

# GSM Based Gas Leakage, Explosion and Fire Alert System with Advanced Security

G. Shashikanth Chandra, Injam Snehith, S. Vinay, Ch. Narsimha Reddy

B. Shiva Ganesh, Managing Director.

## Abstract

Gas leakage is a major concern at homes, offices, industries etc. Many homes and industries had fallen victims of inferno due to unknown Gas leakage at a hidden point. This is dangerous and requires high security to avoid life and property being destroyed. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations, hence SMS based system is proposed. The system is designed to prevent loss/death to occur through gas leakages and hence promote safety of life and property. The main aim of the project is to design and implementation of Industrial/Homes Gas Leakage Monitoring and Detection Alarm System and SMS alerts.

**Keywords:** Arduino UNO, Fire sensor, LCD, Buzzer, DC water Motor, Relay, GSM, Gas sensor, exhaust fan

## 1. INTRODUCTION

Gas leakage and gas cylinder explosion is a regular problem in today's world, especially in developing countries. If the gas leakage can't be detected fast and no action is taken, may lead to explosion and cause severe damages to life and environment. The previous leakage detection systems only use alarms for warning. There is nothing about the protection. In this paper, a system is proposed that can detect not only gas leakage, it can detect explosion, and fire as well. And can take some protective steps.

It is equipped with gas sensor to detect the leaked gas and flame sensor to detect the explosion and fire. It has exhaust fan system to clear the leaked gas and solenoid valve to inlet the water or carbon dioxide gas (CO<sub>2</sub>) if explosion and fire occurs. The explosion security system response individually when there is only a fire with no relation to gas leakage. If any incident

occurs, that information is sent to owner through wireless media, a display shows the alert message and buzzer makes the alarm. It is

equipped with Global System for Mobile communications (GSM) modem as wireless media to send information to owner through Short Message Service (SMS). This ensures preventive actions immediately even in the

absence of people on-site. A prototype of this system has been developed and tested with Liquefied Petroleum Gas (LPG) and

Fire as well. The experimental results show that the system can detect the gas leakage, explosion and fire. It is also able to take protective steps quickly. This life saving system is low-cost and useful. It can protect people from burning alive.

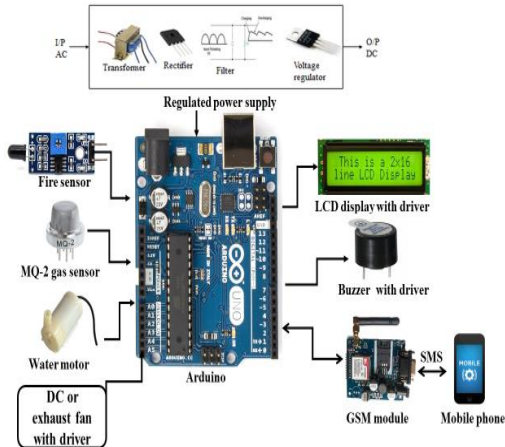
## 2. LITERATURE SURVEY

[1] LPG leakages are a mutual hindrance in household and manufacturing nowadays. It is very life threatening if you will not distinguish and modified right away. The idea behind our project is to give a solution by power cut the gas provision as soon as a gas leakage is perceived apart from activating the sounding alarm. In addition to this, the authorized person will receive a message informing him about the leakage. With the increase of natural gas productions in the last 10 years: Philippines gas industry has really taken its toll. However, the Bureau of Fire Protection prompted the society to yield preventive and security measures against defective electrical cabling and dissolved petroleum gas leaks regardless of fire alarming incidents in the first half of 2017.

[2] Gas is detecting innovation has among the topical research, ponder for rather now and then. With the reason for local gas chamber cooking turned out to be simple and settling them is moreover abbreviated. Be that as it may, at that point are likewise sick impacts of utilizing these barrels. Spillage of residential gas isn't just lethal to human and creature life, yet in addition aims colossal property misfortune. In this way, location and essential advances are to be considered to forestall unfortunate mishaps. Many accidents tendencies due to short circuits, gas leakages, Etc. won't permit a normal person to

enter the accident space, therefore on the scale back any harm. Such accidents are a unit, increasing every day, owing to lack of awareness, precaution measures and mental object. Multiple sensors were used for detection method. This paper presents an intelligent security system helpful for many of the house and business application..

