

## **SMART GAS LEAKAGE DETECTION & REGISTRATION**

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### **ABSTRACT**

*Gas leakage is a major problem with industrial sector, residential premises etc. One of the preventive methods to stop accident associated with the gas leakage is to install a gas leakage detection kit at vulnerable places. The aim of this project is to present such a design that can automatically detect, alert and control gas leakage. The device is intended for use in household safety where appliances and heaters that use natural gas & LPG may be a source of risk. The system can also be used for other application in the industry or plant that depends on LPG & natural gas in their operation. The system consist of two main module: The detection and transmission module & registration. In this project, after the leakage of gas is detected, the valve is automatically closed, thereby stopping the leakage whereas registration module will inform the distributor and consumer about the cylinder information. Gas leakage system consists of GSM module, which alerts the user by sending SMS.*

**Keywords:** *At Mega 328PIC, Gas sensor, IC 7805, L293D, Servo motor and Battery etc.*

### **I. INTRODUCTION**

Liquefied petroleum gas is being used for the past decades as industrial fuel and for domestic purpose. It has a characteristic of smokeless burning in the air. The main constituents of LPG are propane and butane and depending on the applications their proportions vary. Gas leakage detection in residential houses has become one of the fundamental issues in the recent times. Accidents mainly occur due to the negligence and technical fault. Electronic and press media have reported many accidents which were caused mainly because of gas leakage in residential houses and industries. A better system needs to be developed to reduce the accidents because of gas leakage. The gas is generally stored in metallic cylinders as its boiling point is lower than ambient temperature. Gas is molecularly heavy than other gases present in the air. So whenever the gas is leaked it settles closest to the ground level. And unless you provide a powerful exhaust system it cannot be forcefully disposed into open atmosphere. Now-a-days LPG leakage detection in homes, restaurants has been a common issue and the detection systems find applications in the market. Presently they are using load cell to measure the weight of the cylinder. When they find it become empty, consumer will order for a new cylinder. There may be a delay in providing the cylinder for few reasons like we may inform the service provider at the last moment when the gas is empty or there may be a delay in informing the gas provider. So in this system we will use a load cell to measure the amount of gas present in the cylinder and also book the gas automatically when it reaches to a certain level.

## II. EXISTED SYSTEM

In existed system, it is possible only to sense the gas leakage. At present it does not contain the locking mechanism for the regulator and also automatic switching of the regulator valve. We don't have automatic booking of the gas while it gets emptied.

## III. PROPOSED WORK

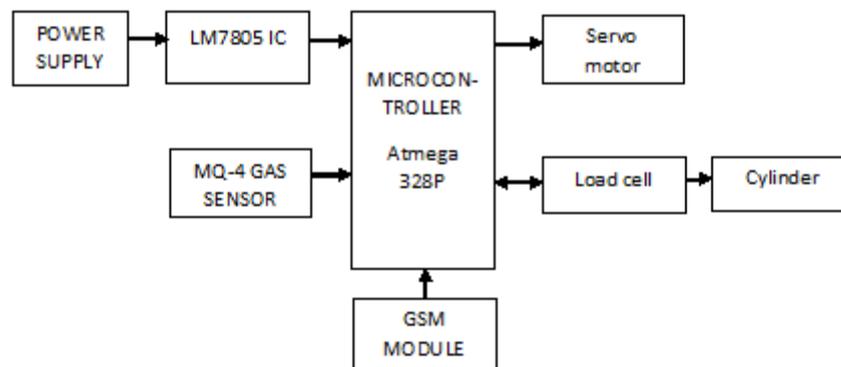
The locking mechanism which is basically used to stop the leakage is done with the help of the stepper motor. The amount of gas present in the cylinder is measured with the help of the load cell. If the weight of the cylinder reaches the defined value or goes below, then the GSM module will send message to the customer and the distributor and regarding the refill of the cylinder. We will detect the gas and also alerts the consumer using the SMS

## IV. AIM OF THE PROJECT

The aim of this project is to detect the gas leakage by using the gas sensor MQ-4 and turned off the main supply of the gas and informing it to the consumer through SMS. By using the load cell, weight of the gas cylinder is measured and the refill of the cylinder SMS is sent to distributor.

