

## AUTOMATIC GAS BOOKING, LEAKAGE AND DETECTION USING GSM

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### ABSTRACT:

This paper proffers to monitor for liquefied petroleum gas (LPG) leakage to avoid fire accidents providing house safety feature where security has been an important issue. The system detects the leakage of LPG using gas sensor and alerts the consumer about the gas leakage by sending SMS. Also it closes the regulator using electromagnetic valve and also switch ON the exhaust fan. The wireless communication is used between the exhaust fan and LPG gas module. The proposed uses the GSM to alert the person about the gas leakage via SMS. When the system detects the LPG concentration in the air exceeds the certain level then it immediately takes action by closing the regulator and switch ON the exhaust fan and alert the consumer by sending the SMS to the registered mobile phone. The gas sensor is used to monitor the leakage of gas and RF is used to switch ON the exhaust fan. This project is also used for automatic booking of the cylinder by using the pressure sensor. When the pressure is low, it indicates the cylinder is going to empty. At that time, the gas cylinder is automatically booked through SMS.

**KEYWORDS:** GSM module, Electro Magnetic valve, gas sensor, pressure sensor, Micro controller.

### 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 pressure sensor to measure the amount of gas present in the cylinder and also book the gas automatically when it reaches to a certain level.

LPG is generally odourless and cannot be detected by human sense of smell because of its odourless nature. A pungent chemical is added to it purposely so that humans can detect the gas. There are few disadvantages anyhow. Firstly, it requires human presence in the vicinity. Secondly, by the time gas leakage is detected, its concentration in the vicinity may exceed the threshold level and may lead to explosion with the spark like light switch. So in order to monitor its presence, sensing systems are deployed in the premises to detect the leakage and avoid accidents. Many sensors are available in the market which can warn the gas leakage. They make use of transmitters, controllers and other accessories but the cost of these kind of sensing systems is high and has technical complexity and also inaccurate with delays. Therefore, there is a need for the development of lower complexity, low cost and fast response systems.

The amount of gas present in the cylinder is measured with the help of the load cell. In this system we make use of the pressure sensor to measure the amount of the gas present in the cylinder.

### **Objective of Project**

The objective of this project is to design a system that can detect the presence of natural gases as well as fire and send an SMS alert to the user and nearest fire station if gas leakage and fire occurred.

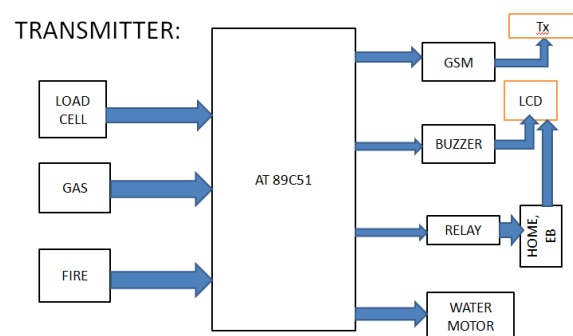
### **Project Methodology:**

This project focuses more on the study case and the project development based on the gas and temperature sensor. The microcontroller will continuously receive the data from both of the sensor in analog packet of data. It will process the data and convert it to ppm and degree Celsius respectively. The converted data will be displayed by the LCD. Whenever the reading of the sensors exceeding the limit set, it will automatically send an SMS alert wirelessly by using GSM Network to the numbers as being set on the source code. The project methodology shows the step by step taken in order to complete the project. The methodology includes the planning, the development of the design and the management of the project.

### **PROPOSED WORK:**

In the proposed system, we will detect the gas and also alerts the consumer using the SMS. It Contains the lock mechanism for the regulator and switching ON the exhaust fan. It helps to book the gas automatically. The proposed system will be implemented in four stages.

### **BLOCK DIAGRAM:**



### **DETECTION OF GAS LEAKAGE:**

This section consists of micro controller, RF transmitter, receiver and gas sensor. When the gas leakage is sensed by the sensor it sends the signal to micro

controller where it is converted into digital form and sends output to the relay.

#### **METHANE GAS SENSOR:**

MQ-5 is a Sensor for Natural Gases Sensitive material. MQ-4 gas sensor is SnO<sub>2</sub>, which has lower conductivity in clear air. When the target combined gas exist, the sensors conductivity is heavier with the gas concentration rising. We used simple circuit to convert respective output signal according to concentration level. MQ-4 gas sensor has high sensitive to Methane, Propane and Butane. The sensor can be used to detect different combustible gas, especially Methane; it is with cost effective and useful for so many applications.

