

ABSTRAK

ANALISIS INTENSITAS CAHAYA PADA PANEL SURYA 100Wp TERHADAP WAKTU PENGISIAN BATERAI LITHIUM-ION PADA ALAT SOLAR DRYER DAUN PEGAGAN

Ahmad Hafiz Rizki

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Kebutuhan energi listrik yang terus meningkat mendorong pemanfaatan energi terbarukan, salah satunya energi surya. Pada alat Solar Dryer, panel surya digunakan sebagai sumber energi untuk mengisi baterai lithium-ion dan mengoperasikan sistem pengering. Penelitian ini bertujuan untuk menganalisis pengaruh intensitas cahaya matahari terhadap daya keluaran panel surya dan pengisian baterai lithium-ion. Penelitian menggunakan panel surya monokristal 100 Wp, baterai lithium-ion 12 V 20 Ah, dan solar charge controller (SCC) PWM 30 A. Pengujian dilakukan selama 180 menit dengan interval pengukuran 30 menit pada variasi sudut kemiringan panel 20°, 25°, dan 30°. Parameter yang diamati meliputi intensitas radiasi matahari, suhu panel, daya keluaran panel, dan tegangan pengisian baterai. Hasil penelitian menunjukkan bahwa intensitas cahaya matahari berpengaruh terhadap daya keluaran panel surya dan pengisian baterai. Sudut kemiringan 20° menghasilkan kinerja terbaik dengan intensitas radiasi tertinggi sebesar 1035 W/m², daya keluaran maksimum sebesar 74,7 W, dan tegangan pengisian baterai tertinggi sebesar 13,64 V. Energi listrik yang dihasilkan panel surya selama pengujian sebesar 115,44 Wh dengan efisiensi sistem sebesar 11,78%, mendekati efisiensi nominal panel surya sebesar 13,60%. Waktu pengisian teoritis baterai diperoleh sebesar 6,23 jam. Berdasarkan hasil penelitian, dapat disimpulkan bahwa semakin tinggi intensitas cahaya matahari yang diterima panel surya, semakin besar daya yang dihasilkan dan semakin efektif proses pengisian baterai pada alat Solar Dryer.

Kata Kunci: Solar Dryer, panel surya, intensitas cahaya, baterai lithium-ion, dan efisiensi.

ABSTRACT

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The increasing demand for electrical energy has encouraged the utilization of renewable energy sources, one of which is solar energy. In the Solar Dryer system, solar panels are used as an energy source to charge lithium-ion batteries and operate the drying system. This study aims to analyze the effect of solar light intensity on the output power of solar panels and the charging process of lithium-ion batteries. The study used a 100 Wp monocrystalline solar panel, a 12 V 20 Ah lithium-ion battery, and a 30 A PWM solar charge controller (SCC). Testing was conducted for 180 minutes with data collection at 30-minute intervals using panel tilt angles of 20°, 25°, and 30°. The observed parameters included solar radiation intensity, panel temperature, panel output power, and battery charging voltage. The results showed that solar light intensity significantly affects the output power of the solar panel and the battery charging process. The 20° tilt angle produced the best performance, with the highest solar radiation intensity of 1035 W/m², maximum output power of 74.7 W, and highest battery charging voltage of 13.64 V. The solar panel generated 115.44 Wh of electrical energy during testing with a system efficiency of 11.78%, which is close to the panel's nominal efficiency of 13.60%. The theoretical battery charging time was calculated to be 6.23 hours. Based on the results, it can be concluded that higher solar light intensity increases the output power of the solar panel and improves the effectiveness of the battery charging process in the Solar Dryer system.

Keywords: *Solar Dryer, solar panel, light intensity, lithium-ion battery, and efficiency.*