

ABSTRAK

Rancang Bangun Kendali Penyiraman Hidroponik dengan *Solar Tracker* Berbasis Iot (*Internet Of Things*)

(2026 : xvi + 56 Halaman + Daftar Tabel + Daftar Gambar + Daftar Lampiran)

Muhammad Arief Wahyudi

062230310461

Jurusan Teknik Elektro

Program Studi D-III Teknik Listrik

Politeknik Negeri Sriwijaya

Kebutuhan energi listrik pada sistem hidroponik dapat dipenuhi melalui pemanfaatan energi surya sebagai sumber energi terbarukan. Penelitian ini bertujuan merancang dan membangun sistem kendali penyiraman hidroponik berbasis panel surya dengan *solar tracker single-axis* dan pemantauan berbasis *Internet of Things (IoT)*, serta menganalisis pengaruh penggunaan *solar tracker* terhadap kinerja panel surya. Metode penelitian meliputi perancangan perangkat keras dan perangkat lunak, pengujian sensor, pengambilan data intensitas cahaya, tegangan, arus, serta perhitungan daya dan efisiensi panel surya. Intensitas cahaya dalam satuan *lux* dikonversi menjadi *irradiance* sebagai dasar perhitungan daya masukan panel surya. Hasil penelitian menunjukkan bahwa panel surya statis menghasilkan energi sebesar 251,88 Wh, sedangkan panel surya dengan *solar tracker* menghasilkan 354,76 Wh, sehingga terjadi peningkatan energi sebesar 102,88 Wh atau 40,84%. Selain itu, sistem *IoT* mampu memantau data secara *real-time* sehingga mempermudah proses monitoring. Berdasarkan hasil tersebut, penggunaan *solar tracker single-axis* terbukti meningkatkan pemanfaatan energi matahari dan mendukung operasional sistem hidroponik berbasis tenaga surya secara lebih efektif dan efisien.

Kata kunci: Solar tracker, Internet of Things (IoT), ESP32, Panel surya, Hidroponik.

ABSTRACT

Design And Development Of An Iot (Internet Of Things)-Based Hydroponic Irrigation Control System Using A Solar Tracker

(2026 : xvi + 56 Pages + List of Tables + List of Figures + List of Appendices)

Muhammad Arief Wahyudi

062230310461

Department of Electrical Engineering

D-III Electrical Engineering Study Program

State Polytechnic of Sriwijaya

The electrical energy requirements of a hydroponic irrigation system can be fulfilled by utilizing solar energy as a renewable energy source. This study aimed to design and develop a hydroponic irrigation control system powered by a photovoltaic panel equipped with a single-axis solar tracker and an Internet of Things (IoT)-based monitoring system, as well as to analyze the effect of the solar tracker on photovoltaic panel performance. The research method included hardware and software design, sensor testing, data collection of light intensity, voltage, and current, followed by power and efficiency calculations. Light intensity measured in lux was converted into irradiance to determine the input power of the photovoltaic panel. The results showed that the static photovoltaic panel generated 251.88 Wh, while the photovoltaic panel with a single-axis solar tracker produced 354.76 Wh, resulting in an energy increase of 102.88 Wh or 40.84%. Furthermore, the IoT-based monitoring system successfully displayed real-time operational data, making system monitoring more efficient. These findings demonstrate that the implementation of a single-axis solar tracker improves solar energy utilization and enhances the performance of photovoltaic systems in supporting hydroponic irrigation applications.

Keywords: Solar tracker, Internet of Things (IoT), ESP32, Solar panel, Hydroponics.