International Journal of Scientific Research and Engineering Development-– Volume 3 Issues 2 Mar- Apr 2020

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Gas Leakage Detector (LPG, IOT-Based): A Review

Mr. Prahlad Kolhe[1],Mr. Vikash Kolhe[2],Prof. Sachin Malviya[3]

[1]Departmentof Computer Science and Engineering (B.Tech), G H Raisoni University,Saikheda,INDIAEmail:prahladkolhe@gmail.com

[2]Department of computer Science and Engineering (B.E.), AbhaGaikward-Patil college of Engineering, Nagpur. INDIA Email:vikashkolhe@gmail.com

[3]Assistance Professor, Department of Computer Science and Engineering,G. H. Raisoni University, Saikheda.,INDIA Email:Sachinnmalviya@ghru.edu.in

----------**********----------

ABSTRACT

This paper reviews the existing solutions, their effectsand brief study of an IOT based gas detector system, as the LPG gas is most commonly used in homes and small-scale industries. It also surveys various technologies used for detection of LPGgas leakage. As this paper also lights on the work related to the existing technologies. WSNs have been used for boundary estimations. With the development of sensors-based Technology, the user and the fire department could be alerted by the message and with the imaging, leakages are detected. more and more new devices are applied to the power system with the help of technology. Accurate boundary estimation, calibration is an important issue due to the fast movement, and invisibility of the gas leakage.

Keywords—**devices,microcontroller,sensors (gas, temperature), wireless control, power supply**

----------**********----------

I. INTRODUCTIION

Technologies have been developing in the 21st century. with the developing technologies gases have been played the vital role in development. The gases are contained and uses as per theneed is been used in many different sectorswhich includes industrial and residentials. These gases mainly contain propane, iso-butane, methane.etc.are harmful and could leadhazardous incidents. The household gases such as LPG mainly contain propane and iso-butane with smelling (distinct odor liquid) agent ethyl mercaptan *(Ethanethiol)*.Many accidents tendencies due to short circuits,gas leakages, Etc. Any such leakage can cause vast damage for industry, human lives, and surrounded ecosystem. Gas leakages could not be avoidable, because of present factors such as technological limitations and human errors. But impact of the incidents could be minimized by detecting such areas or places of leakages as early as possible and taking necessary and immediate actions. This lightthe importance of accurate and timely gas leakage detection in such systems. Using the latest device-basedtechnology such gas leakages would be effectively detected and alarms could be installed on the required areas. Such environments require wireless long-distance reliable solution for gas leakage detection, such as prevention, and automation.

II. NEEDS OF SUCH SYSTEM

The actual needs of gas detection systems follow the incidents and disasters due to leakages and fire in flammable gases. The flammable gases in the LPG(Liquified Petroleum Gas) which are more likely to catch fire(propel) and could lead to the hazardous incidents. The incidents are highlighted in various report, cases, newspapers, channels and social media. The [8] news channels social sites reports the cases of the LPG gases, this includes the cylinder blasts and explosion in residential areas like home and industrial-like Factories, Etc. In the various different places of India, which are Delhi, Hyderabad, Jaipur, Jammu, Chennai, Etc. The report states the confirm 100+ kills within 5 years and more than hundreds of people injured in such blasts. The kills include children, teens, young, women, and adults. This also gives the lead to the loss of material, wealth and provides short-term andlong-term disabilities to human kind. The gas detectors could detect the gas or the leakage which could act to provide intermediate prevention or take an action to reduce such heavy loss.

A. Gas Detectors

[6] There are various techniques of gas detectors

I. Chemical-based- Electrochemical , Photoionization
II. Sensor-based- Catalytic bead (pellistor),Infrared point ,Semiconductor ,Ultrasonic
III. Imaged based-Holographic(holograms generated),Infrared imaging

The technique which are affordable and convenient in a regular basis which are most commonly used are via image sensing and with sensors

The main threats involve Ex-Ox-Tox…. Danger

B. Risk Factor

[7] There are three categories of risk

-Ex – explosion by flammable gases.

-Ox – Oxygen Risk of asphyxiation by oxygen displacement. Oxygen Risk due to increase of flammability by oxygen enrichment.

