e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:03/March-2023 Impact Factor- 7.868 www.irjmets.com

CNG LEAKAGE ALERT SYSTEM FOR VEHICLES USING GSM MODULE

Arya P. Ambekar*1, Sanika S. Dali*2, Sanjay S. Shinde*3

*1,2Student, Department Of Information Technology, D.B.J. College, Chiplun, Maharashtra, India.

*3Professor, Department Of Information Technology, D.B.J. College, Chiplun, Maharashtra, India.

ABSTRACT

In today's era, the CNG as a fuel is widely used in different types of vehicles. This growing use is creating its benefits as well as its disadvantages like CNG leakage is becoming a problem. At present vehicles run on CNG gas as it produces 95% less emissions than conventional petroleum vehicles, but leakage from CNG cylinders can cause damage or accidents or explosions.

CNG spillage in vehicles can be because of many reasons like stuffing of gas tank, improper fitting tank valve. The best solution for a CNG spill is to distinguish it right away and afterward fix the issue so the proposed CNG leakage alert system is designed.

Our main objective in designing this system is to detect and alert the CNG leakage from auto rickshaws. So we have made such a framework that in case of CNG spillage it will detect it automatically and the driver of vehicle will get a message.

We have utilized Arduino UNO as a controller, MQ4 sensor to detect the CNG leakage, GSM module to send the message on driver mobile, jumper wires etc. to make this system.

Keywords: Arduino UNO, GSM SIM900A Module, MQ-4 Sensor, CNG Gas, Leakage.

I. INTRODUCTION

At present, pollution is increasing in all countries. Metropolitan cities like Delhi, Mumbai, Noida, etc. are now using air purifiers because of the rising pollution in the air. One of the greatest reasons for air pollution is the fuel used in vehicles. Vehicles that use petrol and diesel as a fuel that release a large amount of carbon dioxide into the air and thus increase the pollution. Therefore CNG gas is used as an alternative option to petrol or diesel as it is lead and sulphur free which eliminates the harmful emissions and poses less risk to the environment. Hence it is also known as **Green Fuel.**

CNG gas is composed of 80 to 90% methane. It is odourless gas in its natural state hence **ethyl mercaptan** is added as odorant before distribution of gas. But anosmic people (people with no sense of smell) or people with little sense of smell may not respond immediately to CNG leak so they may not be able to take any immediate action. This CNG leakage can cause explosion which will not only affect that vehicles but also the nearby area. In such a situation, a system that will detect CNG gas leakage and prevent people from accidents is required.

So considering this problem we have developed a demo system which is a low budget model which will detect CNG gas leakage and send the appropriate message to the mobile.

II. HYPOTHESIS

If CNG Leakage Alert System is design or implemented in vehicle then it will be helpful to detect the CNG leakage and also it will solve the consequent problems.

III. OBJECTIVES

- To detect CNG Leakage using MQ-4 sensor and Arduino.
- To send the SMS (alert messages) to specified mobile numbers.
- To secure life of the people in danger situation.
- An alert is indicated by the GSM module

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:03/March-2023 Impact Factor- 7.868 www.irjmets.com

IV. METHODOLOGY AND COMPONENTS

1. System Methodology

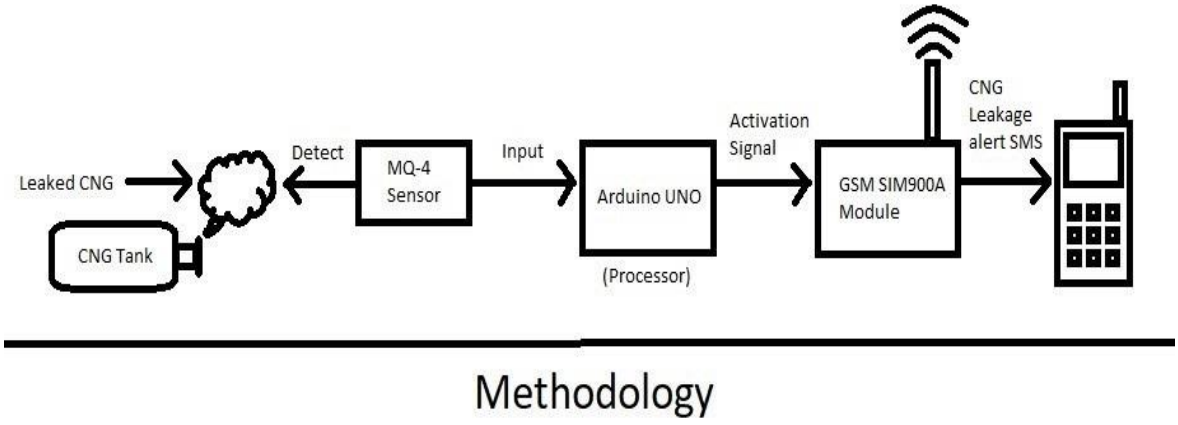


Figure 1: Methodology of CNG leakage alert system

Following are the steps followed to implement CNG leakage alert system:

- Initially MQ-4 sensor detects the leaked CNG gas.
- Next it will send the input signal to the Arduino UNO.
- Then Ardiuno will process on this input signal.
- After processing, Arduino will send the activation signal to the GSM module.
- Then GSM module will be activated and send the warning SMS to the phone number entered in program.

