PIC Microcontroller based LPG Gas Monitoring and Automatic Gas Booking System

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ABSTRACT: In conventional method, when gas is reduced, people manually book the loaded cylinder. LPG gas cylinder is used in every sector of our life. Since in a busy schedule, it is hard to monitor cylinder continuously. If LPG starts leaking from the cylinder it can cause huge destruction and various accidents. So, to be safe from such situations this project is designed. This project basically prevents from such disasters. This system is based on PIC microcontroller, it contains MQ6 Gas sensor which senses the gas if leaked and alerts the consumer by buzzer and through SMS and also turn off the gas valve with help of servo motor. Also, it has a feature of automatic gas booking by which it looks after the level of gas in cylinder with the help of load cell and when it goes near to empty it sends SMS for booking through GSM Module. Two more advantages that our project possesses are it can be battery operated when electricity is cut off and also it is enabled with exhaust fan for proper ventilation at the time of leakage.

KEY WORDS: PIC microcontroller, GSM module, load cell, servo motor,MQ6 gas sensor.

I. INTRODUCTION

LPG is made up of Commercial Propane and Commercial Butane having saturated as well a sun saturated hydrocarbons. Because of its versatile nature of LPG it is used in many needs such as domestic fuel, industrial fuel, auto-mobile fuel, illumination etc. and the demand for LPG is continuously increasing day by day. The liquefied petroleum gas is used widely in homes, industries and in auto-mobiles as fuel because of its desirable properties which include high calorific value, it creates very less smoke and does not cause much harm to the environment. Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is design in microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed each and every second in the LCD display. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the GSM. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. In this system MQ-6 gas sensor used to sense poisonous gas and has high sensitivity to LPG and also response to natural gas. This work modifies the existing safety model installed in industries. In the case of power cut, our system will continue to work with the help of chargeable battery which is an important characteristic of the project and also with the help of exhaust fan, it emits out all the LPG gas leaked from the cylinder and helps in ensuring safety. Thus, we have implemented this project "Smart Gas Cylinder System".

II.OBJECTIVE

The main objective of this project is to detect the gas leakage with the help of MQ6 gas sensor and automatically book the gas by monitoring the level of LPG using load with the GSM module and to send message to the user in case of gas leakage. If there is no response from the user, our project will help to turn off the gas valve in the cylinder by using servo motor.

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. It will detect the gas and also alerts the consumer using the SMS.
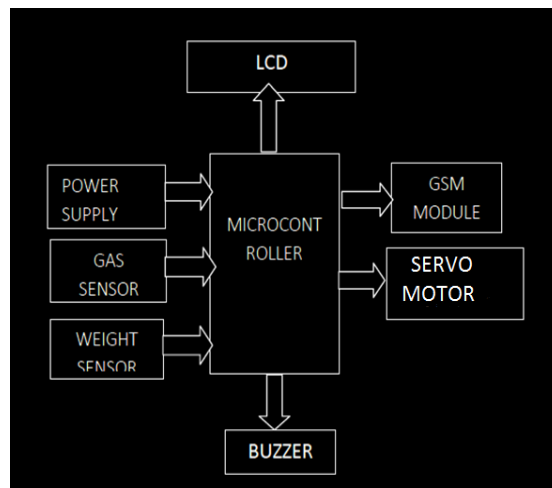

Fig 1.Block Diagram

IV. SYSTEM ARCHITECTURE

A) POWER SUPPLY UNIT:

A 230V power supply which is rectified to 12V dc then further through voltage regulator is used as per requirement. Also this system is back up by a dc battery which is rechargeable so, circuit will remain in operation in case of power cut.

B) PIC MICROCONTROLLER:

The PIC microcontroller PIC16f877a is one of the most renowned microcontrollers in the industry. This controller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output. PIC16F877A also have much application in digital electronics circuits.
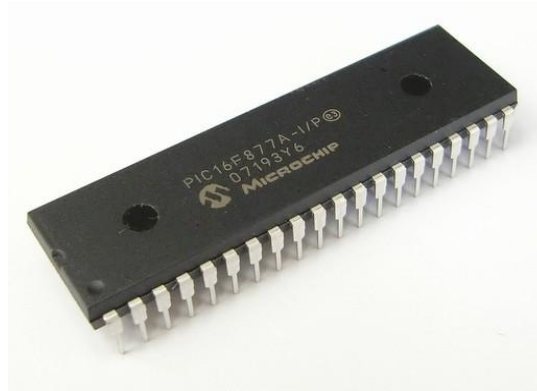
Fig 2.PIC16F877A

C) MQ6 GAS SENSOR:

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. 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. This sensor comes in a package similar to our MQ-3 alcohol sensor, and can be used with the breakout board below.

