

DETECTING THE DISCHARGE OF LPG GAS WITH AUTO VENTILATION AND ADVANCED SYSTEM USING IOT

Submitted in partial fulfillment of the requirements for the
award of Bachelor of Technology degree in
Information Technology

By

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Keshihaa M (Reg No. 39120053)**, who carried out the Project Phase-2 entitled “**Detecting the discharge of LPG gas with auto ventilation and advanced system using IOT.**” under my supervision from November 2022 to May 2023.

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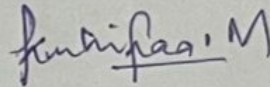
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ABSTRACT

This paper presents a system for detecting the discharge of LPG gas using IoT and load cell technology. The system incorporates an advanced ventilation system that is automatically activated when LPG gas is detected, preventing the accumulation of dangerous gas concentrations. The load cell technology is used to accurately measure the weight of the LPG gas cylinder, providing real-time information about the amount of gas remaining in the cylinder. The IoT technology allows remote monitoring and control of the system, providing alerts and SMS notifications to users in the event of gas leaks or abnormal readings. This system provides a reliable and effective solution for ensuring the safe use of LPG gas in residential and commercial settings. The proposed system provides an effective solution for ensuring the safe use of LPG gas in homes and commercial settings, and the added notification feature enhances its usability and safety measures. In recent years there has been a rapid development in technology which has made human life easier in several aspects. LPG is a need of every one and is widely used for cooking. Some of the common problems experienced during its usage are, the gas cylinders go empty while the peak cooking hours, incognizance of the current status of gasoline present in the container, and the failure to prophesy the working days of the LPG cylinder once installed. All these lead to inconvenience in its use. To deal with these issues Smart Gas Kit is an ideology put forward. It mainly focuses on the application of the IoT used for measuring and displaying the gasoline content present in household LPG cylinder and automatic booking of a new LPG cylinder.

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LIST OF ABBREVIATION

ACRONYM	DESCRIPTION
LPG	Liquefied Petroleum Gas
GSM	Global System form Mobil communication
IDE	Integrated Development Environment
MCU	Micro-controller unit
IOT	Internet Of Things

CHAPTER 1

INTRODUCTION

Internet of things try towards making life less complex what's more, quicker via robotizing the whole little errands related with the life of human. Today, everything is getting keen because of the innovative advancement, for example, of IOT. As IOT is valuable for robotizing the assignments, the upside of IOT can likewise be far reaching for improving the helpful security strategies. Security plays a significant role while constructing home, buildings, industries as well as towns. The enlarged focus of certain gases in the environment can be exceptionally unsafe, in recent time, everyone needs a facility which reduces time and effort and expect their work to be as easy as possible. To ensure the safe use of LPG gas, it is essential to have a reliable system for detecting gas leakage and preventing gas buildup. In this regard, IoT (Internet of Things) technology has emerged as a powerful tool for monitoring and controlling various aspects of daily life, including gas safety. By integrating IoT technology with load cell and auto ventilation systems, it is possible to create an effective solution for detecting the discharge of LPG gas and preventing accidents. This paper proposes a system that incorporates IoT technology, load cell, and auto ventilation systems for detecting LPG gas discharge. The load cell technology is used to measure the weight of the gas cylinder accurately and provide real-time information on the amount of gas remaining. The auto ventilation system is triggered when gas is detected, preventing gas buildup and reducing the risk of accidents. The IoT technology enables remote monitoring and control of the system, providing alerts and notifications to users in the event of gas leaks or abnormal readings. Additionally, the proposed system is equipped with an SMS notification feature, which alerts users in case of gas leakage, enabling prompt action to be taken to prevent accidents. The proposed system presents a reliable and effective solution for ensuring the safe use of LPG gas in homes and commercial settings. By incorporating IoT technology, load cell, and auto ventilation systems, it enables real-time monitoring and control of gas safety, enhancing its usability and safety measures. The SMS notification feature also adds an extra layer of safety, ensuring that users are promptly alerted in case of gas leakage. The challenges include maintenance in which the system will require regular maintenance to ensure that the sensors and other components are working correctly. Data privacy and security in which the system will collect and store

sensitive data, so it will need to be designed with appropriate data privacy and security measures to prevent unauthorized access or data breaches. Overall, this paper presents a valuable contribution to the field of gas safety and provides a blueprint for creating safe and effective gas safety systems.

