

Examination of Thermal and Electrical Performance of Cassegrain Concentrator System

R. Rathika, K. Sakthivel, Anitha. S



Abstract: The sun oriented power (SP) is a one of a kind renewable vitality innovation. SP frameworks can give control, water warming and water decontamination in one unit. This innovation will be to a great degree accommodating in enhancing the personal satisfaction for some individuals around the globe who do not have the vitality expected to carry on with a sound life. A financial allegorical dish sort Cassegrain concentrating framework was created at the foundation of Energy Studies, Anna University Chennai. An old microwave media transmission reception apparatus having a paraboloidal shape made in aluminum frames an essential reflector which guarantees effortlessness of generation and operation. The essential concentrator was settled with mirror cleaned stainless steel with reasonable cement. The optional concentrator is inward mirror. Suitable supporting structure was developed for supporting the cassegrain concentrator. Double hub following framework is mounted for adjusting the concentrator to azimuth and apex point by utilizing DC engine and direct actuator individually. Water goes about as working liquid to expel warm from. The tank is protected with thermocol material upheld with wooden structure on all sides to maintain a strategic distance from convection misfortunes. The material Cost for the framework was Rs 15000.

Keywords: Cassegrain, paraboloidal shape, Double hub

I. INTRODUCTION

While the Sun offers the most inexhaustible wellspring of renewable vitality, the era of power from daylight is at present not practical muchily utilized silicon PV cells requests costly semiconductor manufacture techniques and utilization of constrained high-review silicon sustain stocks. More up to date thin-film cell advancement of the time in light of the inborn constraints of photovoltaic (PV) cells and average lighting conditions. The generation of ordinarnts, while utilizing less expensive manufacture techniques, devour considerably scarcer intriguing materials. Besides, at run of the mill daylight forces, silicon PV cells are generally wasteful (more often than not changing over 15%-19% of the episode daylight to power), requiring extensive boards for a given pinnacle control yield.. More exotic PV materials can

achieve higher efficiencies, but only at a prohibitively higher cost. [2],[4],[6]

II. SOLAR SPECTRUM

The Sun emanates 4×10^{26} W of imperativeness and simply 1.7×10^{17} W accomplishes the Earth. The Earth gets shy of what one billionth of the Sun's vitality yield. Electromagnetic (EM) radiation is a self spreading wave that helps essentialness through space. EM radiation is requested into sorts according to the repeat of the wave. The wavelength of the radiation transmitted by the sun moves and can be approximated as a dull body at 5800 K. Only 43% of the radiation released is undeniable light, between the wavelengths of 380-750 nm. Of the Solar range 8% of the radiation is splendid, under 380 nm, and 49% is infrared, 750 nm to 1 mm The air reduces the proportion of event sun fueled radiation, which is suggested as insolation. Insolation can be gathered into two sorts: organize normal insolation and diffused insolation. Organize run of the mill insolation is the radiation that adventures explicitly through the earth without check. Diffused insolation is dissipated by particles in the atmosphere. The ordinary proportion of direct run of the mill insolation and Temperature for the length of the day for Chennai some place around 09:00 and 17:00 the typical is around 850 W/m^2 [1],[3],[5]

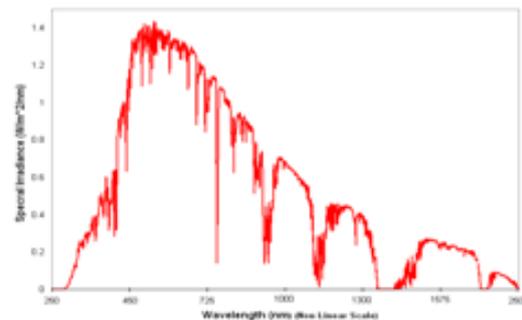


Figure 1: Solar Spectrum at the Surface of the Earth

The produced voltage of the generator is principally relying upon the rotational speed. The motor vitality of the wind turbine is changed over into electrical vitality utilizing the generator and the power is smoothened by utilizing the AC to DC to AC converter. [19],[21]

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III. SOLAR GEOMETRY

The Earth's hub of turn is tilted at a point of 23.450 regarding its orbital plane. This tilt causes the edge at which daylight hits the Earth to change consistently. As the occurrence sun edge moves far from apex point (e) equivalent to zero(directly overhead), daylight is spread over a bigger range and is not at all serious. This method is portrayed in units of Air Mass (AM). An Air Mass equivalent to 1 is the point at which the Sun is specifically overhead sparkling typical to the surface, called peak. Condition 1.1 gives the condition for Air Mass as far as peak point (e). The condition is relevant for edges between 0° and 70°. At an apex point of 60 the Air Mass is 2, which implies episode radiation is halved what it is the point at which the Sun is at peak.

$$AM = \frac{1}{\cos(\theta)} \quad (1.1)$$

The position of the Sun changes significantly consistently. The diverse sorts of sun powered movements are depicted in the accompanying areas. Control misfortune ought to be low. It has higher effectiveness as a result of less power misfortune.

