

Rancang Bangun Sistem Pemutus Arus Listrik Rumah Tangga Secara Otomatis Berbasis Deteksi Kebocoran Gas Untuk mencegah kebakaran

Dani Rizky Kurniawan

Program Studi Teknik Elektro, Fakultas Teknik, Universitas
Muhammadiyah Jember

ABSTRAK

Kebocoran gas LPG merupakan risiko kebakaran serius di rumah tangga, yang seringkali diperparah oleh kelalaian dalam memutus arus listrik saat terjadi kepanikan. Penelitian ini bertujuan untuk merancang dan membangun sebuah sistem pemutus arus listrik otomatis berbasis deteksi kebocoran gas menggunakan teknologi *Internet of Things* (IoT). Sistem ini juga dirancang untuk membandingkan kinerja tiga jenis sensor gas yang berbeda, yaitu MQ-6, MQ-6 V2, dan TGS2610, guna menentukan sensor yang paling optimal. Prototipe sistem ini menggunakan mikrokontroler ESP8266 yang terintegrasi dengan sensor gas, aktuator berupa servo dan relay, serta mengirimkan notifikasi peringatan real-time melalui aplikasi Telegram. Kinerja akurasi sensor dianalisis menggunakan metode Mean Absolute Percentage Error (MAPE) dengan membandingkannya pada alat standar gas leak detector. Hasil pengujian menunjukkan bahwa sensor TGS2610 memiliki akurasi paling unggul dengan nilai MAPE rata-rata terendah sebesar 0,18%, diikuti oleh sensor MQ-6 V2 (0,61%) dan MQ-6 (0,64%). Kesimpulannya, sistem keamanan ini berhasil dirancang dan berfungsi secara efektif dan andal. Seluruh aktuator, seperti relay pemutus listrik dan servo pengaman regulator, bekerja sesuai fungsinya saat gas terdeteksi, dan notifikasi peringatan berhasil terkirim secara konsisten. Berdasarkan tingkat akurasi dan kestabilannya, sensor TGS2610 menjadi pilihan yang paling direkomendasikan untuk implementasi sistem peringatan dini kebocoran gas.

Kata Kunci: Deteksi Kebocoran Gas, Pemutus Arus Otomatis, ESPNow, *internet of Things*, ESP8266, Telegram, Sensor Gas

***Design and Implementation of an Automatic Household Electrical
Current Cut-off System Based on Gas Leak Detection for Fire Prevention***

Dani Rizky Kurniawan

Program Studi Teknik Elektro, Fakultas Teknik, Universitas
Muhammadiyah Jember

ABSTRACT

LPG gas leaks pose a serious fire risk in households, which is often exacerbated by the failure to disconnect the electrical current during a panic. This research aims to design and build an automatic electrical current cut-off system based on gas leak detection using Internet of Things (IoT) technology. The system was also designed to compare the performance of three different gas sensors, namely MQ-6, MQ-6 V2, and TGS2610, to determine the most optimal one. The system prototype utilizes an ESP8266 microcontroller integrated with a gas sensor, actuators such as a servo and a relay, and sends real-time warning notifications via the Telegram application. The sensor's accuracy performance was analyzed using the Mean Absolute Percentage Error (MAPE) method by comparing it to a standard gas leak detector. The test results showed that the TGS2610 sensor had the most superior accuracy with the lowest average MAPE value of 0.18%, followed by the MQ-6 V2 (0.61%) and MQ-6 (0.64%) sensors. In conclusion, this security system was successfully designed and functions effectively and reliably. All actuators, such as the electrical cut-off relay and the regulator safety servo, worked as intended when a gas leak was detected, and warning notifications were successfully and consistently delivered. Based on its level of accuracy and stability, the TGS2610 sensor is the most recommended choice for the implementation of a gas leak early warning system.

Keywords: *Gas Leak Detection, Automatic Electrical Cut-off, ESPNow, Internet of Things, ESP8266, Telegram, Gas Sensor*