1.1 OVERVIEW

The detection of the discharge of LPG gas is crucial for ensuring the safety of people and property in environments where LPG is used. To address this, an auto ventilation and advanced system using the Internet of Things (IoT) can be implemented. The system would use sensors to detect the presence of LPG gas and automatically activate a ventilation system to disperse the gas, reducing the risk of an explosion or fire. Additionally, the IoT component of the system would allow for remote monitoring and control of the system, providing real-time information about gas levels and ventilation system status. The advanced system would also incorporate machine learning algorithms to analyse data from the sensors and identify patterns that could indicate a potential LPG gas leak. This would enable the system to provide early warnings and take proactive measures to prevent disasters. Overall, implementing an auto ventilation and advanced system using IoT for detecting the discharge of LPG gas has the potential to greatly enhance safety in environments where LPG is used.

1.2 PROBLEM STATEMENT

This system would provide real-time monitoring and control of gas levels and ventilation systems, allowing for timely and effective response to gas discharges. The advanced system would incorporate machine learning algorithms to identify potential gas leaks and provide early warnings to prevent disasters. Therefore, the problem statement for this project is to develop an auto ventilation and advanced system using IoT to detect the discharge of LPG gas and prevent potential explosions or fires in environments where LPG is used.

CHAPTER 2

LITERATURE SURVEY

[1] Author S. Jamadagni,'s paper is about determining the discharge of gas and fire in an industry and to notify the user through SMS for awareness. There is a high chance of fire accidents due to the discharge of gas in industries, to determine such discharge of gas, the author have proposed this system. Two sensors have been used for designing this system which is gas sensor and fire sensor. If the sensors detect fire, smoke or gas, the user will be notified in form of SMS and the user have to take the necessary precautions, thus, preventing possible damages. The drawback of this project is that, it doesn't have auto ventilation, the user has to manually take action to avoid incident, and also the message alert will be sent to the person individually rather than a buzzer to alert everybody.

[2] The author L. Jinfeng focuses on indoor safety, as these days a lot of people are adapting to smart kitchens, leakage of gas could become a threat for human and as well as the property. This paper focuses mainly on detecting the discharge of gas and alerting the user in sound or light, so that the user could take the precautions needed. If no action is taken by the user, using civil gas alarms, the valve, which is the gas source will be cut off using a remote switch. NB IoT which is real time monitoring is used to update the concentration of the gas, hereby, monitoring the system. In the future, some changes can be done to this existing project, like a notification can be sent to the user's phone, temperature of the room can be determined, etc.

[3] The author S. M. Zinnuraain's paper is based on monitoring and detecting the leakage of gas for ensuring safety. It is specifically designed for household purposes. It is designed in such a way, that if the cylinder is about to get empty, the user will be notified, so that the user can pre book the cylinder without any inconvenience. The main goal is to alert the user if there is a gas leakage and to prevent from explosion, thereby sending data through wifi communication. Hence possible damages to the human lives, as well as the property can be prevented. This project can be carried out in the future by adding certain features like auto ventilation, determining room temperature, determining the amount of gas that has been leaked.

[4] The author A. M. Anika's proposed system is an intelligent LPG gas leakage detection system that uses IoT technology to provide real-time monitoring and control of gas safety. The system incorporates a gas sensor, microcontroller, Wi-Fi module, and buzzer. The study found that the proposed system effectively detected gas leakage and alerted users through a mobile application. The important advantage is that it has auto ventilation through ventilation fan and water flow through solenoid valve. By implementing this system, the chance of fire accidents can be prevented. Certain features like calculating the weight of the gas cylinder, identifying room temperature, can be added to this existing project.

[5] The author B. Zhu's paper is focused on detecting the leakage of natural gas with real time monitoring, considering the transfer of heat and friction. The leakage is identified by electro conductors which is wrapped in a material, that enlarges when hydrocarbons are present. To estimate the parameter, the genetic algorithm is used. Therefore this system is effective in detecting the gas.

[6] The author Z. Tasnim proposes an IoT-based smart gas leakage detection and auto ventilation system for home safety. The system uses a gas sensor, Arduino board, Wi-Fi module, and fan for auto ventilation. The study found that the proposed system effectively detected gas leakage and prevented gas buildup through auto ventilation. The system allows for remote monitoring and control of gas safety through a mobile application. The study found that the proposed system effectively detected gas leakage and provided real-time monitoring and control of gas safety.

