy, the aftereffects of the Darcy-Brinkman model shift significantly contrasted with the all-encompassing model. The composition offers force to additional test work looking into it viable and assists with considering improved execution in a FPSC channel by presenting the permeable medium.

Z. Badii et al. [7] In this study, a three-dimensional transient CFD model is developed to study an integrated flat solar collector with a PCM layer. Heat transfer and fluid dynamics are simulated in each component by solving the equations of energy and momentum numerically. In addition, the average collector efficiency is increased from 33% to 46% on summer days for PCM with minimum melting temperature. Furthermore, the incorporation of fins increases the storage capacity, especially in the case of MCPs with higher melting temperatures. However, the heat dissipation to the environment in the fin system is greatest during unloading in the afternoon and can slightly reduce the efficiency.

ManFan et al. [8] In this study, a new V-wave absorber with multiple channels and used in the flat plate liquid collector is presented. The absorber is extruded from aluminum and special triangular channels are directly molded to improve solar absorption, reduce thermal resistance and reduce pressure drops. The construction of a V-shaped corrugated absorber can improve the optical and thermal efficiency of the manifold and greatly reduce the pressure drop and power consumption of the pump, but it has little influence on the energy efficiency. However, the potential for increasing the performance of the V-wave absorber is enormous and the design and manufacture of the collector can be further developed.

Alsanossi M. Aboghrara et al. [9] The point of this investigation was to assess the improvement of the presentation boundaries of a fly effect HSA on a creased retentive plate. An energy balance model was created to analyze the presentation boundaries of the proposed HSA with the other two HSAs. The aftereffects of the factual t-test affirmed critical contrasts between the mean viability of the proposed HSA and the fly to-level plate HSA. Consequently, the proposed configuration is viewed as unrivaled in improving the presentation boundaries of SAH contrasted with different plans.

III.OVERVIEW OF FLAT COLLECTORS

Flat-panel authorities are arguably the most fundamental and best-informed innovation for solar water heating systems. The basic idea of this innovation is very simple. The sun heats a dark, flat surface that collects all the expected energy so that the energy at that point is transferred to water, air, or other liquids over time.

These are the primary segments of an average level plate sun oriented authority:

Black surface: assimilates occurrence sunlight based energy

Glass cover-a straightforward layer that coordinates the radiation towards the safeguard however forestalls the deficiency of brilliant and convective warmth from the surface

Cylinders with heat move liquid to move heat from the authority

Backing structure for segment security and fixing

Protection on the sides and lower part of the authority to lessen heat misfortune.

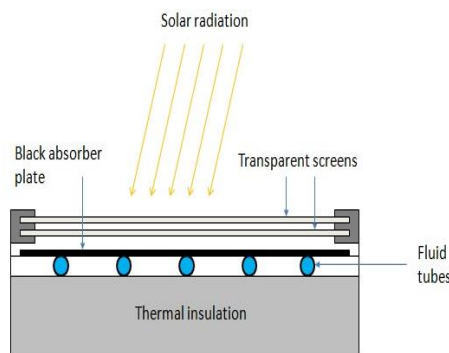


Fig. 1: Schematic of a flat plate solar collector with liquid transport medium

Flat plate systems work normally , at temp range of 30-80°C it achieve max efficiency, Still some newer types of vacuum insulated sensor can reach up to 100¢. It has been shown that the temp of stagnant liquid in flat collectors reaches 200°C because of the introduction of Selective coating.

The advantages of flat plate are:

- Manufacture are Easy
- Low cost
- The diffuse radiation and the collect both beam
- fixed in permanently (no sophisticated of positioning or tracking equipment is the required)
- Some maintenance

Flat sensors are situated towards the equator (i.e. placed south in the northern hemisphere & north in the southern Hemisphere) . The optimal inclination of the collector plate is approximate to the latitude of the location. (+/- 15⁰). The optimal installation angle is the degree of latitude - 10⁰ ,In the Event of solar cooling so as the sun beam is perpendicular to the collector in summer. If the application is solar heating, the optimal installation angle is latitude+ 10⁰. Though year round hot water production, the optimal angle is latitude +5⁰, it provides marginally better performance in winter when hot water is needed most.

IV. PERFORMANCE ANALYSIS OF PARABOLIC TROUGH COLLECTOR

The parabolic solar collector consists of a fuse (working fluid desk), a simple concentric cover, and an explanatory reflector plate. Protection is forever associated with the hearth of the allegorical concentrator. The concentric right upper face serves to protect the assimilation tube from thermal accidents and therefore to maintain the vacuum.

The sample concentrator is positioned above a non-curved structure and the tracking component facing the sun is positioned above the rigid design to track solar radiation through the allegorical concentrator. Figure 2 shows the square outline of the SPTC.

