

OPTIMIZATION OF THE FRESNEL LENS AND COOLING SYSTEM PARAMETERS OF SOLAR PANEL

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Mechanical engineering.

by

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DECLARATION

We ADDEPALLI KONDA SAI NAGA VAMSI VARDHAN(37150005) and BOBBA KARTICK PAVAN CHOWDARY(37150032.) hereby declare that the Project Report entitled “**OPTIMIZATION OF THE FRESNEL LENS AND COOLING SYSTEM PARAMETERS OF SOLAR PANEL** ” done by us under the guidance of **Dr. J.LILLY MERCY M.E. Ph.D.** at **SATHYABAMA Institute Of Science and Technology**, Chennai is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Mechanical engineering

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of ADDEPALLI KONDA SAI NAGA VAMSI VARDHAN (37150005) ,BOBBA KARTHIK PAVAN CHOWDARY (37150032) who carried out the project entitled **“OPTIMISATION OF THE FRESNEL LENS AND COOLING SYSTEM PARAMETERS FOR SOLAR PANEL”** under our supervision from October 2019 to April 2020.

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ABSTRACT

Fossil fuels are burning out at a rapid rate. An alternative that solar energy is the main alternative source for filling up the gap of energy crisis. But development was constrained by the lack of solar cell capable of withstanding the rigors of concentrated solarlight. In this project PV cells are used by arranging a lens system among them, and for heat reduction a cooling system is attached to maximize the efficiency. By using Fresnel lens, the output of PV cell can be maximized and the cost can be minimized. . Here it is found that, with low cost of arranging the system can obtained the power output 2-2.35 times higher than normal PV panel system, i.e. the cost can be reduced in half or power output can be maximize double or greater for a given cost. The maximum performance from this system is around 62.7% increases which are quite satisfactory.

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LIST OF SYMBOLS AND ABBEREVIATIONS

V	Voltage
°C	Temperature
mA	Current
P	Power
cm	Distance

CHAPTER 1

INTRODUCTION

1.1 HISTORY AND BACKGROUND OF SOLAR CELL

By the Nineteen Sixties, solar cells were the most strength supply for lots Earth orbiting satellites and kind of probes into the scheme, considering the fact that they offered the satisfactory energy-to-weight magnitude relation. However, this fulfillment become manageable due to inside the house software, grid charges is probably high, because of residence customers had few specific energy selections, and had been inclined to get hold of the most effective pv cells. The residence strength marketplace drove the occasion of upper efficiencies in big name cells up till the National Science Foundation "Research Applied to National Needs" software started to push improvement of star cells for terrestrial packages. A solar cell, or photovoltaic cell, is an electrical tool that converts the strength of mild at once into strength via the photovoltaic impact, this is a physical and chemical phenomenon. It is a shape of photoelectric cell, described as a device whose electric traits, along side present day, voltage, or resistance, range at the same time as exposed to mild. Individual solar cell gadgets are regularly the electric building blocks of photovoltaic modules, stated colloquially as solar panels. The common place unmarried junction silicon solar cell can produce a most open-circuit voltage of about zero. Five to zero.6 volts. [2]supply is daylight or an artificial slight. In addition to producing power, they will be used as a photograph detector (for example infrared detectors), detecting moderate or other electromagnetic radiation close to the visible variety, or measuring mild intensity.

The operation of a photovoltaic (PV) cell requires three essential attributes:

- ☐ The absorption of light, generating each electron-hole pairs or excitons.
- ☐ The separation of charge corporations of opposite sorts

- The separate extraction of those providers to an outdoor circuit.

In assessment, a solar thermal collector resources warmness via the usage of absorbing daytime, for the purpose of both direct heating or indirect electric powered strength generation from warmness. A "photoelectrolytic cell" (photoelectrochemical cell), as an opportunity, refers each to a form of photovoltaic cell (like that advanced with the resource of Edmond Becquerel and modern-day dye-sensitized solar cells), or to a tool that splits water straight away into hydrogen and oxygen the use of best solar illumination.

1.1.1 Working:

The solar cell works in numerous steps:

- Photons in daylight hit the solar panel and are absorbed by semiconducting materials, consisting of doped silicon.
- Electrons are excited from their present day-day molecular/atomic orbital. Once excited, an electron can either dissipate the strength as warmness and return to its orbital or journey through the cell till it reaches an electrode. Current flows via the cloth to cancel the ability and this power is captured. The chemical bonds of the fabric are important for this way to paintings, and commonly silicon is used in layers, one layer being doped with boron, the alternative phosphorus. These layers have tremendous chemical electric powered powered expenses and ultimately every strain and direct the contemporary of electrons.[1]
- An array of solar cells converts solar power right into a usable quantity of direct present day (DC) power.
- An inverter can convert the power to alternating current (AC).

The maximum typically recognized solar cell is configured as a massive-region p–n junction made from silicon. Other viable solar cell types are natural solar cells, dye sensitized solar cells, perovskite solar cells, quantum dot solar cells and so on. The illuminated detail of a solar cell normally has a apparent

carrying out film for permitting moderate to enter into the energetic cloth and to accumulate the generated rate companies. Typically, films with excessive transmittance and immoderate electric conductance which embody indium tin oxide, wearing out polymers or sporting out nanowire networks are used for the motive.

1.1.2 Materials

In solar cells there are distinct kind substances. There are 6 varieties of materials are there but majorly we are the usage of 2 types polycrystalline, mono crystalline.

1.2.1.1 Polycrystalline silicon:-

Polycrystalline silicon, or multicrystalline silicon (multi-Si) cells are crafted from solid rectangular ingots—big blocks of molten silicon carefully cooled and solidified. They embody small crystals giving the material its common metallic flat effect. Polysilicon cells are the most commonplace type utilized in photovoltaics and are much less high-priced, but additionally an lousy lot an awful lot less inexperienced, than the ones crafted from monocrystalline silicon.

1.2.1.2 Monocrystalline silicon

Monocrystalline silicon solar cells function a unmarried-crystal composition that lets in electrons to transport more freely than in a multi-crystal configuration. Consequently, monocrystalline solar panels deliver a better overall performance than their multicrystalline opposite numbers. Solar panels using mono-Si cells show a first-rate pattern of small white diamonds.

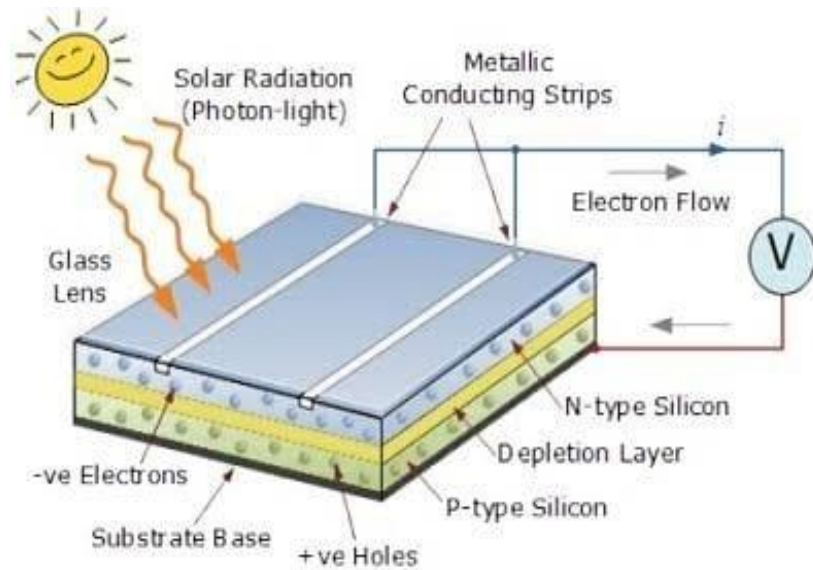


Fig1.1: Working of solar cell

1.2 HISTORY AND BACKGROUND OF FRESNEL LENS

A Fresnel lens is a shape of composite compact lens superior through the French physicist Augustin-Jean Fresnel (1788–1827) for use in lighthouses. It has been known as "the discovery that saved a million ships.

