EMBEDDING REALTIME MULTILEVEL GAS LEAKAGE CONTROL SYSTEM

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Abstract - *Industrial gas leakage and domestic LPG gas leakage remains a disastrous threaten to the society. There have been many attempts at solving this problem but has only limited success. Such existing system is mainly prone to be suitable only for single user domestic application; this in turn leads us to develop this project for Multilevel Gas Pipeline System. Thus the Project titled on "Embedding Real Time Multilevel Gas Leakage Control System", can be used for the prevention of leakage threatening over Multilevel Pipeline system. This project involves the detection of gas leakage using sensors placed at regular intervals and gas leakage block is done by implementing Solenoid Valve to stop the gas passage through the pipeline to avoid excess leakage. Here in Multiple Solenoids are placed at various levels of the pipeline system, thereby creating an aversion or shutdown to the affected pipeline; while making the other users pipelining stages to have their own benefits without shutdown. This could be one of the best gas leakage detection and prevention system in multilevel pipeline. In addition to automatic shutdown of gas flow of a single user pipeline in a multilevel based system, an alert message will be sent to the user and also to gas helpline number '1906' through GSM module provided along with a SIM card of any network providers. As the fulfillment of the project is been established using Arduino MEGA Processor, an immediate response for multilevel usage and Maximum efficiency is achieved.*
*Keywords***: *Gas sensor, GSM, Arduino mega microcontroller, Buzzer, Solenoid valve, Multilevel Pipeline.*

1.INTRODUCTION

At present days, gas used for domestic purpose had increased drastically for a single and Multi-handed applications. In much developed cosmopolitan cities multilevel Gas Pipelining Systems are available without proper gas leakage detection facilities. Due to this heavy accidents may occur and much life of the human beings may end in danger. So to overcome these difficulties an effective system needs to be developed. In existing system, gas leakage can be detected and an alert message can be sent through the GSM module; while gas leakage prevention remains still a threatening. Prevention systems that block the pipeline to prevent excess gas leakage is not fully developed. Gas leaks can be unexpected at the worst of times, and can end up causing serious damages not only to

the underlying pipe system of the building, but it also threatens the safety and well-being of friends and family members inside of the house. For this reason, it's vitally important to take evasive action whenever early signs of a gas line leak are detected. A gas line leak comes with a number of negative possibilities, such as the chance of there being a fire, an explosion, or rising levels of dangerous carbon monoxide. Gas leaks in homes and businesses usually occur when a change is made that affects the gas lines. Flexible gas lines can be crimped and can develop leaks. Gas lines made from improper materials may become brittle or even corrode away. Improper installation may be the source of present or future leaks. Gas lines buried, or embedded in concrete, can break with shifting soil or corrode causing gas leaks under your foundation that may or may not explode. An area of dying vegetation may indicate an underground leak. Gas leaks are common in earthquakes, tornados, hurricanes, tsunami, mud slides and other events of nature. In the proposed system we are using the gas sensor to detect the gas leakage in the tubes for a multistoried building. Here the sensor will be placed at regular intervals. Whenever the gas leakage is detected the sensor will detect the leakage and an alert message will also be sent to the concern person regarding the gas leakage. As a preventive measure we are closing the gas tubes using the solenoid valve. Hence hazards can be avoided in a single and multiple level gas pipe lining systems.

2. RELATED RESEARCH

[1].In this paper, Simulation is used based on discrete components. Simulation results reflect the effectiveness of the presented design and give indication of promising prototype of monitoring system of LPG gas leakage for home and or industrial applications.

[2].In this paper, Arduino Uno is used as microcontroller and Zigbee send data reading from the gas sensor and monitor the system that displayed on LABVIEW Graphical User Interface (GUI), MQ9 sensor is used to detect gas leakage.

[3].In this paper, Analog to Digital technique is used to detect gas leakage using mechanical sensors. When concentration of gas exceeds exhaust fan is used, buzzer starts alarm and alert message is send to the concern person. It gives an overview of gas status for future analysis such as probability to account accidents and so on.

