



Design and Implementation of Wireless Gas Sensing Network for Preventing Industrial Calamity

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ABSTRACT— The former systems can not react in time, even cannot obtain data from an accident. This system gives real time detective of potential risk area, collect the data of leak accident and reports to the proprietor. This system uses Wireless Gas Sensing Network Technology for detecting the seepage of Gas. The hazardous gasses like Liquefied Petroleum Gas and Propane were sensed and displayed each and every second in Liquid Crystal Display. If these gasses exceed normal level then alarm is generated immediately. LED indicators were also used to visualize the status of system. In this system MQ-6 gas sensor used to sense poisonous gas and has high sensitivity to LPG and also response to natural gas. The alert message will be received by the proprietor of an organization through GSM Technology. This work modifies the existing safety model installed in industries. This structure submits instant response time and accurate detection.

Key Words—Gas leak detection, Wireless Gas Sensors, LED,UART,GSM.

1. INTRODUCTION

Poisonous gases are one that causes serious environmental pollution. Air polluted acts as a serious aspects as the soil, water pollution can detected visually and by taste but polluted air cannot be detected as it can be odorless, tasteless and colorless. The poisonous gases causes' serious health impacts so have to be monitored. The Liquefied Petroleum Gas and Natural Gas burn to produce clean energy, however, there is a serious threat about their leakage. The gases may lead to suffocation and may lead to explosion. However; there are still some shortcomings on real time monitoring and on data transmission and accurate location of leakage point when accident happens.

These problems can be solved with help of developing embedded system using wireless gas sensing network. It can collect the data of leak accident and send alert message through GSM. The System is affordable and can be easily implement in the chemical industries and in residential area which is surrounded by the chemical industries or plants, to avoid endangering of human lives. The system also supports to provide real-time monitoring of concentration of the gases which presents in air. As this method is automatic it can send instate information to the proprietor of the firm before reaching the dangerous level.



2. TERMINOLOGIES

A. Micro-controller

A micro-controller is a computer-on-a-chip, containing a processor, memory, and input/output functions. It is a microprocessor emphasizing high integration, in contrast to a general-purpose microprocessor (the kind used in a PC). This system uses Microcontroller PIC 16f877a



B. Gas Sensor

A **gas detector** is a device which detects the presence of various gases within an area, usually as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down

C. GPRS/GSM

General packet radio service (GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM) protocol. GPRS was originally standardized by European Telecommunications Standards Institute (ETSI) in response to the earlier CDPD and i-mode packet-switched cellular technologies

3. SYSTEM ANALYSIS

3.1 Existing System

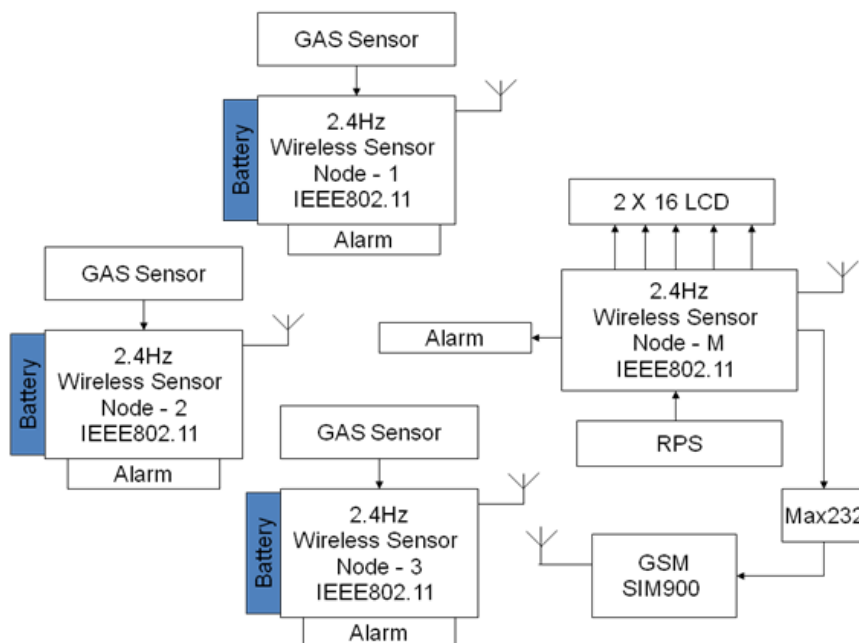
In the past Color identification of chemical reaction using LED's by means of low-cost optical chemical sensors. Colorimetric polymer indicates the color change. In Presence of an acidic vapor the sensor membrane colour shifts from blue to yellow. pH indicator dye is encapsulated to indicate the amount of acidity. These sensing network is controlled and monitored by micro controller by means of radio transceivers.

3.2 Proposed System

In proposed system the status of risk can be identified by using gas sensor. Gas detectors can be used to detect combustible, flammable and toxic gases. As soon as the toxic content is detected an alert message is sent via GSM . Instate intimation to the supervisors and also to necessary departments.

4. STRUCTURE OF THE SYSTEM

The gas leak detection system consists of two modules namely, gas leakage detection module and GSM receiver module with PIC Microcontroller. The pic microcontroller finds its application due to its low power consumption.