**3. Implementation:**



The controlling device of the whole system is Arduino microcontroller. The system consists of gas sensor, fire sensor, buzzer, exhaust fan, GSM, LCD display, water motor are interfaced to microcontroller. The microcontroller gets the information regarding the leakage of any gas through the gas sensor, fire detection using flame sensor and alerts about the condition being sensed using buzzer and sends SMS through GSM Modem. When smoke or gas level and fire increases exhaust fan will be ON automatically and to overcome fire water motor pours the water. The data is also displayed on LCD display. By this way we can take the prevention steps before occurrence of the major fire accidents and we can avoid the human losses and financial losses. The microcontroller is programmed using Arduino IDE software.

**4. Related Work:**

The brief introduction of different modules used in this project is discussed below:

**ARDUINO UNO :**

The **Arduino 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 crystal oscillator, 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.



**FIRE SENSOR:**



Flame Detection Sensor Module is sensitive to the flame, but also can detect ordinary light. Usually used as a flame alarm. Detects a flame or a light source of a wavelength in the range of 760nm-1100 nm. Detection point of about 60 degrees, particularly sensitive to the flame spectrum. Sensitivity is adjustable, stable performance.

**FEATURE:**

- 100% brand new and high quality
- Detection angle about 60 degrees, it is sensitive to the flame spectrum. Accuracy adjustable
- Operating voltage 3.3V-5V
- Output a. analog voltage outputb. digital switch outputs (0 and 1)
- With a mounting screw holePCB size: 3cm \* 1.6cm
- Power indicator (red) and digital switch output indicator (green)
- Comparator chip LM393 ,it is stable.
- Flame detection distance, lighter flame test can be triggered within 0.8m, if the intensity of flame is high , the detection distance will be increased.

**GAS SENSOR:**

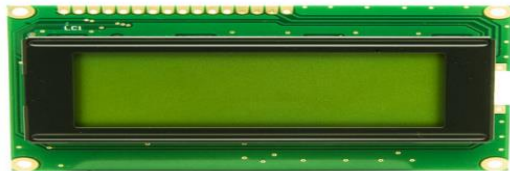
The MQ6 is a simple-to-use liquefied petroleum gas (LPG) sensor. It can be used in gas leakage detecting equipment in consumer and industry applications, this sensor is suitable for detecting LPG, iso-butane, propane, LNG. Avoid the noise of alcohol, cooking fumes and cigarette smoke. The sensitivity can be adjusted by the potentiometer. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all

you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.



#### LCD:

One of the most common devices attached to a micro controller is an 16X2 LCD display. This means 16 characters per line by 2 lines respectively.



The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

#### DC MOTOR:

A DC motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors.

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator.

The current carrying conductor is placed in a magnetic field perpendicularly, and then the conductor experiences a force in the direction mutually perpendicular to both the direction of field and the current carrying conductor. Fleming's left-hand rule says that if we extend the index finger, middle finger and thumb of our left hand perpendicular to each other, in such a way that the middle finger is along the direction of current in the conductor, and index finger is along the direction of magnetic field i.e. north to south pole, then thumb indicates the direction of created mechanical force.



#### RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protection relays".



#### BUZZER:

A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signaling device. We are using electromagnetic buzzer in our project. The vibrating disk in a magnetic buzzer is attracted to the pole by the magnetic field. When an oscillating signal is moved through the coil, it produces a fluctuating magnetic field which vibrates the disk at a frequency equal to that of the drive signal.





## GSM MODULE:

GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. This is a GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz and which can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMS.



## WATER MOTOR:



This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA.

## 4. CONCLUSION:

The existing model presents an Integrating feature of all the hardware components which has been used and developed in it with ATmega328p Microcontroller. The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for “**GSM Based Gas Leakage, Explosion and Fire Alert System with Advanced Security**” has been designed perfectly. Thus, the project has been successfully designed and tested.

## 5. ACKNOWLEDGEMENT

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## Author's Profile:

B. Shiva Ganesh, Department of Electronics and Communication Engineering, GITAM School of Technology, Rudraram (V), Patancheru (M), Sangareddy (D), Telangana, 502329, India.

G. Shashikanth Chandra, Department of Electronics and Communication Engineering, GITAM School of Technology, Rudraram (V), Patancheru (M), Sangareddy (D), Telangana, 502329, India.

Injam Snehith, Department of Electronics and Communication Engineering, GITAM School of Technology, Rudraram (V), Patancheru (M), Sangareddy (D), Telangana, 502329, India.

S. Vinay, Department of Electronics and Communication Engineering, GITAM School of Technology, Rudraram (V), Patancheru (M), Sangareddy (D), Telangana, 502329, India.

Ch. Narsimha Reddy, M.E, Assistant Professor, Department of Electronics and Communication Engineering, GITAM School of Technology, Rudraram (V), Patancheru (M), Sangareddy (D), Telangana, 502329, India.