The layout permits the development of lenses of massive aperture and brief focal period with out the mass and extent of cloth that could be required through a lens of traditional design. A Fresnel lens may be made loads thinner than a comparable conventional lens, in a few times taking the form of a flat sheet. The plenty less complicated dioptric (virtually refractive) shape of the lens have emerge as first proposed thru Count Buffon,[4] and independently reinvented through Fresnel. The catadioptric form of the lens, completely invented with the useful beneficial aid of the use of Fresnel, has outer elements that use current inner mirrored image in addition to refraction; it is able to seize extra oblique moderate from a mild supply and upload it to the beam of a lighthouse, making the moderate visible from more distances

The Fresnel lens reduces the quantity of cloth required in assessment to a conventional lens thru dividing the lens into a difficult and speedy of concentric annular sections. An notable Fresnel lens need to have an infinite

sort of sections. In every section, the general thickness is decreased as compared to an same smooth lens. This successfully divides the non-saved floor of a well-known lens into a hard and fast of surfaces of the same curvature, with stepwise discontinuities among them.

In some lenses, the curved surfaces are modified with flat surfaces, with an amazing attitude in each section. Such a lens may be seemed as an array of prisms prepared in a circular style, with steeper prisms on the edges, and a flat or slightly convex center. In the first (and largest) Fresnel lenses, each segment changed into certainly a separate prism. 'Single-piece' Fresnel lenses have been later produced, getting used for vehicle headlamps, brake, parking, and turn signal lenses, and so forth. In current-day instances, pc-managed milling device (CNC) or 3-D printers might be used to manufacture extra complicated lenses.

Fresnel lens format lets in a big reduce price in thickness (and consequently mass and quantity of cloth), at the price of lowering the imaging extremely good of the lens, it is why particular imaging packages together with photographs normally even though use massive traditional lenses.

Fresnel lenses are commonly made from glass or plastic; their duration varies from huge (antique historical lighthouses, meter period) to medium (e-book-analyzing aids, OHP viewgraph projectors) to small (TLR/SLR digicam indicates, micro-optics). In many instances they will be very thin and flat, nearly flexible, with thicknesses within the 1 to 5 mm (zero.04 to zero.2 in) range.

Most present day-day Fresnel lenses consist only of refractive elements. Lighthouse lenses, however, generally have a tendency to embody each refracting and reflecting factors, the latter being out of doors the metal jewelry visible inside the pics. While the inner factors are sections of refractive lenses, the outer elements are reflecting prisms, every of which plays refractions and on regular internal mirrored image averting the slight loss that takes place in reflected photograph from a silvered replicate.

1.2.1 TYPES

There are vital forms of Fresnel lens: imaging and non-imaging. Imaging Fresnel lenses use segments with curved pass-sections and convey sharp snap shots, even as non-imaging lenses have segments with flat bypass-sections, and do now not produce sharp pics. As the quantity of segments will growth, the two kinds of lens come to be extra just like every splendid. In the summary case of a countless huge shape of segments, the difference among curved and flat segments disappears.

1.2.1.1 Imaging

Spherical:-

A round Fresnel lens is equal to a easy spherical lens, the usage of ring-shaped segments which might be every a portion of a sphere, that every one attention mild on a single factor. This kind of lens produces a sharp image, although no longer quite as clean as the equal simple spherical lens due to diffraction at the edges of the ridges.

1.2.1.2 Cylindrical:-

A cylindrical Fresnel lens is equal to a simple cylindrical lens, the usage of immediately segments with circular move-segment, focusing mild on a unmarried line. This type produces a pointy image, even though no longer pretty as clear as the equivalent easy cylindrical lens because of diffraction at the rims of the ridges.

1.2.1.3 Non-imaging

Spot:-

A non-imaging spot Fresnel lens makes use of ring-formed segments with pass sections which might be straight traces as opposed to round arcs. Such a lens can consciousness mild on a small spot, but does now not produce a

sharp photograph. These lenses have application in solar strength, including focusing daylight on a solar panel.

1.2.1.Linear:-

A non-imaging linear Fresnel lens uses immediately segments whose pass sections are instantly traces as opposed to arcs. These lenses consciousness mild right into a slender band. They do no longer produce a sharp image, but can be used in solar power, such as for focusing daylight on a pipe, to warmth the water inside.

1.2.1. Solar power

Since plastic Fresnel lenses may be made larger than glass lenses, in addition to being tons less expensive and lighter, they're used to concentrate daylight for heating in solar cookers, in solar forges, and in solar collectors used to warmness water for home use. They also can be used to generate steam or to power a Stirling engine.

Fresnel lenses can concentrate daylight onto solar cells with a ratio of virtually 500: 1 This lets in the lively solar-cell surface to be decreased, lowering value and permitting using greater green cells that might otherwise be too highly-priced.[19] In the early 21st century, Fresnel reflectors commenced for use in concentrating solar strength (CSP) plants to pay attention solar power. One software changed into to preheat water on the coal-fired Liddell Power Station, in Hunter Valley Australia.

Fresnel lenses can be used to sinter sand, allowing three-D printing in glass.

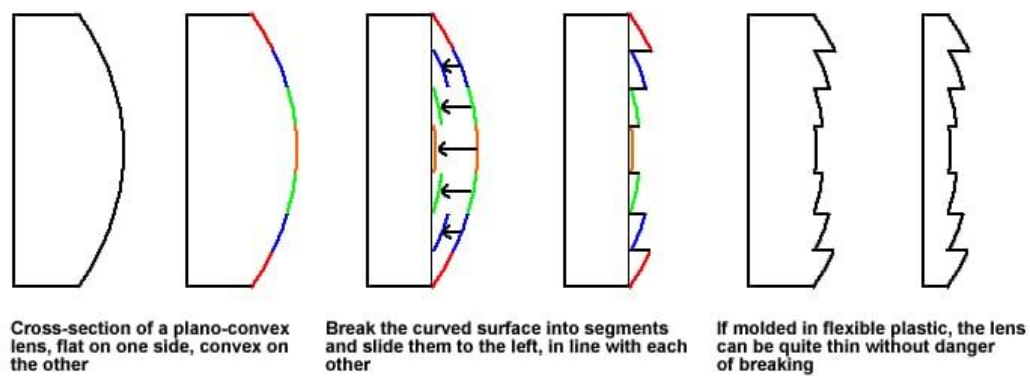


Fig1.2: Fresnel lens and convex lens comparison

1.3 COOLING SYSTEMS

PV panel Cooling strategies The important gain of cooling is clear: better electrical output. However, cooling calls for a separate gadget as a way to get rid of warmth to a degree. The production and maintenance of that device may be costly and there may be a opportunity that the value of system preservation could outweigh the benefits of the stepped forward electrical yield. Hence, normal electric gain may be discussed in maximum of the studies made as an example [1-7]. Two styles of cooling may be outstanding: active cooling, which consumes power (pump, fan, etc.) and passive cooling, which uses natural convection/conduction to permit warmth extraction.

