

LPG GAS LEAKAGE DETECTION SYSTEM WITH AUTO CUT OFF REGULATOR

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ABSTRACT

This project aims to develop a system which is capable of detecting LPG gas leaks. This proposed gas detection system detects various gases such as propane, butane, propene, and butene, which are very harmful to the surroundings. After the sensor detects a gas leak, it sends the signal to the Arduino for further processing. The Arduino sends the signal to the buzzer, which then turns on to warn people in the area. It also cuts off the power to the equipment via a relay and simultaneously turns on the exhaust fans to remove harmful gases from the environment.

1.INTRODUCTION

Gas leakage detection using smart management is a cutting-edge approach to ensuring safety and efficiency in various settings. Gas leakage can be hazardous and potentially life-threatening, as it can lead to fires, explosions, or health risks. By leveraging smart technologies, such as Internet of Things (IoT) devices and data analytics, gas leakage detection systems can detect, monitor, and manage gas leaks in real time, allowing for prompt response and prevention of dangerous situations. The core concept behind gas leakage detection using smart management is to deploy a network of sensors and devices that continuously monitor gas levels in different areas. These sensors can be installed in residential, commercial, or industrial spaces, including homes, offices, factories, and warehouses.

Liquefied petroleum gas (LPG), or propane, which is a flammable gas used in many applications like homes, hostels, industries, because of its desirable properties . Once a gas leak is detected, the smart management system can trigger immediate actions to mitigate the risk. These actions can include activating alarms or sirens to alert occupants or nearby individuals, sending notifications to relevant stakeholders, and initiating automated shut-off valves to stop the gas supply. Additionally, this proposed system can provide detailed information about the leakage of the gas and fire. Furthermore, these systems can generate valuable data and insights that can be used for preventive maintenance and optimization. Analyzing historical data on gas levels, patterns, and incidents makes it possible to identify potential vulnerabilities, improve gas usage efficiency, and optimize safety protocols. The residential community, consisting of multiple apartment buildings and houses, was located in a metropolitan area with a significant population. The community utilized natural gas for heating, cooking, and other daily activities. Concerns over gas leaks and potential risks prompted the community management to invest in a smart gas leakage detection system.

LITERATURE SURVEY

Design and Implementation of an Economic Gas Leakage Detector published by A. Mahalingam, R. T. Naayagi , N. E. Mastroakis This system is developed to detect the leakage of the gas and provides immediate alarm to the user. Later in 2013 a few people developed a system for home safety in which it helps to detect the leakage of LPG along with the buzzer. It is constructed using microcontroller ARM version 7 processor and simulated using Keil softwarebut there is limitation to this system that is it will not determine the weight of the cylinder LPG gas monitoring and automatic cylinder booking with alert system Published by Hitendra Rawat, Ashish Kushwah, Khyati Asthana, Akanksha Shivhare. This system focuses on identification of energy efficient fuels like petroleum, petroleum gases, alcohol and notify the people around the area about the leak through SMS. It also sense surrounding temperature, so that we can tell that there no fire accidents occurs and another crucial aspect to consider is automatic cylinder booking through this we can easily notify the current expenditure of LPG gas in day to day routine. Alert message is passed to the

user to book the cylinder through SMS. Drawback is In this system no measures are taken to put off the fire and cylinder's weight can not be determined Gas Leakage Detection Based on IOT Published by Suma V, Ramya R Shekar, Akshay Kumar A This methods is developed to detect and monitor the LPG gas . Here they have used MQ6 sensor to detect the gas once it detect the gas it display the gas leakage on LCD along with the gas values There are some of the problems faced recently that is gas leakages and booking issues, so this developed system is helpful to the customer. It also helps in protecting life and property from apparent accidents. The primary aim of the system is to identify gas leaks with the use of gas sensors and user should be notified to prevent injure or outburst. The secondary aim is to detect the amount of the gas remaining in the cylinder which can be done through weight sensor. Disadvantages of this system is no measures are taken to detect the fire. Detection and Smart Alerting Published by Asmita Varma, Prabhakar S, Kayalvizhi Jayavel The proposed system aids in detecting gas leaks through sensor with a smart alerting message and alram to the users so this brings safety against the leakage of harmful and toxic gases. A gas at certain concentration might not be

flammable Although they are stable at low temperatures, they can become explosive at high temperature as a result humidity sensor would be beneficial to include . Disadvantages is No measures are taken to detect the fire and measuring the weight of the cylinder

NEED OF STUDY Rapid Detection: Gas leaks can occur in various places such as residential, commercial, and industrial environments. An effective gas leakage detection system with auto ventilation can provide early warning signs, allowing occupants to evacuate safely and preventing further damage. By studying different detection technologies, such as gas sensors, monitoring systems, and data analysis techniques, we can enhance the speed and accuracy of gas leak detection. Safety and Property Protection: Leakage of the gas is extremely dangerous which leads to fire hazards, explosion, and health issues to human and property. The study of early detection of gas leakage helps us to prevent accidents to theproperty and human life.

