

REAL TIME SAFETY MONITORING SYSTEM FOR DRAINAGE WORKERS

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Abstract: Monitoring of the drainage system plays an important role in maintain cleanliness in a city. While workers suffers problem like poisonous gas attack it can cause health problems and even death. This project is to develop a system for detecting the toxic gases, temperature and heart rate of a worker. The system consist of gas sensor that detects toxic and flammable gases. When the gas reaches the limit the system gives a GSM warning message and display in 16*2 LCD Display. Heartbeat and temperature sensors measure a person's heart rate and temperature inside a hole and then display it on an LCD and send an SMS via GSM. The plan also contains panic alert to a person in an emergency when there is a threat to employees.

Keywords: Monitoring drainage system; GSM; Gas sensor; Heartbeat sensor; Temperature sensor; LCD; Threshold limit

I. INTRODUCTION

Drainage cleaning is difficult task, the well drainage is a framework required of workers to perform their duties such as cleaning and repairing. While cleaning workers suffers problem like toxic gas attack causes health problems. If the problem is not addressed it creates negative consequences. Monitoring of the drainage system is used to detect toxic gases and temperature level inside the shaft. The system contains gas sensors that are used to detect the flammable gases and toxins. Temperature sensor to detect the temperature and heart beat sensor to calculate the heart rate. When the gas reaches the limit the system gives a GSM warning message and display in 16*2 LCD Display. The heart beat and temperature sensors measure employee's heart rate and temperature inside the hole and display it via LCD and SMS sent via GSM. The system contains a panic switch for emergency situations.

II. RELATED WORKS

In [1] this project consist of flow sensor and ultrasonic sensor used to detects the leaks and overflow with the help of wireless sensor network (WSN) based on Zigbee and IOT technology.

In [2] the system uses wireless sensor containing sensor nodes. Real time IOT system that alerts the control channel via SMS when any hole exceeds its limit values.

In [3] this plan will check the water and gas level of the sewage system and the estimated amounts will be stored in cloud storage and sewage system status will be analysed and sent to the organization's office via SMS using GSM module

In [4] the system contains three gas sensors such as carbon monoxide, hydrogen sulphide and methane. Ultrasonic sensor was used to detect the obstruction, heart beat sensor to measure human heart rate sensor and SMS sent via GSM in an unusual situation

In [5] the device will monitor the heart rate of a person using a pulse oximetry sensor, methane concentration and oxygen concentration and send a warning to employees and exterior unit. When parameters depart from the safe range.

In [6] the system consist of various types of sensors like flow, level, and gas sensors that interact with ARM7. This plan monitors the water level, water flow and gases. If the plumbing system is blocked and water overflows this barrier will naturally be detected by a sensor. When the sensor reach limit, the problem will be displayed and a message sent by GSM to the nearest municipal service for further corrective action

In [7] the water flow sensor helps to detect the flow of water by sensing the sensing the sensor in various locations, the location of the water leak can be detected and resolved. In addition to this feature, the volume of the water flow can also be calculated with the help of water flow sensors and arduino.

PROPOSED SYSTEM

Monitoring the underground drainage system will help monitor human safety will help monitor human safety within the pit using sensor. Different types of sensors (temperature, heart rate and gas sensor) are connected to a microcontroller to make the system clever. When the affected sensors reach the limit, the indicator of that number is sent via a warning message and displayed on the 16*2 LCD Display. Employee heart rate and temperature inside the hole send via SMS. The system also contains a panic switch which is used to alert an emergency somebody when there is threat to employee. used alert somebody in emergency situation where there is a threat to workers.

A. ARCHIECTURE OF THE PROPOSED

The monitoring system consist of sensors such as gas, temperature, heartbeat sensor interface with microcontroller .When the sensors reach the limit and the indication of the value is sent alert message through LCD.

The heart beat sensor provides an output the system send an SMS through GSM.

MICROCONTROLLER (8051)

8051 is an microcontroller consist of 8 bits. 8051 contain CPU with Boolean processor,5 or 6 interrupts,2 or 3 16 bit timer /counters, programmable full duplex serial port, 32 input/output lines, ROM/EPROM and RAM .The 8051 architecture is quite strange and original. The 8051 handles disruptive. The microcontroller 8051 has many outstanding features suitable for such integration and controlling applications.