1.3.1 Passive cooling techniques

When it comes to passive cooling strategies, they can be divided into 3 foremost organizations: air passive cooling, water passive cooling, and conductive cooling. Conductive cooling in most cases finally ends up with air passive cooling, however an important distinction is that the winning mechanism of warmth transfer from PV cells is conductive in nature. Worked on an experimental have a look at on polycrystalline PV cells in controlled situations. Two PV cells were used: one with aluminum fins as a warmness sink, with thermal grease applied and one without a warmness sink. Illumination was numerous from 2 hundred to 800 W/m² . A relative increase in electric performance of 9 % has been received through utilization of passive

cooling with a heat sink. The PV module heats up with the aid of five-6 °C whilst as compared with a PV module on a ordinary mount. It has been mentioned that the temperature difference rises with the boom of insolation. In different words, passive go with the flow channels can have the opposite impact on PV modu1

1. 3.1.1 Heat sink:-

Heat sink is one of the cooling approaches which uses a high thermal conductivity metal to take away the heat from the photovoltaic cell. By way of investigating numerically the temperature reduction of the PV panels throughout a clear day of summer by using the usage of distinct arrangements of ribbed wall warmth sink of air and passive cooling. The take a look at observed that the most power produced by using PV panel in case of the usage of warmth sink was increased with the aid of 6.97% and seven.55% compared to the reference case, studied experimentally the working temperature version for the PV module with and without energetic cooling machine to recognise the electrical performance of the PV module.

1.3.2 Active cooling strategies

Active cooling strategies can be taken into consideration as those techniques that constantly eat power in an effort to cool the PV module. Most of the methods used are based totally on air or water cooling. Hence, essential consumption machine is pump or fan wanted for keeping fluid circulate. In general, lively cooling strategies result in greater produced power and greater reachable thermal power, but when power consumption is taken under consideration, query arises if cooling device can help itself. When concentrated PV cells are used, lively cooling device can effortlessly be carried out, specifically because of fluid-to-cell mass ratio and the capability to apply less cooling fluid. Thus, less strength is needed to maintain the machine.

1.3.2.1 Heat ex-changer:-

Several research have investigated numerically and experimentally the overall performance of the PV cells the use of lively cooling water with the useful resource of warmth ex-changer. Applied an experimental research of enhancing the electrical efficiency of photovoltaic /thermal machine via the use of water cooling method. The cooling mechanism was contained of heat ex-changer and seven pipes of water connected to the lower back of the PV panel. The most cell efficiency for the square warmness ex-changer cooling become thirteen.07%, at the same time as for uncooled PV cells become 7.82% as shown in Bahaidarah et al. studied experimentally and numerically the performance of a hybrid PV water cooled system. A warmness ex-changer become linked to the again of the PV cells to beautify the performance of the PV panel for the weather of Dhahran, Saudi Arabia. The hybrid PV-water cooled device become consisted of a 230 W mono-crystalline kind, cooling panel (warmth exchanger) become connected to the back aspect of the PV module, and insulated tank to save the cooling water. It turned into observed that the running temperature of the water cooled PV panel became decreased remarkably to approximately 20% as shown in Fig. 14 and the electric performance increase was nine%. In addition, the strength series of the water cooled PV machine became nearly four instances more than the PV only system.

CHAPTER 2

LITERATURE SURVEY

REVIEW ON COOLING SYSTEM IN SOLAR PANEL

Gray, Allison K,(2007) Have reached on Concentrating PV structures are taken into consideration a promising approach to reduce solar energy conversion costs where Fresnel lenses or mirrors are used in exchange for expensive PV material. So, they used active and passive cooling systems. In Active cooling a pump is used to flow into the cooling fluid and cast off the waste heat. Passive cooling designs deplete the waste warmness by way of natural convection. **This** cooling approach typically makes use of heat sinks without using a pump or fan to growth the dissipation price.

Md. Riaz Pervez,(2010) The experimental study of PV output power with solar cell is measured for each the cooling mode and without cooling mode and in comparison the effects. The consequences indicate that the common energy output is two-2.5 times higher than regular PV cell gadget.

REVIEW ON SOLAR PANEL

[Britt; Jeffery 2012] They have presented an experimental research to observe a semiconductor cloth used in a PV cell and its significance in determining the performance of the solar cell at various parameters such as regards to behavior with admire to temperature, weight and as well as other parameters with which it is used and all the ones make contributions to the figuring out factor of performance of the PV module

[Ho; Frank 1995] They worked on the experiment that improving the performance of Solar Cells. They have discovered that the efficiency of the solar cell varies from 15% to 22% and innovations are being done by means of converting the combination of semiconductor fabric within the PV cell and discover advanced efficiency. The inventor has analyzed the properties of semiconductor cloth thoroughly and has come out with a aggregate of cells-cascaded cell, allows accomplishing greater than basic performance of 23%.

[Britt; Jeffery 2009] They have presented an experimental investigation to have a look at the semiconductor device utilized in a PV cell and its importance in figuring out the performance of the solar cell at various parameters such as on the subject of conduct with appreciate to temperature, weight and in addition to different parameters with which it's miles used and all the ones make contributions to the figuring out aspect of performance of the PV cell. The inventor has conducted many experimental researchers to plot improvised methods and apparatus for forming skinny movie layers of semiconductor substances.

[Zhao 2007] They had worked Solar Collectors. The solar device is categorized as a multi-layer warmness garage structure. The heat emitting from the solar can be beneficial in different methods melted salts, water steam, smelting raw material and photo electric cell. As compared thermal power technology the solar electric power technology reduces the civil works within the building, avoids pollutants, waste managing and air preheat-pollution remedy with comparative calculation for building a solar thermal energy station, it is inferred that it's costs extensive compared to conventional power station. However thinking about the environmental effect on the space career and land utilization, his technique is extra suitable.

REVIEW ON FRESNEL LENS WITH SOLAR PANEL

Udawatet al (2016) Had Studied that Performance of Fresnel Lens Solar Concentrator". Solar energy may be utilized for producing medium temperature (100°C -150°C) low pressure (upto200°C) steam. Fresnel lens solar concentrators are very beneficial to generate low stress steam for business and cooking applications. The overall performance of Fresnel lens solar concentrator is around 51%. By observeing that Fresnel lens Solar Concentrator has a very good capability in generation excessive intensity of light and heat.

2.1 SUMMARY OF LITERATURE REVIEW

The thermal behavior of the switching gadgets or additives seems to be quite thrilling with many packages on the performance of the Solar PV device both from user point of view and application factor of view. Hardly very few researches are being tried in assessment of the overall performance of the solar PV panels with reference to the switching additives of the inverter. Therefore an earnest try is made to analyze and evaluate the performance of the solar PV panel on this regard by having an experimental setup and investigations. By adding the Fresnel lens there may be a some improvement inside the performance, will end result with a top of the line power utilization by the power system with extra return.

