DESIGN AND DEVELOPMENT OF A LONG-RANGE AUTOMATIC WATER FILLING SYSTEM BASED ON ARDUINO AND LORA RA-02 WITH PUMP CONTROL USING VARIABLE SPEED DRIVE

Ilham Saputro
Electrical Engineering Study Program, Faculty of Science and Technology
University of Technology Yogyakarta
Jl. Ringroad Utara Jombor Sleman Yogyakarta
E-mail: ilhamsaputro2702@gmail.com

ABSTRACT

Access to clean water distribution remains a challenge in several areas with limited supply. To address this issue, an automatic long-range water filling system was designed, capable of operating over extended distances where the water pump and storage tank are located far apart. This study aims to design and build a remote water filling system based on Arduino and the LoRa RA-02 module, with pump control managed through a Variable Speed Drive (VSD). An ultrasonic sensor serves as the primary input to measure water level, which is transmitted wirelessly via the LoRa RA-02 module to a receiving microcontroller. The microcontroller adjusts the pump motor speed via VSD based on the detected water level. Test results show the system operates autonomously in controlling the water filling process remotely. The ultrasonic sensor achieved an accuracy rate of up to 96.2%, LoRa communication remained stable up to 321.7 meters in unobstructed conditions and 262.6 meters in obstructed environments, and the motor speed could be dynamically adjusted via VSD. If the water level remains stagnant during the filling process, the VSD gradually increases motor speed until reaching the maximum frequency of 50 Hz. This ensures optimal and responsive water delivery based on real-time tank conditions.

Keywords: Arduino, LoRa RA-02, Variable Speed Drive, ultrasonic sensor, automatic water filling.