[4].In this paper, the system is based on low power arm Lpc 2103 microcontroller and zigbee techniques. The gas sensor node collects the data regarding gas leakage and also provides leakage area. The collected information is forwarded to the central monitoring unit to update the data. Data are continuously transmitted from ZIGBEE sensor nodes 2 to ZIG-BEE coordinator.
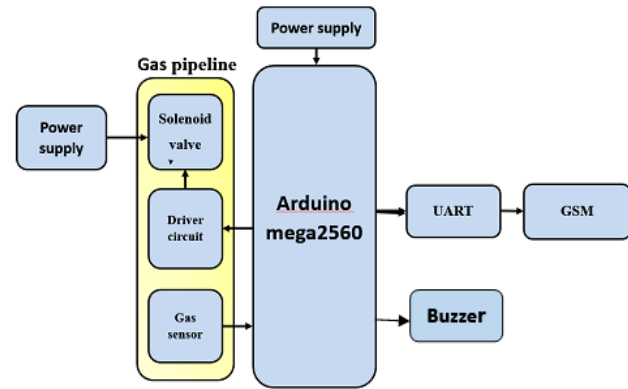

Figure 1: Prototype Design

3. METHODOLOGY

Base board on which all the components are to be mounted is chosen based on dimensional requirements. Arduino MEGA module is selected as the microcontroller unit for the project. GSM module is connected, as it is the signaling system which sends the SMS to the user's smartphone. Solenoid valve is connected to the gas pipeline. MQ-6 gas sensor is connected near to the gas source. All the necessary circuit connections and piping connections are made to make the gas detection more accurate and efficient. When the gas sensor detects a gas leakage, an input signal is sent to the arduino and the microcontroller processes the signal. With respect to the gas detection, arduino sends output signals to activate the solenoid valve and the GSM module. The solenoid valve closes the gas pipeline and restricts the gas flow. The GSM module sends the message to the smartphone using the SIM card provided in the slot.□□It can be used in Domestic applications as well as in industries. Efficient, Compact Design and Component usage. Use of many sensors makes the device more efficient in detecting the gas leakage. Decreased Response time than the previous model as it uses solenoid valve rather than stepper motor. Exhaust Fan is not used. Hence power is saved. The solenoid valve runs on rechargeable battery. Hence works even in the absence of power supply.

4. ADVANTAGES

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5. RESULT AND DISCUSSION

In our prototype, a main gas pipeline is split into Pipeline 1 and 2, of which, the outlet is placed near the gas sensor. Solenoid valves are placed in the path of the pipelines and control valves are placed to control the flow of gas to the sensor manually, for experimental demonstration purposes. The Arduino mega board is connected to a computer system by means of USB cable through which the processing is monitored by using serial monitor tool of Arduino software. The solenoid valve is connected to a driver circuit, controlled by Arduino signal, powered by a separate rechargeable lead acid battery. For demonstration, first the Arduino software is run in computer and Arduino is connected to a port and serial monitor tool is executed. At first, the gas sensor at the opening of pipeline 1 is made to detect gas with the help of IP solution. As the gas sensor detected the gas from the IP solution, when the level of gas exceeds 800, it sends a signal to the Arduino board, which signals the driver circuit to actuate the solenoid valves to close the first pipeline. In addition, Buzzer is alarmed.
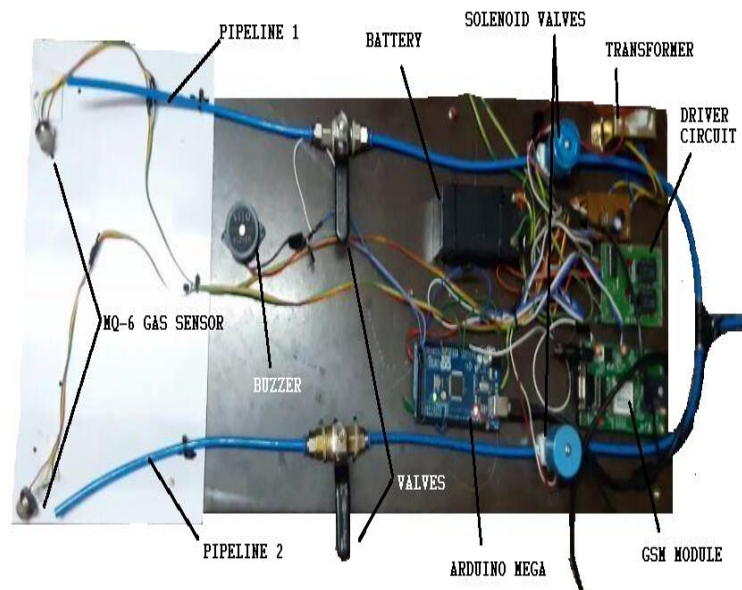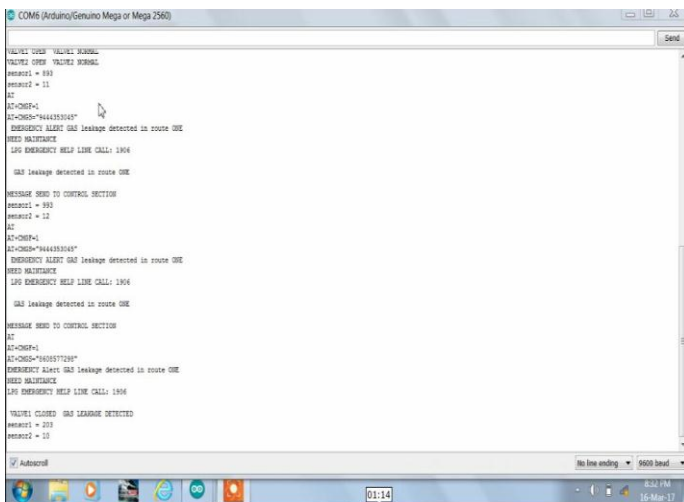