### 4.1 Description

As shown in below block diagram



**Fig. 1 Block diagram of gas leakage security system.**

In the initial step, the gas leakage is detected by the gas sensor MQ-4. This detects the gas leakage and gives the signal to the microcontroller. After that in second step the microcontroller receive the signal, send by gas sensor. It sends activation signal to other external devices attached with it. Such as Servo motor, LCD (Liquid crystal display), GSM module [10]. In the last step GSM module activated, which send warning SMS to the user. Servo motor attached to microcontroller, which in turns rotates the knob of regulator of the cylinder, as a result main power of gas supplies turn off. At the end, when the gas leakage is successfully stopped then with the help of reset button the whole system reached to the initial stage.

## I. MQ-4 Gas Sensor

This is a simple-to-use compressed natural gas (CNG) sensor, suitable for sensing natural gas (composed of mostly Methane [CH<sub>4</sub>]) concentrations in the air. The MQ-4 can detect natural 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.



Fig. 2 MQ-4 gas sensor [5]

## II. Microcontroller (AT MEGA 328P)

AT mega 328 is used for this project with total 28 pins out of which 14 digital pins & 6 analog pins are used. Pin 7 is connected at VCC & pin 8 is connected to ground. Internally pin no.20 is connected to VCC & pin no. 22 is connected to ground respectively. Pin no. 9, 10 are connected to crystal oscillator of 16 MHz with ceramic capacitor of 22pF. These capacitors are used to reduce the noise.

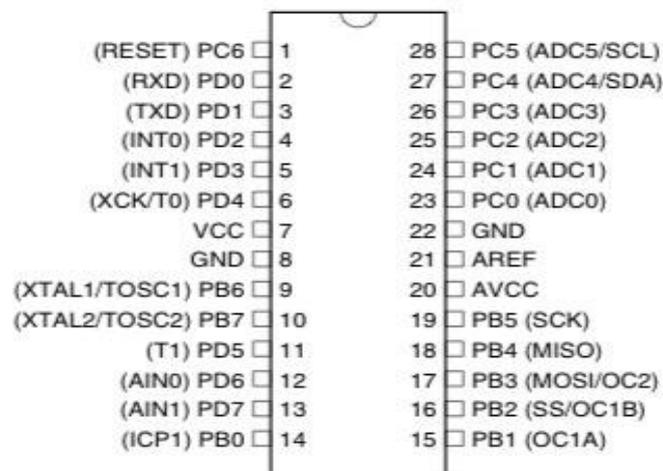


Fig. 3 Microcontroller Atmega 328P

## III. GSM Module

GSM module is used to send an SMS to the user cell phone [8]. When the gas leakage is detected by the gas sensor, microcontroller sends a signal to GSM module [2], in which one of the tasks is to send the text SMS. GSM module requires one SIM card. This module is capable to accept any network SIM card. Fig. 4 shows a GSM module IC (Integrated circuit). This module has a unique identity number like mobile phones have. These module works on 12V DC supply. We can send SMS and also send a voice message. These SMS or voice messages are saved in the microcontroller memory. Multiple SMSs can also be sends to user, police and fire station etc.



**Fig. 4 GSM module IC**

#### IV. Servo motor

Servo motor is a special type of motor which is automatically operated up to certain limit for a given command with help of error-sensing feedback to correct the performance. A servo motor is basically a DC motor (in some special cases it is AC motor) along with some other special purpose components that make a DC motor a servo. In a servo unit, we will find a small DC motor, a potentiometer, gear arrangement and an intelligent circuitry. The intelligent circuitry along with the potentiometer makes the servo to rotate according to our wishes.



**Fig. 5 Servo motor**

#### V. CONCLUSION

The automatic gas booking system was proposed, designed and successfully implemented in this paper for human simplicity and gas leakage detection is useful in home safety and industrial applications. This system detects the leakage of the gas and alerts the owner about the leakage of gas by SMS. The system continuously monitor the weight of the gas cylinder and its display on LCD makes it an efficient home security system and also can be used in industries and other places to detect gas leaks. This is an efficient method for automatically detecting and controlling the LPG gas leakage.

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