[7] The author M.A.Subramanian's paper is based on the study of a smart LPG gas leakage detection and control system that uses IoT technology to provide real-time monitoring and control of gas safety. The system incorporates a gas sensor, Raspberry Pi, Wi-Fi module, and relay for gas valve control. The study found that the proposed system effectively detected gas leakage and controlled the gas valve in case of gas leakage. Gas flow measurement devices were used to measure the pressure in the cylinder different equipment's such as Pitot tubes work by comparing the pressure in a small diameter tube (impact pressure) to the static pressure around the tube. In Venturi Pressure measurements are taken before and at the mid-point of a constriction, then the flow rate is calculated from the difference in these two measurements. Orifice plates are a well-proven flow measurement technology.

Because orifice plates are interchangeable, a technician can change the plate size to achieve desired pressure differential with changing flow rates. The article highlights the importance of gas leakage detection systems and their components, such as gas sensors, microcontrollers, and communication protocols. The article also discusses various IoT-based gas leakage detection systems and their features, including notifications using pushbullet.

[8] The author R. K. Kodali says that IoT technology can be effectively integrated with gas safety systems to provide real-time monitoring and control of gas safety. The proposed systems incorporate gas sensors, microcontrollers, Wi-Fi modules, and other components to detect gas leakage and prevent gas buildup through auto ventilation or gas valve control. The studies show that the proposed systems effectively detected gas leakage and alerted users through mobile applications or buzzers. Overall, the integration of IoT technology with gas safety systems presents a promising solution for ensuring the safe use of LPG gas in homes and commercial settings.

[9] The author S. Unnikrishnan's proposed paper is based on gas leakage detection systems to provide real-time monitoring and notifications using IOT. The proposed systems incorporate gas sensors, microcontrollers, Wi-Fi modules, and notifications. The studies show that the proposed systems effectively detected gas leakage and notified the users through notifications. The studies highlight the importance of developing efficient LPG monitoring and leakage detection systems to ensure the safety of individuals and properties. The proposed systems effectively detect LPG leakage and send notifications to the users through different means, including mobile applications, SMS, and LCD displays. Overall, the integration of IoT technology with gas leakage detection systems and notifications presents a promising solution for ensuring the safe use of LPG gas in homes and industries.

[10] The author V. Suma proposes an IoT-based LPG gas leakage detection and notification system that uses an MQ-2 gas sensor, NodeMCU, and a mobile application for notifications. The system effectively detects LPG leakage and sends notifications to the users through the mobile application. The studies highlight the importance of developing efficient LPG monitoring and leakage detection systems to ensure the safety of individuals and properties. The proposed systems effectively

detect LPG leakage and send notifications to the users through different means, including mobile applications, SMS, and LCD displays. Overall, the literature survey presents a promising solution for developing efficient LPG monitoring and leakage detection systems.

2.1 INFERENCES FROM LITREATURE SURVEY

Gas detection systems are essential for ensuring the safety of people and property in environments where LPG is used. Traditional gas detection systems rely on sensors to detect the presence of gas and alert users to potential danger. Auto ventilation systems can effectively disperse gas and prevent potential explosions or fires. These systems automatically activate ventilation fans in response to gas detection, reducing the concentration of gas and minimizing the risk of ignition. The use of IoT in gas detection systems can provide real-time monitoring and control, allowing for more timely and effective response to gas discharges. This includes remote monitoring and control, which can provide increased flexibility and convenience for users. Overall, the literature survey suggests that the implementation of an auto ventilation and advanced system using IoT for detecting the discharge of LPG gas has significant potential to enhance safety in environments where LPG is used.

2.2 OPEN PROBLEMS IN EXISTING SYSTEM

To address these open problems, the implementation of more accurate and reliable gas detection sensors, advanced machine learning algorithms, and improved ventilation systems may be necessary. Additionally, the use of IoT and remote monitoring and control can enhance the real-time capabilities of gas detection systems and enable more effective responses to gas discharges. existing systems may not be able to effectively handle large-scale gas discharges, which can lead to widespread danger and damage.

