**DESIGN AND CONSTRUCTION**

**OF**

**A SOLAR TRACKING SYSTEM**

**A PROJECT REPORT**

**Submitted by**

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**CHAPTER 1**

**INTRODUTION**

**1.1 BACKGROUND OF THE STUDY**

Solar energy is a renewable and sustainable energy source that holds great promise for addressing the world’s energy needs while reducing carbon emissions. Solar photovoltaic (PV) systems convert sunlight into electricity, but their efficiency can be significantly improved through the use of solar trackers.

A solar tracker is a device that makes use of solar panels or mirrors to track the movement of the sun throughout the day, maximizing the amount of Sunlight they receive. By continuously adjusting the position of the solar panels or mirrors to face the sun. Solar trackers ensure that the panels operate at their maximum efficiency, thus increasing the Overall energy output of the system.

The concept of solar tracking dates back to ancient times when civilizations used passive solar tracking techniques to harness solar energy for heating and cooking purposes. However, modern solar trackers are technologically advance devices that utilize advanced technology such as sensors, motors, control Systems to accurately track the sun’s movement with high precision.

**There are several type of solar tracker Including**

1. Single bois trackers

2. Dual Axis trackers

3. Concentrated Solar power (CSP)

1. Single Axis Trackers: These trackers move solar panels along one axis, typically either the east-west axis (horizontal) or The north-south axis (vertical)
2. Dual Axis Trackers: Dual axis trackers can adjust solar panels or mirrors along both the east-west and north-south axis, allowing them to accurately track the sun’s movement in all directions.
3. Concentrated solar power (CSP) trackers: CSP system use mirrors or lenses to concentrate sunlight unto a small area, typically a receiver or heat exchanger. Solar trackers are essential Components of CSP systems, as they ensure that concentrated sunlight remains focused on the receiver throughout the day, maximizing thermal efficiency

**1.2 AIM AND OBJECTIVES**

The primary aim of this research project is to design and construct a reliable, efficient solar tracking System that optimizes the orientation of photovoltaic Panels throughout the day to maximize their Solar energy capture, thereby Increasing the overall energy output and efficiency of the solar power system compared to stationary installations.

The specific objectives are to:

1. To develop and integrate automated control systems using sensors and actuators that accurately track the sun’s position from Sunrise to Sunsets
2. To systematically test and evaluate the performance of the solar tracker under various weather Conditions.
3. To assess the economic viability and environmental Impact of implementing solar trackers on a larger scale.
4. To design a robust and efficient solar tracking mechanism that can adjust the solar panels In response to the sun movement

**1.2 STATEMENT OF THE PROBLEM**

The tracking system help to solve the problem of stationary panels by tracking the movement of the sun, which can significantly improve the efficiency of solar panels , maximizing the amount of sunlight captured and converting it into electricity.

In regions with high solar variability or where the angle of sunlight changes significantly throughout the day, solar trackers can adapt panel positions to maximize energy capture, making them suitable for a wider range of geographical locations.

* 1. **RELEVANCE OF THE STUDY**

1. Solar trackers enable photovoltaic (PV) panels to remain In optimal alignment with the sun throughout the day significantly increasing their energy absorption and efficiency compared to stationary panels.
2. Solar trackers Increase the efficiency of energy capture, fewer panels may be required to produce the same amount of energy as a larger array of stationary panels
   1. **SCOPE AND LIMITATIONS**

The Scope ensure a through approach to the development of a solar tracker, from Initial design through the testing and final deployment ensuring the system meets all requirements and is built with all requirements and is built with suitable, high- quality material

The following are limitations of the project:

1. Designing the mechanical components of a solar tracker system, including the frame, mounting structure and tracking mechanism.
2. Factors such as sensor accuracy, mechanical tolerances, and control algorithm performance must be carefully calibrated to ensure that the panel remain aligned with the sun.
3. Solar tracker systems can be more expensive to Install and maintain compared to fixed-tilts systems.

**1.7 METHODOLOGY**

The methodology approach to this project work as follows

1. Review of related works by Visiting the library and Internet search.
2. Consultation with project supervisor and workshop technologist.
3. Define project objectives and requirements for the solar tracker system.