

ABSTRAK

Wahyu Trisna Prayoga. 2026. Rancang Bangun Sistem Monitoring *Water Flow* dan Pendataan Waktu Aktif Sibel Berbasis Internet of Things (IoT) Menggunakan ESP32 dan Google Sheets. Skripsi. Program Studi Teknik Elektro, Fakultas Teknik, Universitas PGRI Madiun. Pembimbing (I) Ihtiari Prastyaningrum, M.Si. (II) Ridam Dwi Laksono S.Si., M.Pd.

Proses pencatatan penggunaan sibel yang masih dilakukan secara manual menyebabkan informasi mengenai debit air, volume air, waktu aktif sibel, dan biaya penggunaan sulit dipantau secara cepat serta berpotensi menimbulkan kesalahan pencatatan. Penelitian ini bertujuan merancang dan membangun sistem monitoring *water flow* dan pendataan waktu aktif sibel berbasis *Internet of Things* (IoT) menggunakan ESP32 dan Google Sheets sehingga proses monitoring dapat dilakukan secara otomatis dan real-time. Sistem yang dikembangkan terdiri atas sensor *water flow* YF-S201 sebagai pendeteksi debit dan volume air, mikrokontroler ESP32 sebagai pusat pengendali, relay sebagai pengendali pompa air, keypad 4×4 sebagai media pengaturan waktu operasi, LCD 16×2 I2C sebagai media tampilan informasi, serta Google Sheets yang dihubungkan melalui Google Apps Script sebagai media penyimpanan data berbasis *cloud*. Metode penelitian yang digunakan adalah metode eksperimen yang meliputi tahap perancangan perangkat keras dan perangkat lunak, pembuatan prototype, integrasi sistem, serta pengujian setiap komponen dan keseluruhan sistem. Pengujian dilakukan terhadap sensor *water flow*, ESP32, koneksi Wi-Fi, pengiriman data ke Google Sheets, dashboard monitoring, relay dan pompa air, LCD, keypad, serta pengujian akurasi sensor menggunakan volume acuan hingga 40 liter. Hasil penelitian menunjukkan bahwa sistem mampu melakukan monitoring debit air, volume air, waktu aktif sibel, dan biaya penggunaan secara real-time. Data hasil monitoring berhasil ditampilkan pada LCD dan dikirim ke Google Sheets dengan waktu respons rata-rata 2–3 detik tanpa mengalami kehilangan data. Hasil pengujian akurasi sensor menunjukkan nilai kesalahan (*error*) berkisar antara 0,78%–1,00% dengan tingkat akurasi 99,00%–99,22%. Selain itu, relay mampu mengendalikan pompa air secara otomatis sesuai waktu yang diatur melalui keypad, sedangkan dashboard Google Sheets berhasil menampilkan data monitoring dalam bentuk tabel dan grafik secara real-time. Berdasarkan hasil pengujian tersebut, sistem yang dirancang mampu bekerja sesuai dengan tujuan penelitian, yaitu melakukan monitoring debit air dan pendataan waktu aktif sibel secara otomatis, menyimpan data ke Google Sheets, serta menyediakan informasi penggunaan air yang akurat dan mudah diakses. Dengan demikian, sistem ini dapat menjadi solusi yang efektif untuk meningkatkan efisiensi proses monitoring penggunaan sibel berbasis *Internet of Things* (IoT).

Kata Kunci: *Internet of Things (IoT), ESP32, Water Flow, Monitoring Sibel, Google Sheets.*

ABSTRAK

Wahyu Trisna Rayoga. 2026. *Design and Development of a Water Flow Monitoring System and Sibel Active Time Recording Based on the Internet of Things (IoT) Using ESP32 and Google Sheets*. Undergraduate Thesis. Electrical Engineering Study Program, Faculty of Engineering, Universitas PGRI Madiun. Advisor (I) Ihtiari Prastyaningrum, M.Si.(II) Ridam Dwi Laksono S.Si., M.Pd

The manual recording process of Sibel usage often results in inefficient management of water flow rate, water volume, operating time, and usage cost data, as well as increasing the possibility of recording errors. This research aims to design and develop an Internet of Things (IoT)-based water flow monitoring system and Sibel active time recording using an ESP32 microcontroller and Google Sheets, enabling automatic and real-time monitoring. The proposed system consists of a YF-S201 water flow sensor for measuring water flow rate and volume, an ESP32 microcontroller as the main controller, a relay for controlling the water pump, a 4×4 keypad for setting the operating time, a 16×2 I2C LCD for displaying monitoring information, and Google Sheets integrated through Google Apps Script as a cloud-based data storage platform. The research employed an experimental method, including hardware and software design, prototype development, system integration, and performance testing of each component as well as the complete system. The tests included evaluation of the water flow sensor, ESP32, Wi-Fi connectivity, Google Sheets data transmission, monitoring dashboard, relay, water pump, LCD, keypad, and sensor accuracy using a reference water volume of up to 40 liters. The experimental results indicate that the system is capable of monitoring water flow rate, water volume, Sibel operating time, and usage cost in real time. Monitoring data were successfully displayed on the LCD and automatically transmitted to Google Sheets with an average response time of 2–3 seconds without data loss. The water flow sensor achieved an error rate ranging from 0.78% to 1.00%, corresponding to an accuracy of 99.00%–99.22%. In addition, the relay successfully controlled the water pump according to the operating time set through the keypad, while the Google Sheets dashboard displayed monitoring data in the form of tables and charts in real time. Based on the overall testing results, the developed system successfully achieved the objectives of automatically monitoring water flow and recording Sibel operating time, storing monitoring data in Google Sheets, and providing accurate and easily accessible information. Therefore, the proposed system can serve as an effective solution for improving the efficiency of Sibel monitoring through Internet of Things (IoT) technology.

Keywords: Internet of Things (IoT), ESP32, Water Flow, Google Sheets, Sibel Monitoring.