INTISARI

Gas banyak digunakan dalam industri sebagai bahan bakar atau sebagai bahan utama, seperti gas hidrogen pada pabrik pupuk amonia dan *Liquified Petroleum Gas* (LPG) pada pabrik LPG. Namun gas tersebut dapat menimbulkan bahaya kebakaran dan ledakan apabila terjadi kebocoran gas. Hal preventif yang tersedia saat ini adalah diterapkannya pendeteksi gas baik yang bersifat permanen maupun yang portabel. Pendeteksi gas tipe permanen mempunyai respon otomatis namun tidak dapat melindungi pekerja secara kontinyu dan jangkauannya terbatas, sedangkan pendeteksi gas tipe portabel dapat melindungi secara kontinyu dan dapat menjangkau tempat yang sempit namun tidak mempunyai respon otomatis. Dari hal ini penulis mencoba merumuskan sebuah solusi berupa pendeteksi gas portabel yang mempunyai respon otomatis dengan memanfaatkan jaringan *wireless* dan teknologi *Internet of Things* (IoT). Perancangan alat pendeteksi gas portabel dimulai dengan penentuan ruang lingkup desain, kemudian dilanjutkan dengan penentuan jenis sensor, jaringan, mikrokontroler, perumusan spesifikasi alat, pembuatan kerangka, perumusan kode pemrograman, pembuatan prototipe akhir, hingga pengujian baik pengujian fungsionalitas maupun deteksi alat terhadap gas eksplosif. Hasil uji fungsionalitas menunjukkan alat dapat beroperasi seperti desain. Hasil uji deteksi alat menunjukkan terdapat kenaikan voltase 0,003v atau diatasnya di setiap percobaan gas di bawah 10% *Lower Explosive Limit* (LEL) dengan konsentrasi udara awal yang berbeda-beda. Hal ini menunjukkan alat lolos syarat yaitu mampu mendeteksi konsentrasi gas di bawah nilai 10% LEL. Dari tulisan ini maka telah dihasilkan rancangan alat pendeteksi gas portabel dan telah dibuat serta diuji fungsionalitas dan deteksinya dengan hasil mampu berfungsi sesuai rancangan desain, lolos syarat sebagai alat deteksi gas, dan mampu memberikan respon otomatis yaitu dapat memberikan indikasi alarm dan mengontrol relay secara nirkabel.

Kata Kunci: pendeteksi gas, portabel, respon otomatis, LEL, IoT, mikrokontroler

ABSTRACT

Gas is widely used in industries as a fuel or as a main ingredient, such as the use of hydrogen gas in ammonia fertilizer plants and Liquified Petroleum Gas (LPG) in LPG plants. But the gas can cause fire and explosion hazards if there is a gas leak. The preventive action currently available is the application of fixed and portable gas detector devices to detect gas leaks. Fixed detectors have automatic responses but cannot protect workers in a continuous manner and their range is limited, while portable detectors can protect continuously and can reach narrow spaces but do not have the automatic responses advantage. Based on this matter, the author tries to formulate a solution in the form of a portable gas detector that has automatic responses by utilizing wireless networks and the Internet of Things (IoT) technology. The design process of the portable gas detectors begins with determining the scope of design, then proceed with determining the type of sensor, network, microcontroller, formulating the specifications, creating the framework, formulating programming code, making final prototypes, and ends with testing both the functionality and detection capability. The functionality test results showed that the prototype devices are able to operate as designed. The detection test results showed that there was a 0.003v voltage increase or above in each under 10% Lower Explosive Limit (LEL) gas experiment with different initial air concentrations. This shows that the devices meet the requirement as a gas detection device, which is able to detect gas concentrations below the value of 10% LEL. From this paper, both the design and the devices have been produced and the results showed that the devices are able to function according to the design plan, passed the requirements as a gas detection device, and are able to provide automatic responses that can provide alarm indications and control relays wirelessly.

Keywords: gas detector, portable, automatic response, LEL, IoT, microcontroller