

Comparison of Different Solar Panel & Use of Optical fiber

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Abstract

Now a days people are researching optimum solution means minimum investment and maximum benefit so by keeping in mind we decided to use the abundantly resources i.e solar energy to generate electricity and get maximum efficiency. The aim of our project is to compare of two solar panel one is mono crystalline and other one is poly crystalline and find the efficiency of both solar panel, the panel which give us maximum efficiency we use that panel, and we try to increase further more efficiency with the help of optical fiber. We found that efficiency of mono crystalline solar panel is maximum than poly crystalline and after the use of optical fiber the efficiency of mono crystalline is increase by 1.5% and that of poly crystalline is increase by 1%. we use the principle of optical fiber i.e. TIR (total internal reflection) and prepared optical fiber by using mirror strips at home and successfully execute our project.

1. Introduction

Dwindling nature of fossil fuels led many countries to search for new and alternative sources of energy. Solar energy is a clean, eco-friendly and abundantly available energy source. The useful forms of solar energy are either heat or electricity. The electricity demand is increasing day by day. The conversion of solar energy to electricity through PV module is becoming popular but overprice of cells and lower efficiency hinder its use in developing

countries. To reduce high cost per unit electricity, one way is to improve the performance of PV system. New cost effective mirror reflecting linear focusing solar concentrator may be a good solution. As mirror based radiation intensity over the panel is more, the consequences is increased temperature of the panel. But panel temperature above 25 degree Celsius reduce the open circuit voltage and decrease efficiency. Thus proper cooling is needed to

improve the panel performance. we are using optical fiber for enhancing the efficiency of solar panel. Through the use of optical fiber we will concentrate the solar radiation on the panel. Due to concentration of more solar radiation on solar panel, it will increase the overall efficiency.

- Compare the efficiency of mono crystalline solar panel and polycrystalline solar panel
- Compare efficiency before and after use of optical fiber
- Design optical fiber using mirror strips
- Increase efficiency

2.Objective

3.Functional Block Diagram:

