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A REAL TIME GAS MONITORING SYSTEM- A SURVEY

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Abstract:

The main aim of this paper is to survey the different kinds of gas monitoring systems implemented in various applications to prevent from dangers. The gas monitoring system is based on both wired and wireless sensor technology. Leakage of gases may cause fatal fire accidents and hazardous condition is the major issue nowadays. The leakage of every gas is monitored through gas monitoring system to avoid such condition. This type of monitoring system can be helpful in hospitals, homes, hotels and many commercial places.

Keywords: Gas sensor, microcontroller, GSM Module.

I. Introduction:

The substance with the temperature above its boiling point is said to be a Gas. Gas are classified in to many such as flammable gases, inflammable, toxic gases, etc:-Flammable gases are Ammonia, butane, carbon monoxide, cyclo propane, ethane, ethyl chloride, hydrogen, propane, methane and silane. These gases mix with air or oxygen in the specific concentration and will get exploded [1].

Such type of gases are kept in a closed container and monitored through monitoring system. Leakage of these gases in the air is the serious problem. Many existing system are available for the detection of gas using wireless sensing technology. The main components used in all the devices are microcontroller, a sensor to detect the particular gas, a supply, and alarm circuit (either a GSM or led or buzzer)[2]. This type of system can also predict the gas concentration which is present in air.

Endangering of human life can be avoided by the monitoring system. The paper is essential as follows, section I deals with the introduction of gas detection and monitoring of gases. Section II presents the detail of gas sensor. In section III

the survey of different leakage monitoring system is discussed. Section IV shows the conclusion of the paper.

II. Gas Sensor:



Fig1. GAS Sensor.

[3] Gas sensor is the sub part of the chemical sensor it measures the concentration of gas in its vicinity. Each gas has a unique breakdown voltage. i.e. the electric field at which it is ionized. The voltage is been measured by the sensor to identify the gas. The concentration of the gas can be determined by measuring the current discharge in the device. Fig(2) shows the internal structure of the gas sensor. Gas sensor is used in robotics, industrial, automobile, medicines, machine applications. The different types of gas sensor are optical, electrochemical, calorimetric, metal oxide based sensors, capacitance based sensors.

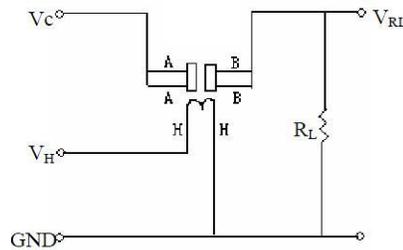


Fig2. Internal circuit of GAS sensor.

Power of Sensitivity body (Ps): $P_s = 2V_c * R_s / (R_s + R_L)^2$

Resistance of sensor (Rs):

$$R_s = (V_c / V_{R_L} - 1) * R_L$$

Where R_s is the sensor resistance;

V_c is the supply voltage to load cell;

V_{R_L} is the voltage across load resistance; R_L is the load resistance.

III. Literature Survey

1. ARM Based Gas Monitoring System: In this paper the monitoring of gas using ARM microcontroller is described.

The main aim is to detect the LPG gas which is the mixture of hydrocarbon gas and it is referred as butane or propane.

three major components in this system are a Gas sensor, ARM microcontroller, and a GSM module and indicating

component such as buzzer, sprinkler are used . The sensor senses the leakage of gas and a microcontroller receives the signal from the sensor node. The gas sensor used is MQ6 which detects LPG gas with high sensitivity. When the concentration of gas air is beyond the certain level, the relay is turned on and gives a interrupt signal to microcontroller to turn on the buzzer and GSM as shown in fig(3) The GSM module sends SMS message to the person number which is fixed on the device. This transmission is done by RS232.[4]

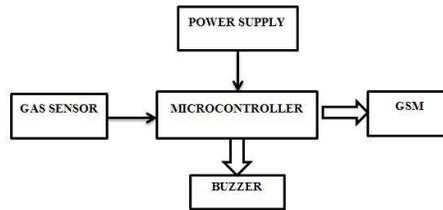


Fig3. Block diagram of ARM based gas monitoring system.

2. Hazardous Gas Detection using ARDUINO:

The technology with displaying the concentration of each gas detected in the LCD display is presented. This system uses three different sensors for detecting different gases such as carbon monoxide, methane and LPG in the same time on the same device and it shows the concentration of each gas displayed on LCD. MQ2, MQ7, MQ4 sensors senses the gas. The sensed value is passed to Programmable. Interface Controller. ADC converter is placed in the PIC for converting analog signals (sensed gases are analog in nature) in to digital format. The name and the concentration of the Gases sensed are displayed on the LCD. The block diagram of the system is shown in fig(4). By this method we can easily find which gas is actually detected. The LCD will display only the detected gas along with its concentration. The main disadvantage in this type is, it won't alert to the user by sending the SMS.[5]

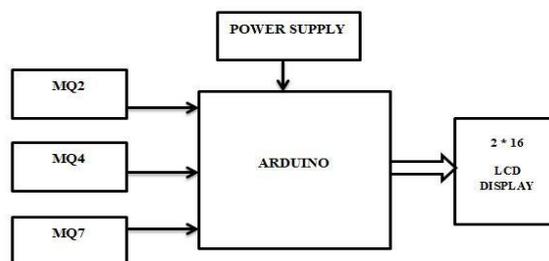


Fig4. Block diagram of hazardous gas using ARDUINO.

