RESEARCHERID
THOMSON REUTERS
[ICITAIC-2018]
ISSN 2348 – 8034
Impact Factor- 5.070
GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

GAS LEAKAGE DETECTION AND SMART ALERTING SYSTEM

K.Manichandana, Simrah UmmeRuman, Harshavardhini Biderkota, Ms.Pr Anisha, Dr.B V Ramana Murthy, and Mr.C Kishor Kumar
Stanley College of Engineering and Technology for Women, Chapel Road, Abids, Hyderabad, 500001.

ABSTRACT
Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system can also be used in homes and offices. There have been many incidents like explosions of fire due to gas leakage. Such incidents can cause dangerous effects if the leakage is not detected at an early stage. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane if sensed should be displayed and notify each and every second in the LCD display. If these gases exceed the normal level then an alarm is generated immediately and also an alert message is sent to the authorized person through the INTERNET.

Keywords: *Internet of Things, Gas Leakage Detection, Smart Alerting Technique.*

1. INTRODUCTION
The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way .we work, live, and play. Internet of Things (IOT) is the networking of 'things' by which physical things can communicate with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. The Internet of Things (IOT) is an important topic in technology industry, policy, and engineering circles. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities. The large-scale implementation of IOT devices promises to transform many aspects of the way we live. For consumers, new IOT products like Internet-enabled appliances, home automation components, and energy management devices are moving us toward a vision of the "smart home'', offering more security and energy efficiency. IOT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of "smart cities'', which help minimize congestion and energy consumption. IOT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors.
Through IOT, internet has now extended its roots to almost every possible thing present around us and is no more limited to our personal computers and mobile phones. Safety, the elementary concern of any project, has not been left untouched by IOT. The system consists of gas detector sensors, Arduino board, ESP8266 and Cloud server. Sensors will sense the value per time and the system will send the values to cloud server and the server will check if the sensor values have increased the threshold value. If sensor value crosses the limit the server will send the command to hardware for buzzing the alarm. Server also sends the notification message to user.

2. LITERATURE SURVEY

A number of reviews on the subject of gas leakage detection techniques were done in the past either as part of research papers/technical reports on a certain leak detection method and other gas related subjects

A.Mahalingam,r.T. Naayagi,n.E. Mastorakis ; they introduce design and implementation of an economic gas leakage detector. They gave the formulation of many problems in previous gas leakage detectors. They told that several standards have been formulated for the design of a gas leakage detection system such as IEEE, BS 5730,

ISSN 2348 – 8034
Impact Factor- 5.070

and IEC.For this work, the recommended UK safety standards have been adopted. The proposed alarm system is mainly meant to detect LPG leakage, which is most commonly used in residential and commercial premises. The system detects not only the presence of gas (gas leak), but also the amount of leakage in the air, and accordingly raises an appropriate audio visual alarm. The objective of the system is to detect LPG gases such as propane and butane. The allowed UK level for butane is 600 ppm above which it is considered to be of high level and poses a danger.
The proposed system ensures a continuous monitoring of the gas levels. If the gas level increases above the normal threshold level of 400 ppm butane (LPG), the system starts to issue early warning alarms at 100ms interval, which implies low level gas leakage. If the leakage level increases to 575 ppm of butane (LPG), the system activates high severity audio alarms at 50 ms intervals warning the occupants to run to safety. [1]

P.Meenakshi Vidya, S.Abinaya, G.Geetha Rajeshwari, N.Guna,"Automatic LPG detection and hazard controlling" published in April 2014 published in April 2014 proposed the leakage detection and real time gas monitoring system. In this system, the gas leakage is detected and controlled by means of exhaust fan. The level of LPG in cylinder is also continuously monitored. [2]

Pal-Stefan Murvaya, Ioan Sileaa, 2008, they told in their survey on gas leak detection and localization techniques various ways to detect the gas leakage. They introduce some old or new technique to detect the gas. The proposed techniques in their paper are nontechnical methods, hardware-based methods which include acoustic methods, optical methods and active methods. In their survey they told a wide variety of leak detecting techniques is available for gas pipelines. Some techniques have been improved since their first proposal and some new ones were designed as a result of advances in sensor manufacturing and computing power. However, each detection method comes with its advantages and disadvantages. Leak detection techniques in each category share some advantages and disadvantages.
For example, all external techniques which involve detection done from outside the pipeline by visual observation or portable detectors are able to detect very small leaks and the leak location, but the detection time is very long. Methods based on the mathematical model of the pipe have good results at high flow rates while at low flow rates a mass balance-based detection system would be more suitable. This disadvantage is prone to disappear for some of these techniques due to forthcoming technological advancements.[3]

Srinivasan,Leela,Jeyabharathi, Kirthik,Rajasree; in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in household and other areas wherehousehold gas is handled and used. It alerts the subscriber through the alarm and the status display besides turning off the gas supply valve as a primary safety measure. [4]