CHAPTER-3

REQUIREMENT ANALYSIS

3.1 RISK ANALYSIS OF THE PROJECT

There is a risk of technical failure or malfunction of the sensors, IoT components, and ventilation systems, which could result in a failure to detect gas discharges or to disperse the gas effectively. To mitigate the risks, the project team should prioritize the selection of high-quality components and systems, perform rigorous testing and validation of the system, and implement redundancy and fail-safe mechanisms to ensure the system's reliability and robustness. The project team should also adhere to relevant safety and environmental regulations, provide adequate training and education to system operators, and maintain the system properly to ensure its continued effectiveness.

3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

The way we create software today has changed dramatically the last 30 years, from the childhood of personal computers in the early 80s to today's powerful devices such as Smartphones, Tablets and PCs. The Internet has also changed the way we use devices and software. We still have traditional desktop applications, but Web Sites, Web Applications and so- called Apps for Smartphones, etc. are dominating the software market today. We need to find and learn Programming Languages that are suitable for the New Age of Programming. We have today several thousand different Programming Languages today. The need to learn more than one Programming Language to survive in today's software market.

3.2.1 INTERNET OF THINGS (IoT):

The Internet of things (IoT) describes the network of physical objects “things” that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.

Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional

fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT can also be used in healthcare systems.

The IoT is the strategy for gadgets that encase hardware, and network, which enables these devices to fix, act together and switch information. IoT incorporates broadening Internet beneficial than standard gadgets, for example, work areas to any decision of generally non web get to material gadgets and on a day by day source objects. Inserted through innovation, these gadgets can banter and coordinate over the Internet, and they can be a little checked and restricted.

3.2.2 ARDUINO IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. Before uploading your sketch, you need to select the correct items from the Tools > Board and Tools > Port menus. The boards are described below. On the Mac, the serial port is probably something like /dev/tty.usbmodem241 (for an Uno or Mega2560 or Leonardo) or /dev/tty.usbserial-1B1 (for a Duemilanove or earlier USB board), or /dev/tty.USA19QW1b1P1.1 (for a serial board connected with a Key span USB-to-

Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should be `/dev/ttyACMx`, `/dev/ttyUSBx` or similar. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the Upload item from the Sketch menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila) that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error. When you upload a sketch, you're using the Arduino bootloader, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

3.2.3 EMBEDDED C:

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems. Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence

mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems. Modern embedded systems are often based on microcontrollers (i.e. CPU's with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP). Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

CHAPTER 4

Detecting the discharge of LPG gas with auto ventilation and advanced system

The project "Detecting the discharge of LPG gas with auto ventilation and advanced system using IoT" aims to develop a comprehensive solution for detecting gas discharges and preventing potential explosions or fires in environments where LPG is used. The system utilizes advanced gas sensors and machine learning algorithms to identify potential gas leaks, and activates ventilation fans automatically to disperse the gas and minimize the risk of ignition. The system also incorporates IoT technology to provide real-time monitoring and control, enabling remote monitoring and proactive measures to prevent disasters. The system works by constantly monitoring the area for gas leaks using the gas detector. If a leak is detected, the microcontroller triggers the ventilation system that is the servo motor to remove the gas from the area and sends an alert message to the user using GSM module and the buzzer will be turned on. The load cell measures the weight of the Gas sensors

The project's benefits include increased safety in environments where LPG is used, improved accuracy and reliability of gas detection systems, and enhanced real-time monitoring and control capabilities. The project can also contribute to the reduction of environmental damage and financial losses resulting from gas leaks or discharges.

To achieve these benefits, the project team will need to carefully design and integrate the various components of the system, including the gas sensors, ventilation fans, IoT devices, and machine learning algorithms. Rigorous testing and validation will also be necessary to ensure the system's accuracy, reliability, and safety. Adequate training and education will be necessary for system operators, and ongoing maintenance will be necessary to ensure the system's continued effectiveness.

Overall, the project has significant potential to enhance safety in environments where LPG is used, and to provide a more accurate, reliable, and effective gas detection system.

4.1 PROJECT MANAGEMENT PLAN

Module 1: Defining project scope and objectives

Module 2: Conducting a feasibility study

Module 3: Designing the system

Module 4: Installing the system

Module 5: Developing the software and integrating with hardware components

Module 6: Testing and validating the system

Module 7: Evaluating the system

4.2 SELECTED METHODOLOGY OR PROCESS MODEL

4.2.1 Agile Methodology

There are several methodologies and process models that could be used for implementing the project "Detecting the discharge of LPG gas with auto ventilation and load cell and advanced system using IoT." One such model that could be used is the Agile methodology.