3. Automatic LPG Booking, Leakage Detection and Real Time Gas Measurement Monitoring System: The leakage detection and automatic LPG booking is the main advantage in this system.[6] This device uses components same as that

of other detection system such as Gas sensor, GSM module, a microcontroller, indicator and a LCD display. In addition it uses the weight sensor to detect the amount of gas present in the cylinder, if the amount of cylinder weighs less than or equal to 10kg it automatically sends the booking message to the dealer through the GSM interfaced with the microcontroller ATMEGA16A as shown in fig(5). The L6D weight sensor module is implemented on the device. The GSM accepts only AT commands. When the leakage is found the microcontroller sends the message to the number which is programmed on the device. The microcontroller has the feature of 16kb RAM internally in which entire coding can be stored in it. The LCD display will show the gas leakage detection, refilling of gas booking. The LCD display will operate at +5V dc supply.

Table 1: Comparison Table.

SYSTEM	SENSOR USED	INDICATION	FEATURES
ARM Based Gas Monitoring System	MQ6	Sends SMS message to the user	Alerts the user through the GSM module
Hazardous Gas Detection using ARDUINO	MQ2,MQ4,MQ7	Via the LCD display	Displays the concentration of gas detected
Automatic LPG Booking, Leakage Detection and Real Time Gas Measurement Monitoring System	MQ6	Sends SMS to user and also displays through LCD	Displays concentration , automatically books the cylinder and alerts the user through GSM
A wireless sensor–actuator system for hazardous gases detection and control	Catalytic sensor	Wireless Actuator to the sensor node	WSnodes detects the gas and sends to the WSN. In parallel WSN performs the actuation Action.
Internet of things(IOT) based real time gas leakage monitoring and controlling	Electronic sensor which obeys the principle of detecting LPG	To the Facebook or twitter account through Xively	User can easily look at the history of data and accurately determine the time and date at which emergency Condition occurred.

System configuration is that when small amount of LPG placed near the device it automatically detects and sends the alert message to the user. This is a cost efficient system. [6],

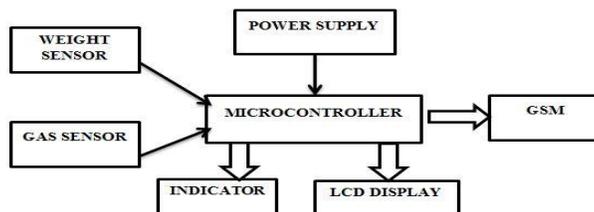


Fig5. Block diagram.

4. A wireless sensor–actuator system for hazardous gases detection and control: In this paper, author proposed a wireless sensor– actuator system which detects the gas quickly and provides an immediate isolation for the leak gas.[7] The sensor node consists of catalytic gas sensors, micro processing unit and wireless transceiver which is used to communicate with wireless actuator using ZigBee and BAC net protocol. The wireless actuator consists of power management circuit, micro processing unit and gas valve. The sensor used here is a catalytic sensor which is based Wheatstone bridge sensing circuit. The sensing circuit consumes 227 mw power supplies. Fig(6) shows the representation of operation of WSN. The control and operation of a wireless actuator is enabled by software algorithms programmed on microprocessor(MCU)STM32F102C6.

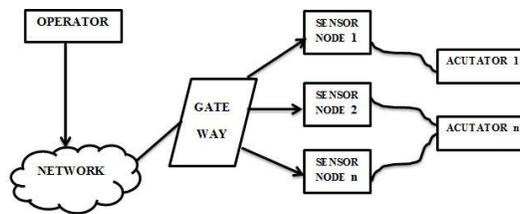


Fig6. Block diagram of WSN operation.

5. Internet of things (IOT) based real time gas leakage monitoring and controlling: The proposed paper aims is to monitor the leakage of the gas with the help of electronic sensor over the new platform Xively to feed real time sensor data over the internet. It consists of a gas sensor to detect the LPG gas, a solenoid valve (a electromechanical device used for controlling of liquid or gas flow), an exhaust fan to reduce the gas concentration in air. The information is fed to the user account (Facebook or twitter) through the Xively platform. The Ethernet shield is connected to the Arduino board as shown in fig(7). The shield also includes a reset controller, to ensure that the W5100 Ethernet module is properly reset on power-up. Then the system feeds the result to our account. [8] .

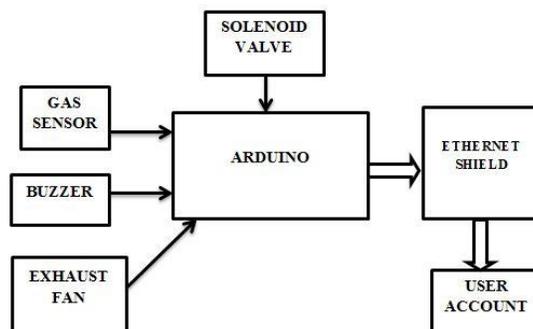


Fig7. Block diagram of leakage monitoring using IOT.

IV. Conclusion

A wide variety of gas leakage and monitoring system is available. Every detection system has some advantages and disadvantages. Table(1) represents the few comparison between the systems. To overcome the disadvantages in existing system, new systems are developing day by day. A few existing systems and their block diagrams are discussed in this paper. The main aim of this paper is to detect the gases and to prevent from hazardous accidents. Hence it is very useful in homes, hospitals, hotels and many commercial places.

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