NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696
VOLUME 6, ISSUE 4, Apr.-2019

# CASE STUDY OF SOLAR ENERGY

MISS. PATIL POONAM SAMBHAJI
(Vidyavardhini Institute of Technology Pal)
poonampatil81998@gmail.com

MISS. PATIL SHITAL SARJERAO
( Vidyavardhini Institute of Technology Pal)
shitalpatil301198@gmail.com

MISS. BHOSALE SUNITA SHIVAJI
(Vidyavardhini Institute of Technology Pal)
sunitabhosalek98@gmail.com

MISS. JADHAV AARATI DATTATRAY
( Vidyavardhini Institute of Technology Pal)
jadhavaarati41@gmail.com

MISS. FAKIR RIHANA AKABAR
(Vidyavardhini Institute of Technology Pal)
rihanafakir99@gmail.com

**ABSTRACT**
To study the efficiency increasing of electric energy generation in the Photovoltaic System is concentrated on this paper. There are four cases to improve the efficiency of power producing from the Photovoltaic System. This article not only describes the differences of facilities before and after the proposal, but also evaluates the electric energy generation efficiency and improved results for each proposal. Finally, the better efficiency of all improving ways is analyzed to get into conclusions in order to provide further improvement and reference for the industry in the future. Overall, these proposed methods can improve the efficiency of solar photovoltaic electric energy generation in about 30.18%.

**KEYWORDS –** Solar Cell, Photovoltaic, Tracking Device, Inverter

**Vidyavardhini Institute of Tecnology , Pal**

## I. INTRODUCTION

Energy, the most important phenomenon these days is used for different applications like transportation, industrial, household etc. Energy specifically 'Electricity' provides the major path to develop a nation to the fullest. The use of energy plays a very important role in one's life. The availability and accessibility of sufficient amount of energy accelerates individuals and nations development.

The generation of energy results into burning of fossil fuels. The coal that is used to generate energy results into deforestation and hence increases the rate of carbon emission increasing global warming. Due to an overuse of fossil fuels they are on the verge of depletion. Since energy use has become an integral part it becomes necessary that the supply that we get is sustainable, secure, economical, free from losses and most importantly eco-friendly. Hence to overcome all these and meet the ever increasing demands of energy 'Going Solar' is the best option. With the recent rise in energy costs many people have been looking to alternative sources of energy. One of the greatest energy sources (our sun) is readily available for the taking. We just need to be able to harness its power. Sun is the never ending source of energy, is absolutely free. It is a clean energy and is ecofriendly. It is a very large source of energy.

The power from the sun that the earth receives per day is about $1.8\times10^{11}$ MW which is many thousand times larger than our current power consumption from all the sources. 1000KW of energy is produced by burning 100L of oil which in turn is produced by 1sqm of an efficient panel.

The amount of electricity a solar panel produces depends on three main things:

- The size of the panel
- The efficiency of the solar cells
- The amount of sunlight the panel gets

Since solar energy focuses on the most threatening issues like carbon emission, global warming, reduction in the consumption of fossil fuels it can be termed as sustainable energy.

## II. INFORMATION OF COLLEGE

Vidyavardhini Institute of Technology Pal (VVIT) was established in 2009. Pal is a picturesque town surrounded by mills,57 KMS away from Kolhapur. The aim of college is to education on campus is spread over seven acres area with residential accommodation for staff and students.

**Salient Features:**

1. Well qualified, experienced.
2. Well-equipped laboratories and work-shop.
3. Personal attention for progress of students for curricular and extracurricular activities.
4. Well strengthened library facilities, with more than 15000 books periodicals etc.
5. Hostel accommodation for boys and girls is available.
6. Exceptionally good track record in MSBTE Examination results and extra-curricular activities.
7. Institute is connected to INTERNET/E-mail facility.
8. Every year a large number of students get admission to direct second year for diploma courses.

## III. INFORMATION OF SOLAR PANELAS INSTALLED IN COLLEGE

**Location of Solar Panels in College:**

**Total Lode of College :**

| Name Of Sector | Total Wattage |
|---|---|
| 1.Ground Floor | 4590 watt |
| 2.First Floor | 4613 watt |
| 3.Second Floor | 18880 watt |
| 4.Third Floor | 4620 watt |
| 5.Fouth Floor | 960 watt |
| 6.Mecanical Department | 800 watt |
| 7.Sorrounding Area Of College | 2805 watt |
| **TOTAL** | **37268 watt** |
| | **37.26 KW** |

