TWIN ALIGNMENT MAXIMUM POWER MAKING IN SOLAR PANEL

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Abstract— The main objective of our project is to design and fabricate a dual axis solar tracking system. Solar panels are one of the useful innovations in converting the sunrays falling on it into useful electrical energy. But the greatest disadvantages are that this panel once installed, cannot be tilted. Hence the amount of sunrays falling on it will be maximum for a certain time and minimum after the certain time. Hence this project is built in an idea of eliminating this disadvantage so that the sunrays are falling on the panel all the time and the power generation is maximum throughout the day. Simple components such as the motor, spur gear, lead screw etc. are used in the fabrication of this project. The low cost of the project makes the project more feasible and hence can be installed in almost all places and the power generation can be done. The amount of power generated depends upon the rate of sunrays falling on it and the capacity of the panel. The parts of our project are designed in the Creo software and are assembled and is fabrication part is carried out.

Keywords— Twin alignment system, Solar panel

1. INTRODUCTION

The world population is increasing day by day and the demand for energy is increasing accordingly. Oil and coal is the main source of energy nowadays, and is expected to end up from the world during the recent century which explores a serious problem in providing the humanity with an affordable and reliable source of energy. The need of the hour is renewable energy resources with cheap running costs. Solar energy is considered as one of the main energy resources in warm countries.

In general, India has a relatively long sunny day for more than ten months and partly cloudy sky for most of the days of the rest two months. This makes our country, especially the desert sides in the west, which include Rajasthan, Gujarat, Madhya Pradesh etc. very rich is solar energy. Many projects have been done on using photovoltaic cells in collecting solar radiation and converting it into electrical energy but most of these projects did not take into account the difference of the sun angle of incidence by installing the panels in a fixed orientation which influences very highly the solar energy collected by the panel.

As we know that the angle of inclination ranges between -90° after sun rise and +90° before sun set passing with 0° at noon. This makes the collected solar radiation to be 0% at sun rise and sun set and 100% at noon. This variation of solar radiations collection leads the photovoltaic panel to lose more than 40% of the collected energy.

In the last few decades world has seen a boom in renewable energy systems because of depleting resources of fossil fuels. The depleting sources of fossil fuels have caused world to pay attention to renewable energy systems. Global energy demand will almost triple in next three decades. Depleting fossil fuels will be able to provide energy only for next two centuries. Solar energy is one of promising resource for tomorrow's energy. Fortunately, Pakistan lies in such region of world where solar energy is abundant and sunlight is present almost thought the year. It can be seen that in Pakistan yearly sum of global irradiance is quite high i.e., approximately 2000kWh/m2.

Most of the cities of Pakistan receive between 2,200 and 2,500 hours of sun . To fulfill the energy needs of a country like Pakistan there is a need to devise efficient solar systems which could capture maximum power.

2. LITERATURE REVIEW

The major components which are used to complete this project are PIC MICEOCONTROLLER FIRE SENSOR, GAS SENSOR, PIR SENSOR, GSM MODULE

A. LDR sendor

A light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. The resistance of a photoresistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photoresistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.

A photoresistor is made of a high resistance semiconductor. In the dark, a photoresistor can have a resistance as high as several megohms (MΩ), while in the light, a photoresistor can have a resistance as low as a few hundred ohms.

If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into

the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistor may react substantially differently to photons within certain wavelength bands.

B. DC motor

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule.

When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.

C. Bearing with bearing cap

Ball and roller bearings are used widely in instruments and machines in order to minimize friction and power loss. While the concept of the ball bearing dates back at least to Leonardo da Vinci, their design and manufacture has become remarkablysophisticated.

This technology was brought to its present state of perfection only after a long period of research and development. The benefits of such specialized research can be obtained when it is possible to use a standardized bearing of the proper size and type

D. Solar panel

Solar panel refers either to a photovoltaic module, a solar thermal energy panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells.

Solar panels can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.

Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output - an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module.

There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules.