Falohun A.S., Oke A.O., and Abolaji B.M. 2016, in this paper they proposed their dangerous gas detection using an integrated circuit and MQ-9. In this basically, they used an embedded design which includes typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, and may lack human interaction device. The amount and type of detectors and the type of fire alarm system that one chooses for property protection will depend on the owner's property protection goals, the value of the property and the requirements of the owner's insurance company.
Generally, heat detection will be used in all areas that are not considered high value. Here again, one of the most common mistakes in fire alarm generally, heat detection will be used in all areas that are not considered high value. Here again, one of the most common mistakes in fire alarm system application is to provide partial protection of a building and expect high performance from the installed systems of any kind.System application is to provide partial protection of a building and expect high performance from the installed systems of any kind. [5]

Hina Ruqsar, Chandana R , Nandini R , Dr. T P Surekha , have proposed a system that along with monitoring and detection of gas leakage, real time data is made available through real time feed over internet They have used Xively IOT platform to provide real time sensor data over the internet. [6]

ISSN 2348 – 8034
Impact Factor- 5.070

3. PROPOSED MODEL

Circuit diagram:

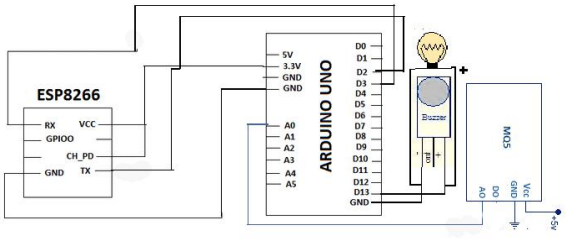


Figure 1

Hardware components:
a) Arduino uno
The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

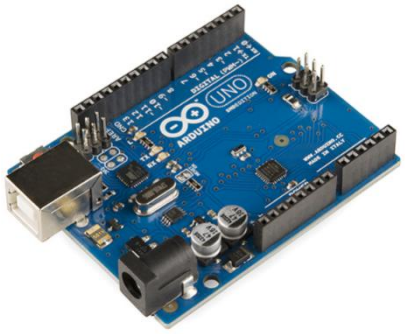


Figure 2

b) ESP8266 WIFI module
The **ESP8266**is a low-cost WIFImicrochip with full TCP/IP stack and microcontroller capability produced by manufacturer Espressif Systems.

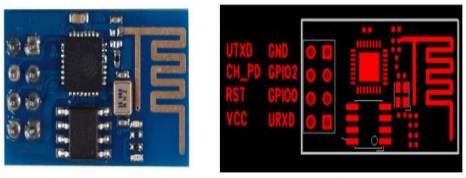


Figure 3

c) MQ-5 sensor
The Grove - Gas Sensor (MQ5) module is useful for gas leakage detection (in home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer.

ISSN 2348 – 8034
Impact Factor- 5.070

Figure 4

d) Buzzer
A buzzer or beeper is an audio signaling device which maybe mechanical,electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of users of user input such as a mouse click or keys.

Figure 5

e) Led
A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

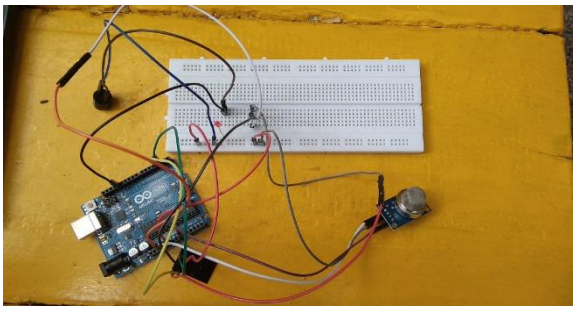
Figure 6

f)Jumper wires
Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

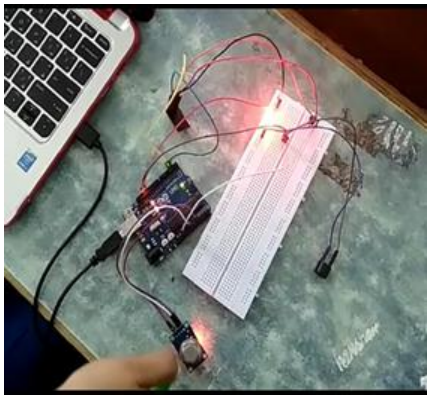
Figure 7

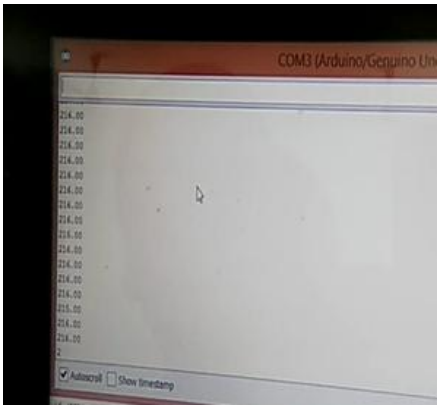
ISSN 2348 – 8034
Impact Factor- 5.070

So we have connected the circuit consisting of all the above mentioned components as per the circuit diagram given in figure 1.



