

GAS TANKER SAFETY SYTEM

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Abstract—{Our project aims at implementing some safety measures in the gas tanker which will help us to foresee the accidents and prevent them. Our ultimate aim is to prevent any gas tanker explosions and save the people from such accidents. We have two circuits to implement this. The first circuit which is to be placed on the gas tanker and the second circuit is placed near the houses adjacent to the national highways that are highly prone to accidents. The first circuit detects if there is any leakage in the tanker and send an alert message to an emergency number on detecting a leakage. The message also contains the position of the vehicle so that fireforce can act immediately and arrest the gas leakage and chances for an explosion. The second circuit placed near the houses detects the gas leakage and on detecting a leakage the circuits switch off the AC power supply to the house. This circuit aims at preventing any accidental sparks produced by switching any electric devices.}

I. INTRODUCTION

LPG , Liquefied Petroleum Gas is the most common fuel used by the people. Tanker lorry is mainly used for transportation of LPG. Same time it is provided with scarcely any safety measures. The cases of Gas Tanker Explosions are increasing day by day. Even then the authorities are not providing any safety measures in tankers. We have conducted a case study of major gas tanker explosions and we have found that the reasons which led to these explosions are: Low Safety measures in Gas tankers, People were unaware about Gas leakage, Lack of rapid action, Rash driving of Tanker drivers.

We provide two types of protection systems through our project:

- One on the body of Gas Tanker
- Next in the houses close to roads

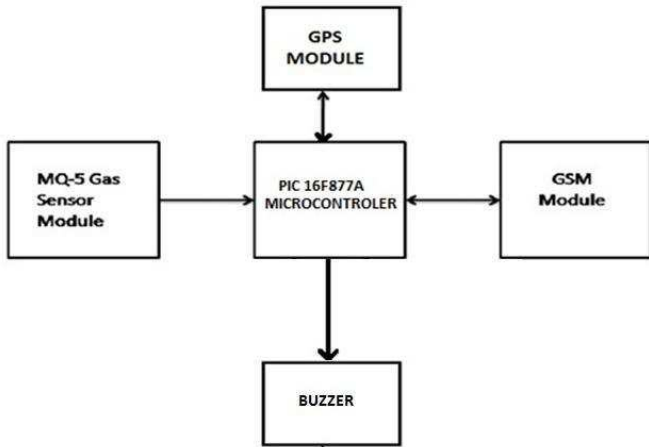
This first system is attached on the body of Gas Tanker lorries. When there is a gas leakage it is detected using a gas sensor and its output is given to microcontroller. On sensing the gas leakage the microcontroller will switch on an alarm, which

will make the nearby people aware about gas leakage so that they can escape to safe place. At the same time in order to provide a rapid rescue action, we send this gas leakage information to emergency services like police, ambulance, fire & rescue service etc through GPS & GSM modules in our system. By using GPS receiver we track the current location of the tanker and that location information including with the gas leakage warning information is send to emergency service numbers using the GSM modem.

Our second protection system is placed near the houses adjacent to national highways or routes of gas tanker Lorries. This acts as an added protection system to our first one. When there is a massive gas leakage, gas will spread to nearby houses. People inside the houses may not be aware about it. So this system provides protection to them and it is placed near the houses in a convenient position. When gas spreads and reaches nearby houses gas sensor will detect its presence and give an indication to the microcontroller. Then microcontroller will suddenly switch on the alarm, which makes the people aware. If such a massive gas leakage happens during night time and if people unknowingly try to switch on the lights using pressing switches, it will lead to a massive explosion. This is due to the fact that switches used in houses are mainly mechanical which cause sparking during its operation. So in order to prevent such a tragedy we are providing a relay controller in the AC circuit of houses. When the gas sensor detects a gas leakage, microcontroller will trigger the relay included in AC circuit of house, which cut the power supply to the house.