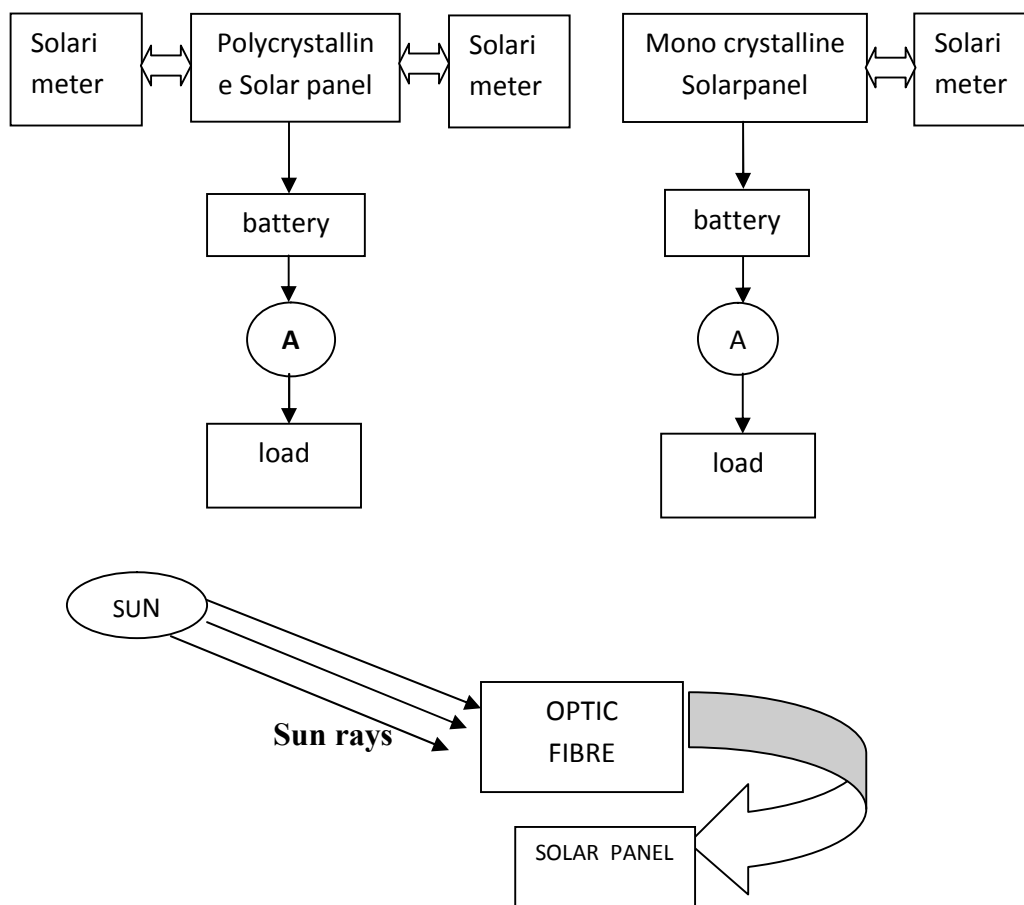


Fig3.8: Electrical energy generate through the panel

4. Description of project:

Elements:

1. Solar Panel-Using photovoltaic effect
SPV module convert light energy from sun to useful electrical energy. Most of

the modules are constructed using crystalline silicon cells or thin-film cells. Voltage and current are generated at output terminals when exposed to sun light.

a). **Polycrystalline:** Polycrystalline solar panels are also made from silicon. However, instead of using a single crystal of silicon, manufacturers melt many fragments of silicon together to form the wafers for the panel. Polycrystalline solar panels are also referred to as “multi-crystalline,” or many-crystal silicon.



Fig: Polycrystalline solar panel

Because there are many crystals in each cell, there is less freedom for the electrons to move. As a result, polycrystalline solar

panels have lower efficiency ratings than mono-crystalline panels.

b). **Mono crystalline:**

To make solar cells for mono crystalline solar panels, silicon is formed into bars and cut into wafers.



Fig: Mono-crystalline solar panel

These types of panels are called “mono crystalline” to indicate that the silicon used is single-crystal silicon. Because the cell is composed of a single crystal, the electrons that generate a flow of electricity have more room to move. As a result, mono crystalline

panels are more efficient than their polycrystalline counter parts.

2.Optical Fiber-In this project we will use the optical fiber to enhance the efficiency of the solar panel. Optical fiber works on the principle of total internal reflection. When the ray incident on the surface at the angel greater then the critical angel,ray reflected back back into the same medium.

3.Multi-meter:-We have used 4 multi-meter,two of them for monocrystalline and two for polycrystalline solar panel for measuring the current and voltage.

5.Working Principle:

- We Connect the two monocrystalline each of 10watt, in series connection to make the 20 watt solar panel.
- We connect polycrystalline in the circuit also.
- Two multi-meter are connected to the mono-crystalline solar panel and two are also connected to the polycrystalline

solar panel for measuring the voltage and current of the panel.

- We take reading of voltage and current of both panel for 10 days
- After taking the reading of solar panel we calculate efficiency.
- We take reading for next 10 days with optical fiber.
- We analysis the reading and found that mono crystalline gives more efficiency than poly crystalline.
- After using the optical fiber we enhance the efficiency upto 1.5% of both panel.

6. Future Scope:

- We can use our idea in big industries
- We can enhance efficiency of panel by using optical fiber
- We increase by 1.5% of both panel which much considerable data
- We can use our project in that vary area where no much intensity of rays is incident
- We generate energy of panel by using optical fiber is much more than prior

7. Observation Table:

Table 1: Observation of solar panel without optical fiber

TIME	RADIATION	MONOCRYSTALLINE				POLYCRYSTALLINE			
		V(volt)	I(amp)	P(watt)	N%	v(volt)	I(amp)	P(watt)	N%
12:20	516	42.2	0.58	24.47	31.4	21	1.08	22.68	25.27
12:35	508	41.1	0.58	23.83	31.11	20.7	1.09	22.56	25.54
12:50	501	40.3	0.57	22.97	30.40	20.5	1.06	21.73	24.94
13:05	475	40.4	0.58	23.43	32.71	20.5	1.08	22.14	26.8
13:20	490	40.5	0.58	23.52	32.73	20.4	1.09	22.15	26.90
13:35	507	41.1	0.59	24.24	31.7	20.8	1.09	22.67	25.71
13:50	496	40.8	0.55	22.44	30	20.64	1.03	21.59	24.59
14:05	487	40.7	0.54	21.97	29.92	20.6	0.99	20.39	24.08
14:20	461	40.5	0.54	21.87	31.4	20.5	1.00	20.5	25.57
14:35	460	41	0.59	24.19	31.32	20.8	1.00	20.8	26
14:50	427	40.8	0.43	17.54	27.54	20.7	0.81	16.76	22.58
15:05	402	41	0.42	17.22	28.40	20	0.78	15.6	22.31
15:20	378	40.6	0.38	15.42	27.06	20.0	0.72	14.83	22.56
15:35	330	40.3	0.32	12.89	25.9	20.4	0.6	12.24	21.32
15:50	288	40.9	0.29	11.8	27.31	20.7	0.54	11.17	22.31

