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## System for IOT-based Industrial Gas Leakage Monitoring and Control

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**Abstract** -This project aims to propose a design that has the ability to automatically detect, notify, and control gas leaks. In this project, the valve is automatically closed after a gas leak is detected, preventing the leaking. To avoid fire incidents, the electric power supply is also turned off. In particular, a gas sensor with great sensitivity to gases like propane and butane has been deployed. The GSM module in the gas leak detection system sends an SMS to the user to notify them.

### INTRODUCTION

Gas leakage is a severe issue that is seen in many locations today, including homes, workplaces, and vehicles like Compressed Natural Gas (CNG), buses, and cars. Dangerous incidents are frequently caused by gas leaks, it has been observed. Propane, also known as liquefied petroleum gas (LPG), is a flammable mixture of hydrocarbon gases that is used as fuel in a variety of settings, including homes, hotels, businesses, cars, and other vehicles. It has many positive traits, such as a high calorific value, less soot and smoke production, and little environmental damage. Liquid petroleum gas (LPG), which is extremely flammable, can burn even a ways from the site of the leak. Propane and butane, which are both extremely flammable chemical molecules, make up the majority of this energy source. These gases have a simple ignition source. LPG is mostly used in homes for cooking. If there is a leak, the gases could result in an explosion. Gas leak accidents result in both property damage and human injury. Home fires have been more frequent over the past few years, posing a greater risk to both human life and property. Explosion, fire, and suffocation issues may develop depending on their physical properties, such as toxicity, flammability, etc. More fatalities have been connected to gas cylinder explosions in recent years. The Bhopal gas catastrophe is an incident caused by a gas leak.

### LITERATURE SURVEY

MeenakshiVidyaet.al..<sup>[1]</sup> proposed the leakage detection and real time gas monitoring system. In this system, the gasleakage is detected and controlled by means of exhaust fan.The level of LPG in cylinder is also continuously monitored. K.Padmapriyaet.al..<sup>[2]</sup> proposed the design of wireless LPG monitoring system. In this project, the user is alerted about the gas leakage through SMS and the power supply is turned off. Selvapriyaet.al..<sup>[3]</sup> proposed the system in which the leakage is detected by the gas sensor and produce the results in the audio and visual forms. It provides a design approach on software as well as hardware. L.K.Hemaet.al..<sup>[4]</sup> proposed the smart sensor technology. In this flexible reliable smart gas detection system is developed. In this, the leakage is detected and controlled by using exhaust fan. B. D. Jolheet.al..<sup>[5]</sup> proposed the system in which two sensors are used for detecting the gas leakage and for monitoring the level of gas in the cylinder respectively. Ashish Shrivastava<sup>[6]</sup>et.al... proposed the system in which two types of gases namely LPG and CNG are detected for home safety as well for vehicles. R.Padmapriya<sup>[7]</sup> et.al... proposed the system which ARM7 processor and simulates using keil software to alert the user by sending SMS. V.Ramya<sup>[8]</sup>et.al... proposed the system that uses two different sensors for detecting the leakage and requires resetting manually after every situation. A.Mahalingam<sup>[9]</sup>et.al... proposed the system to meet UK occupational health and safety standards and also it alerts the user by SMS. M.B.Frish<sup>[10]</sup>et.al... proposed the system that uses trace sensing technology and also detects the leakage.

### EXISTING METHODOLOGY

Currently it only detects the fire and gas leakage in certain important areas only. In existing system, the fire and gas leaks are measured and the communication is through wires to the control station. In this gas leakage detection system project, already propose an Arduino and IoT based gas leakage detection system, which will help in detecting any gas leakage with the help of MQ5 gas sensor and send this data over the internet to the IoT module and that will in turn alert the user about this gas leakage. The device will continuously monitor the level of gas in the surroundings air with the help of MQ5 gas sensor. Therefore, with the help of this project, we can easily detect LPG gas leakage and cannot control the leakage.

**ARDUINO UNO**

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

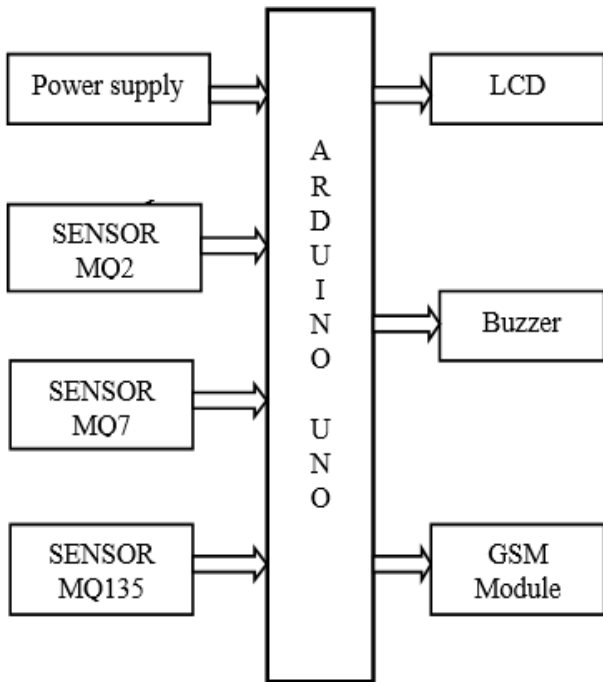


**Arduino UNO**

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards. In the UNO you can find two 6 pin connectors. One is near the USB – TTL Chip and the other one is at the end of the board. These pins are used to program those two microcontrollers. The USB – TTL chip on this board is an ATMega16U. And the connector marked as 2 is used to burn the bootloader into the ATmega328 microcontroller. Arduino UNO ISCP Pins Reset Button. As the name indicates this tactile switch is used to reset the ATmega328 microcontroller. It's connected to the PC6/Reset pin, which is pulled up through a 10K.