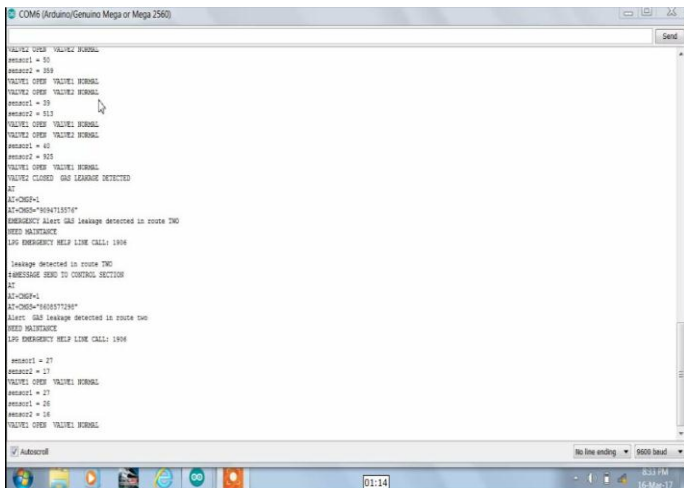**Figure 2: Pipelines Blocking System**

The necessary microcontroller program was encoded using Embedded C Programming language. The Program was feeded to the Microcontroller using Arduino software. The output of the software is obtained as follows

Figure 3: Serial Monitor Output for Pipeline 1 Detection and Valve 1 is closed

Figure 4: Serial Monitor Output for Pipeline 2 Detection and Valve 2 is closed

For the second demonstration, gas sensor at the end of pipeline 2 is triggered manually. Now the gas sensor sends a signal to arduino which with the help of driver circuit, blocks the second pipeline and buzzer is alarmed. When the gas leakage is detected, the GSM module sends a programmed message to the mobile numbers which are stored in the SIM card. and also, the solenoid valve closes the gas pipeline simultaneously, preventing any more damage and reducing the risk of explosion or combustion. Hence, the objective of our project has been achieved by utilising the microcontroller of Arduino mega board. The gas sensor lifetime will be from 2 to 4 years based on the surrounding environment. Hence a yearly replacement of the sensor is advisable for efficient gas detection.

6. CONCLUSION

Thus by this project of "Embedding Real Time Multilevel Gas leakage Control System", we have created a prototype which has the capability to prevent any damage to the surrounding by LPG leakage. In this prototype, we have only used 2 sensors for demonstration purposes, but during implementation, multiple sensors can be used which makes the system even more reliable and accurate. This prototype not only suits for single user applications but also has its possibilities to work under high pressure industrial applications. In future work, all the wires can be replaced by wireless systems facilitated with Bluetooth or Wi-Fi connectivity which in turn increases the response time and flexibility of the placement of the sensors. Successful implementation of this project will surely result in the reduction of fire accidents and loss of life due to LPG gas leakage.

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