The Agile methodology is an iterative and incremental approach to software development, which emphasizes collaboration, flexibility, and customer satisfaction. It involves breaking down the project into smaller, more manageable tasks, which are then developed in short cycles or sprints. The Agile methodology also emphasizes continuous testing and validation, allowing for early detection of errors and making changes as necessary.

The Agile methodology is particularly suited for projects where requirements may be uncertain or subject to change, as it allows for greater flexibility and adaptability. It also promotes collaboration and communication between team members, stakeholders, and customers, ensuring that the project meets the needs and expectations of all parties involved.

In the context of the project "Detecting the discharge of LPG gas with auto ventilation and load cell and advanced system using IoT," the Agile methodology could be used to break down the project into smaller, more manageable tasks, such as designing the system architecture, selecting and integrating the hardware components,

developing and testing the software, and installing and maintaining the system. The Agile methodology could also be used to facilitate collaboration and communication between team members and stakeholders, ensuring that the system meets the needs and expectations of all parties involved.

Overall, the Agile methodology is a flexible and adaptable approach that could be well-suited for the implementation of the project "Detecting the discharge of LPG gas with auto ventilation and load cell and advanced system using IoT."

4.2.2 Unified Process

The UP model consists of four phases: Inception, Elaboration, Construction, and Transition. Each phase involves specific activities and goals that are designed to move the project towards completion.

1. Inception: This phase focuses on defining the scope and goals of the project, identifying stakeholders, and understanding the business case. The goal of this phase is to determine the feasibility of the project and to create a plan for moving forward.
2. Elaboration: This phase focuses on refining the requirements and defining the architecture of the system. The goal of this phase is to create a detailed design of the system and to identify potential risks and mitigations.
3. Construction: This phase focuses on implementing the system according to the design specifications. The goal of this phase is to create a functional system that meets the requirements and specifications of the stakeholders.
4. Transition: This phase focuses on deploying the system to the production environment and providing training and support to users. The goal of this phase is to ensure that the system is stable, reliable, and meets the needs of the stakeholders.

Overall, the Unified Process model provides a structured and iterative approach to software development that could be suitable for implementing the project "Detecting the discharge of LPG gas with auto ventilation and with load cell and advanced system using IoT."

4.3 SYSTEM ARCHITECTURE

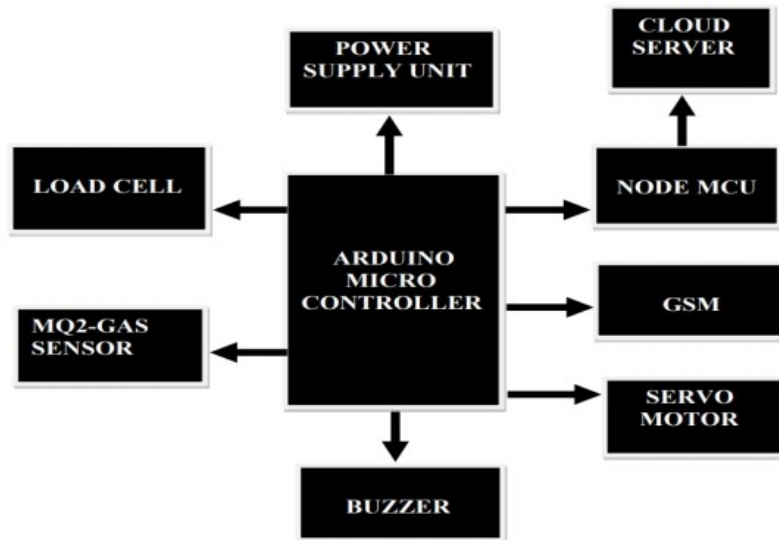


Fig: 4.3.1 System Architecture

4.4 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

Embedded software for microcontrollers: This software will be responsible for managing the various sensors, actuators, and other hardware components used in the system, as well as performing data processing and communication with other devices. The embedded software for microcontrollers is a critical component of the proposed system as it will be responsible for managing the various sensors, actuators, and other hardware components used in the system, as well as performing data processing and communication with other devices. The software will be developed using programming languages like C and will be compiled and loaded onto the microcontrollers. The software will be responsible for performing the following functions:

- Collecting data from the various sensors and load cell in the system.
- Processing the data collected from the sensors and load cell to detect any abnormality or discharge of LPG gas.