#### **LCD DISPLAY:**

LCD stands for Liquid Crystal Display. They have become very common with industry by clearly replacing the use of Cathode Ray Tubes (CRT). CRT consumes more power than LCD and also bigger and heavier. We all know about LCD's, but no one knows the exact working of it. LCD is finding wide spread use replacing LEDs (seven segments or other multi segment LEDs) due to the following reasons:

- 1) The declining prices of LCDs.
- 2) The ability to display numbers, characters and graphics related data. This is in contrast to LEDs, which are limited to numbers and a few characters.
- 3) Incorporation of a controller into the LCD, thereby making the CPU to keep displaying the data.
- 4) Ease to program for characters, strings and graphics related data.

These are specialized for being used with the microcontrollers, which makes that they cannot be activated by

standard IC circuits. They are used for writing different messages on a miniature LCD.

#### **LOAD CELL:**

As per dictionary, a load cell is described as a "weight measurement device necessary for electronic scales that display weights in digits." However, load cell is not restricted to weight measurement in electronic scales. Load cell is a passive transducer or sensor which converts applied force into electrical signals. They are also referred to as "Load transducers".



Strain-gauge load cells convert the load acting on them into electrical signals. The measuring is done with very small resistor patterns called strain gauges - effectively small, flexible circuit boards. The gauges are bonded onto a beam or structural member that deforms when weight is applied, in turn deforming the strain-gauge. As the strain gauge is deformed, its electrical resistance changes in proportion to the load. The change to the circuit caused by force is much smaller than the changes caused by variation in temperature. Higher quality load cells cancel out the effects of temperature using two techniques. By matching the expansion rate of the strain gauge to the expansion rate of the metal it's mounted on, undue strain on the gauges can be avoided as the load cell warms up and cools down. The most important method of temperature compensation involves using

multiple strain gauges, which all respond to the change in temperature with the same change in resistance. Some load cell designs use gauges which are never subjected to any force, but only serve to counterbalance the temperature effects on the gauges that measuring force. Most designs use 4 strain gauges, some in compression, and some under tension, which maximizes the sensitivity of the load cell, and automatically cancels the effect of temperature. It is often easy to measure the parameters like length, displacement, weight etc that can be felt easily by some senses. However, it is very difficult to measure the dimensions like force, stress and strain that cannot be really sensed directly by any instrument. For such cases special devices called strain gauges are very useful. There are some materials whose resistance changes when strain is applied to them or when they are stretched and this change in resistance can be measured easily. For applying the strain you need force, thus the change in resistance of the material can be calibrated to measure the applied force. Thus the devices whose resistance changes due to applied strain or applied force are called as the strain gauges.

#### **GSM MODULE:**

GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL modem s SIM900 quad-band GSM / GPRS device, works on frequencies 850 MHZ, 900 HZ, 800 MHZ and 1900 HZ. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with 5V microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.).



**GSM SIM800 Module**

The baud rate can be configurable from 9600-115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable User to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART (Universal Synchronous Asynchronous Receiver and Transmitter) feature.

#### **RESULTS AND DISCUSSION:**

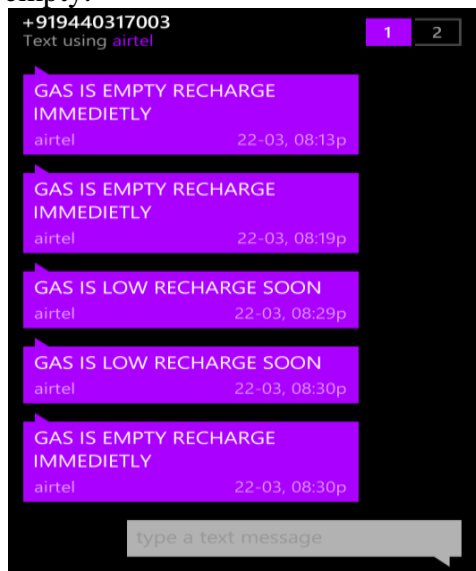
In ATMEL based LPG gas Monitoring & Automatic Cylinder booking with Alert System MQ-4 gas sensor, LM-35 Temperature sensor, 10 kg load cell( for prototype) as input devices and Piezoelectric buzzer, 16x2 LCD display and GSM module used as output devices.



LCD showing output of Temperature, gas level and weight

Actually the room temperature is 25°C, but we increased temperature of LM35 upto 53°C. Initially before gas leakage the output of gas sensor is 0 ppm, but when it sense gas the output is 267 ppm. We have placed 10kg load cell, so the maximum capacity is 10kg load. 338 is in the units of grams of weight.

The above figure represents SMS messages in user mobile phone which is send by GSM module for different kinds of input reaction in our project. The message “GAS IS LOW RECHARGE SOON” is sent to the user when the LPG gas reaches to minimum threshold level. So the user comes to know to when to book the cylinder to avoid delay in delivering cylinder. The message “GAS IS EMPTY RECHARGE IMMEDIETLY” is sent when the weight of the gas is fully empty.



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