A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

E. Lead-Acid wet cell

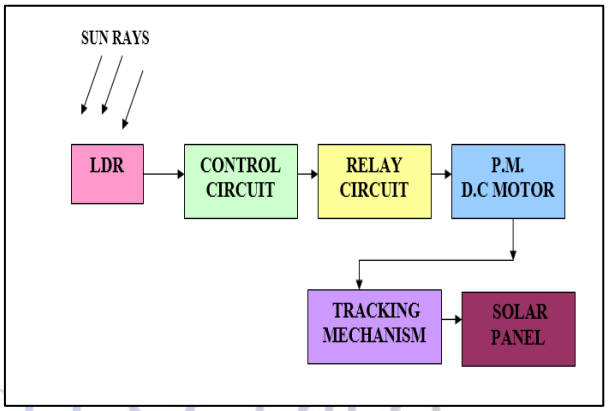
Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

F. Spur gear

The spur gears, which are designed to transmit motion and power between parallel shafts, are the most economical gears in the power transmission industry.

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with teeth projecting radially. Though the teeth are not straight-sided (but usually of special form to achieve a constant drive ratio, mainly involute but less commonly cycloidal), the edge of each tooth is straight and aligned parallel to the axis of rotation. These gears mesh together correctly only if fitted to parallel shafts.

3. BLOCK DIAGRAM



A. Block diagram description

The block diagram explains about the control structure of the solar panel in dual axis, were as the LDR defines the rotating angle of the solar panel.

4. WORKING PRINCIPLE

The block diagram for the process of dual axis solar tracking system is given above. As discussed earlier, usage of solar energy has emerged a long days back.

But they are fixed and cannot move along the direction of the sun. Hence our project deals with the fabrication of the dual axis solar tracking system.

The major components involved in this system are the solar panel, battery for storing the power, gear mechanism for tracking the sun, a permanent magnet DC motor to drive the gear mechanism (tracking system) and the frame.

Hence when the sun rays falls on the solar panel, it senses the angle of the sun and sends it to the control unit. Then the control unit actuates the gear mechanism according to the direction of the sun.

This gear mechanism drives the solar panel to the direction of the sun so that the maximum energy is obtained from the sun. The direction of the sun is sensed at frequent intervals.

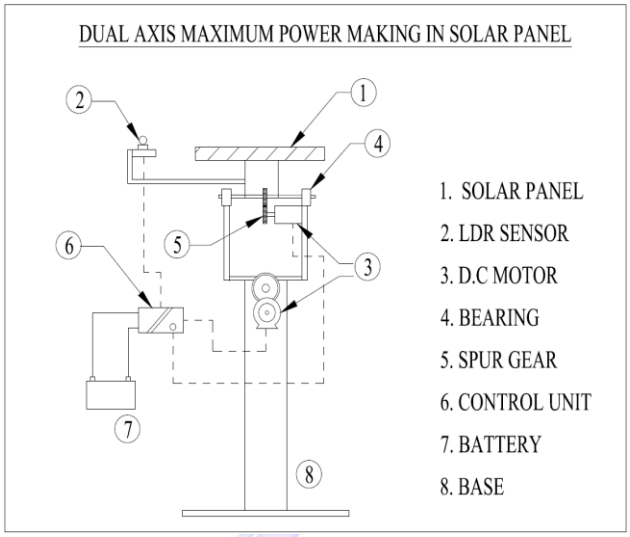
The DC motor drives the gear mechanism which in turn drives the solar panel so that the panel faces the sun

straight-to-straight and uses the maximum energy from the sun all day.

Also there is a lead screw operated by another DC motor for tracking the solar power in another axis.

Hence according to the sun's direction, the control unit receives signals from the LDR sensors and the control unit actuates the corresponding motors so that the spur gears or the lead screw are actuated in order to track the solar power throughout the day.

5. FABRICATION FIGURE



6. HARDWARE DESCRIPTION

D.C MOTOR

- ✓ VOLT: 12V D.C
- ✓ WATTS: 90W
- ✓ RPM: 60 RPM

BATTERY

- Material : Lead-Acid Free maintenance Battery
- Output Voltage : 12 V D.C
- Output Power : 40 Ampere-Hour

BEARING

- SIZE : 20 X 45 X 12 MM

MATERIAL: STEEL

7. RESULT AND DISCUSSION

The energy produces from the sunlight is fully utilized during sunrise and sunset. With the help of these techniques the power generation will be in higher level than the single axis production.

8. CONCLUSION

This paper presents a simple concept to produce more electrical energy with the help of sunlight that to this is an basic concept from the natural resource sun flower, but this concept will improve the production rate of electrical energy.

At the best it can improve minimum of 30% of normal production. The entire processes is based on reliable components and which is at affordable cost to implement it in all the existing solar power production areas.

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