-Tox –poisoning by toxic gases.

III. METHODOLOGIES

C. Image based:

[1]Most of the gases(Imaged-based) are invisible to human eyes thus, Infrared imaging allows the workers to “see” volatile organic compounds that are invisible to the human eye .The image sensing based systems are generally used in industrial sectors with the image detecting they have the systems which could control a leak or take immediate actionsprovided via the Drew images captured from the surrounding,By looking for the right wavelength of infrared “heat” the camera sees what people cannot.

This could be used to locate the terminal of leakage and could perform the safety actions. the technology benefits the industries in many ways.The ThermaCAM® GasFindIRTM camera from FLIR Systems, is an infrared spectral imager which helps to visualize the absorptive and emissive properties of gases /vapors from the environment. Using these technologies we can detect various gases like [10]propane,[9] butane...etc with their infrared spectrum.

[11] fig 1: The video demonstrates the Invisible Gas Using FLIR Thermal Imager.

D. Sensor-based

sensor-based technology is most convenient to use. As the technology is much affordable and is used widely. The device uses the sensor which senses the Environment as per its sensing capacity. Then the communication happens with the wired or wireless medium. The data transmitted to the processing system which processes the data from its self-stored default data or via the programmed basis. The actuated system then performs the task which is operated and instructed by the processed system.

[3] The method comprises of the wireless communication system from the transmitter to the receiver the transmitter sends the sensed data over the channel the receiver takes the processed data. If it detects any harmful gases in the ambiance, the system will trigger an alarm to the user. The system works accordingly with the hardware peripherals. The LPG gas detection sensor used is MQ-6(which detects the change in concentration of LPG the air)when the system sense the data is processed by the MSP 430 microcontroller which cast the data wireless through CC1200 radio transceivers data casted, is fetched by CC1200 again as a receiver .the [5]ADC converter converts into digital values, the microcontroller which is efficient and has low power consumption which compares the values with the default set values if the data is altered the microcontroller drives the alarming system connected with the LED and buzzer which in Addition displays the message on LCD. This buzzer provides the alertness to the people who are within the organization. This system also provides visual alertness to the user through the LCD and LED.

[2] The system comprises of three units :1) sensor unit 2)microcontroller unit 3) GSM modem

The systemconsists of fire (flame sensor) and gasleakage detection system, Microcontroller with GSM module and protection circuitry. The hardware peripherals mainly includea sensor section, control unit, network module,and power supply. The microcontroller sends signal to the GSM module and if the connection establishedthe microcontroller sends an acknowledgment signal back to the microcontroller. Then if there is any gas leakage in the atmosphere it is detected by the gas sensor unit using the MQ-6 and MQ-9 Gas Sensors which detect gas leakage by comparing the concentration of ethanol which is present as a mixture in the LPG and CNG with air sensors. After the sensor unit detects the gas leakage, a signal is sent to the Analog-Digital Converter unit of the microcontroller which then sends activation signal to other external devices connected to it such as buzzer, GSM module. And in case of fire leakage the fire flames detected by the temperature sensor and activates the buzzer and water sprinkler. The GSM module gets activated which sends a warning [4] SMS to the user. At the end, when the gas or fire leakage is successfully stopped then with the help of the reset button the whole system is made to reach its initial stage. It then

gives analog voltage as output.