Real-time Monitoring, Early Warning and Alarm Systems: With advancements in Internet of Things (IoT) technologies, gas leakage detectionsystems can be connected to a centralized monitoring system. This

allows for continuous monitoring of gas levels, leakage of gas, fire, under weight of the cylinder, and alarms. Through a smart management system, alerts and notifications can be sent to building owners, facility managers, or emergency services, enabling prompt response and necessary actions. Gas detection systems contain audible alarm and alert the occupants to take immediate action. Such early warnings play a crucial role in emergency response. Energy Efficiency: Gas leakage can result in the wastage of valuable resources. By identifying and addressing leaks promptly, energy efficiency can be improved, leading to cost savings and reduced environmental impact.

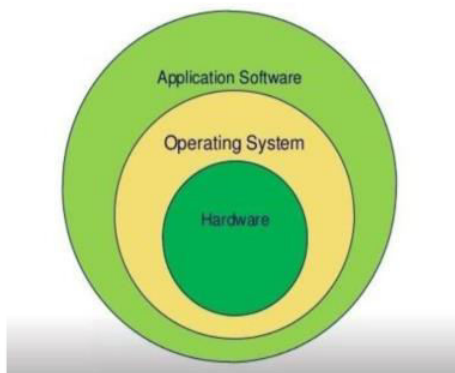


FIG.1.1 Overview of embedded system architecture

Now, let us see the details of the various building blocks of the hardware of an

embedded system. As shown in Fig. the building blocks are;

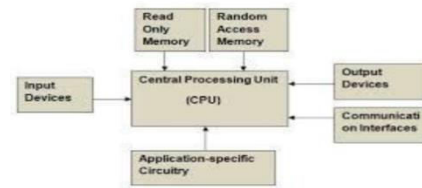
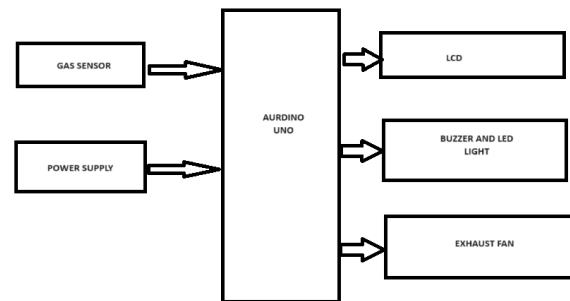


FIG.1.2 Various building blocks of hardware of an embedded system .

2. BLOCK DIAGRAM



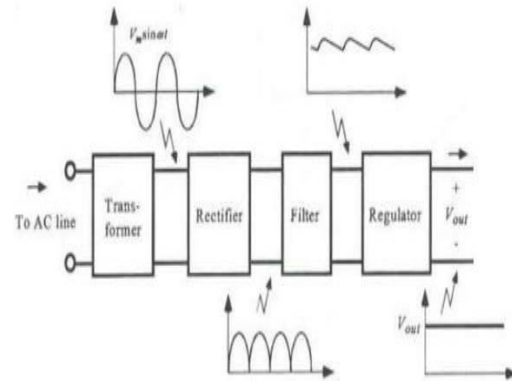
The block diagram of the proposed system is shown in figure .It consists of power supply section, alcohol sensor, stepper motor, LCD, microcontroller, alarm and LEDs. The various units were designed and tested separately. The detected analog voltage values are read by the microcontroller; the Arduino Uno board contains 8 channels, 10-bit device that changes an analog voltage on a pin to a digital number. The system will link input voltages from 0-5V with values from 0-1023V to generate 5Vs for every 1024 units. The system will process the

analog signal and convert it to digital value of 0 or 1. Also, the analog values from the alcohol sensor will be scaled to percentage, and this percentage is equivalent to the analog voltage values in ppm (part per million). Each stage will be a condition to perform a task based on the level of gas. In the intoxication gas stage, the LED indicator will be activated only, the alarm will be OFF and the regulator will be ON so the fan will be OFF while the alarm and red LED will be ON. Therefore, once the system detect GAS in stage the fan will be ON.

3.DESCRPTION OF COMPONENTS

3.1 POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.



3.1 Block Diagram of Power supply

3.3 BUZZER

3.3.1 GENERAL DESCRIPTION

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or key stroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."



Fig 3.4 Buzzer

3.4 TRANSFORMER

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.

The secondary induced voltage V_S , of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

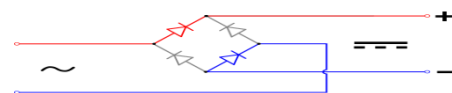
3.5 BRIDGE RECTIFIER

A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input

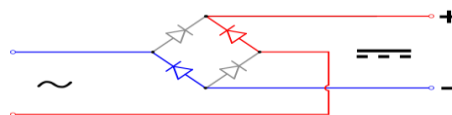
voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

3.5.1 BASIC OPERATION

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right hand corner, current flows to the right along the upper colored path to the output, and returns to the input supply via the lower one.