CHAPTER 3

AIM AND SCOPE OF THE PROJECT

3.1 AIM OF THE PROJECT

- To enhance the power output from solar cell via using fresnel. Lens.
- Adding the cooling device to prevent the temperature
- Locating the optimal distance from the fresnel lens to the solar panels via the use of the effects thinking about both efficiency and existence span of solar panel.
- Perform the checks on solar cell without burning.

3.2 SCOPE OF THE PROJECT

Now a days, Usage of strength is increasing each day. But the manufacturing of strength isn't always growing, for reducing the shortage of manufacturing we will use solar strength. In our environment we've got plentiful get entry to to the solar energy because of low performance of pv cells we are not getting the extra power output from solar cell. So, with the aid of using the fresnel lens we will get greater performance upto 3to4 times ot normal usage. But we have one downside, by way of growing light intensity the temperature also will increase. By adding cooling devise we can decrease the temperature. So, existence span of solar cell will not increased and performance may be growth.

CHAPTER 4

MATERIALS AND METHODS

4.1 MATERIALS REQUIRED

Materials required for our research are solar cell, fresnel lens, aluminum water jacket, air cooling fins, small motor for movement of water, multi-meter for checking out the voltage and infrared Thermometer for checking the solar cell temperature, battery for running the cooling system, Aluminium stand.



Fig4.1: Multi-meter with solar cell

4.1.1 MULTIMETER

A multi-meter or a multi-tester, additionally called a VOM (volt-ohm-milliammeter), is an electronic measuring device that mixes several size functions in a single unit. A normal multimeter can degree voltage, current, and resistance. Analog multimeters use a microammeter with a shifting pointer to expose readings. Digital multimeters (DMM, DVOM) have a numeric display, and might. Digital multimeters have rendered analog multimeters obsolescent, because of the truth they're now decrease charge, better precision, and further physical sturdy.

A multimeter is the aggregate of a DC voltmeter, AC voltmeter, ammeter, and ohmmeter. An un-amplified analog multimeter combines a meter movement,

range resistors and switches; VTVMs are amplified analog meters and consist of lively circuitry.

For an analog meter movement, DC voltage is measured with a sequence resistor associated between the meter movement and the circuit beneath take a look at. A transfer (generally rotary) lets in greater resistance to be inserted in collection with the meter movement to observe high voltages. They made product from the primary complete-scale deflection current of the motion, and the sum of the gathering resistance and the movement's personal resistance, gives the whole-scale voltage of the variety. As an example, a meter movement that required 1 mA for whole-scale deflection, with an inner resistance of 500 Ω , ought to, on a 10 V form of the multimeter, have 9,500 Ω of collection resistance.

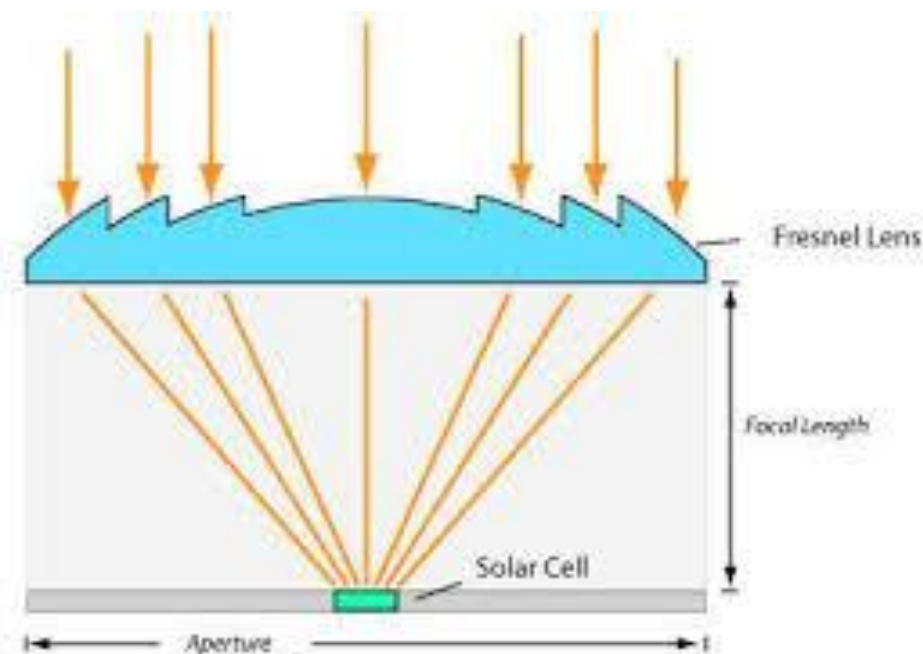


Fig 4.2: Usage of Fresnel lens

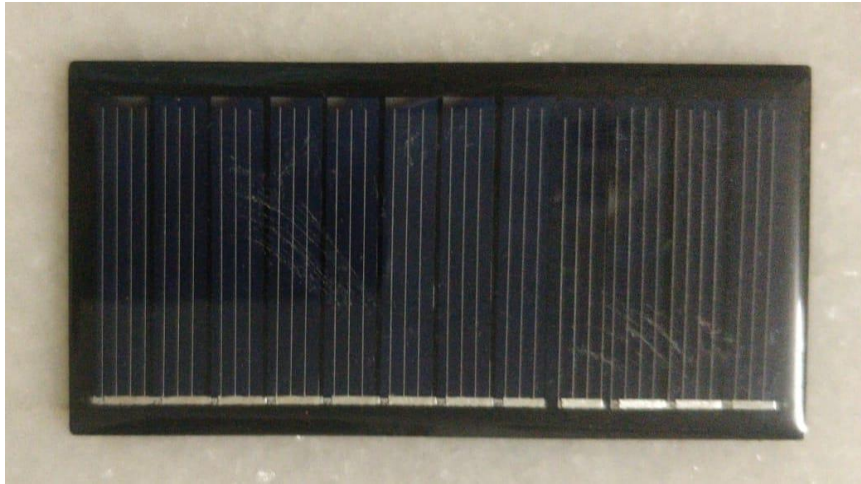


Fig 4.3: - Solar cell

4.1.2 SOLAR CELL

A solar cell (additionally called a photovoltaic cell or PV cell) is described as an electrical device that converts solar energy into power through the photovoltaic impact. A solar cell is basically a p-n junction diode. Solar cell is defined as a device whose electrical characteristics – consisting of current, voltage, or resistance – range while exposed to light.

When light reaches the p-n junction, the mild photons can without difficulty enter in the junction, via very skinny p-kind layer. The mild strength, in the shape of photons, components enough power to the junction to create some of electron-hollow pairs. The incident light breaks the thermal equilibrium condition of the junction. The free electrons in the depletion vicinity can quick come to the n-kind aspect of the junction

Similarly, the holes inside the depletion can fast come to the p-type facet of the junction. Once, the newly created unfastened electrons come to the n-type aspect, can't similarly go the junction due to barrier capacity of the junction.

Similarly, the newly created holes as soon as come to the p-type aspect can't in addition move the junction have become of same barrier capability of the junction. As the attention of electrons becomes higher in one facet, i.E. N-kind aspect of the junction and awareness of holes will become more in some other aspect, i.E. The p-type aspect of the junction, the p-n junction will behave like a small battery cell. A voltage is set up that is referred to as

picture voltage. If we join a small load throughout the junction, there may be a tiny current flowing through it.

