

ABSTRAK
RANCANG BANGUN MESIN PENGISIAN GALON OTOMATIS
BERBASIS PANEL SURYA MENGGUNAKAN
MIKROKONTROLER ESP32

(2026 : xv + 63 Halaman + Daftar Tabel + Daftar Gambar + Daftar Lampiran)

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Penelitian ini bertujuan merancang dan membangun mesin pengisian galon otomatis berbasis panel surya menggunakan mikrokontroler ESP32. Sistem terdiri atas panel surya, baterai, Solar Charge Controller (SCC), sensor flow, sensor PZEM-017, pompa DC, dan ESP32 sebagai pengendali utama. Pengujian dilakukan selama tiga hari pada pukul 08.00–17.00 WIB untuk mengetahui karakteristik tegangan, arus, dan daya keluaran panel surya berdasarkan variasi waktu, serta pada kondisi standby dan saat proses pengisian galon berlangsung. Hasil pengujian menunjukkan bahwa tegangan panel surya berada pada rentang 18,1–20,1 V, arus 0,02–0,05 A, dan daya 0,3–0,9 W. Pada kondisi standby diperoleh tegangan 18,7 V, arus 0,02 A, dan daya 0,3 W, sedangkan saat pengisian galon berlangsung tegangan menjadi 17,8 V, arus meningkat menjadi 0,04 A, dan daya menjadi 0,7 W. Sistem mampu melakukan pengisian galon berkapasitas ± 19 liter dalam waktu sekitar ± 5 menit dan beroperasi dengan baik menggunakan energi surya sebagai sumber daya utama.

Kata kunci: Panel Surya, Otomatisasi, Tegangan, Arus, Daya.

ABSTRACT

DESIGN AND CONSTRUCTION OF AN AUTOMATIC GALLON FILLING MACHINE BASED ON SOLAR PANEL USING ESP32 MICROCONTROLLER

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This research aims to design and build an automatic gallon filling machine based on solar panels using an ESP32 microcontroller. The system consists of solar panels, batteries, Solar Charge Controller (SCC), flow sensors, PZEM-017 sensors, DC pumps, and ESP32 as the main controller. Testing was conducted for three days at 08.00–17.00 WIB to determine the characteristics of the voltage, current, and output power of the solar panels based on time variations, as well as in standby conditions and during the gallon filling process. Test results showed that the solar panel voltage ranged from 18.1–20.1 V, with a current of 0.02–0.05 A, and a power of 0.3–0.9 W. In standby mode, the voltage was 18.7 V, a current of 0.02 A, and a power of 0.3 W. During the gallon filling process, the voltage increased to 17.8 V, the current increased to 0.04 A, and the power to 0.7 W. The system was capable of filling a gallon with a capacity of approximately 19 liters in approximately 5 minutes and operated well using solar energy as the primary power source.

Keywords: Solar Panel, Automation, Voltage, Current, Power.