

Design and Application of a Solar Orientation Measurement System

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ABSTRACT

This paper presents a novel solar orientation measurement system based on solar cells. A methodology for calculating the solar orientation is developed in which the time and latitude angles of the sun are determined from the measured output voltages of inclined solar cells. Three types of measurement system are considered, namely a single cell type, a double cell type, and a quadrantal cell type. The relationship between the measured output voltages of the solar cells and the solar position is fully explored and documented for each measurement system. In the quadrantal measurement system, a variation in the time angle or latitude angle of the sun generates a corresponding change in the comparative output voltages of the East/West (E/W) or South/North (S/N) solar cells, respectively. By inclining the solar cells at an angle of 45 degrees, it is found that the comparative voltage ratio is sufficiently large that the time and latitude angles can be accurately predicted. The proposed measurement system provides a valuable contribution to the ongoing development of tracking systems in the solar energy technology field.

Keywords : Solar cell, Solar orientation, Solar collector

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