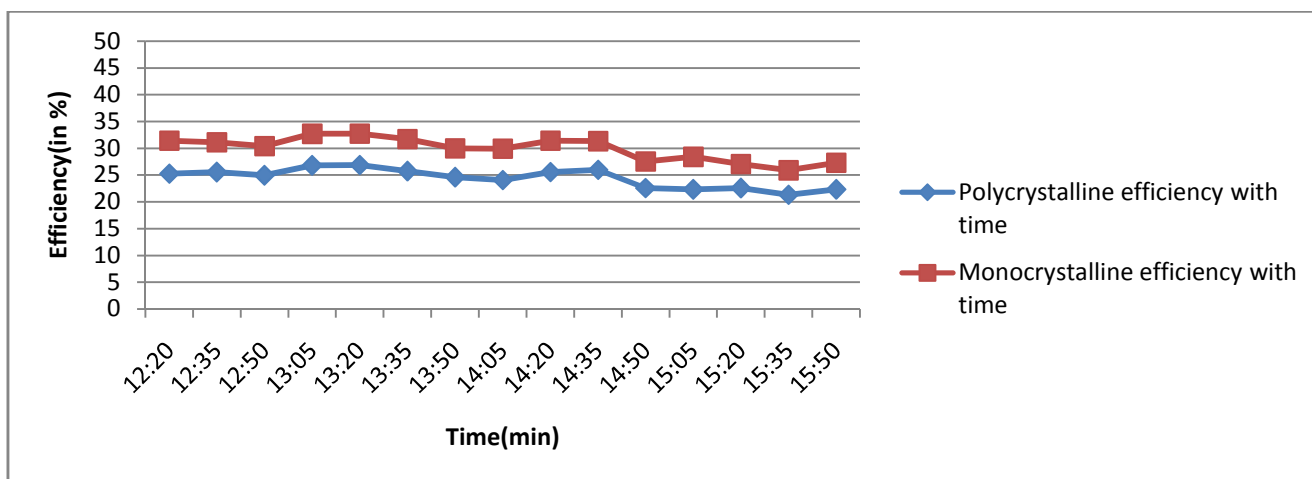
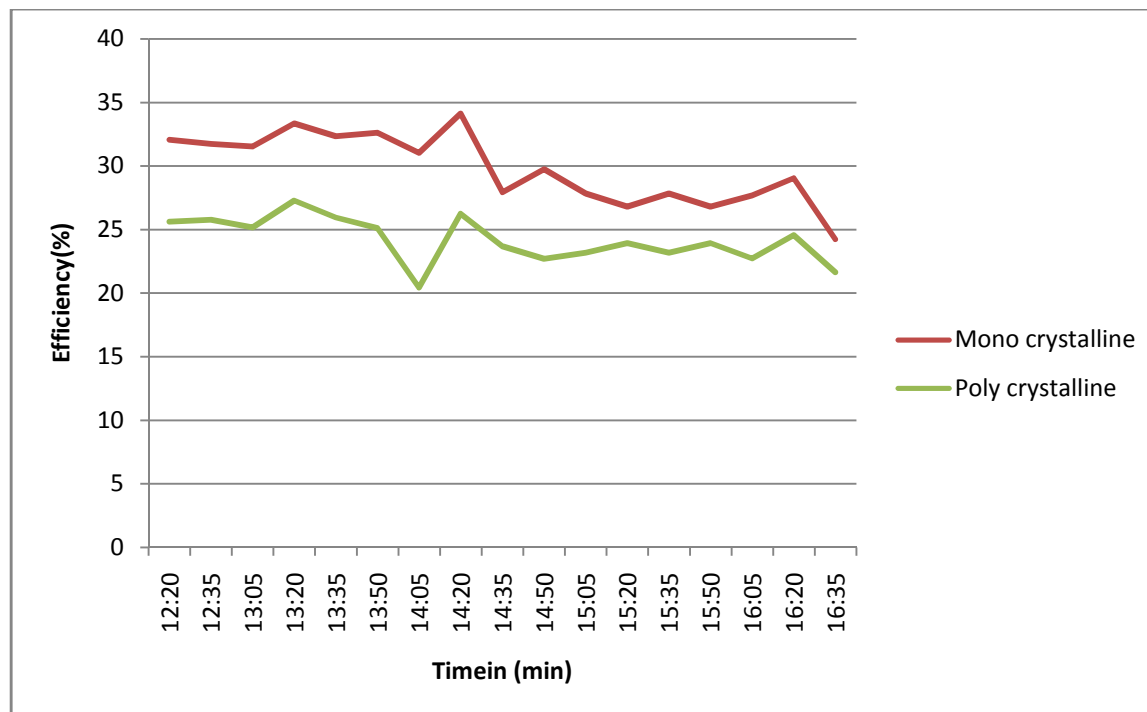


