

Solar Tracking System

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Abstract:- Solar tracking system is unconventional method of producing electricity from solar energy in contemporary times. Today there are multiple sources of energy production, most of which are non-renewable and hazardous to the environment. Thus, this system is an attempt to eradicate the use of such methods and use effective method for eco-friendly energy production from sun by continuously tracking its motion.

Keywords:- Green-Energy, Electricity, Eco-Friendly, Solar, Renewable, Tracking.

I. INTRODUCTION

In today's era of modernization, when the world is ameliorating at good pace, technologies must walk hand in hand with the requirements of science and humanity. We have limited sources of energy production. India uses almost majorly coal for electricity production. [Nearly 32,285 MW coal and gas based thermal power projects are under construction as on 1 April 2021] [5]. And with a nation of such vast population, the needs of electricity cannot be compromised. But with current methods of energy production, it is severely affecting the environment with the residual pollution it creates, not only the pollution but it results into depletion of natural resources such as coal, water, uranium etc. The need of solar energy cannot be overlooked. Thus, this system is best alternative for the production of green electricity.

Solar panel tracking system is used to effectively produce solar electricity by absorbing maximum amount of sunlight. As we are aware that the sun gradually keeps changing its position thus, altering the intensity of light falling on stationary solar plates. Through solar panel tracking system we attempt to eliminate this drawback from the conventional solar systems. With this updated version of solar plates, one can ensure the efficient production of electricity in the intense sunlight period, which otherwise is confined due to improper absorption of sunlight.

The system consists of basic equipment available at ease (mentioned above), and thus ensuring cost-effectivity of the model.

As, the sun changes its position the solar panel will accordingly adjust itself, such feature is absent in conventional solar panels. The importance of such system is therefore axiomatic.

Further, the energy produced can be used for multiple application. But our prime focus would on storing the

produced energy and utilizing it in railway tunnels and road tunnels as a source of light.

This will not only improve the electricity but also decrement in need of other resources for mass energy production, such as coal etc. We have implemented such system on a microscopic level, on the upsurge of massive solar panels with tracking systems embedded in them, the energy production from sun will meet drastic difference both in amount and efficiency of electricity.

II. COMPONENTS USED

➤ *Arduino Uno :*

Arduino uno board is used for the control and manipulation of system components interlinked to one another.

➤ *LDR :*

Light Dependent Resistors are used to detect the variation in intensity of solar radiation. As per the intensity it aids to decide upon the direction of rotation of the motor.

➤ *Servo Motor :*

S095 Servo Motor is used to rotate the solar panel in 180 degrees of direction directed through LDR.

➤ *Solar Panel :*

12V, 100mA Solar panel is used in order to produce electricity from solar radiation. The panel is able to generate 1.34A of current in 12-hour duration.

➤ *Jumper Wires :*

Used to connect the components with each other and to create a working circuit.

➤ *Wooden Base :*

It is used as a stand and base for the solar panel system.

➤ *6A Battery :*

It is used to store the electricity generated by the solar panel.

III. FEATURES



Fig 1 Working Model of Solar Tracking System

- Built with Minimum of Components.
- Works Successfully with all Functioning Intact and Fine.
- Able to Produce Electricity in Small Quantities from Solar Radiation.
- Resolves the Problem of Energy Loss Due to Improper Absorption
- Works Even in Low Intensity.
- Satisfy Smaller Electricity Needs at Macroscopic Level.

IV. LITERATURE REVIEW

- *Implementation of Solar Tracker using Arduino P.Ramya, R.Anantha M.E, (Ph.D)*

The authors have created a solar tracking system which runs on the principle of LDR sensing solar panel movements. It is a vertical axis solar tracking system used to generate electricity.

This research conducted by authors uses basic equipment's for successful implementation of the tracker. They have used components such as LDR, Motor, solar panel etc.

- *Solar Tracking System- A Review, Suneetha Racharla, K.Rajan.*

There are different types of solar tracking systems and accordingly different sets of uses and efficiencies as per the architecture. Author introduces us to multitudes of such system. And also, about the solar positioning and how angles change astronomically is both introduced in the research work. Based on the axis there are two types of solar panels, 1. Vertical axis 2. Horizontal axis. And two types of systems, single axis system and dual axis system.in which dual axis system is more efficient than the single axis system.

Authors further elaborates about the two mechanisms of rotation namely, active trackers and passive trackers.