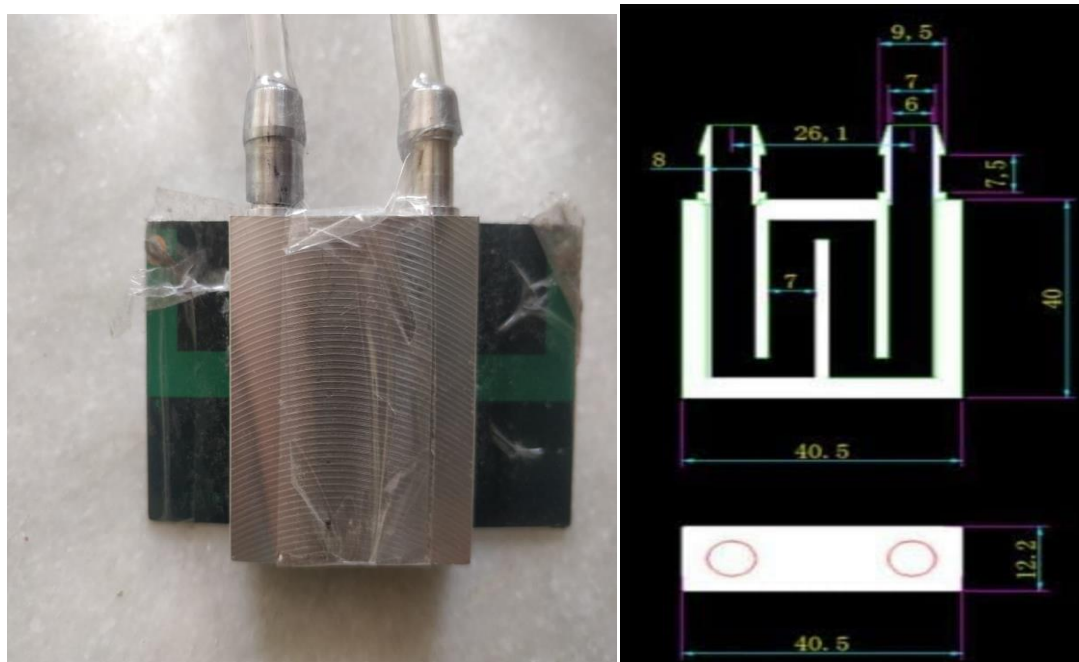


Fig 4.4:-Aluminium water jacket

4.1.3 COOLING SYSTEM

Aluminum water jacket is attached to the back of the solar cell. aluminium is good conductor of heat water circulate is connected to aluminium water jacket the warmth dissipated from the solar cell is transferred with assist of thermal paste. Aluminium water jacket will reduce the temperature of the solar cell.



Fig 4.5:-Fresnel lens

4.1.4 FRESNEL LENS

Fresnel lens of length 28cm, height 21cm and focal period of 41cm the factor consented lens it converges solar light and increases the depth of light and also will increase the heat.

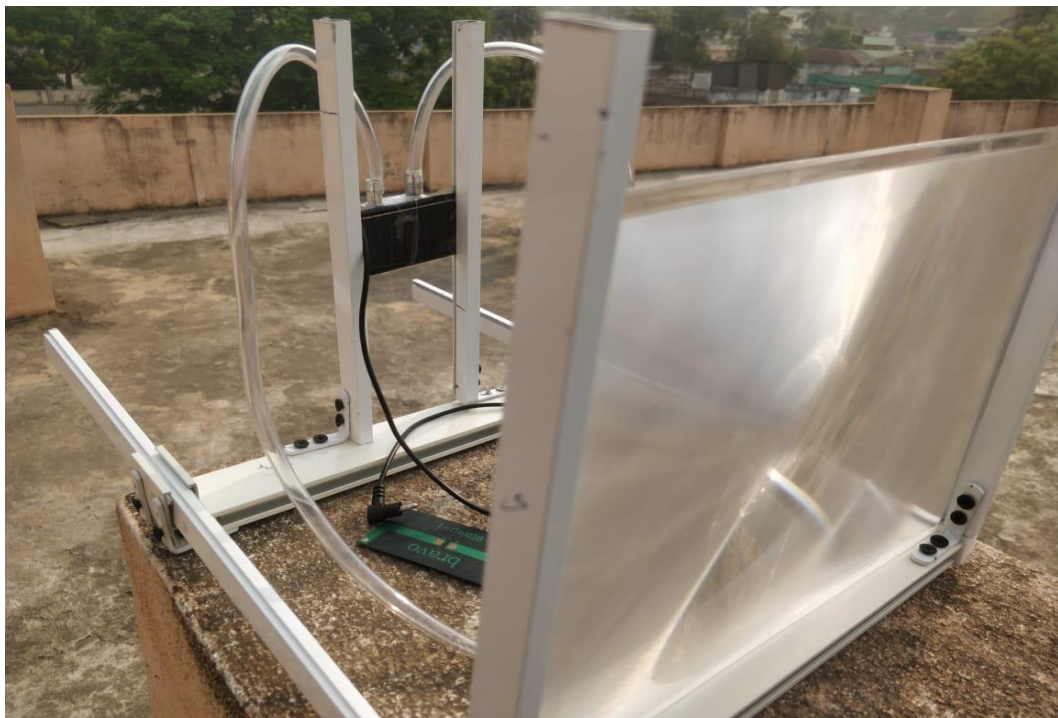


Fig 4.6: Experiment of solar cell with Fresnel lens

4.1.5 THERMOMETER

A thermometer is an device that measures temperature. It can degree the temperature of a strong which include food, a liquid together with water, or a fuel which include air. The three maximum commonplace devices of measurement for temperature are Celsius, Fahrenheit, and kelvin.

Infrared Thermometers

Kelvin thermometers are usually electric devices that could report tiny variations in radiation. These versions could now not be visible and won't trade air pressure sufficient to raise the extent of mercury in a liquid thermometer.

Electronic thermometers paintings with an instrument called a thermistor. A thermistor changes its resistance to an electric contemporary based totally on the temperature. A laptop measures the thermistor's resistance and converts it to a temperature reading.



Fig 4.7:-Infrared Thermometer

4.2 METHODS INVOLVED

The techniques which are involved in

- Test the solar cell energy output at peak temperature via using the multimeter without any fresnel lens and cooling device.
- Take the values of voltage and current up-to 3 days to get stabilize output without Fresnel lens.
- By measuring the sizes of Fresnel lens and solar cell we need to build the stand that can be movable the space in between the solar cell and Fresnel lens.
- Now take a look at the solar cell power output with Fresnel lens by way of various the space between the Fresnel lens and solar cell from 2cm to End point, due to mild depth through converting the distance. Take the temperature readings with the assist of thermometer along with voltage and present day values upto 3 days.
- After taking the readings we've located that the energy output is growing in comparison to regular solar cell output. But the hassle is temperature is increasing hastily at a sure distance the solar cell become commenced burning. And the voltage was losing because of temperature. Because of increasing temperature the efficiency and life span of solar cell is reducing.
- So, we're including the cooling device that water cooling and air cooling system. At first attach the air cooling gadget take the readings and second connect the water cooling gadget separately and take readings.
- Attach the water jacket and fan with aluminium fins to the solar cell. Do the identical in step-4 through walking the cooling systems up-to three days.
- By evaluating all the values we will get the most fulfilling distance. So, the power output will be boom and life span will not be reduced.

