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Design and Development of Dual Axis Solar Tracking System

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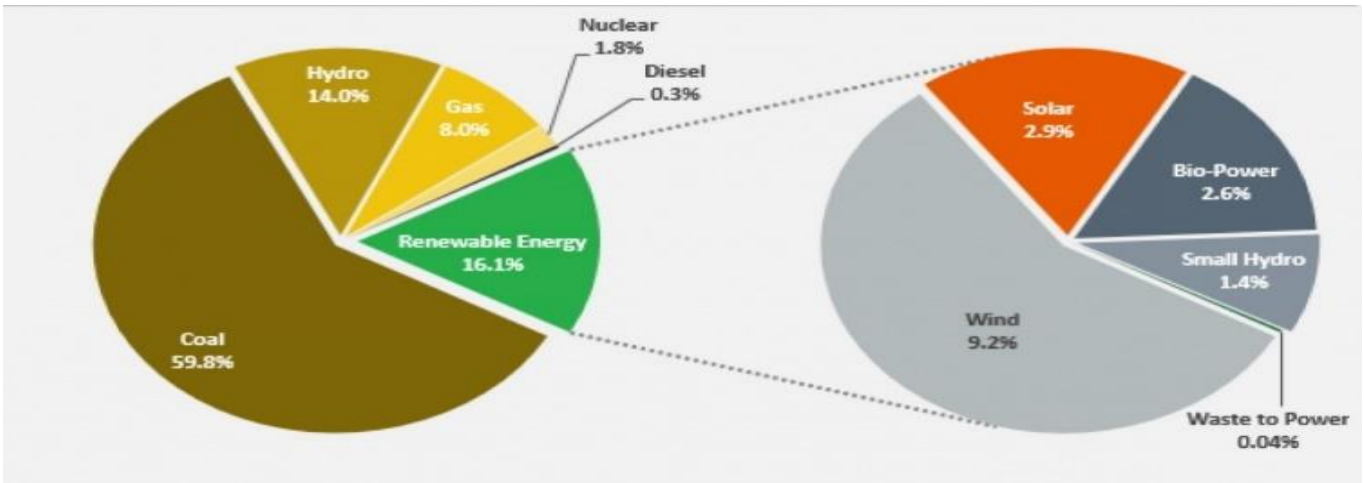
Abstract: The producing the power from the utilization of fossil fuels is the biggest challenge for the next half century. To overcome the problem of producing energy from fossil fuels is done with help of converting solar energy into electrical energy using photovoltaic panels. This is Best and Simplest way to getting power from renewable sources. There are different ways to produce power from sun radiation and most efficient, simplest way is solar tracking devices. There is different type of solar tracking devices like Fixed Solar Tracking System, Single axis solar tracking system and Dual axis solar tracking system. From the research papers and Comparison study of this different system, we conclude that Dual Axis Solar Tracking System has more efficiency than other two.

Dual axis solar tracker can simultaneously track sun's radiation in both horizontal and vertical axis. They use the same principle as the mountings of astronomical telescopes. To achieve maximum efficiency, PV panels is always perpendicular to the Sun rays. This work done with help of hardware like DC motors, Gears, bearing, PV panels, connecting wires etc. and work of software is to tracking position of Sun with direct relations between Earth-Sun geometry. That is why Dual Axis Solar Tracking System gives Maximum output than other two system.

INTRODUCTION

Due to increasing population the demand of people also increasing day by day and due to this energy consumption also increase. Because of more demand of energy requirement of Fossil fuels Also increase and in last few years there is shortage of fossil fuels and in upcoming 10years some of fossil fuels will be finished. To overcome this problem, we must use alternative energy like Renewable energy for example Solar energy, Biomass Energy, wind energy. Renewable energy is inexhaustible means no harmful emissions like fossil fuel. Renewable energy is green energy.

