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***SOLAR TRACKING SYSTEM***

***INTRODUCTION:***

**1.Design and Implementation of a Dual-Axis Solar Tracking System**

The developments in solar energy technology, brought about by the rise in the consumption of renewable energy sources, have now included solar tracking systems among the options emerging. Solar tracking systems optimize the efficiency of photovoltaic (PV) systems, which improve upon otherwise stationary fixed solar panels capable of collecting sunlight only within certain angles. These are solar trackers that enable panels to rotate with the sun, thus optimizing energy capture throughout the day.

**2. AUTOMATIC SOLAR TRACKER SYSTEM**

The search for sustainable energy sources has recently intensified by the need to reduce dependency on fossil fuels and, thus, mitigate climate change impacts. Solar energy, being one of the most abundant resources available and renewable, has received a lot of attention as getting a good substitute for fossil fuels. However, the effectiveness of solar energy systems is influenced considerably by the alignment of solar panels in relation to the position of the sun.

**3.Solar Tracker System for PV Power Plants**

With the exponential increase in demand for renewable energy across the globe, improvement of the efficiency of photovoltaic (PV) systems has become a key object of research among scientists and engineers. Among the most abundant and sustainable resources available on the planet, solar energy, with its immense potential to reduce emissions and enhance energy independence

**4.A Review of Solar Tracking Systems: ASolar Following Technique**

Renewable energy is gaining importance globally, and solar energy has become paramount when compared to pivoting its clean and sustainable credentials environment against fossil fuel energy. Due to its clean attributes and capacity to mitigate emissions, solar energy harvesting has gained favor in applications. Solar energy systems' efficacies are perceived to be far more solar-dependant. The sun itself has a variable location in the sky during the day and from season to season. Even though such fixed solar panels are economical and simple to install, such panel installations fail to harness the full amount of sunlight that could, therefore, create more energy as the sun's position changes.

**5.Design and Development of an Automatic Solar Tracker**

Solar tracking mechanism is playing an immensely relevant role in the capture of solar energy, thereby alleviating the energy crisis rampant through developing nations in which energy requirement is rising exponentially. By orienting itself to the rays of the sun from morning till night, a solar tracking system can enhance energy generation AT LEAST BY 40% comparison TO STATIONARY solar panel.

***LITERATURE REVIEW:***

**1.Design and Implementation of a Dual-Axis Solar Tracking System**

This study outlines the development, execution, and assessment of a novel dual-axis solar tracker featuring photoelectric sensors, simple mechanics, and stepper motor drives. It autonomously rotates the solar panel using PID control that incorporates photoresistors to maintain maximum sunlight exposure optimally throughout the day. Analytical and experimental comparisons with a fixed-tilt panel reveal that the advanced tracker outperforms the fixed panel by approximately 24.6% during real-world testing and 26.7% in theoretical models, substantiating claimed energy benefits always. While an initial investment is required, increased energy yield allows the system fully optimized for small- to medium-scale photovoltaic systems within a 1.4- year recovery period.

**2.AUTOMATIC SOLAR TRACKER SYSTEM**

An Automatic Solar Tracking System (ASTS) is proposed in the paper that aims to optimize the collection of solar energy by keeping a solar panel perpendicular to the sun all the time, which increases the effectiveness of the panel by 25 to 30 percent when compared to stationary panels. The system has a microcontroller (AT89C52), LDRs, stepper motors, and employs light dependant resistors to supply control feedback from the sunlight intensity to adjust the panel's position. It can be operated manually or automatically with control given through an LCD/keypad or GUI software run on a computer. The ASTS comes equipped with reliable operation fault detection for day and night which checks for failure during varying day conditions. This system has great adaptability for larger solar energy collecting systems but his high initial cost and reduced performance in cloudy and rainy weather reduces appeal.

**3.Solar Tracker System for PV Power Plants**

The solar tracking system suggested here seeks to improve the productivity of photovoltaic (PV) panels by adjusting the angle of the panel so that the maximum energy output can be achieved. It has a 24V DC motor that is structurally driven by IBL2403, enabling it to move freely and allow for changes in real time. Two LED powered light intensity sensors are employed to locate the sun, and the guidance provided by the difference in signal strength determines the position the panel should take to avoid movement and energy usage. The design goals are to strengthen the device’s energy efficiency and reliability while reducing expenditure, which works for small PV installations while harnessing more energy compared to the fixed panels.

**4.Review on Solar Tracking System: A Technique of Solar**

The review analyzes the effectiveness of solar tracking systems toward improving the overall efficiency of solar energy harnessing. It is unquestionable that solar energy serves as a clean and renewed resource of energy. Despite its advantages, solar energy beats the restrictions set by the location of the sun in the sky at a particular time. Fixed solar panels lose their efficiency and stop being as useful as the sun’s position alters throughout the day and the year - Solar Tracking systems (whether passive or active) enable the panels to follow the sun's path and as a result, optimize energy output by as much as 10% to 100%, depending on various factors. - Single-axis trackers Dual-axis trackers

**5. Design and Development of an Automatic Solar Tracker**

Solar tracking mechanism is a considerable part of solar energy capture in order to solve the world-wide energy shortage, especially in the developing countries. Maximising the sun’s rays all throughout daylight hours, the energy produced is increased by about 40% in comparison with panels that are immobile. They consist of detectors, algorithms, a control area, positioning components, movement systems, and sensors that collectively orient panels by the angle of the sun determined by the Earth's shape. Different types of tracking systems are used such as flat plate photovoltaic panels, concentrated photovoltaic systems, and dual-axis trackers (active or passive). Overall, solar tracking

***METHODOLOGY:***

The methodology of the study on solar tracking systems has a defined framework for assessing how these systems improve the capture of solar energy. This part describes the main procedures and research techniques that will be applied in evaluating the various types of solar tracking technologies.The **fourth research paper** methodology is most reliable and appropriate to be implemented to best possible outcome.

***REFERENCES:***

1. Green, M. A., Emery, K., Hishikawa, Y., Warta, W., & Zou, J. (2010). "Solar cell efficiency tables (version 35)." *Progress in Photovoltaics: Research and Applications*, 18(1), 1-34. doi:10.1002/pip.1045
2. Kalogirou, S. A. (2009). "Solar Energy Engineering: Processes and Systems." *Academic Press*. ISBN: 978-0-12-374501-0.
3. Hegazy, A. A., & El-Sayed, A. (2015). "Performance evaluation of solar tracking systems." *Renewable Energy*, 83, 1-10. doi:10.1016/j.renene.2015.04.014