- By calculating and watching we will get the most desirable distance in among the solar cell and fresnel lens.

CHAPTER 5

RESULTS AND DISCUSSIONS

❖ The average output of the solar cell that we are used is 0.3W

5.1 FABRICATION OF MODEL



Fig 5.1:- Fabrication of project model

- Aluminium frame was fabricated for containing Fresnel lens and solar cell.
 - In the frame we are able to change the space among the Fresnel lens and solar cell.
 - Cooling system is constructed using aluminium water jacket that is attached via using the thermal paste, small water pump is geared up with the water jacket for the delivery of water for cooling.
 - Solar cell and the Fresnel lens are delivered to the body.
 - Solar cell is attached up to the 2 wires for taking open circuit voltage and short circuit current
 - Values of current and voltage are observed at midday
- Observation
- From the date the present day ,Temperature increases with distance between the fresnel lens and the solar cell.

- When temperature decrease voltage of the cell drops
- Life span of the solar cell decreases with growth in temperature

5.2 RESULTS

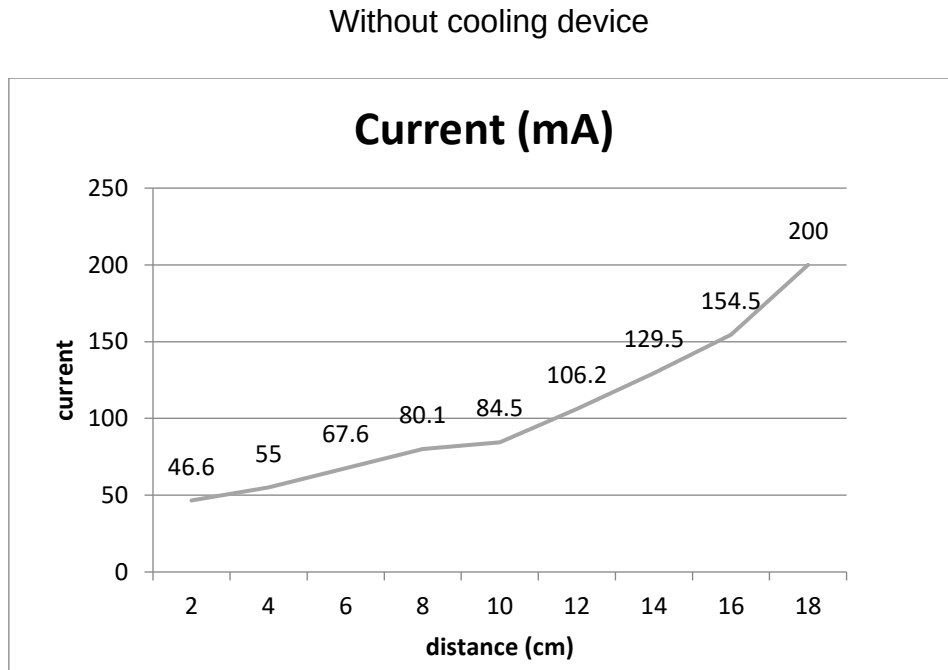


Fig 5.2:- Distance Vs Current

- Figure indicates that the values of modern-day with the gap taken from 2cm to 18cm. The most important conclusion of graph is Current elevated from 46.6mA to 200mA.

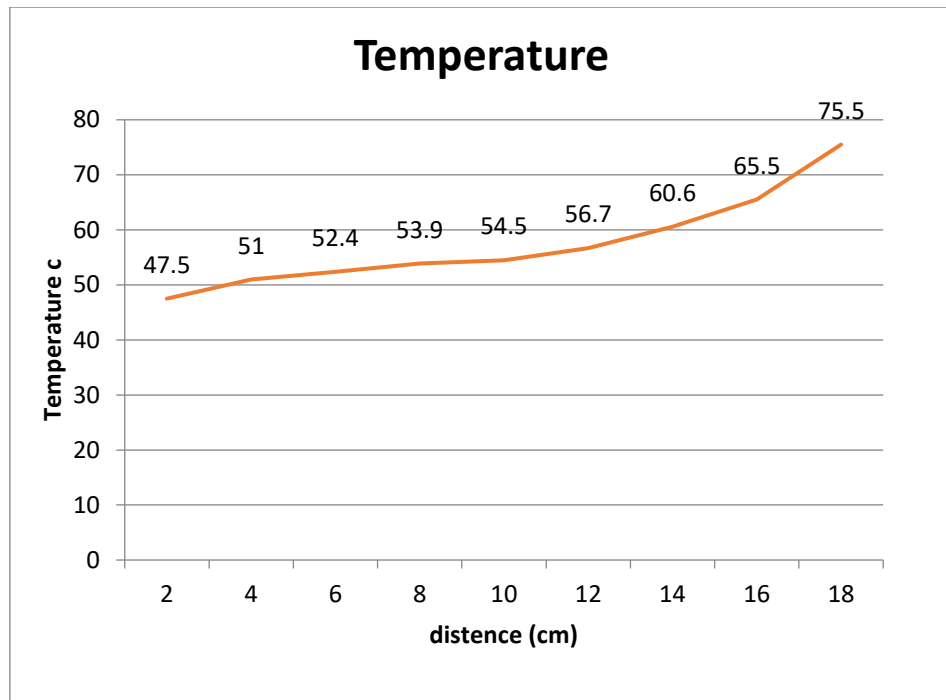


Fig 5.3:- Distance Vs Temperature

- Figure shows that the values of temperature with the gap taken from 2cm to 18cm. The main conclusion of graph is Temperature will increase with distance from 47.5 (c) to 75(c).

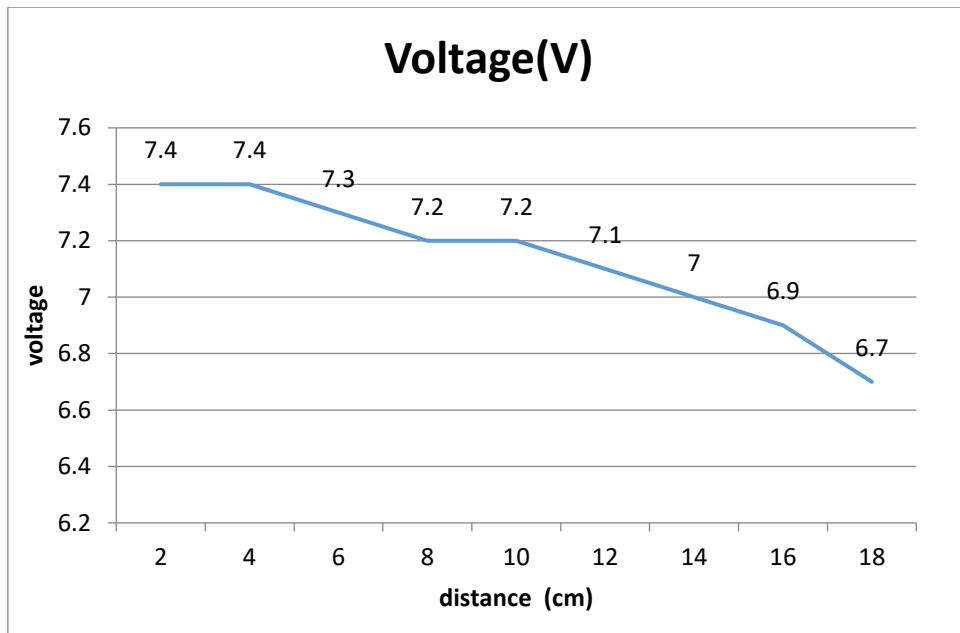


Fig 5.4:-Distance Vs Voltage

- Figure indicates that the values of voltage with the distance taken from 2cm to 18cm. The primary conclusion of graph is Voltage dropped from 7.4V to 6.7V