3. RESULTS AND DISCUSSION





When the gas exceeds the normal level then the led glows and a buzzer is triggered immediately at the incident place and also an alert message (i.e. Push Notification) is sent to the authorized person.

4. CONCLUSION

In this paper we use IOT technology for enhancing the existing safety standards. While making this prototype has been to bring a revolution in the field of safety against the leakage of harmful and toxic gases in environment and hence nullify any major or minor hazard being caused due to them. We have used the IOT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority. This system will be able to detect the gas in environment using the gas sensors.

5. FUTURE SCOPE

As no system is perfect, neither is this one. So it leaves us with the further scope of improvement. In addition to gas leakage detection, the weight measurement system can also be incorporated, thus giving the user intimation about the refill time of cylinder.

REFERENCES

[1] Shital Imade, Priyanka Rajmanes, Aishwarya Gavali , Prof. V. N. Nayakwadi "GAS LEAKAGE DETECTION AND SMART ALERTING SYSTEM USING IOT"

[2] Falohun A.S., Oke A.O., Abolaji B.M. "Dangerous Gas Detection using an Integrated Circuit and MQ-9" in International Journal of Computer Applications (0975 –8887) Volume 135 – No.7, February 2016

[3] Kumar Keshamoni and Sabbani Hemanth. "Smart Gas Level Monitoring, Booking & Gas Leakage Detector over IoT " International Advance Computing Conference IEEE, 2017

[4] Petros Spachos , Liang Song and Dimitrios Hatzinakos. "Gas Leak Detection and Localization System Through Wireless Sensor Networks" The 11th Annual IEEE Consumer Communications and Networking Conference - Demos. IEEE, 2014.

[5] "Design and Implementation of an Economic Gas Leakage Detector"National Institute of Health (2004). What you need to know about natural gas detectors.

[6]Prof.M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi,M.Gunasekaran "Gsm based LPG leakage detection and controlling system" the International Journal of Engineering and Science (IJES) ISSN (e): 2319 – 1813 ISSN (p):2319 – 1805 Pages 112-116 March- 2015

[7]*Srinivasan,Leela,Jeyabharathi,Kirthika,Rajasree"GAS LEAKAGE DETECTION AND CONTROL" Scientific Journal of Impact Factor(SJIF): 3.134*

[8] Pal-Stefan Murvaya, IoanSileaa "A survey on gas leak detection and localization techniques"

[9] Ashish Shrivastava,Ratnesh Prabhaker, Rajeev Kumar and Rahul Verma "GSM BASED GAS LEAKAGE DETECTION SYSTEM" in International Journal of Technical Research and Applications e-ISSN: 2320-8163,www.ijtra.com Volume 1, Issue 2 (may-june 2013).

[10] Sunithaa.J, sushmitha.D,"Embedded control system for LPG leakage detection and Prevention", International conference on computing and control engineering.(ICCCE 2012),12 & 13 April 2012.

[11] Mr. SagarShinde, Mr .S. B. Patil,Dr. A. J. Patil, "Development of movable gas tanker leakage detection using wireless sensor network based on embedded system",International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 6, November- December 2012, pp.1180-1183

[12] C.Selvapriya, S.Sathyaprabha, M.Abdulrahim," LPG leakage monitoring and multilevel alerting system", published in 2013.

[13] Zhao Yang, Mingliang Liu, Min Shao, Yingjie Ji Research on leakage detection and analysis of leakage point in the gas pipeline system. In Open Journal of Safety Science and Technology; 2011

[14] Falohun A.S., Oke A.O., Abolaji B.M. "Dangerous gas detection using an integrated circuit and MQ-9. In International Journal of Computer Applications. 2016; 135(7).

[15] 2017 IJEDR | Volume 5, Issue 2 | ISSN: 2321-9939 "Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor"

[16] Tyler Kersnovski, Felipe Gonzalez, Kye Morton. "A UAV System For Autonomous Target Detection And Gas Sensing." Yellowstone Conference Center, Big Sky, Montana, IEEE 2017

[17] *Mohammad Reza Akhondi, Alex Talevski, Simon Carlsen, Stig Petersen. "Applications of Wireless Sensor Networks In the Oil, Gas And Resources Industries." International Conference On Advanced Information Networking And Applications, IEEE 2010*

[18] Chet Sandber, Jim Holmes, Ken Mccoy, And Heinrich Koppitsch "The Application Of A Continuous Leak Detection System To Pipelines And Associated Equipment." Ieee Transactions On Industry Applications, Vol. 25, No. 5, September-October 198.

