

PROTOTYPE OF AN AUTOMATIC RINSING SYSTEM IN THE BATTERY PRODUCTION PROCESS BASED ON IOT (INTERNET OF THINGS) USING ESP32

Anivan Aditia

Electrical Engineering Study Program, Faculty of Science and Technology

University of Technology Yogyakarta

Jl. Ringroad Utara Jombor Sleman Yogyakarta

E-mail: anivanaditiya@gmail.com

ABSTRACT

The rinsing process is a crucial stage in battery production, serving to eliminate residual electrolyte solution (sulfuric acid) after the charging phase. When performed suboptimal, leftover electrolyte can lead to battery corrosion and degrade product quality. Manual rinsing, however, is often inconsistent, time-consuming, and difficult to control. In response to these challenges, this study aims to design an Internet of Things (IoT)-based automatic rinsing system utilizing the ESP32 microcontroller. The system integrates an E18-D80NK sensor to detect the presence of the battery, an HCSR04 ultrasonic sensor to monitor water levels in the tank, and a pH sensor to measure the acidity of the rinse water. The rinsing process is executed via a water pump and a conveyor mechanism controlled by relays and monitored through an MQTT-based application, enabling both manual and remote automatic operation. Test results demonstrate that the system achieves 100% detection accuracy of batteries within a 1–35 cm range, monitors water levels with over 90% accuracy and precision, and reads pH values with 96.2% accuracy. The system is also capable of automatically repeating the rinsing cycle if the water pH does not reach 5.5 and provides monitoring alerts when the tank is empty or when rinse water conditions require attention. Consequently, the system proves effective in optimizing the battery rinsing process.

Keywords: IoT, ESP32, battery rinsing, pH sensor, ultrasonic sensor, MQTT, automation.