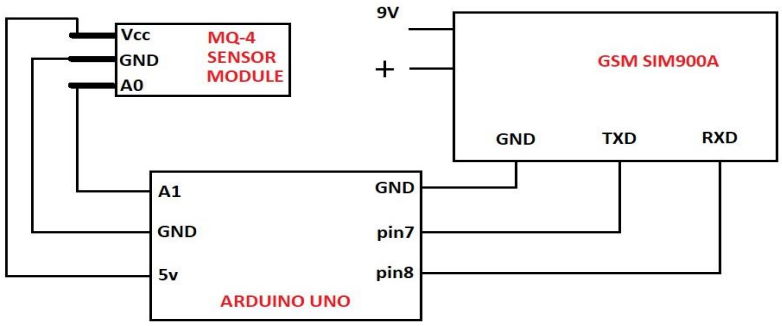


Figure 2: Block diagram of CNG leakage alert system

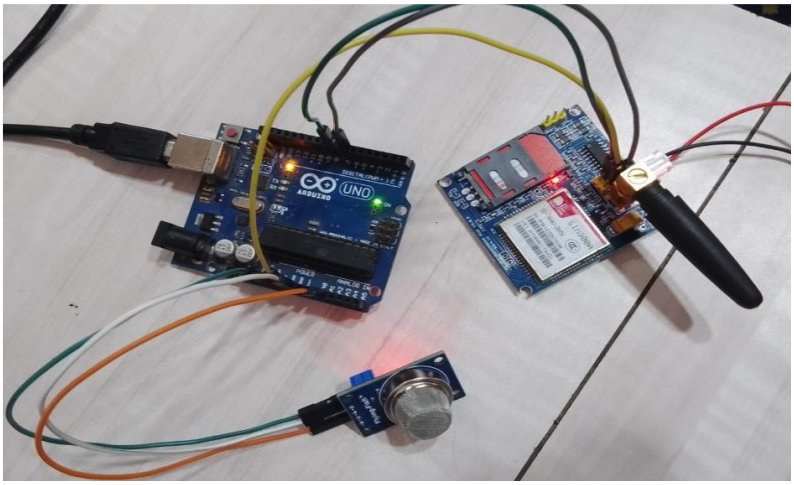


Figure 3: Implementation of CNG leakage alert system

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:03/March-2023 Impact Factor- 7.868 www.irjmets.com

2. Components

Following are the main components used in our system:

1. Arduino UNO
2. GSM SIM900A Module
3. MQ-4 Sensor

1. Arduino UNO :

Arduino UNO is ATmega328P based microcontroller. It has 13 digital pins which is mostly used for connecting output component like LED, LCD, Relay, etc. Analog pins of Arduino UNO are used to connect input sensors. It has power supply pin of 5V and 3.3V and GND pin which are used to give power to input and output components. Power jack is used to give power to Arduino. USB port is used to upload the program in Arduino. It has reset button which is used to restart the program which is already uploaded.

In our system we have used Arduino UNO to receive the input signal from sensor and send the activation signal to the SIM900A GSM Module.

2. MQ-4 Sensor:

In MQ-4 sensor SnO2 (tin dioxide) is used as an sensitive material. SnO2 has low conductivity in clean air. MQ-4 sensor consist of 4 pins which are:

- Vcc
- GND
- D0
- A0

Vcc pin is used to supply voltage to the MQ-4 sensor. Generally supply is of +5V.

GND pin of MQ-4 sensor is connected to the GND pin of Arduino UNO.

A0 pin produces signal which is equivalent to the intensity of Methane.

3. GSM SIM900A module:

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:03/March-2023 Impact Factor- 7.868 www.irjmets.com

GSM stands for Global System for Mobile Communication. It is second generation standard for mobile network which is digital cellular technology and is used to transmit the SMS to the driver of the vehicle.