From renewable energy India Generate 16.1% of energy and contribution in generation of electricity in renewable energy is most of wind energy that is 9.2% and from solar energy 2.9%, bio-Power 2.6% and from small hydro plant 1.4% from all these energies we work on maximum utilization of solar energy. This is done by with help of solar tracking system like Dual Axis Solar Tracking System. According to research and calculation we conclude that Dual Axis Solar Tracking system is most efficient than other systems like Fixed Tracking System and Single Axis System



LITERATURE REVIEW

We looked at several research papers related to the Design of Dual Axis Solar Tracking system. We analyzed these research papers based on common Subject. We identified a few fields such as tracking system, electricity generation from solar radiations and collect output from this like power produce from tracking systems, algorithm of design for collection of data sets, Algorithms used for Arduino UN

The authors in [1] have examined 30 Journal Papers from most recent Publication for this project and carefully analyzing the most relevant findings. They design dual axis Solar tracking system with the help of Wheatstone bridge circuit, this is unique equipment among the design. From reading of 'I-V' and 'P-V' graphs, they found that output power of PV panel using dual axis solar tracker for single axis is greater higher than fixed solar tracker. This Solar tracking system is cost-effective and very simple.

The author in [2] introduced main objective of tracking system and is to prove that dual axis Solar tracker is more efficient than fixed solar tracker in utilizing Maximum amount of Solar energy. According to Calculation dual axis solar tracking system utilize 37.76% of more energy than fixed solar tracker. They done research not only with tracking mechanism but also with helps of LDRs and unique design consisting with gear, bearing, timing belt, optimum rated Servo motors & Metal frame which all together made it possible.

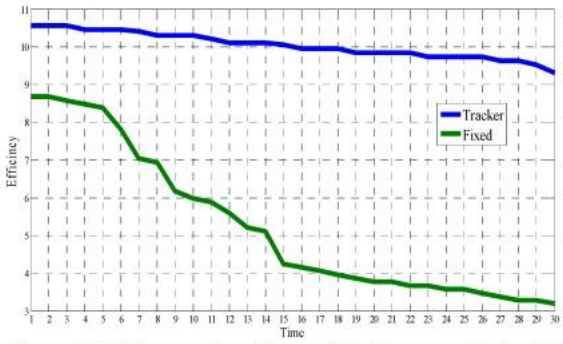


Figure 5:Efficiency of tracking and fixed systems during 30 minutes

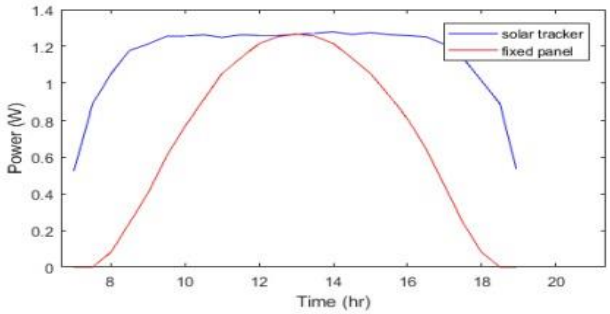
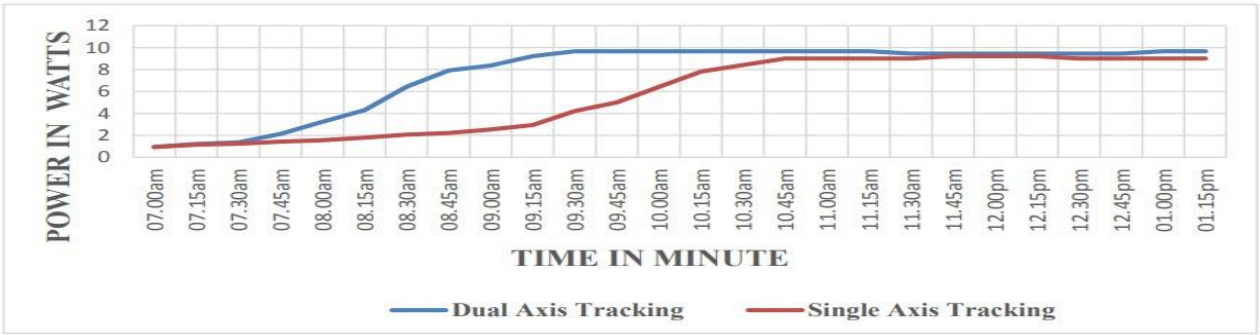


Figure – Comparison of output power between solar and fixed panel

In [3], authors represents both single & dual axis solar tracker system. Microcontroller based dual axis solar tracker was designed and LDRs used as sensor to calculate Intensity of light. According to comparison between computational result both single and dual axis solar tracker system, Dual axis is 25%. More efficient than single axis tracker. the main motive of this paper is comparison study of single axis solar tracker system and dual axis solar tracker system.