**Specification Solar Panel :**

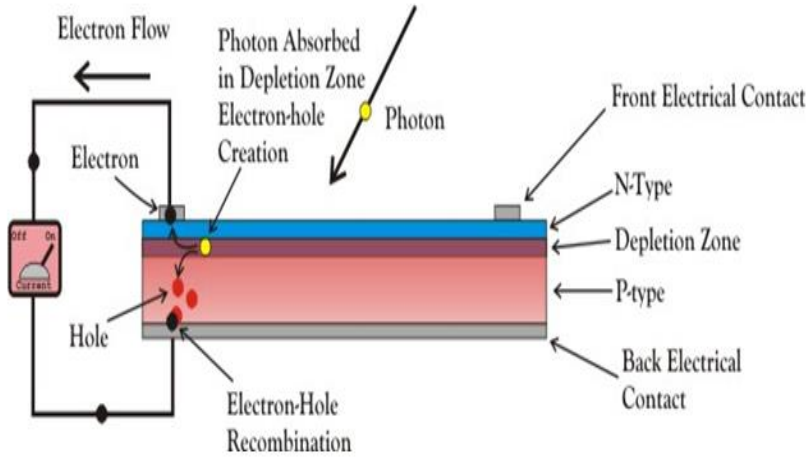
| Sr.NO. | Specification | Ratings |
|---|---|---|
| 1. | Modal No. | KS72P320 |
| 2. | Maximum Power | 320 W |
| 3. | Maximum Power Voltage | 37.18 V |
| 4. | Maximum Power Current | 8.61 A |
| 5. | Open Circuit Voltage | 45.62 V |
| 6. | Short Circuit Voltage | 9.16 A |
| 7. | Fuse Rating | 15 A |
| 8. | Bypass Diode Rating | 20 A |

**Specification of Inverter:**

| Sr.No. | specification | Rating |
|---|---|---|
| 1. | Name of Manufacturer with address | Power one ITALY |
| 2. | Make of the inverter | ABB Inverter |
| 3. | Model No. | PVI-10.0 TL-OUTD-S |
| 4. | AC Capacity of Inverter | 10 kw |
| 5. | No. of Inverter Installed | 1 No. |
| 6. | Total AC capacity of Inverter | 10 kw |
| 7. | Serial Nos. | 1819109389 |

## IV. CONSTRUCTION & WORKING OF SOLAR CELL

**Construction :**




Although this is basically a junction diode, but according to the construction it is little bit different form conventional p-n junction diode. A very thin layer of p-type semiconductor is grown on a relatively thicker n-type semiconductor. We provide few finer electrodes on the top of the p-type semiconductor layer. These electrodes do not obstruct light to reach the thin p-type layer. Just below the p-type layer there is a p-n junction. We also provide a current collecting electrode at the bottom of the n-type layer. We encapsulate the entire assembly by thin glass to protect the **solar cell** from any mechanical shock

**Working :**

When light reaches the p-n junction, the light photons can easily enter in the junction, through very thin p-type layer. The light energy, in the form of photons, supplies sufficient energy to the junction to create a number of electron-hole pairs. The incident light breaks the thermal equilibrium condition of the junction. The free electrons in the depletion region can quickly come to the n-type side of the junction. Similarly, the holes in the depletion can quickly come to the p-type side of the junction. Once, the newly created free electrons come to the n-type side, cannot further cross the junction because of barrier potential of the junction.

Similarly, the newly created holes once come to the p-type side cannot further cross the junction became of same barrier potential of the junction. As the concentration of electrons becomes higher in one side i.e. n-type side of the junction and concentration of holes becomes more in another side i.e. the p-type side of the junction, the p-n junction will behave like a small battery cell. A voltage is set up which is known as photo voltage. If we connect a small load across the junction, there will be a tiny current flowing through it.

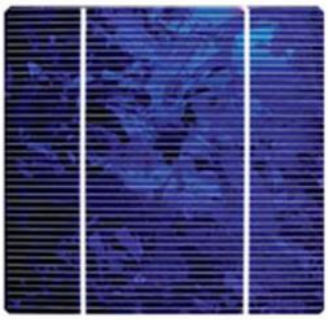
## V. SOLAR PANELS & ITS TYPES

**Mono crystalline**

Mono crystalline silicon (also called "single-crystal silicon", "single-crystal Si", "mono c-Si", or mono-Si) is the base material for silicon chips used in virtually all electronic equipment today. Mono-Si also serves as a photovoltaic, light-absorbing material in the manufacture of solar cells. It consists of silicon in which the crystal lattice of the entire solid is continuous, unbroken to its edges, and free of any grain boundaries. Mono-Si can be prepared as an intrinsic semiconductor that consists only of exceedingly pure silicon, or it can be doped by the addition of other elements such as boron or phosphorus to make p-type or n-type silicon.

Due to its semiconducting properties, single-crystal silicon is perhaps the most important technological material of the last few decades-the "silicon era", because its availability at an affordable cost has been essential for the development of the electronic devices on which the present day electronics and IT revolution is based. Mono crystalline silicon differs from other allotropic forms, such as non-crystalline amorphous silicon used in thin-film solar cells and polycrystalline silicon, which consists of small crystals also known as crystallites

**Polycrystalline**



Polycrystalline silicon, also called poly silicon or poly-Si, is a high purity, polycrystalline form of silicon, used as a raw material by the solar photovoltaic and electronics industry. Poly silicon is produced from metallurgical grade silicon by a chemical purification process, called the Siemens process. This process involves distillation of volatile silicon compounds, and their decomposition into silicon at high temperatures. An emerging, alternative process of refinement uses a fluidized bed reactor. The photovoltaic industry also produces upgraded metallurgical-grade silicon (UMG-Si), using metallurgical instead of chemical purification processes. When produced for the electronics industry, polysilicon contains impurity levels of less than one part per billion (ppb), while polycrystalline solar grade silicon (SoG-Si) is generally less pure.

