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Remote Gsm Monitoring Dual Axis Solar Tracking with Cleaning Mechanism

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ABSTRACT

As the requirement of electricity is increasing, the sources are rapidly decreasing in the environment. As a result, renewable resources are playing vital role in replacing the sources. The solar energy is one of the best energys which can be used as renewable resources. This paper represents a dual axis solar tracker system, its construction includes – sensors, motors, integrated electric biaxial system and the GSM which will report the fault notice automatically. It's a fusion to locate the sun and keep a constant track of it continuously. The dust gets accumulated on the module which automatically reduces the efficiency of the module. In order to maintain it efficiency the regular cleaning of the module is necessary.

Keywords : DC motors, GSM, LDR, microcontroller, servo motor, solar module.

I. INTRODUCTION

A renewable resource is a resource which can be reused and replaced naturally. Renewable energy almost never run out for example solar energy is powered by heat from the sun likewise tidal energy and wind energy.

In last ten years, many residential areas and commercial building around the world used electrical solar system as a backup power. The solar energy is derived from the sun in the form of radiation. It is also an unlimited energy resource which is going to become increasingly important in next few years.
In order to utilize the superiority of solar energy the solar tracker was constructed. The solar tracker is use to track the light throughout the day using light sensors. The only way to increase the efficiency of the module is to increase the intensity of light falling on it and by keeping the module aligned with the sun position. But according to environmental conditions where with time dust gets accumulated on solar module it decreases its efficiency. The periodic cleaning of the module is very necessary in order to maintain the efficiency. The cleaning can be done by two ways by manual cleaning and automatic cleaning. But manual cleaning may include life risk so the automatic cleaning is mostly preferred and it also reduces human work. Regular monitoring of module is not possible every time so by implementing the GSM it gives real time monitoring of module.

II. DISCRIPTION

A. Solar module

The solar module is an assembly of photo-voltaic cells mounted on a frame work for installation. Photo-voltaic cells directly generate electricity by using sunlight as a source as energy. In this project the panel used of rating 20watts, 12volts and 1.4amps.

B. Servo motor

Servo motor is one of the various types of DC motor. It is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. Servo motor only rotates by the maximum of 180 degrees. In this project the servo motor used of rating is 2Kg/Nm.

C. DC Motor

A DC motor is a rotary electrical motor that convert electrical energy to mechanical energy. This single-phase motor operates on Flemings hand rule. In this project two motors are used of same rating 12volt, 500mA. One is for cleaning and another for module rotation.

D. Light detecting resistor

Light dependent resistor is a type of variable resistor whose resistance decreases with increase in intensity of light. In this project two LDR are used. One for detecting the intensity of light and another for sensing necessity of cleaning.

III. Block diagram

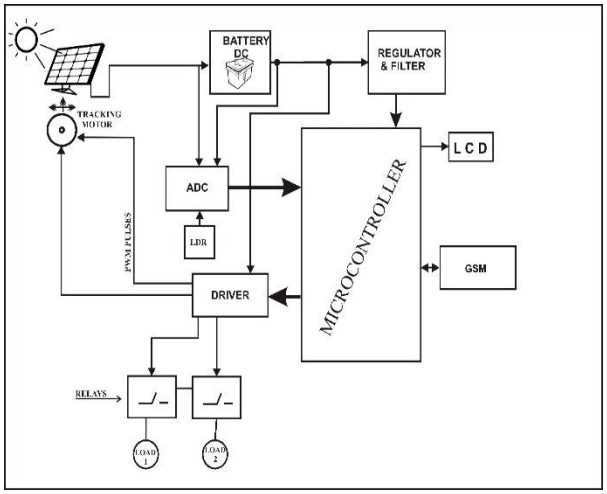

FIGURE 1 : Block diagram of remote GSM monitoring of dual axis solar tracking with cleaning mechanism

IV. Working

The working of dual axis tracker with cleaning mechanism of solar module and its GSM monitoring is explained in tree steps:

A. Tracking mechanism

The tracking mechanism is based on the rotation of earth around its own axis and angle associated with the sun. The system is always in synchronization with the rotation of the earth throughout the day from the time of sunrises to sunset. The sun light falls on the solar module LDR sense the intensity of light and adjust the solar module in such a way that it is always aligned to sun's position. The position of the module changes throughout the day in order to track the maximum intensity of light. After the sunset the module is again brought back to its original position by using limit switch.

B. Cleaning mechanism

The cleaning mechanism is based on the amount of dust accumulated on the module. As the dust gets accumulated on the module, it reduces the intensity of the light falling on the module. As the intensity of the light reduces LDR will sense it and as a result, it will send a signal to the motor and it will start the cleaning through the wiper placed on the module. And hence, module will get the required amount of intensity of the light.

C. Monitoring mechanism

Monitoring mechanism is done by GSM monitoring, which includes all the parameters that is required to be monitored. This helps to get the required information about the module in real time monitoring. The parameters to be monitored are as follows -

a. Voltage
b. Intensity of light
c. Battery charging percentage

V. Experimental setup

Table.1 shows the current and voltage value received from both the static and tracking panel for different times in a day. From the table it is seen that at 9:00am there is much improvement in current by tracking panel compared to the static panel. But as time passes on this difference in current these two technologies decrease up to 1:00pm. As the sun moves towards west this difference increases again. But in case of voltage the variation is lesser as compared with current, as the voltage has no direct relation with sunlight intensity.

TABLE1: Current and voltage values of static and tracking panel at different times in a day

Time	Static panel		Tracking panel	
	Current (ampere)	Voltage (volts)	Current (ampere)	Voltage (volts)
9:00 am	0.20	10.3	0.27	10.9
11:00 am	0.23	10.8	0.30	11.3
12:00 pm	0.29	11.5	0.35	11.8
1:00 pm	0.26	11.2	0.31	11.6
3:00 pm	0.16	10.9	0.26	10.7
5:00 pm	0.12	6.7	0.14	6.8

Table 2 shows the power value of both the static and tracking panel. The maximum power output of tracking panel is increased as compared to the static panel. More amount power gain is achieved during the morning and afternoon because the tracking system can accurately track the sun's position while the static system not.

TABLE 2: Power values of both static and tracking panel

Time	Static panel power	Tracking panel power	Power gained by tracking panel (%)
9:00 am	2.4	3.34	34.45
11:00am	2.8	3.57	27.32
12:00pm	3.2	4.02	25.65
1:00pm	3.17	3.54	19.34
3:00pm	2	2.15	39.02
5:00pm	0.68	0.8	25.80

VI. Conclusion

In this paper of sun tracking with cleaning mechanism and GSM monitoring of module is presented where solar module move 180^{o} in a day. It is observed that the energy generation in dual axis solar tracking is increased much high than the flat module. It consists of a wiper which slides over a module and clean it, which increases the intensity of light falling on the module by 15-20% in case of tracking-cum-cleaning.

For industrial need, this tracking-cum-cleaning is most suitable also the real time monitoring. Real time monitoring is necessary so as that we can get all the required parameters also detects the fault if any. In industry, the panel setup is at a distinct distance and it is nearly impossible to reach all of the modules in time.

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