IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

A REVIEW: COMPARISON BETWEEN FIXED AND DUAL AXIS SOLAR TRACKING SYSTEM

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Abstract

Electric power has become a basic need in today's life. Due to the usage of abundant power, there is a need to search for an alternate energy source. Solar energy is one such reliable source. Photovoltaic panels are used to collect solar energy and convert it into electrical energy. But these photovoltaic panels are inefficient as they are fixed only at a particular angle. This inefficiency can be decreased by designing a solar tracker system which changes its position automatically in accordance with the sun's movement. This paper presents the comparison of single axis solar tracking system and dual axis solar tracking system with the fixed mount solar system. This paper presents the design & development of bi-directional solar tracking system. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun .Due to the atmosphere the sun energy is not as great in the morning and evening compared to noontime, which initiated the development of solar tracker.

Index Terms: *ARM processor, sensors, Solar Tracking Counter, Solar panel, DC Servomotor*

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1. INTRODUCTION

Solar Panels are a form of active solar power, a term that describes how solar panels make use of the sun's energy; solar panels harvest sunlight and actively convert it to electricity. Solar Cells, or photovoltaic cells, are arranged in a grid-like pattern on the surface of the solar panel. Solar panels are typically constructed with crystalline silicon, which is used in other industries (such as the microprocessor industry), and the more expensive gallium arsenide, which is produced exclusively for use in photovoltaic (solar) cells.

When the sun rays are incident on the solar cell, due to the photovoltaic effect, light energy from the sun is used to convert it to electrical energy. The solar panels can be mounted as a fixed type or used as a tracker type. In the fixed type, the solar panel is mounted on the surface of the roof or ground irrespective of sun's direction at a particular angle. In single and dual axis solar tracking type the solar panel moves according to the movement of the sun. In the first paper, Asmarashid Ponniran[1] experimentally verifies the efficiency and electrical energy output of single axis solar tracking panel with fixed mount. In the second paper, M. Serhan [2] proves that dual axis tracking system has higher efficiency When compared to the fixed mount.

Table-1: Fixed Vs Dual-Axis

HOUR	POWER FOR FIXED MOUNT (mW)	POWER FOR DUAL AXIS (mW)
7.00	14.75	38
800	23.987	49.72
900	43.876	52.70
1000	47.94	54.95
1100	52	52.97
1200	57.66	59.61
1300	57.96	58.04
1400	56.41	56.56
1500	54.68	55.31
1600	48.17	54.85
1700	36.96	52.36
1800	27.72	52.66
1900	12.69	33.22

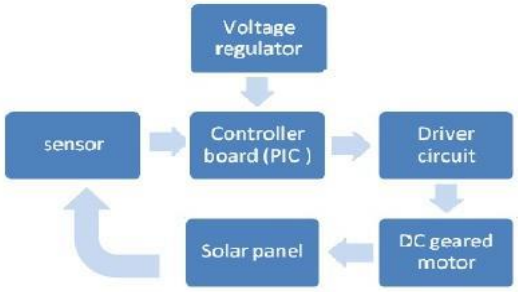

Fig-1: Block Diagram of Single Axis Tracker System

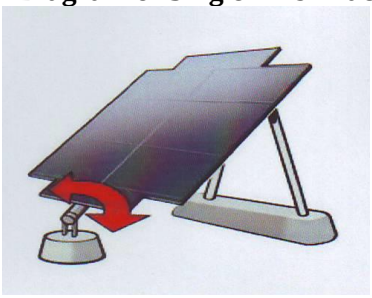

Fig-2: Single axis solar tracker

Fig. 3: Passive tracker

3.LITERATURE REVIEW

1] "Mostefa Ghassoul et all",' Design, construction and testing of a cost effective intelligent sun tracking system to extract maximum solar energy' describes in his paper design, construction and testing of a cost effective intelligent sun
tracking system to extract maximum solar energy.It is designed to be driven by a
microchip PIC 18F452 micro controller. The system is based on two mechanisms.
The first one is the search mechanism (PILOT) which locates the position of the
sun. The second mechanism (intelligent PANELS) aligns itself with the PILOT
only if maximum energy possible could be extracted**.**[1]

2] "Robert H. Dold et all ", 'Two axis solar tracker capable of withstanding the extreme weather conditions'describes
the solar tracker includes a solar array, a frame, a base, a pivot frame, and a first and second actuator. The solar array is mounted to the frame and captures sunlight. The base is pivotally connected to the frame and defines a pivot axis for elevational movement of the solar array. The pivot frame is also pivotally connected to the frame and defines a pivot axis for azimuthal movement of the solar array. The base is pivotally connected to the frame and defines a pivot axis for elevational movement of the solar array. The pivot frame is also pivotally connected to the frame and defines a pivot axis for azimuthal movement of the solar array. The first actuator controls elevational movement of the solar array and the second actuator controls azimuthal movement of the solar array.The solar tracker is pivotable between a raised position and a stowed position [2]

3]"William F Taylor et all ", 'Conventional solar tracker employing controllable moveable solar panels'describes a conventional solar tracker employing controllable moveable solar panels to expose them continuously to the path of the sun both throughout the day and throughout the year. For example, reference may be made to U.S. Pat. No. 6,058,930. The system may comprise of a solar panel array assembly having at least two attachments, a support anchor assembly for attaching to a surface and having at least two attachments, and a support structure including a plurality of elongated support rods for securing the array assembly above the support anchor assembly. Each support rod may be attached at one end to one of the attachments of the solar panel array and attached at the other end to one of the
attachments of the support anchor assembly[3]

4] "Tiberiu Tudorache et all ",' the performance of a single axis solar tracking PV panel' Discussed the performance of a single axis solar tracking PV panel designed and executed by University Politehnica of Bucharest in cooperation with Techno soft International SRL.The performance of the equipment was experimentally tested in comparison with a fixed PV panel.This paper deals with the performance estimation of a solar tracking PV panel of single axis type. [4]

5] "Bhavesh Pandey et all "**, '**Programmable system on chip device to control a small model of solar tracker' discusses a system using a system on chip device to control a small model of solar tracker.
Voltage across the solar panel and a photo resistor is fed as an input to the PSoC (Programmable System on Chip) to be processed and the output is fed to the
geared DC motor.One microcontroller can be used to control many solar panels; only correct information needs to be sent. Efficiency is increased almost by a factor of 2.[5]

6] "L. Kancevica et al" , (2012)**,** Renewable Energy and Energy Efficiency, Vol. 2012, noted that a cause of sun tracking device, solar radiation were continuously striking perpendicular on the flat plate collector, which ultimately produced average 1.4 times more heat energy in comparison with stationary collector of the same size.**[**6**]**

4. DISCUSSION

Maximum current can be obtained from solar panel. Solar trackers are devices used to orient photovoltaic panels, reflectors, lenses or other optical devices towards the sun. Since the sun's position in the sky changes with the seasons and the time of day, trackers are used to align the collection system to maximize energy production. Test showed that power used by tracker system is less than the power gain by tracking the sun accurately. The most important conclusion of this research, is the total cost of construction of the tracker system is very low. This means the system can be mass produced at lower cost and at affordable rate by many communities in the developing countries.
we have come to a conclusion that both single-axis and dual-axis are highly efficient in terms of the electrical energy output when compared to the fixed mount system. Dual-axis tracking system works well even during cloudy days when compared with single-axis tracker. Hence the efficiency of dual-axis tracker system is higher when compared with single-axis tracker system. Even though the hardware complexity is higher

in the Dual axis tracker when compared with fixed and single tracker it provides a higher efficiency and it is also cost effective.

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