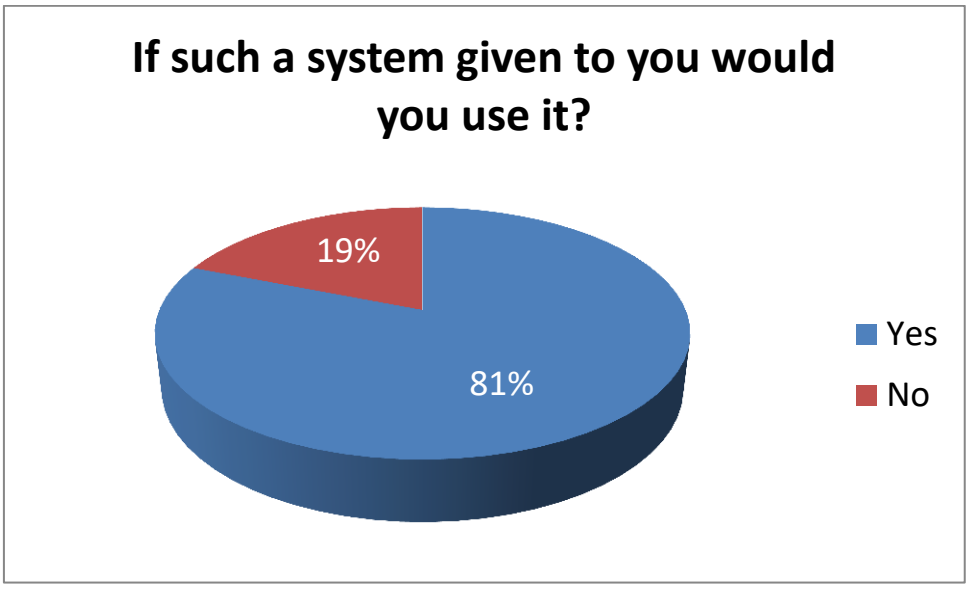
When a gas leakage is detected by a gas sensor Arduino UNO sends signal to GSM Module. One SIM card is required to send the SMS via GSM Module. This module is able to accept any network SIM card. This module requires 5V DC supply to operate

V. SURVEY

As per our set objective we have taken a survey through which we can understand how many people wants to implement this system in their vehicle.

Below is the list of some of the questions that we have asked in the survey:

1. Do you think CNG as a fuel is beneficial for you if yes then how?
2. Have you implemented CNG leakage alert system in your vehicle?
3. Do you need such CNG Leakage Alert system in your vehicle?



Almost all people think CNG is beneficial in case of cost friendliness and it gives high mileage and average and it is eco-friendly. Also there is no risk of CNG theft.

From survey we have noticed that there is no any driver/owner of the vehicle who has implemented such type of system which will detect CNG leakage.

81% people want to use this system in their vehicle. 19% people think that there is no need to use this system because after every 3 years company provides the after-sale-services.

So after studying the overall survey we have decided to build a budget friendly CNG Leakage Alert System which will help the driver/owner of the vehicle for preventing CNG tank from being empty, explosion which can be caused due to CNG gas leakage.

VI. LIMITATIONS

- GSM SIM900A requires 2G SIM which is not easily available now days.
- There might be range problems in some places so alert message may not to be send to the driver mobile.

VII. FUTURE SCOPE

- Needs to be used upgraded GSM module.
- When alert generate at the same time should share a contact of any closest specialist who doing a CNG related work.

VIII. CONCLUSION

After testing this system we have observed that CNG Leakage Alert System will detect the CNG gas will using MQ-4 sensor. After detecting the CNG gas sensor will send the input signal to Arduino UNO microcontroller.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:03/March-2023 Impact Factor- 7.868 www.irjmets.com

Then Arduino UNO will send the activation signal to activate the GSM Module. We can conclude that if there is a CNG leak then this system will detect it quickly and it will solve all the subsequent problems.

ACKNOWLEDGEMENTS

The authors can acknowledge professor, friend or family member who help in research work in this section.

IX. REFERENCES

[1] https://how2electronics.com/gas-leakage-detector-gsm-arduino-sms-alert/
[2] https://www.businesstoday.in/auto/story/what-causes-fire-in-cng-cars-and-how-to-remain-safe-109565-2018-08-06
[3] https://www.acko.com/car-guide/cng-car-maintenance-and-safety-guide/
[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7429099/
[5] https://techatronic.com/lpg-gas-leakage-detector-using-arduino-arduino-project/
[6] https://circuitdigest.com/microcontroller-projects/arduino-based-lpg-gas-leakage-detector-alarm
[7] "Design of an IoT based Gas Wastage Monitoring, Leakage Detecting and Alerting System"
[8] https://nevonprojects.com/cnglpg-gas-leakage-accident-prevention-project/
[9] https://www.ijisrt.com/assets/upload/files/IJISRT21APR658.pdf
[10] https://genesisgas.com/leak.html
[11] https://www.researchgate.net/publication/318501595_LPGCNG_Gas_Leakage_Detection_System_with_GSM_Module
[12] https://www.academia.edu/59407986/LPG_CNG_Gas_Leakage_Detection_System_with_GSM_Module
[13] https://en.wikipedia.org/wiki/Gas_leak
[14] https://control.com/technical-articles/an-introduction-to-gas-leakage-detection-systems/#:~:text=Gas%20leakage%20detection%20systems%20are,system%20to%20activate%20safety%20precautions.
[15] https://www.internationaljournalssrg.org/IJCSE/2020/Volume7-Issue7/IJCSE-V7I7P112.pdf
[16] https://www.persistencemarketresearch.com/market-research/gas-leak-detector-market.asp
[17] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3521200
[18] https://www.mdpi.com/2673-4591/2/1/28