

ABSTRAK
PERANCANGAN *SOLAR TRACKING SYSTEM* 2X100 WP DI
LABORATORIUM REKAYASA JURUSAN TEKNIK ELEKTRO
(55 Halaman + 18 Tabel + 25 Gambar +)

Junius Andre Nurman

062230320678

Teknik Elektronika

Politeknik Negeri Sriwijaya

Permasalahan utama dalam sistem Pembangkit Listrik Tenaga Surya (PLTS) statis adalah efisiensi konversi energi yang rendah akibat posisi panel yang tidak selalu optimal terhadap arah sinar matahari. Untuk mengatasi hal tersebut, penelitian ini merancang dan mengimplementasikan *Solar Tracking System* dua panel surya berkapasitas total 200 Wp dengan mekanisme pelacakan empat arah (dua sumbu) berbasis mikrokontroler ESP32 dan sensor GY-302. Sistem ini mampu menyesuaikan sudut azimuth dan elevasi panel secara otomatis untuk memaksimalkan penyerapan radiasi matahari sepanjang hari. Proses perancangan meliputi pemilihan dan integrasi komponen utama seperti motor parabola, sensor arus ACS712, sensor tegangan, serta pemantauan data secara real-time.

Metodologi yang digunakan dalam penelitian ini mencakup eksperimen pengukuran arus, tegangan, dan daya listrik dari panel surya pada berbagai sudut kemiringan, serta validasi data terhadap teori sudut deklinasi matahari. Hasil pengujian menunjukkan bahwa sistem solar tracker mampu meningkatkan efisiensi daya hingga dibandingkan panel statis, dengan output listrik yang lebih stabil dan optimal. Penelitian ini membuktikan bahwa penerapan sistem pelacak matahari dengan pendekatan dua arah sangat potensial untuk diaplikasikan pada skala rumah tangga maupun industri kecil dalam mendukung transisi energi terbarukan.

Kata Kunci: PLTS, Solar Tracking, ESP32, Panel Surya, Efisiensi Energi.

ABSTRAK
DESIGN OF A 2X100 WP SOLAR TRACKING SYSTEM IN THE
ENGINEERING LABORATORY OF THE ELECTRICAL ENGINEERING
DEPARTMENT
(55 Page + 18 Table + 25 Picture)

Junius Andre Nurman

062230320678

Eletrical Engginering

Sriwijaya State Polytechnic'

The main problem in static Solar Power Generation (PLTS) systems is low energy conversion efficiency due to the panel position that is not always optimal to the direction of sunlight. To overcome this, this study designs and implements a Solar Tracking System of two solar panels with a total capacity of 200 Wp with a four-way (two-axis) tracking mechanism based on the ESP32 microcontroller and GY-302 sensor. This system is able to adjust the azimuth and elevation angles of the panels automatically to maximize the absorption of solar radiation throughout the day. The design process includes the selection and integration of main components such as parabolic motors, ACS712 current sensors, voltage sensors, and real-time data monitoring.

The methodology used in this study included experiments measuring the current, voltage, and electrical power of solar panels at various tilt angles, as well as data validation against the theory of solar declination angles. The test results showed that the solar tracker system was able to increase power efficiency by up to compared to static panels, with a more stable and optimal electrical output. This study proves that the application of a solar tracker system with a two-way approach has great potential for application on a household scale and small industries in supporting the renewable energy transition.

Kata Kunci: PLTS, Solar Tracking, ESP32, Panel Surya, Efisiensi Energi.