[19] Aggarwal, R. and Lal Das, M. (2012) RFID Security in the Context of "Internet of Things". First International Conference on Security of Internet of Things, Kerala, 17-19 August 2012.

[20] *Prof. S. K. Nanda B. B. Didpaye. Automated uni_ed system for lpg using microcontroller and gsm module a review.*

[21] *International Journal of Advanced Research in Computer and Communication Engineering, IJARCCE, 4(1), January 2015.*
[22] .Mahesh S.R Pooja R Preethi K. Mane Kumuda S. Shivalingesh B.M, Ramesh C. LPG detection, measurement and booking system. IJRSI, 1(6), November 2014.
[23] Shailendra Kumar Dewangan3 Praveen Singh Rathore4 Abid Khan1, Neju K. Prince2. Gsm based automatic lpg ordering system with leakage alert. IJRET: International Journal of Research in Engineering and Technology, 3(12), Jun-2014.
[24] P Rajasekar S Shyamaladevi, V G Rajaramya and P Sebastin Ashok. Arm7 based automated high performance system for lpg refillbooking & leakage detection. International journal of engineering research, science and technology (IJERST), 3(2), May, 2014
[25] Dr. M. Dhanabhakyam& T. Sumathi. A study on customers attitude and satisfaction towards hplpg in house hold. The SIJ Transactions on Industrial, Financial and Business Management (IFBM), 2(2), March-April 2014
[26] Selvapriya C, Sathya Prabha S, Abdulrahim M, Aarthi K C, 'LPG Leakage Monitoring and Multilevel Alerting System', International JournalOf Engineering Sciences & Research Technology, ISSN: 2277-9655,2(11): November, 2013.
[27] AravindaBeliraya, 'GSM Based Gas Leakage Detection System Using Arduino', International Journal of Engineering Technology Science andResearch, ISSN 2394 – 3386, Volume 4, Issue 10, October 2017.
[28] Prof. K.R.Katole 'Hazardous Gas Detection using ARDUINO', International Journal of Science Technology & Engineering, ISSN (online):2349-784X, Volume 2, Issue 10, April 2016.
[29] T.Soundarya, J.V. Anchitaalagammai, G. Deepa Priya, S.S. Karthick kumar, 'C-Leakage: Cylinder LPG Gas Leakage Detection for HomeSafety', IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 9, Issue1, Ver. VI, pp. 53-58, Feb. 2014.
[30] Harsh Mehta, Kunal Jadhav, Avinash Mishra, Prof. Anushree Deshmukh, 'IOT based home automation system using arduino board',International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395 -0056, p-ISSN: 2395-0072,pp.1541-1544, Volume: 04,Issue: 01, Jan -2017.
[31] T.H.Mujawar, V.D.Bachuwar, M.S.Kasbe, Deshmukh, 'Development of wireless sensor network system for LPG gas leakage detectionsystem', International Journal of Scientific & Engineering Research, ISSN 2229-5518,pp.558-563, Volume 6, Issue 4, April-2015.
[32] Onengiye M. Georgewill, Chukwunazo J. Ezeofor, 'Design and Implementation of SMS-Based Industrial/Homes Gas Leakage Monitoring &Detection Alarm System', International Journal of Engineering Trends and Technology (IJETT), ISSN: 2231-5381, Volume 35, Number 9,May 2016.
[33] Anitha A, 'Home security system using internet of things',IOP Conf. Series: Materials Science and Engineering, 14th ICSET 2017 - 263042026 doi:10.1088/1757 899X/263/4/042026.
[34] Girish Yadav, 'Arduino based Security System – An Application of IOT' International Journal of Engineering Trends and Technology(IJETT), ISSN: 2231-5381, pp. 209-212, April 2017.
[35] Abhishek Gupta,'Economical and Optimal Gas Leakage Detection and Alert System', International Journal of Scientific and ResearchPublications, ISSN 2250-3153, pp.260-263, Volume 7, Issue 11, November 2017.
[36] Ganesh D, AniletBala.A, 'Improvement on Gas Leakage Detection and Location System Based On Wireless Sensor Network' IJEDR, ISSN:2321-9939,pp.407-411, Volume 3, Issue 2, 2015.
[37] Ashish Shrivastava, RatneshPrabhaker, Rajeev Kumar, Rahul Verma, 'GSM BASED GAS LEAKAGE DETECTION SYSTEM',International Journal of Technical Research and Applications, e-ISSN: 2320-8163, Volume 1, Issue 2, PP. 42-45, May-June 2013.
[38]. Luay Fraiwan, Khaldon Lweesy, Aya Bani-Salma, Nour Mani, "A Wireless Home Safety Gas Leakage Detection System". Biomedical Engineering (MECBME), 2011 1st Middle East Conference on 21-24 Feb. 2011.