Fig 1: Variation of efficiency with respect to time without optical fiber

Table 2: Observation of solar panel with optical fiber

TIME	RADIATION (watt/m ²)	MONOCRYSTALLINE				POLYCRYSTALLINE			
		V(volt)	I(amp)	P(watt)	N%	V(volt)	I(amp)	P(watt)	N%
12:20	516	42.3	0.58	24.95	32.06	1.09	21.1	27.89	25.63
12:35	508	41.2	0.59	24.308	31.73	20.7	1.10	22.77	25.77
12:50	501	40.4	0.59	23.836	31.54	20.5	1.05	21.39	25.176
13:05	475	40.5	0.59	23.896	33.35	20.5	1.10	22.39	27.29
13:20	490	40.6	0.6	24.123	33.89	20.5	1.11	22.40	27.30
13:35	507	41.2	0.60	24.72	32.33	20.8	1.11	22.88	25.95
13:50	496	40.9	0.56	22.904	32.62	20.64	1.05	21.679	25.12
14:05	487	40.7	0.56	22.792	31.03	20.7	1	20.7	24.44
14:20	460	41	1.00	41	34.12	20.8	1.01	21.008	26.26
14:35	427	40.9	0.44	17.996	27.94	20.8	0.92	19.139	23.69
14:50	402	41	.44	18.04	29.75	20.1	0.79	15.879	22.71
15:05	378	40.7	0.39	15.83	27.84	20.6	0.74	15.244	23.19
16:20	330	40.4	0.33	13.332	26.79	20.5	0.64	13.73	23.93
16:35	288	40.10	0.30	12.03	27.69	20.7	0.55	11.385	22.73
16:50	241	40.6	0.26	10.556	29.04	20.6	0.502	10.3	24.57

**Fig 2: Variation of efficiency with respect to time with optical fiber**

Advantages

- Solar energy is a clean and renewable energy source.
- Once a solar panel is installed, solar energy can be produced free of charge.
- Solar energy will last forever whereas it is estimated that the world's oil reserves will last for 30 to 40 years.
- Solar energy causes no pollution.
- Solar cells make absolutely no noise at all. On the other hand, the giant machines utilized for pumping oil are extremely noisy and therefore very impractical.

Disadvantages:

- Solar panels can be expensive to install resulting in a time-lag of many years for savings on energy bills to match initial investments.
- Electricity generation depends entirely on a country's exposure to sunlight; this could be limited by a country's climate.
- Solar power stations do not match the power output of similar sized conventional power stations; they can also be very expensive to build.
- Solar power is used to charge batteries so that solar powered devices can be used at night. The batteries can often be large and heavy, taking up space and needing to be replaced from time to time.

Conclusion:

The listed system is non-conventional and the way of power generation technique is also eco friendly. It has advantage that it does not utilize any external source. By using this system we will be able to reduce power crisis and load shedding. The stored electricity could satisfy the daily requirement for street lighting. We can also use it for signal system on road, tollbooth or any other useful work.

Reference:

1. G.D.Rai "Non conventional energy source" Khanna publication.
2. D.P. Kothari, K.C. singal, Rakesh Ranjan "Renewable energy source and emerging technology" PHI
3. www.elsevier.com/
4. Jordan general of mechanical and industrial engineering
5. H.M. "characteristics of solar panel" Energy, vol.24, no.2, 1999, 85-92
6. R.Kawamura, K.sasatni, T.Onizuka "solid energy matter"