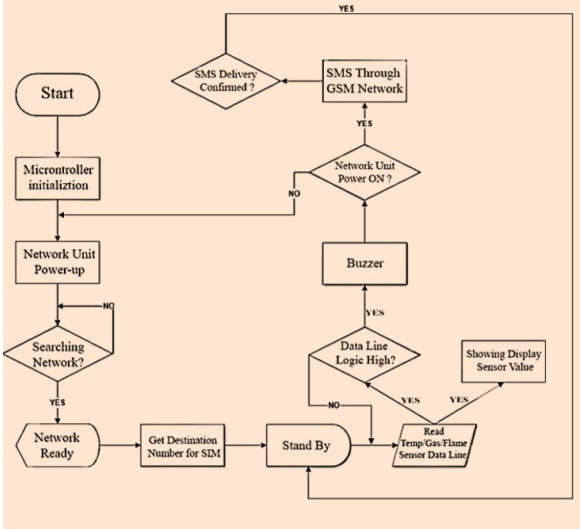

Fig 2:Flowcchart of sensor based System

IV. CONCLUSION

The methodologies given in the papers and their proposed system are satisfied in a constrained environment. The infrared imaging or the imaging via different technologies determine the location of the incident. The system which gives the information of the imaging-based output could be used to control the hazard before it happens and could be detached whereas the sensor-based system only alerts the user ,as incident happens or after the fire is exploded. For the safety the systems could define the approximate used of the data that leads to refine accurate boundary Estimation and calibration of processed data. the derived resultsare noted that average time required to detect LPG leakage is less at PPM. The system works effectively and gives alert for excess temperature detection above 50°C for any change in condition. The alert is provided by the LED, LCD,buzzer or SMS which to the respective subscriber/user via the system module. Results, today in many areas[12]It has also improved the IOT based monitoring and detection in various oil and gas industries.

REFERENCES

[1]J.F.TEGSTAM, FLIR Systems AB, Danderyd, SwedenR.DANJOUX,ITCEurasia, Danderyd, Sweden*Gas leak detection in the oil and gas industry using infrared optical imaging*Thermografie-Kolloquium 2007 - Vortrag 03

[2] S. Gajare1, Dr. P. M. Mahajan Rupali*Home and Industrial Safety System for fire and gas Leakage detection*Rupali (IRJET) e-ISSN: 2395-0056Volume: 05 Issue: 07 | July 2018 p-ISSN: 2395-0072

[3] *Automation*G. B. Jirage1, B. T. Jadhav2, P. A. *Portable Wireless Liquid Petroleum Gas leakage Detection System for Home and Industrial* IJEECS ISSN 2348-117X Volume 5, Issue 5 May 2016

[4]P. Kanaka Maha Lakshmi, P.S.G. Aruna Sri, P.Gopi Krishna *An IOT Based LPG Leakage Sensing and Alerting System*International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6, April 2019. Retrieval Number:F3727048619 /19@BEIESP

[5] Sriwati .ST .MT ,bAndaniAchmad, Ansar Suyuti ,*Intelligent system of LPG gas leakage detection for web-based living house security*ICIC international ©2019 ISSN 2185-2766 Volume 10, Number 2, February 2019 DOI: 10.24507/icicelb.10.02.89

[6] Wikipedia, the free encyclopedia*Gas detector*

(last edited :30 dec 2019) (Date of access:dec,2019) URL:https://en.wikipedia.org/wiki/Gas_detector

[7]Dräger Safety AG & Co. KGaA*Introduction to Gas Detection Systems2008* Retrieved From URL:https://www.draeger.com/Library/Content/introduction_gds_fl_9046421_en_1.pdf (date of access: dec,2019)

[8]NDTV *Lpg Cylinder Explosion*(Date of Access:dec,2019)URL: https://www.ndtv.com/topic/lpg-cylinder-explosion

[9]NIST Chemistry WebBook*NIST Standard Reference Database Number 69*Last updated: 2018 DOI: https://doi.org/10.18434/T4D303 Accessed:dec,2019 URL:https://webbook.nist.gov/cgi/cbook.cgi?ID=C106978&Type=IR-SPEC&Index=1

[10]NIST Chemistry WebBook*NIST Standard Reference Database Number 69* Last updated: 2018 DOI: https://doi.org/10.18434/T4D303 Accessed:dec,2019URL:https://webbook.nist.gov/cgi/cbook.cgi?ID=C74986&Type=IR-SPEC&Index=1

[11]Industrial Agencies*See Invisible Methane Gas Using FLIR Thermal Imager*(video uploaded on30 Dec,2017) (Date of Access:dec,2019) URL: https://www.youtube.com/watch?v=pyocuLVWa1Q/

[12] Written by Rich Castagna*IoT-Based Monitoring Networks' Role in Oil and Gas Industries*(12th November 2019) URL:https://www.iotworldtoday.com/2019/11/12/iot-based-monitoring-networks-role-in-oil-and-gas-industries/ (Acessed:dec,2019)