With cooling gadget

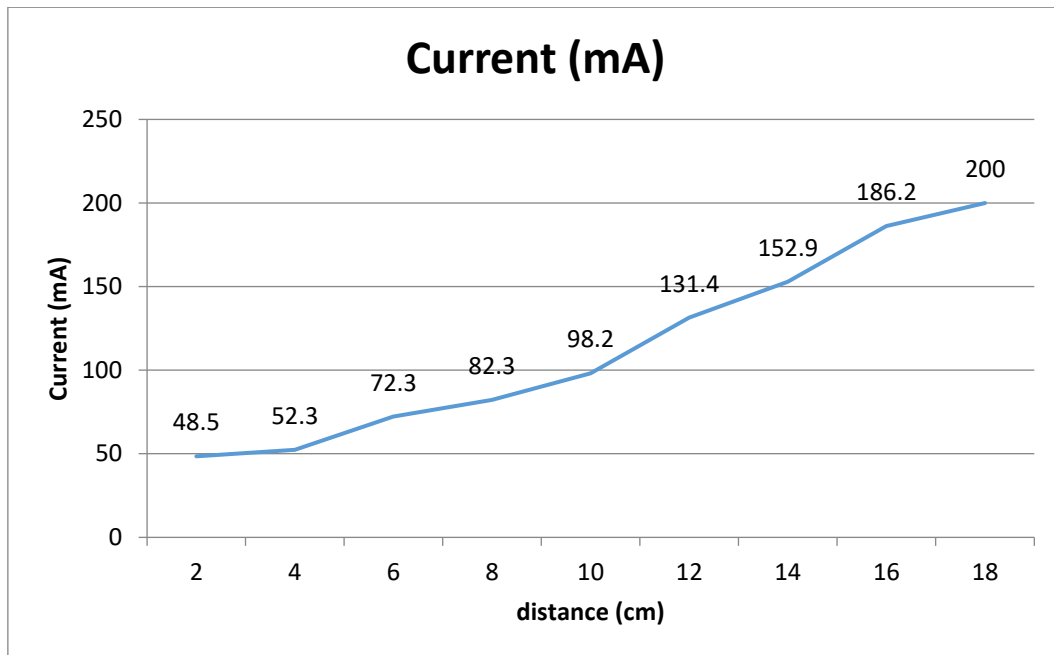


Fig 5.5:- Distance Vs Current with cooling system

- Figure shows that the values of current with the distance taken from 2cm to 18cm. The most important conclusion of graph is Current will increase with distance from 48.5 mA to 200 mA

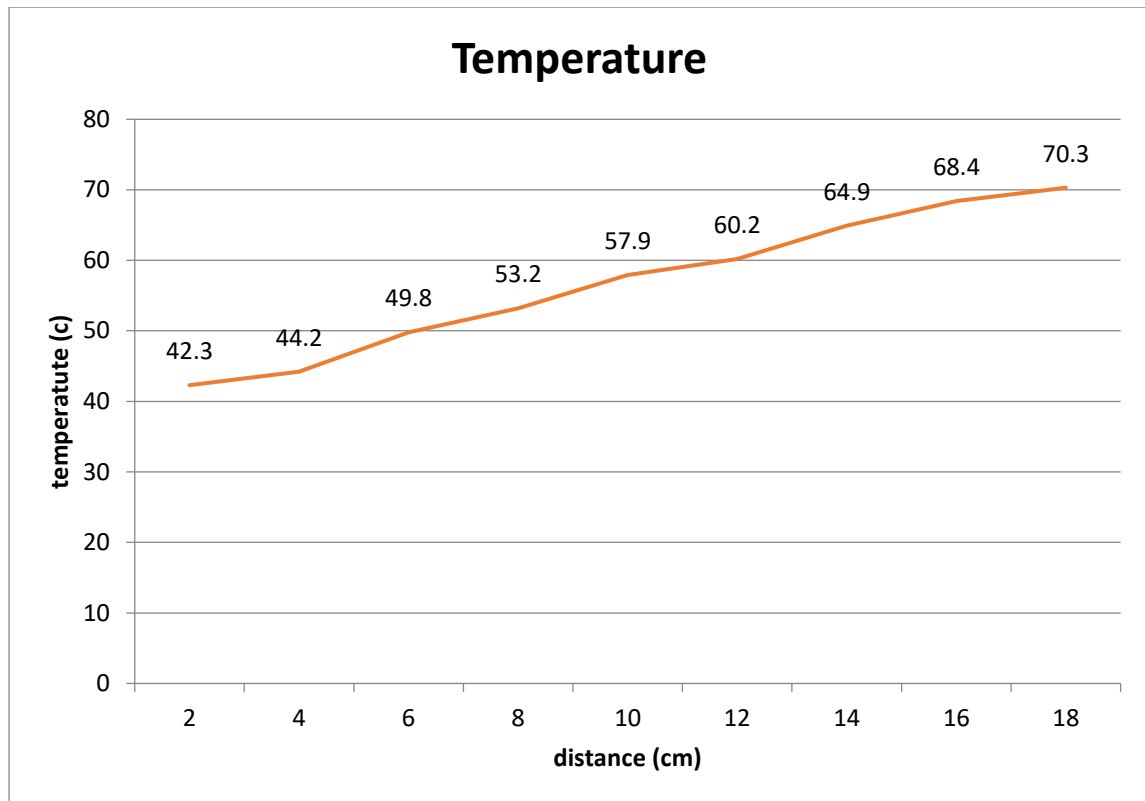


Fig 5.6:- Distance Vs Temperature with cooling system

- Figure indicates that the values of temperature with the distance taken from 2cm to 18cm. The essential conclusion of graph is Temperature increases with increase in distance from 42.3°C to 70.3°C.

