

ABSTRAK

**PERANCANGAN SISTEM PEMANTAUAN KONSUMSI DAYA LISTRIK
BERBASIS ESP32 MENGGUNAKAN NODE-RED DAN NOTIFIKASI
WHATSAPP MELALUI ULTRAMSG**

(M. Akbar Fadhillah, 2026, ... halaman)

Bengkel kendaraan bermotor menggunakan berbagai peralatan listrik yang menyebabkan konsumsi energi cukup besar, namun keterbatasan pemantauan secara real-time membuat pemilik bengkel sulit mengetahui penggunaan daya dan memperkirakan biaya listrik secara akurat. Penelitian ini bertujuan merancang dan membangun sistem pemantauan konsumsi daya listrik berbasis Internet of Things (IoT) menggunakan mikrokontroler ESP32 DevKit V1 yang terintegrasi dengan sensor PZEM-004T dan Current Transformer (CT) 100A untuk mengukur parameter tegangan, arus, daya aktif, energi, frekuensi, dan faktor daya. Data hasil pengukuran ditampilkan pada LCD I2C 16×2 dan dikirim ke server Node-RED melalui koneksi Wi-Fi menggunakan protokol HTTP POST sehingga dapat dipantau secara real-time melalui dashboard berbasis web. Selain itu, sistem secara otomatis mengirimkan notifikasi peringatan kepada pemilik bengkel melalui aplikasi WhatsApp menggunakan layanan Ultrams API ketika konsumsi daya melebihi batas yang telah ditentukan. Sistem dikembangkan menggunakan Arduino IDE 2.x dengan bahasa pemrograman C/C++ dan dirancang agar sederhana, ekonomis, serta mudah diimplementasikan sehingga dapat menjadi solusi praktis untuk pemantauan konsumsi energi listrik pada bengkel maupun usaha kecil lainnya.

Kata Kunci: pemantauan daya listrik; IoT; ESP32; PZEM-004T; Node-RED; WhatsApp.

ABSTRACT
DESIGN OF AN ESP32-BASED ELECTRICAL POWER CONSUMPTION
MONITORING SYSTEM USING NODE-RED AND WHATSAPP
NOTIFICATION VIA ULTRAMSG

(M. Akbar Fadhilah, 2026, ... pages)

Motor vehicle workshops operate various electrical equipment that results in significant energy consumption; however, the lack of real-time monitoring makes it difficult for workshop owners to identify electricity usage and accurately estimate operational costs. This study aims to design and develop an Internet of Things (IoT)-based electrical power monitoring system using the ESP32 DevKit V1 microcontroller integrated with a PZEM-004T sensor and a 100A Current Transformer (CT) to measure electrical parameters, including voltage, current, active power, energy consumption, frequency, and power factor. The measured data are displayed on a 16×2 I2C LCD and transmitted to a Node-RED server via a Wi-Fi connection using the HTTP POST protocol, allowing real-time monitoring through a web-based dashboard. In addition, the system automatically sends warning notifications to the workshop owner through WhatsApp using the Ultramsig API service when power consumption exceeds a predefined threshold. The system was developed using Arduino IDE 2.x with the C/C++ programming language and was designed to be simple, cost-effective, and easy to implement, making it a practical solution for monitoring electrical energy consumption in workshops and other small businesses.

Keywords: power monitoring; Internet of Things (IoT); ESP32; PZEM-004T; Node-RED; WhatsApp.