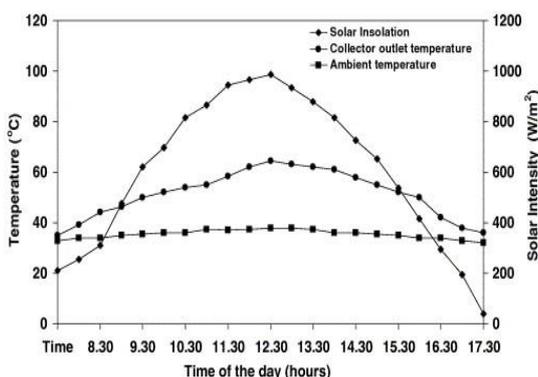


Figure 2: Solar Insolation Level and Temperature at Chennai area

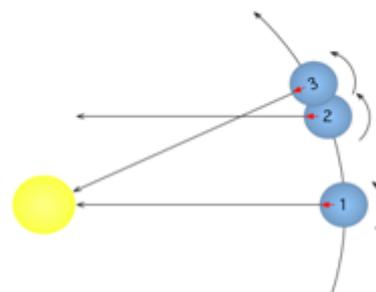
IV. DIURNAL ROTATION

Initially, fundamental development of the Sun is diurnal, or consistently, rotate. The sun creates an obvious circumvent Earth predictably, pivoting a center point called the perfect center. This center point differentiates once in a while from our appealing center by as much as 6degree. If onlookers were staying on the eminent equator in the midst of the equinox, the sun will move explicitly above the head moving from East to West. In case the passerby were to mastermind a telescope on a center pointed explicitly at sublime north, the turn of the telescope taking after the Sun will be 1degree predictably, or 360degree reliably. [8],[10] ,[12]

V. SOLAR TIME

Since the occasion sun edge moves far from zenith point (e) indistinguishable from zero(directly overhead), light is distributed over a more noteworthy range and is lnot certifiable. This method is portrayed in units of Air Mass (AM). An Air Mass equivalent to 1 is the point at which the Sun is expressly above the head sparkling ordinary to the

surface, called peak. Condition 1.1 gives the condition for Air Mass the degree that apex point (e). The condition is relevant for edges between 0° and 70°. At a zenith motivation behind 60 the Air Mass is 2, which derives scene radiation is half of what it is The point at which the Sun is at apex



Declination Angle Versus Day of Year

FIG 3:Declination angle versus day of year

VI. TRACKING MECHANISM

. Following frameworks are found in all concentrator applications in light of the fact that such frameworks don't create vitality except if arranged intently toward the sun.

The level mount structure has 2 tomahawks of headway that transparently tracks.The immediate actuator gives a moderate, steady development to the illustrative dish as it diverts on its rotate from East to West. The stature turn takes after the north-south improvement of the Sun. This turn is gradually still and slung close. This region can pivot the zenith rotate and acclimate to sublime North. The foundation is expected to deal with the qualities and depictions of higher breeze speeds. [20]

VII. CONCLUSION

The outline and advancement of an illustrative dish sun oriented water radiator for local boiling point water application is exhibited in this paper together with the anticipated and real warm execution of the framework. The execution of the warmer as far as proficiency is higher than anticipated. While no point by point execution examination is introduced here, it has dependably been feasible for the water temperature to achieve 100oC in concurrence with the composed necessity of the radiator. The principle investigate fields for this work are sun oriented - gatherer material science, segments outline and advancement, material economy, vitality cost funds, and decrease of carbon dioxide discharge into the environment. Except for the straight actuator (Superjack) the various segments were produced using locally accessible materials. This advances nearby substance usage of made merchandise and ventures. The utilization of the following system, Superjack, takes out the requirement for consistent checking by a human administrator and this outcomes in the diminishment of the cost of work.

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