Fig 3.MQ6 gas sensor

Fig.4.Capacitive Sensor

D) DC MOTOR:

A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple

turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch DC current to each coil on and off and have no brushes.)
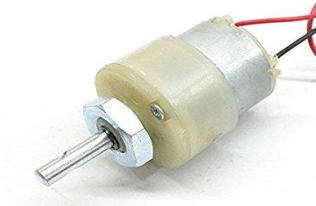

Fig.5. DC Motor

E) RELAY:

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.
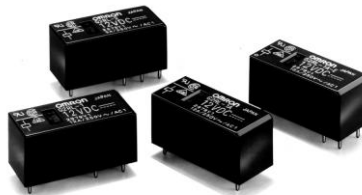

Fig.6. Relay

F) CONVEYOR BELT:

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, sand, overburden and more.

Fig.7. Conveyor Belt

G) BLOWER FAN:

Industrial fans and blowers are machines whose primary function is to provide and accommodate a large flow of air or gas to various parts of a building or other structures. This is achieved by rotating a number of blades, connected to a hub and shaft, and driven by a motor or turbine.

Fig.8.Blower

H) LIMIT SWITCH:

They are used for controlling machinery as part of a control system, as a safety interlocks, or to count objects passing a point. A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation. They can determine the presence or absence, passing, positioning, and end of travel of an object. It is an ON/OFF sensor that set the maximum range for a device movement, the driver motor is either stopped or reverted by toggling the switch, the system should have some kind of hysteresis so when the switch is toggled back it allows other control to drive the motor otherwise the system will oscillate around toggling position. It is just like a SPDT(Single Pole Double Throw) switch which has 3 contacts i.e COM (Common), NO, NC.A Single Pole Double Throw (SPDT) switch is a switch that only has a single input and can connect to and switch between 2 outputs. This means it has one input terminal and two output terminals. NO is the Normally Open contact (open if the plunger is free), NC is the Normally Closed contact (closed if the plunger is free) and COM is the common.
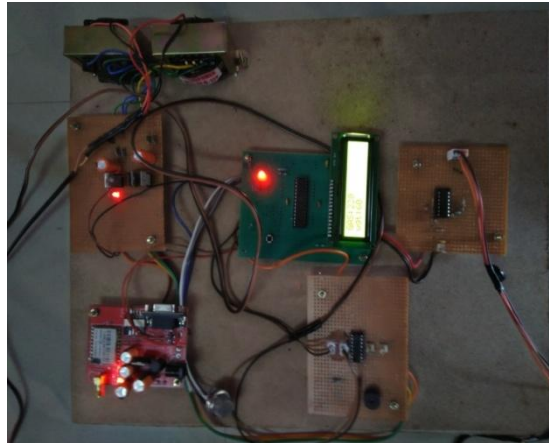

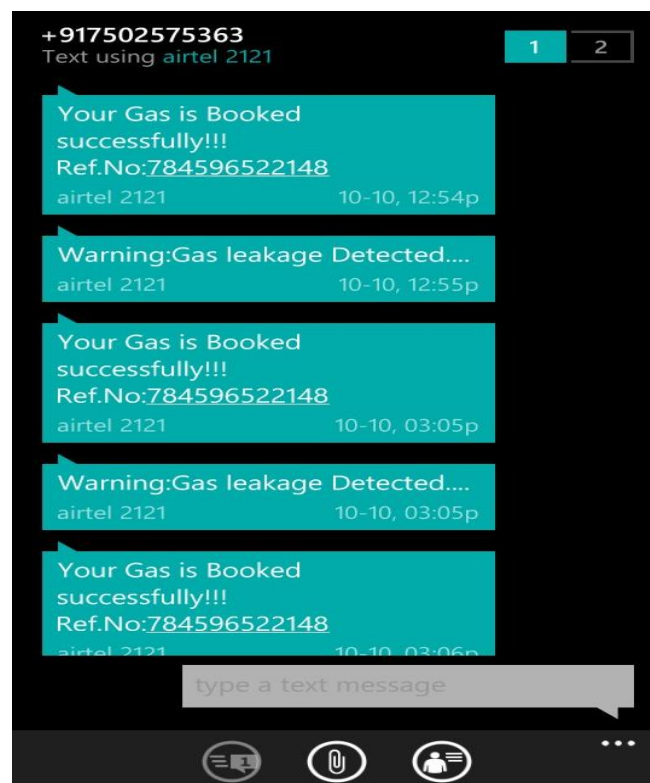Fig.9.Limit Switch

V.WORKING MODEL

Fig 10.Project Prototype

VI.MESSAGE DISPLAY

Fig 11.Final output

VII. CONCLUSION

This paper represents the work on developing an affordable and efficient method that can sort different categories of plastics, glass , metals , and metals . The system can segregate only one type of waste at a time as the solid waste material object moves on a conveyor belt one at a time behind each other. The entire sensing module can be placed along a single platform where the object is stable to ensure better result. This can be largely implemented in

various municipal corporations, taking into consideration various factors such as reduction in manpower, avoid risk at hazardous places, improve accuracy, increase speed of waste management etc.

VIII. FUTURE SCOPE

In Future, the work can be implemented by making use of a robotic arm to pick and place certain materials which can be re-used. A robotic arm can be used to reposition an object in certain direction. Also, limit sensors can be placed at the top of each of the collecting bins to unload them when they are full.

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