**MQ2 SENSOR**

MQ-2 gas sensor module. It is a sensor detector used to detects the flammable gas and smoke concentration of the combustible gas in the air, and output is read in the analog voltage and digital value output. Supply input voltage is 5v. it is very sensitive to H2, LPG, CH4, CO, SMOKE, PROPANE. It has three pins for transmitter, receiver, ground and sensitivity can be adjust by the potentiometer. Detects LPG from 200ppm to 10000ppm.

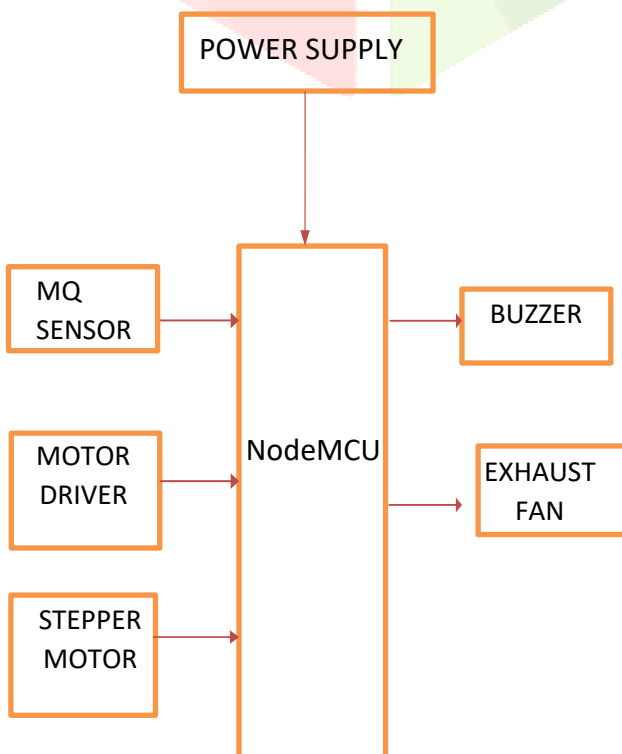


**EXISTING BLOCK DIAGRAM**

**PROPOSED METHODOLOGY**

A process can be automatically stopped by connecting a control system to a gas leakage detection device, which can also be used to detect other emission. Operation in the area where the leak is occurring may hear an alarm from Gas Leakage Detection, which will give them the chance to flee. Rapid expansion of oil and gas industry leads to gas leakage incidents which are very serious and dangerous. Solutions need to be find out at least to minimize the effects of these incidents since gas leaks also produce a significant financial loss. The challenges are not only to design a prototype of the device that can only detect but also automatically respond to it whenever the leakage occurs.

**PROPOSED BLOCK DIAGRAM**





MQ2 Sensor

## GSM MODULE

GSM module is employed to send SMS alerting on gas detection. GSM is meant as a device used for exchanging the information. SIM card is recovered from the GSM to control the wireless node. 5V output of the DC supply is required by the GSM for functioning. The modem needs only three connections (transmitter, receiver, ground) to interface with Arduino controller. Atmega 328 is the excess power supply used. Arduino microcontroller is connected with the receiver pin to the other device. The Arduino provides information to other GSM devices. The GSM will send output through the SIM inserted into its SIM slot to a number written into the code to alert about the leakage of the LPG gas or the other gas sensed by the sensor. AT commands are accustomed to communicate with the GSM module.



## STEPPER MOTOR

A driving circuit is used to power the stepper. Step-by-step rotation can be done with ease. It is attached to a handle that is mechanically attached to the cylinder's valve. The microprocessor triggers the rotation of the motor in the event of a gas leak. The valve is consequently shut, preventing the gas leak.

## WORKING

The MQ gas sensors can identify gas leaks. The microcontroller receives the analogue output from the gas sensor and uses its built-in ADC to convert it to digital form. It consists of a set of predefined instructions. The gas leak is signalled by an alert that the buzzer generates. The user is then informed by SMS sent via the GSM module. This information is used to turn on the exhaust fan. As a result, the gas concentration in the room decreases. The gas pipe's primary valve is closed by rotating the stepper motor.

## GSM/GPRS Module with RS232 with Interface

## BUZZER

Buzzer is used to alarm the beep sound to indicate and warn the danger to the people working around. The buzzer is the output of the system. The sound of the buzzer is beep-beep, which indicates the danger. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."



Buzzer

## CONCLUSION

The system is very useful, simple and easy to install. The components used in the system are available in the local market. This is an efficient method for automatically detecting and controlling the Gas Leakage. Moreover, the fire accidents are also prevented by switching off the power supply. By ensuring fire & LPG security in different industries (especially readymade garments), this system can help reducing losses of lives, livelihoods and properties.

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