In [4], The main objective of this paper to design Solar tracker system with very precision. Project is divided into two Parts, Hardware & Software. Hardware means solar panel, DC-Motors, LDRs Sensors, etc. and second part i.e., software is thinking behavior of system, how system work under different weather conditions etc. In this work of sensing position of sun is carried out in two stage primary & secondary. primary stage means sensing position of sun by direct relationship between earth-sun geometry.

The authors in [5], represents the design and construction of a self-powered automatic dual axis solar and positioning system. It can execute both front and back tracking operation without any manual help, also it can rotate 360 degrees. this design will be self-powered which will reduce extra operational cost.

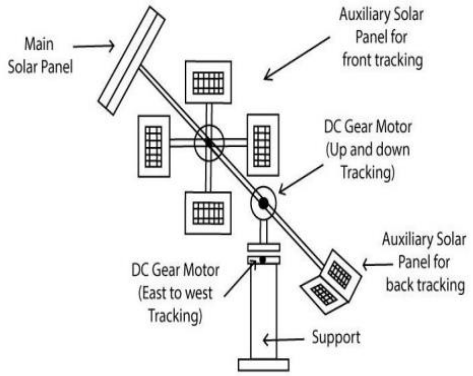
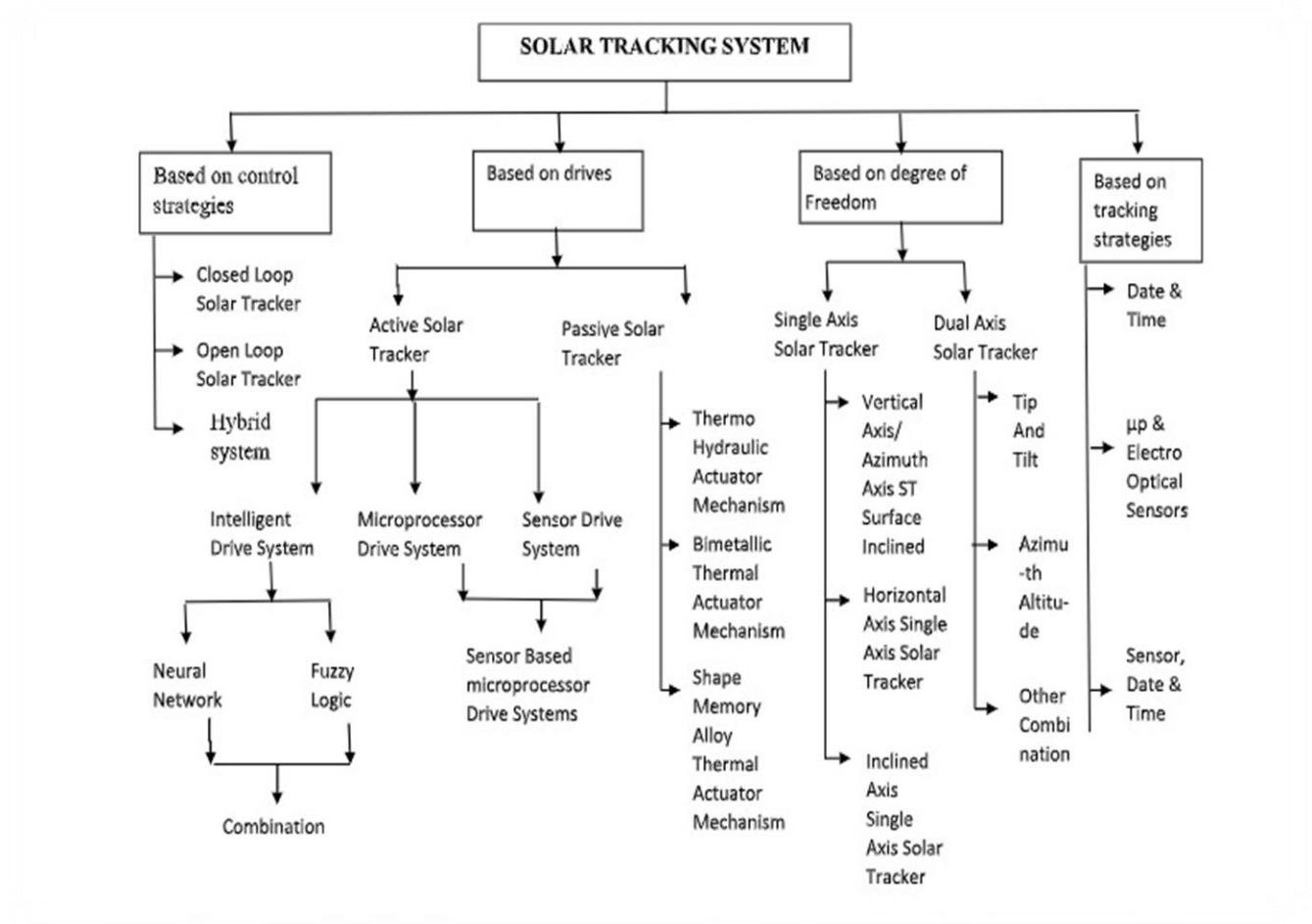