Active trackers use components like LDR to track the motion of sun, and passive trackers uses the super condensed fluid, which evaporates on exposure of sun, and creates vapor pressure which directs the solar panel to heavy side.

- *Micro-Controller-Based Sun Tracking System, Nasir Ahmed Filfil, Deia Hallbot Mohuseen, DR. Khamis A. Zidan*

In this particular research work, emphasis is given on astronomical method of tracking the position sun during each hour, which then is loaded into microcontroller to automatically adjust the solar panels. The authors have worked out such arrangements using 3 mathematical equations to find out terms like hour angle to better understand the positioning of the sun.

Such method does not need any trackers, active or passive.

V. FLOWCHART/ METHODOLOGY

- *STEP 1: Assembling the Architecture of Model.*
- *STEP 2: Making Proper Connections of Component with Each Other and Arduino Uno Board.*
- *STEP 3: Making Connections with the Battery for Storing the Generated Electricity.*
- *STEP 4: Setting Up the Solar Tracking System in Daylight to Work.*
- *STEP 5: Storing the Electricity Produced into Batteries and Utilizing it in the Required Places. (Roadways and Railways Tunnels)*
- *Circuit Diagram :*

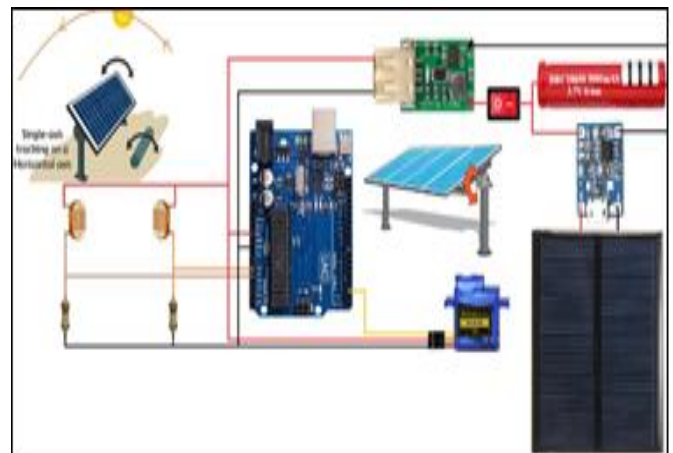


Fig 2 Circuit Diagram

VI. RESULTS AND DISCUSSIONS

Time	Charging Rate (A)
06:00	0.02
07:00	0.1
08:00	0.18
09:00	0.19
10:00	0.09
11:00	0.07
12:00	0.2
13:00	0.16
14:00	0.12
15:00	0.09
16:00	0.06
17:00	0.04
18:00	0.02

Fig 3 Showing the Charging Rate of 6A Battery Per Hour with Solar Tracking System.

- Charge (in Ah) = Current (in amperes) x Time (in hours)
- Charge = 0.02 + 0.1 + 0.18 + 0.19 + 0.09 + 0.07 + 0.2 + 0.16 + 0.12 + 0.09 + 0.06 + 0.04 + 0.02 = 1.34 A

Time	Current Generated (A)
6 am	0.1A
7 am	0.1A
8 am	0.1A
9 am	0.1A
10 am	0.1A
11 am	0.1A
12 pm	0.1A
1 pm	0.1A
2 pm	0.1A
3 pm	0.1A
4 pm	0.1A
5 pm	0.1A
6 pm	0.1A

Fig 4 Showing the Charging rate of 6A Battery with Static Solar Panel

- Charge (in Ah) = Current (in amperes) x Time (in hours)
- Charge = 0.1 A x 12 hours Charge = 1.2 ampere-hours
- Therefore, the overall data generated by the static solar panel in this scenario is 1.2 ampere-hours.
- To calculate the efficiency difference between two,
- Percentage Difference = $[(1.34 A - 1.2 A) / 1.34 A] * 100$
Percentage Difference = $[0.14 A / 1.34 A] * 100$
Percentage Difference = 10.45%
- From the results above we can convey that the energy produced by the solar tracking system is 10.45% more than the energy produced by static solar panel.
- The efficiency of solar tracking system becomes axiomatic.

VII. CONCLUSION

As we are aware, energy is driving force behind progress and development of humankind, thus there is a need of better and effective way. By storing the energy and utilizing it in tunnels where light source is mandatory 24 x 7.

While ensuring the need of solar tracking system in day-to-day life and to compromise the inefficiencies of conventional system, this model is a must alternative.

Thus, we increased the absorption of solar radiation and consequently, energy generation which in previous system was way much lesser as the data suggests.

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