Garcia-Cortes et al. took a closer look at PTC's non-collapsible connection reflector plate and made it clear that the key factor in the deformation of the sun-facing panel is its own weight [10].

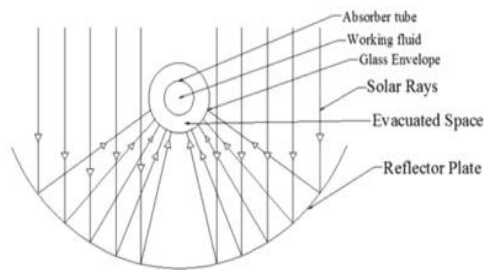


Fig. 2. Solar parabolic trough collector Of schematic diagram Many scientists have studied the design problems of PTC solar structures and explanatory concentrators. Eckhard and Michael considered further weight problems and gained an extension of the project by testing experimental models [11].

V. FLAT PLATE COLLECTOR—THE PATTERN OF SIMPLE SURFACES

The Flat-plate collectors is known, among other things, also in the SECS language. A container of boiling water facing the sun, shaped like a huge box, is also a level collector for optocaloric use. We will unequivocally characterize a flat, non-concentrated PV module as an optoelectronic level authority (with some unwanted additional optocaloric properties) (see Fig. 3). Based on our basic design principles, we generally refer to level sensors for photovoltaic panels or solar authorities for boiling water. Anyway, what would you find in the level authority model other than the simple box model? Flat-plate collectors are also archaic methods of maintaining the microclimate in metropolitan areas, as can be found in squares.

There are basically two types of CPD: covered and uncovered. When an FPC is coated, the frame acts as a protective coating, the curved connection with the permeable surface provides a response to a more

distinct advantage. The roof containment frame can be fully examined for the master plan.

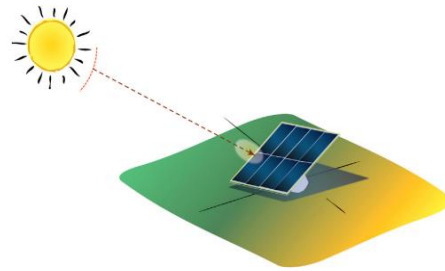


Fig. 3 Schematic of a flat plate absorber as a non-concentrating PV module.

VI. TYPICAL FLAT PLATE COLLECTOR

Flat collectors can heat the fluid inside utilizing immediate or backhanded daylight from various points. They additionally work with the diffused light that wins in an overcast climate, since it is the encompassing warmth that is consumed and not the light, in contrast to photovoltaic cells. The coursing water temperature mostly relies upon the season, the lucidity of the sky, and the gradualness with which the water moves through the authority pipes.

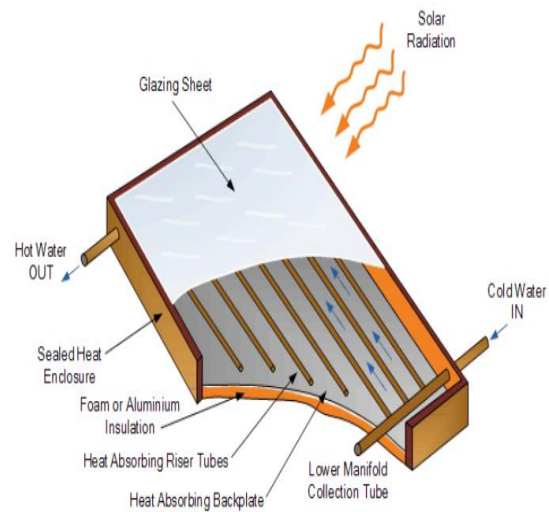


Fig. 4. Typical Flat Plate Collector

VII. SOLAR ENERGY IN POWER PLANTS

Many solar power plants have been put into operation in recent years. In India, a 4000 MW solar-based ultra-mega solar power plant project in the western province of Rajasthan has been booked for February 2014 in 7 years. It will be introduced in two stages, initially 1000 MW and in stages 3000 MW by six public-private companies. PTCs are generally used for the electric age in many countries due to their high fixation rate and high-temperature capability. It takes a lot of high-pressure steam to generate electricity. A pressure factor of 18 bar has been solved in a concentrate of energy practice with clear

competence. Scientists simulated solar-powered PTC plants to improve annual electricity production.

VIII. CONCLUSION

The present energy catastrophe led to the inventive study on renewable energy. For future electricity needs, solar energy is an ideal remedy. All ongoing essential developmental efforts & research are primarily aimed at further improving the performance of PTC systems in the interest of reducing their costs and make them competing with other formal energy systems. Generally, the advanced of solar PTC research has shown that the using PTC is ideal for the harvesting of maximum solar energy for various applications. In this article focuses on the performance of the parabolic solar collectors. This paper also highlighted of the uses PTC in the desalination processes and the industrial purposes, as well as in the air heating and the cooling systems.

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