Over all structure of the system

4.1 RECEIVER SECTION

Leak detection module consists of MQ-6 gas sensor to detect amount of combustible gas present in the surrounding. As the leakage detects the PIC microcontroller sends the message to LCD which displays “Gas Leakage Detected”. The Microcontroller checks the concentration of gas is within safe level if it beyond safe level (safety level is programmable) then PIC controller not only immediately activates buzzer but also switch on the LED so that the CRITICAL state of system is identified by an employee of an organization through illustration process and GSM module sends an alert message to the proprietor of an organization through pic controller.

4.2 GAS LEAK DETECTION

The Main Function of Gas Leak detection module is to detect the changes in concentration of LPG gas, then PIC controller Immediately activates Buzzer.MQ-6 gas sensor Shown in Figure 2 is used to sense the poisonous gas and has high sensitivity to LPG and also response to Natural Gas. It is portable gas detector which has long life with low cost.



MQ-6 Sensor

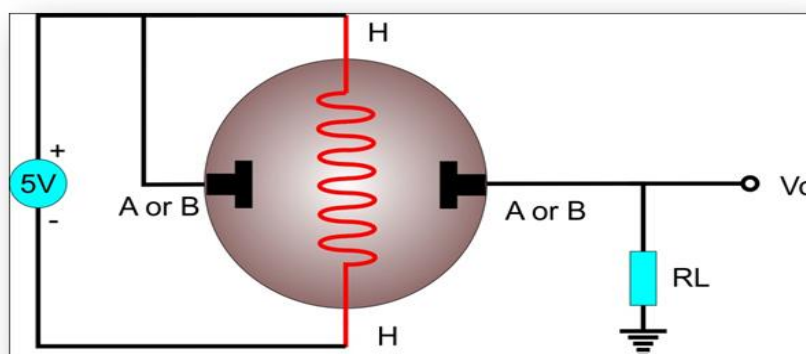


FEATURES OF MQ6-LPG SENSOR

- High sensitivity LPG, iso-butane, propane
- Small sensitivity to alcohol, smoke
- Fast response
- Wide detection range
- Stable performance and long life
- Simple drive circuit

4.3 WORKING OF MQ-6 - LPG SENSOR

When we supply the power of 5V to MQ-6-LPG gas Sensor, heat is produced at the coil H in-order to sense the presence of gas. The resistor (RS) is used to reduce the high voltage flowing into the sensor. The sensing resistance of the resistor is 10kΩ-60kΩ. The sensor detects the concentration of gas within the range of 10,0000 - 200 ppm.



Gas sensor circuit

5. SYSTEM DESIGN

A. Hardware Design

The specification of LPG Gas sensor MQ-6 is shown in below.

Table 1. Specification of LPG Sensor

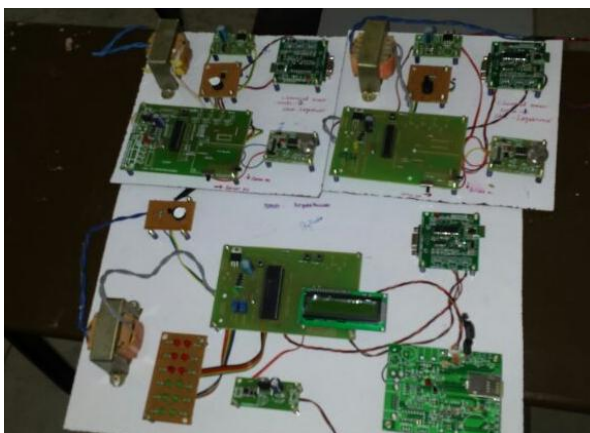
Model No.	MQ-6
Sensor Type	Semiconductor
Standard	Bakelite (Black Bakelite)
Detection Gas	Isobutene, Butane, LPG
Concentration	300-1000 ppm



The data transmission based on IEEE802.11. In order to reduce cost of system, shorten product development cycle and lower the difficulty, the factors including power consumption, transmitting power, receiving sensitivity, chip cost, protocol stack costs and number of peripheral components the chip need mainly considered when choose the chip.

6. OPERATION OF THE EMBEDDED SYSTEM

The Microcontroller acts as the master node since it controls the activities of all the slave nodes and other modules. The communication between the microcontroller and gas sensor nodes takes place through the wireless technology. The MQ6 gas sensor detects the seepage of gas once if the concentration level of the gas reaches the threshold level. This threshold value can be set according to the safety measures. Once the gas leakage is detected then it intimates the microcontroller, so that immediately activates the buzzer and GSM module. This buzzer provides the alertness to the people who are within the organization. The GSM module communicates with the micro controller through the UART protocol and AT commands. Therefore finally the proprietor of an organization receives the instate information through the message send by the GSM module. This system also provide visual alertness to the environment through the LED indication.



CONCLUSION

Movable Gas Tanker leak detection, Protection compromises sensitive sensors, and GSM Receiver module which is smart, low cost, low power and low Maintenance. System gives quick response rate, accurate detection; monitors gas leakage, Collect the data from a scene of accident and supply it to the possessor.

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BIOGRAPHY

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Dr.S.PadmaPriya received her BE (Electronics and Communication) from Madras University in the year 1991. And M.Tech (Information Technology) from Punjab University and M.E.(Embedded Systems) from Anna University, and Ph.D. (Computer Science) from Berhampur University . She has been the member for evaluation committee for projects and served has Resource coordinator for Bharathidasan University and IGNOU. She has published papers in many national level conferences on embedded systems. She is now presently Heading over the Information Technology Department in Prathyusha Institute of Technology and Management.

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