BLOCK DIAGRAM OF PROPOSED SYSTEM

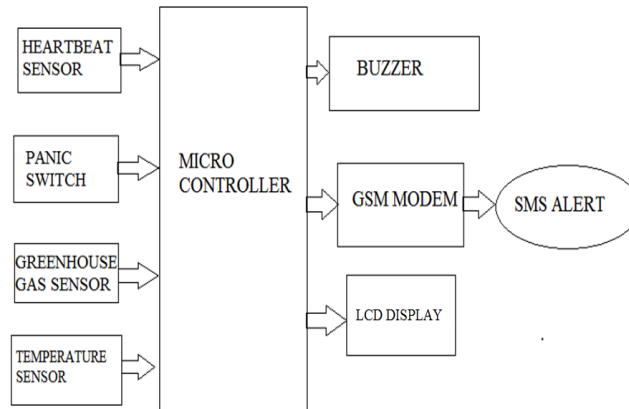


Fig. 1 Block diagram of the proposed scheme

1) HEART BEAT SENSOR :

Heart beat sensor is used to measure a person’s heart rate. If the heartbeat output is abnormal it sends a warning message via GSM. The heartbeat provides the pulse per minute(BPM) when the finger is inserted into it. The sensor contains a red LED and a light detector .the LED the finger and is found on the other side. The heart pumps blood to the arteries, the finger becomes a little opaque so light reaches the detector. In each heart it strikes a different detector signal. This variation is converted into electric signal. This signal is amplified and triggered by an amplifier that emits 5v logic level.

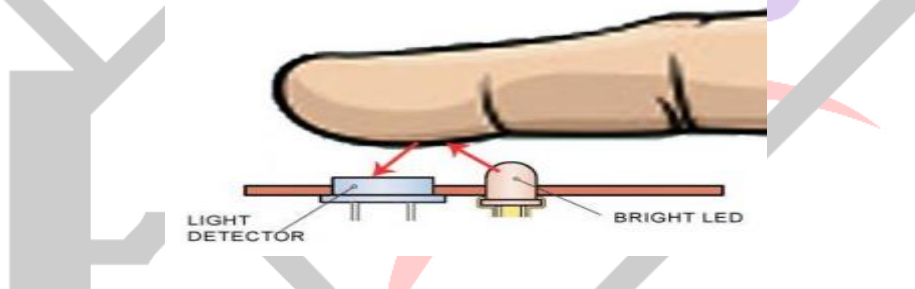


Fig. 2 Sensor principle

HEART BEAT
78BPM

TRIGGER
LEVEL OF
SENSOR

HEART BEAT
SENSOR



HEART BEAT
78BPM

TRIGGER
LEVEL OF
SENSOR

Fig.3 Signal of heart beat and sensor signal output graph

HEART BEAT
SENSOR

2) GAS SENSOR:

In this drainage monitoring gas sensor detect the combustibile and toxic gases. The detectic depend on the level of gases in drainage.

Gas sensor-MQ7: MQ-7 Gas sensor in snO₂ with less conductivity in air. The sensor detects CO at lower temperature. The sensor conductivity is increase proportionally with the gas concentration rising. MQ-7 gas sensor has larger sensitivity to carbon monoxide. The sensor used to detect the gases contain CO.

MQ2 Sensor: The sensor detects the methane gas at concentration from 300ppm to 10,000ppm.

Table.1.Detection range of gas

NO	SENSOR NAME	DETECTION RANGE OF GAS
I.	Methane gas sensor	150-10000ppm
I.	Carbon monoxide sensor	10-10000ppm
I.	Hydrogen sulphide sensor	1-200ppm

Threshold limit of gas depend on the limit of gases inside the drainage.

