Use of semiconductor sensors in air leakage and detecting devices

Authors: Natia Kobakhidze, Nikoloz Tsagareishvili

Supervisor: Irakli Giorgadze

Georgian-American High School, Tbilisi, Georgia, gahs.18@gmail.com

Introduction

Despite the fact that we use natural gas every day we all know the risks that come with it: The leak of dangerous gases and reserving it. Because the leakage may lead to an explosion and poisoning civilians, when the loss is not only material, but people die. Unfortunately this is not rare, Gas is transparent, not visible for unarmed eye and mostly it has no smell, that is why people cannot detect the danger on time. Because of this, people invented gas sensors, so they can protect themselves from deadly gases. Nowadays, scientists all over the world are trying to invent new technology that detects gas leakage. That's why we aimed to set up the device, which will execute similar function.

Theoretical part

Gas detectors, in which sensors, working on different physical principles, are used as sensitive elements measure and indicate the concentration of certain gases in an air. When the sensors response surpasses a dangerous gas level, audible or visible indicators, such as alarms, lights or a combination of signals warn the users. While many of the older, standard gas detector units were originally fabricated to detect one gas, modern multifunctional or multi-gas devices are capable of detecting several gases at once.

Gas detectors are categorized by the type of gas they detect: combustible or toxic. Catalytic and infrared sensors detect combustible gases and electrochemical and metal oxide semiconductor technologies detect as combustible as toxic gases.

Experimental part

Comparison conducted in other countries have shown pros and cons of the devices. There is an opportunity and need for not only qualitative, but constructional changes in device. The purpose of creating the gas leak detector and operating system of self-closing valve is to solve above mentioned problem and keep people safe.

The new system consists of three main components:

1. Semiconductor sensor;
2. Electrical block which is built on the microprocessor;
3. Electromagnetic switch-off valve.

We have studied the characteristics, properties and functioning physical principles of different types of sensors. Our attention was drawn to semiconductor sensors.

Conclusion

After the tests of experimental copy of the system, parameters have been established. The system, besides the sound and visual signals, will obey the main purpose: to block the gas supply network in the apartment. I.e. the controllable valve will be locked by the signal, which is generated by the microprocessor.

The proposed mechanism is different from existing systems by several signs that ensure high sensitivity and accuracy of the device. In addition, cost of the device will be significantly reduced.

References

1. The necessity of equiping natural gas leakage detectors and other monitoring systems in multi-storey buildings, by N. Iashvili, V. Padiurashvili, Z. Azmaiparashvili and others.
2. Systematical approach towards the problem of natural gas leakage by N. Iashvili
3. http://www.edaphic.com.au/gas-detection-encyclopedia/