Figure - Self-powered solar tracker and positioning device construction

The authors in [6] studies the solution of two axis solar tracking system based on solar map. which can predict the exact apparent position of son by avoiding the need of sensor or guidance system. This paper is used a low microcontroller suitably programmed, to electric motor to ensure that the panel structured is always oriented towards sun.

In [7] authors said that This is Review on sun tracking technology solar PV system. Solar energy is vast & huge amount and free of cost renewable Source of energy. Due to this, today's world thinks about to Utilize this renewable energy by converting solar radiations into electrical energy using P-V cells or Solar Panels. The objective of this paper is performance analysis of different tracking systems & their efficiency, & output. from performance analysis of different Solar tracking system, we conclude that dual axis Solar tracking system is more efficient.

Types of Solar Axis tracking system



CHARACTERISTICS OF DUAL AXIS SOLAR TRACKING SYSTEM

1. **Increase Efficiency***:* Dual-axis solar tracking systems can increase the efficiency of solar panels by up to 40% as compared to fixed solar panel mounting systems.
2. **More Accurate***:* This type of tracking system can accurately position solar panels towards the sun, which means that they can capture more solar energy throughout the day
3. **Versatile***:* A dual-axis solar tracking system is ideal for locations that experience variations in the sun's angle throughout the day and year, as it allows solar panels to maintain an optimal angle towards the sun.

4. **Maintenance***:* Dual-axis solar tracking systems require more maintenance than fixed systems, as they have more moving parts that require routine inspection and maintenance.
5. **Energy Consumption***:* Dual-axis solar tracking systems consume some energy to operate the motors that drive the tracking mechanism, which means that a small portion of the energy generated by the solar panels is used to power the tracking system.
6. **High Cost***:* Dual-axis solar tracking systems are more expensive than fixed solar panel mounting systems due to the additional components required for the tracking mechanism.

Overall, a dual-axis solar tracking system is an effective way to maximize solar energy production, especially in locations with varying light angles throughout the day and year.

CONCLUSION

After studying Different Research Paper, we conclude so many things. First is to use of Renewable Source Of energy due to lack of fossil fuel, second Thing is we can utilize more energy by using solar tracker system like fixed solar tracker system, Single solar tracker System and Dual axis Solar system. Among all these system Dual Axial Solar System is most Efficient.

This Mechanism could be used in wide range of application that required solar tracking like solar dish, lens, and other PV systems.

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