THRESHOLD LIMIT OF GAS

Table .2 Threshold limit of gas

NO	SENSOR NAME	THRESHOLD LIMIT
I.	Methane gas sensor	750ppm
I.	Carbon monoxide sensor	35ppm
I.	Hydrogen sulphide sensor	45ppm

2) TEMPERATURE SENSOR :

Temperature sensor used to detect the temperature. There are integrated circuits (ICs), pyrometers, resistance temperature detectors (RTDs), thermistors, thermocouples, electro mechanical , infrared sensor, semiconductor sensor and volume (EMV). LM35 is a precised IC temperature sensor whose output proportional to the temperature (in °C). The sensor is sealed and not subjected to oxidation. LM35 measured temperature precisely.

Equation to get temperature using LM35:

$$\text{Temp} = (5.0 * \text{analogRead}(\text{tempPin}) * 100.0) / 1024$$

3) PANIC SWITCH :

Panic switch is an electronic device which is used to alert somebody in an emergency situation when there is a threat to person. A panic switch is controlled using panic alarm switch. These switch connected to the monitoring centre through buzzer.

4) LCD display :

LCD display do not generate light but they modifies the light.. They convert or modulate the light under electrical stimulus. LCD'S are light controllers which require external source of light.

5) GSM :

A **GSM modem** is a specialized modem consist of SIM card, operates like a mobile phone. GSM modem is like mobile connected to computer. The GSM allows computer to use it and communicate with mobile network. The GSM modem is used for providing mobile internet and also sending SMS and MMS.

GSM is the combination of TDMA (Time Division Multiple Access), FDMA(Frequency Division Multiple Access) and frequency hopping. GSM uses two frequency bands of 25 MHz width(890 to 915) MHz for up-link and (935 to 960) MHz for down-link. After two 75 MHz band were added. Then 1710 to1785 MHz for up-link and 1805 to 1880 MHz for down-link. Up-link is the link from ground station to the satellite and down-link is the link from the satellite down to one or more ground stations or receivers. GSM divides the 25 MHz band into 124 channels. Each channel 200 KHz width and remaining 200 KHz is used as a guard band to avoid interference.

The gas levels are detected using gas sensors sent to the microcontroller. The measured gas levels are displayed in the16*2 LCD if one gas level exceeds the threshold limit. An alert message is sent as SMS to authorized user via GSM modem. The data transmission was tested with the sensors with common battery.

For the testing of the sensors, the system has been placed close to the manholes and water drainage systems. The gas sensors are also working in hazardous condition when there is higher concentration of gases is present. All the sensors detect the range and sends an alert SMS and also display it in LCD when the gas sensor reaches the threshold limit.

IV. PERFORMANCE AND EVALUATION

The gas sensor detect the toxic and combustible gases inside the manhole when it reaches the threshold limit an alert SMS is send through GSM. The heart rate of the worker and temperature inside the manhole display in LCD and also an SMS send.

PARAMETER	RANGE
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GAS REACHES ABOVE THRESHOLD	Emergency
TEMPERATURE	38Deg
HEART BEAT	72 BEATS

V. RESULT

The system consist of sensors detect temperature, heartbeat and toxic gases and display it in LCD and an alert SMS sent through GSM.

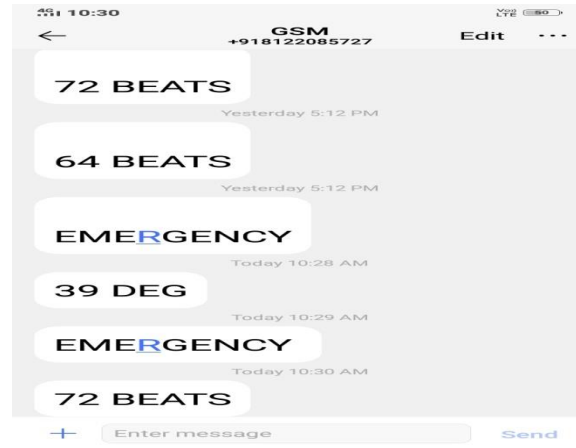


Fig. 4 Alert SMS through GSM

VI. CONCLUSION

Drainage safety monitoring is a challenging problem. This system proposes different methods of monitoring the safety of drainage workers in the underground drainage. parameters such as temperature, toxic gases, heartbeat of worker was monitored using gas sensor, temperature sensor and heart beat sensor and display the output in an LCD and alert SMS send through GSM. This system used to avoid the hazardous situations happen in manhole while cleaning.

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