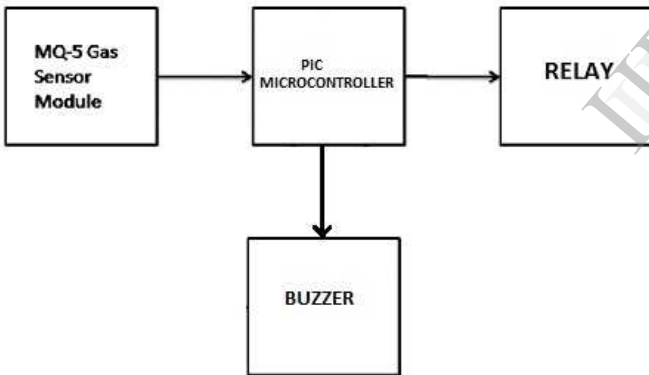
II. SYSTEM OVERVIEW

A. Block Diagram 1



This block is placed on the body of gas tanker. The objective of this circuit is to send an alert message to emergency number on detection of a gas leakage. The message include warning for gas leakage and the location of lorry.

B. Block Diagram 2



This block is placed near the houses to detect the gas leakage and cut off the AC power supply to the house on detecting a leakage. An alarm is also provided to alert the people.

C. Block Diagram Explanation

1) PIC Microcontroller:

The PIC microcontroller is the heart of both the safety systems. It is used to interface different devices used in the circuit. PIC is a family of modified Harvard architecture microcontrollers. It is made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller". PIC 16f877A is used in our circuits.

2)GPS Module

The GPS Module is used to find the location of the tanker lorry in terms of latitude ad longitude. The GPS Module gives many informations other than the location but we extract only those we need.

3)GSM Module

The GSM Module is used to send the message to the emergency number. GSM Module can be used to send and receive messages, make calls, use internet via GPRS etc. But we are using it only to send messages.

4)Gas Sensor

The Gas Sensor used in the circuit is MQ-6. This is a typical gas sensor whose output voltage vary according to variation in concentration of LPG in the atmosphere.

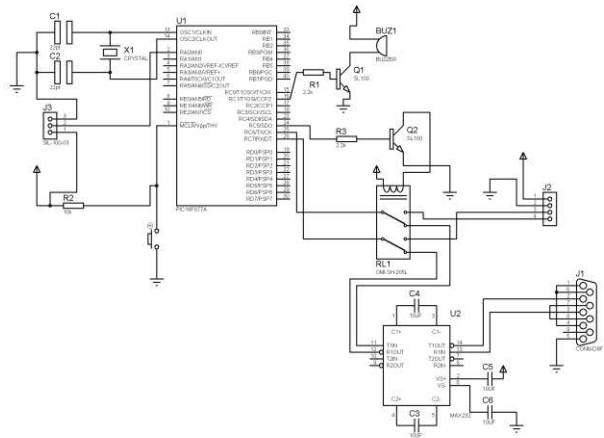
5) Buzzer

A DC Buzzer is used in our circuit to alert the people on the event of any gas leakage. The buzzer works on 12V DC supply.

6) Relay

A relay is used in the second circuit. The purpose of this is to cut off the AC power supply to the house when a leakage of LPG is detected. This makes sure to prevent any accidental sparks from electric switches which may result in explosions.

III. HARDWARE IMPLEMENTATION



The gas sensor MQ-6 is connected to the pin 2 of PIC. This is an analog input pin and can detect voltage at this pin and convert it to 10 bit binary value corresponding to the input voltage between 0 and 5V. The GPS module and GSM module uses serial communication and is connected to the serial port (pins 25 and 26) of PIC. But since the PIC16f877A has only one serial port and we have two devices using serial communication a dual input relay is used to switch the devices connected to the serial port. The relay and dc buzzer is driven with transistor SL100 and is switched on and off by the output ports of PIC. The GSM module is connected to the normally connected pins of relay and the GPS module to the normally off pins of relay. The GPS module uses TTL logic for communication. So it is connected directly to the pins of relay. But the GSM module uses RS232 logic for

communication. Therefore it requires a conversion from TTL logic to RS232 for data transfer from PIC to the GSM module and a conversion from RS232 level to TTL logic level for data transfer from GSM module to PIC. This level conversion is executed by using the IC MAX232 between the relay and GSM module.

When the circuit is powered on it checks whether the GSM module is functioning properly and sends a message to the number stored in PIC indicating GSM is ON. Now the PIC constantly checks for the voltage at the analog input. When the output of gas sensor crosses a predefined value, i.e. the concentration of LPG increases beyond a limit, the alarm is triggered and also the relay is switched to connect to GPS module to trace the location of the lorry. After tracing the location the relay is switched back to the GSM module. Now the caution message is sent to the emergency number along with the location of tanker lorry.

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