When the right hand corner is positive relative to the left hand corner, current flows along the upper colored path and returns to the supply via the lower colored path.



3.6 Arduino UNO And Controller

Microcontroller:

3.6.1 Introduction:

Microcontroller as the name suggest, a small controller. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwaves ovens, toys....etc, where automation is needed.

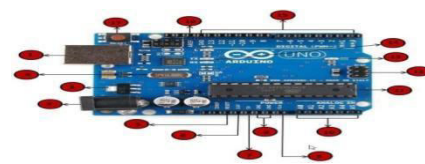
Arduino Uno Microcontroller:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

ARDUINO UNO BOARD:

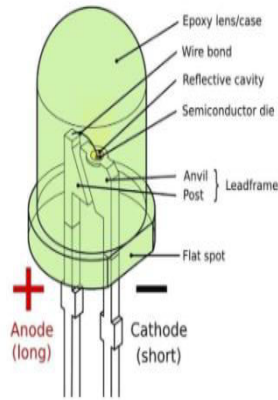
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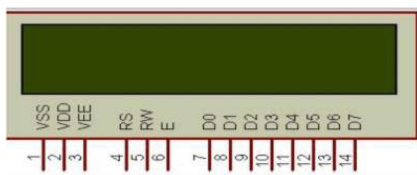
3.7 LIGHT EMITTING DIODE(LED):

LED is abbreviation of Light Emitting Diode. It's nothing, but just a combination of semiconductors which emits light when current pass through it . Over the years, semiconductor technology has advanced to bigger heights, Light Emitting Devices have also been a part of this revolution and as a result, Now we have LED's which give better illumination with low power consumption.



3.8 LIQUID CRYSTAL DISPLAY(LCD):

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.



4. WORKING PRINCIPLE

This suggested model is built using a variety of sensors. This system will be utilized in a variety of settings, including homes, businesses, and schools. The suggested architectural design for a gas warning system is shown below. The Raspberry pi is used to link the different sensors and hardware components in this alert system. The MQ-3 sensor detects methane, butane, propane, liquefied petroleum gas (LPG), and smoke. The MQ-3 sensor detects alcohol, grain alcohol, and smoke. The LCD is used to constantly show the detected data. The motor portion is activated automatically when the cylinder valve is opened/closed. Potentiometers are used to test the sensitivity of sensors.. This system will be used in any place like houses, industries, schools, etc. The following diagram shows the proposed architecture diagram for a gas alert system. Detection of gas leakage is the process by which sensor leaks and flames are identified as potentially harmful. The gas sensor (MQ3) interfaced to the arduino uno may be used for such detection. Whenever the sensor detects gas, a voltage is produced and the arduino is supplied as an input. If the gas is detected the motor gets turned ON and buzzer will get to beep to give an alert and turned off.

5. RESULT

Gas leaks cause serious mishaps that result in material losses and human injuries. Gas leakage is caused mostly by poor equipment maintenance and a lack of public knowledge. As a result, detecting LPG leaks is critical for avoiding accidents and saving lives. This article described a method for detecting and alerting LPG leaks. When LPG leakage is detected, this device activates an LED and a buzzer to warn people. This method is basic yet dependable. As a result, detecting GAS leaks is critical for avoiding accidents and saving lives. This article described a method for detecting and alerting GAS leaks. When LPG leakage is detected, this device activates an LED and a buzzer to warn people

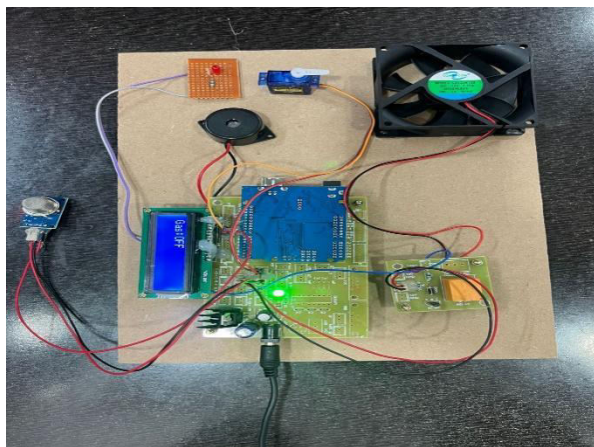


FIG 5.1 hard ware model

6. CONCLUSION

CONCLUSION

From the use of cylinder up to the use of petroleum pipelines. The biggest threat in using this technology is security. And our project will prove to be boom for households and industries.

FUTURE SCOPE

With recent development in technology, Temperature display during periods wherein no message buffers are empty is one such theoretical improvement that is well possible. Another very interesting and significant improvement would be to accommodate multiple receiver MODEMS at different positions in the geographical area carrying duplicate SIM cards. Multilingual display can be another added variation in the project. Audio output can be introduced to make it user Friendly.

7. REFERENCE

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