The poly silicon feedstock large rods, usually broken into chunks of specific sizes and packaged in clean rooms before shipment – is directly cast into multi crystalline ingots or submitted to a recrystallization process to grow single crystal boules. The products are then sliced into thin silicon wafers and used for the production of solar cells, integrated circuits and other semiconductor devices.

## VI. CLEANIN & MAINTENANCE TIPS FOR SOLAR PANELS

**Tips for Maintenance of Solar Panels**

Keep solar panels out of shade as energy production become inefficient when they are kept form absorbing any sunlight Keep an eye on the solar panels and make sure the inverters are flashing green lights. If they are not flashing, you are losing money by no longer compensating for your electricity use

Document the day-to-day performance to improve solar panel maintenance. It is important to write down how much energy has been produced at a consistent time every day and make special note of dates where it is very cloudy. Some of the result will be inconsistent. (Your manufacturer would be able to provide you with the best monitoring system for your solar panels.)

Monitoring systems help you see how much you are benefiting the environment and how much CO2 you are emitting into the atmosphere. They can also help you know how much you could benefit from the feed-in tariff scheme.

**Tips for Cleaning of Solar Panels**

Solar panel cleaning kits come in very handy for cleaning solar panels. Inside the kit, you will find a biodegradable soap, a wiper, and a small brush or brush with a longer handle.

Mix the soap in the bucket with water. Instruction are provided on the bottle. Dip the brush in the bucket and begin gently wiping the solar panels. You can use plain water or a soft brush to remove any grime or dirt that has built up on the panels.

How to clean solar panels has never gotten easier! Clean solar panels when they are moist or wet so any dirt so residue that is stuck on them can be wiped off easily.

Never use an abrasive sponge or soap for your solar panels cleaning as you may scratch the glass. The best way to clean solar panels by using a soft rag or biodegradable soap.

It is important not to use harsh material when cleaning solar panels as they could cause damage , and solar panels are costly to repair.

If you clean often, you might be able to just run a hose along the panels to remove any dirt. Fewer calls on solar panel maintenance.

For your safety and the safety of others around you, use a long handled wiper to clean the panels while you are standing on the ground.

If you must get on the roof, take proper care as once you being cleaning, the roof become slippery and you could slide off when you get down, so use safety ropes or a harness for support.

Always watch out for dirt on the solar panels to make sure it does not build up since they can absorb sunlight better when they are free of dirt.

## VII. CONCLUSION

The geographic location of Plant is belonged to the subtropical zone. Especially, the Kolhapur district is full of sunshine. The environmental condition is very suitable to develop photovoltaic. Consequently, as long as we improve moreover on the utilizing technology of solar energy, we can have infinite future of developing photovoltaic.

Cases adopted by this study to improve and increase the efficiency of power producing from the photovoltaic system are listed in the followings:

1) Use the amorphous transformer-The improved efficiency increased 1.1%.
2) Remove the anti-reverse diode-The improved efficiency increased 0.1%.
3) Establish the cooling system by sprinkling water-The improved efficiency increased 2.9%.
4) SOLAR CELL WITH A TRACKING DEVICE (MPPT)-THE IMPROVED EFFICIENCY INCREASED 26.08%.

## VII. ACKNOWLEDGMENT

We feel profound pleasure in bringing out this project report for which we have to go from pillar to post to make it a reality. This project work reflects contributions of many people with whom we had long discussions and without which it would not have been possible. We must first of all, express our heartiest gratitude to respected **PROF. Mr. JADHAV. V. G (Dept. of Electrical Engg.)** for providing us all guidance to complete project.

It would be unfair if we do not mention the valuable contribution and timely co-operation extended to us by staff member of our **Electrical** department. And especially we can never forget the most worthy advice given

by **PROF. MR. PRASADI. A. G. (H.O.D., Dept. of Electrical Engg.)** , that would help us the entire lifetime.

## VIII. REFERENCES

1) Yang, J.-D. (2009) Solar Cell Materials. Wu-Nan Book Inc.
2) Baechler, M.C., Gilbride, T., Ruiz, K., Steward, H. and Love, P.M. (2007) High- Performance Home Technologies Solar Thermal & Photovoltaic Systems. NREL/TP-550-41085 PNNL-16362. [
3) Ching-Lung Lin Department of Electrical Engineering, Mingshin University of Science and Technology, Hsin-Chu, Taiwan Email: cll@must.edu.tw