

ABSTRAK

RANCANG BANGUN SISTEM DETEKSI DAN MITIGASI KEBOCORAN GAS LPG BERBASIS IOT MENGGUNAKAN *WATER MIST* DAN *EXHAUST FAN*

(Ridho Phaslah Simamora 2026: 61 Halaman)

Kebocoran gas LPG merupakan salah satu penyebab utama terjadinya kebakaran dan ledakan yang dapat menimbulkan kerugian materi maupun korban jiwa. Risiko tersebut sering terjadi pada toko sembako, pangkalan gas, maupun lingkungan rumah tangga yang menggunakan LPG sebagai sumber energi. Penelitian ini bertujuan untuk merancang dan membangun sistem monitoring dan mitigasi kebocoran gas LPG berbasis *Internet of Things (IoT)* menggunakan sensor MQ-6 dan mikrokontroler ESP32, mengimplementasikan sistem mitigasi otomatis berupa *Exhaust Fan* dan *Water Mist*, serta mengimplementasikan sistem notifikasi *Telegram Bot* sebagai peringatan dini kepada pengguna. Metode yang digunakan meliputi perancangan perangkat keras, perancangan perangkat lunak, implementasi sistem, serta pengujian sensor, notifikasi *Telegram*, *Exhaust Fan*, *Water Mist*, dan efektivitas sistem mitigasi. Hasil pengujian menunjukkan bahwa sensor MQ-6 mampu mendeteksi kebocoran gas LPG pada berbagai jarak dengan nilai ADC tertinggi sebesar 453 pada jarak 25 cm dan masih mampu mendeteksi gas hingga jarak 175 cm dengan nilai ADC sebesar 3. Sistem notifikasi *Telegram* berhasil mengirimkan informasi kondisi AMAN, WASPADA, dan BAHAYA secara *real-time* dengan waktu pengiriman sekitar 1,5 detik. *Exhaust Fan* dan *Water Mist* berhasil bekerja sesuai logika yang telah dirancang, dimana *Exhaust Fan* aktif pada kondisi WASPADA dan BAHAYA, sedangkan *Water Mist* aktif pada kondisi BAHAYA. Pengujian efektivitas mitigasi menunjukkan bahwa sistem mampu menurunkan nilai ADC hingga kembali ke kondisi AMAN dalam waktu 1,5 hingga 7 detik. Berdasarkan hasil tersebut, sistem yang dikembangkan berhasil menjalankan fungsi deteksi, notifikasi, dan mitigasi kebocoran gas LPG secara otomatis sehingga dapat meningkatkan aspek keselamatan pada area penyimpanan dan penggunaan gas LPG.

Kata kunci : LPG, MQ-6, ESP32, *Internet of Things*, *Telegram Bot*, *Water Mist*

ABSTRACT

DESIGN AND CONSTRUCTION OF AN IOT-BASED LPG GAS LEAK DETECTION AND MITIGATION SYSTEM USING *WATER MIST* AND *AN EXHAUST FAN*

(Ridho Phaslah Simamora 2026: 61 Pages)

LPG leakage is one of the main causes of fires and explosions that may result in property damage and loss of life. This risk commonly occurs in grocery stores, LPG distribution outlets, and households that use LPG as an energy source. This study aims to design and develop an LPG leakage monitoring and mitigation system based on Internet of Things (IoT) using an MQ-6 sensor and ESP32 microcontroller, implement an automatic mitigation system utilizing Exhaust Fan and Water Mist, and develop a* Telegram Bot notification system as an early warning mechanism for users. The research method includes hardware design, software design, system implementation, and testing of the sensor; Telegram notification, Exhaust Fan*,* Water Mist*, and mitigation system effectiveness. The test results show that the MQ-6 sensor was able to detect LPG leakage at various distances, with the highest ADC value of 453 at a distance of 25 cm and still capable of detecting gas up to a distance of 175 cm with an ADC value of 3. The* Telegram notification system successfully delivered NORMAL, WARNING, and DANGER status information in real-time with a delivery time of approximately 1.5 seconds. The Exhaust Fan and Water Mist operated according to the designed logic, where the Exhaust Fan was activated during WARNING and DANGER conditions, while the Water Mist was activated only during DANGER conditions. The mitigation effectiveness test showed that the system was able to reduce the ADC value and return the system to a NORMAL condition within 1.5 to 7 seconds. Based on these results, the developed system successfully performed automatic detection, notification, and mitigation of LPG leakage, thereby improving safety in LPG storage and utilization areas.*

Keywords: LPG, MQ-6, ESP32, *Internet of Things*, *Telegram Bot*, *Water Mist*