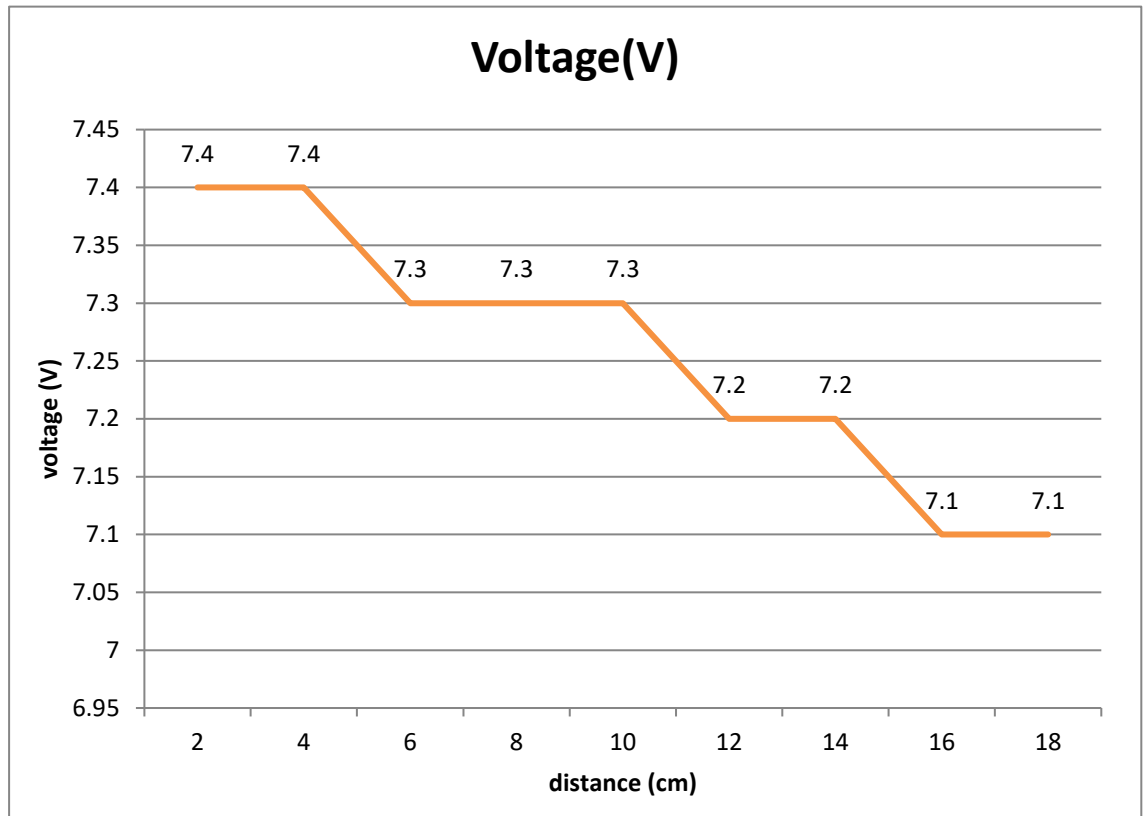


Fig 5.7: - Distance Vs Voltage with cooling system

- Figure suggests that the values of voltage with the distance taken from 2cm to 18cm. The essential end of graph is Voltage became dropped by means of 7.4V to 7.1V
- Comparing the power values of with and without cooling system

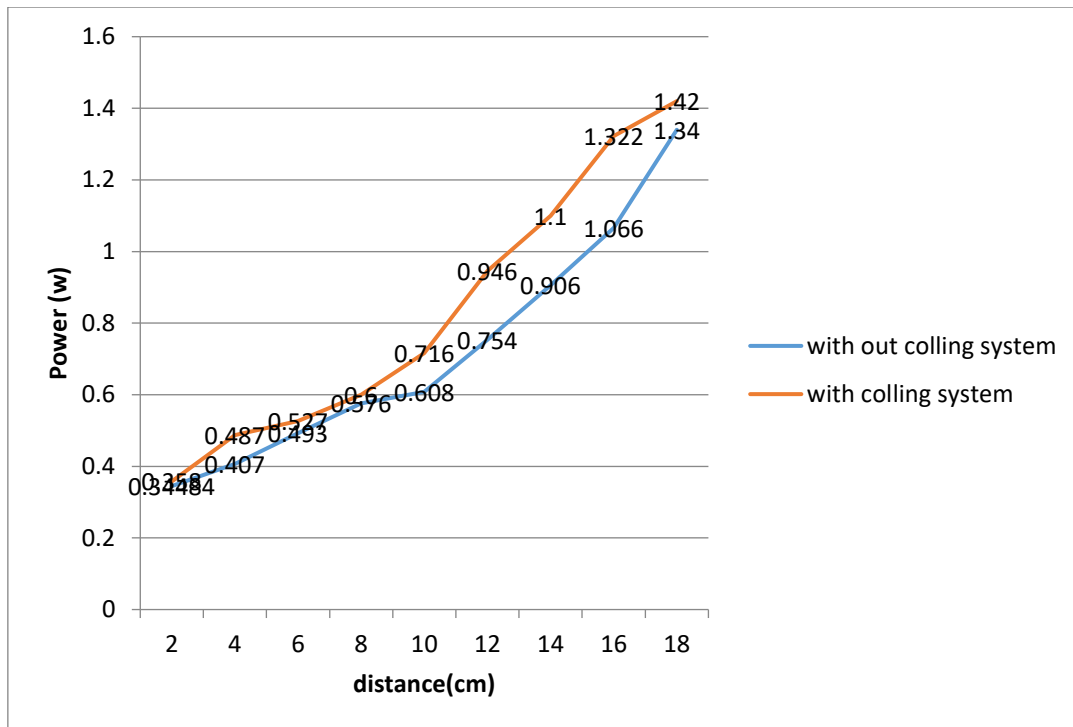


Fig 5.8:- Distance Vs Power

- Comparing the values of with cooling system and without the cooling system, which increase the distance of solar cell, and also increases the present day output of Fresnel lance from 46.6mA to 200mA and will increase with the aid of 329.18% at 18 cm and temperature extended from 47.5 to 75. Five. The drop in voltage is because of increases in temperature from 7. Four to 6.7 and drop by nine%.
- The cooling device that's connected to the solar cell, at maximum distance the contemporary output extended form 48.5mA to 200mA. Which is 312.3% increases and additionally temperature boom from forty two.3 to 70.3 and voltage drop 7.4 to 7.1 (4.05% drop)
- Comparing the solar cell with and without cooling device, we're able to manage the Temperature and additionally the voltage drop which increases the energy output of the machine and will increase lifes span of solar cell.



Fig 5.9:-Burned solar cell

- The Mono crystalline solar cells temperature range is from 26°C - 65°C . Which run's without any damage. While the gap between the solar cell and Fresnel lens reached more than 18cm the cell was burning (fig-5.9) because of it we're stopped at 18cm. The cell with cooling device at 65°C is optioned at 14cm and, the present day is at 152.9mA and, the voltage is at 7.1V and, power is 0.94W. The power output without cooling system is at 0.90W and, power output without Fresnel lens is at 0.32W. At the optimal point the temperature range is from 50°C to 65°C and, the current range is from 150mA to 170mA and, the voltage range is from 7.1V to 7.3V and the power output is 2 times higher than normal solar cell.

CHAPTER 6

SUMMARY AND CONCLUSION OF THE RESEARCH

With the use of the fresnel lens with solar cell the output can be increased upto 4 times. And the main disadvantage is excessive temperature will damage the solar cell for controlling the temperature cooling device are brought into solar cells .By means of various the parameters which include distance between solar cell and fersnal lens and cooling device and optimise the parameters for better output and higher lifespan of the solar cell . With optimised parameters the cost of manufacturing is halved or the with same cost energy production is doubled.

1. ADVANTAGES:

- Easy renovation
- Low cost
- Simple in construction
- High power as compared to normal cell

2. DISADVANTAGE:

- Produces greater temperature
- Fresnel lens and solar cell need to be clean
- Burning risks of System
- Continuous chance of water

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