- Controlling the actuators in the system to activate the auto-ventilation system to prevent any dangerous build up of LPG gas.
- Communicating with other devices in the system, such as the cloud-based service and the web application, to send and receive data and instructions.

Cloud services and web application: A cloud-based service will be used to collect and store data from the IoT sensors. A web application will also be developed to visualize data and provide users with real-time alerts and notifications.

4.5 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

- Hardware and software installation: The hardware components of the system will be installed, including the sensors, load cell, actuators, microcontrollers, and other devices. The software will also be installed, including the embedded software for microcontrollers, cloud-based service, and web application.
- System configuration: The system will be configured to meet the needs and requirements of the production environment. This includes setting up the communication protocols, configuring the sensors and actuators, and setting up the cloud-based service and web application.
- Testing and validation: The system will undergo extensive testing and validation to ensure that it meets the requirements and specifications of stakeholders and users. This includes unit testing, integration testing, system testing, performance testing, and security testing.
- System maintenance: The system will require ongoing maintenance to ensure that it continues to function optimally. This includes regular updates and patches to the software, hardware maintenance, and system monitoring.
- System improvement: The system will also undergo continuous improvement to address any issues or feedback from stakeholders and users. This includes software updates and upgrades, hardware upgrades, and system optimizations.

Overall, the transition/ software to operations plan is critical for the successful deployment of the proposed system in a production environment. The plan ensures that the system is reliable, scalable, and meets the needs and expectations of the users.

CHAPTER 5

DESIGN AND DEVELOPMENT

5.1 SYSTEM SETUP

The system works by constantly monitoring the area for gas leaks using the gas detector. If a leak is detected, the microcontroller triggers the ventilation system that is the servo motor to remove the gas from the area and sends an alert message to the user using GSM module and the buzzer will be turned on. The load cell measures the weight of the gas cylinder and sends data to the microcontroller, which can be used to trigger alerts when the cylinder needs to be refilled. The system can be connected to the internet using an IoT device to enable remote monitoring and alerts. The power supply of 230 V has been reduced into 12 V and 16 V in the form of AC. Bridge rectifier is used to convert the AC inputs to DC outputs. A constant power of 12 V is being stored in the capacitor which supplies power to Arduino followed by other components. Overall, the system works by constantly monitoring the area for gas leaks using the gas detector. If a leak is detected, the microcontroller triggers the ventilation system that is the servo motor to remove the gas from the area and sends an alert message to the user using GSM module and the buzzer will be turned on. The load cell measures the weight of the gas cylinder and sends data to the microcontroller, which can be used to trigger alerts when the cylinder needs to be refilled. The system can be connected to the internet using an IoT device to enable remote monitoring and alerts.

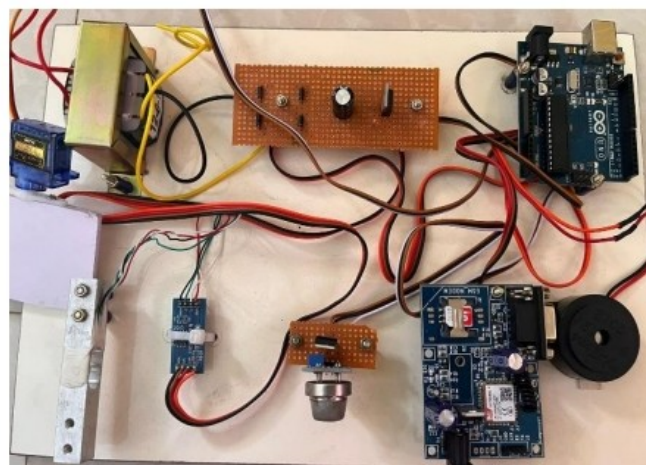


Fig: 5.1.1 System Setup

5.2 ARDUINO

Arduino is an open source, computer hardware and software company, project and user community that designs and manufactures Single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output – activating a motor, turning on an LED, publishing something online. 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.



Fig: 5.2.1 Arduino

5.3 ARDUINO UNO

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from

personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

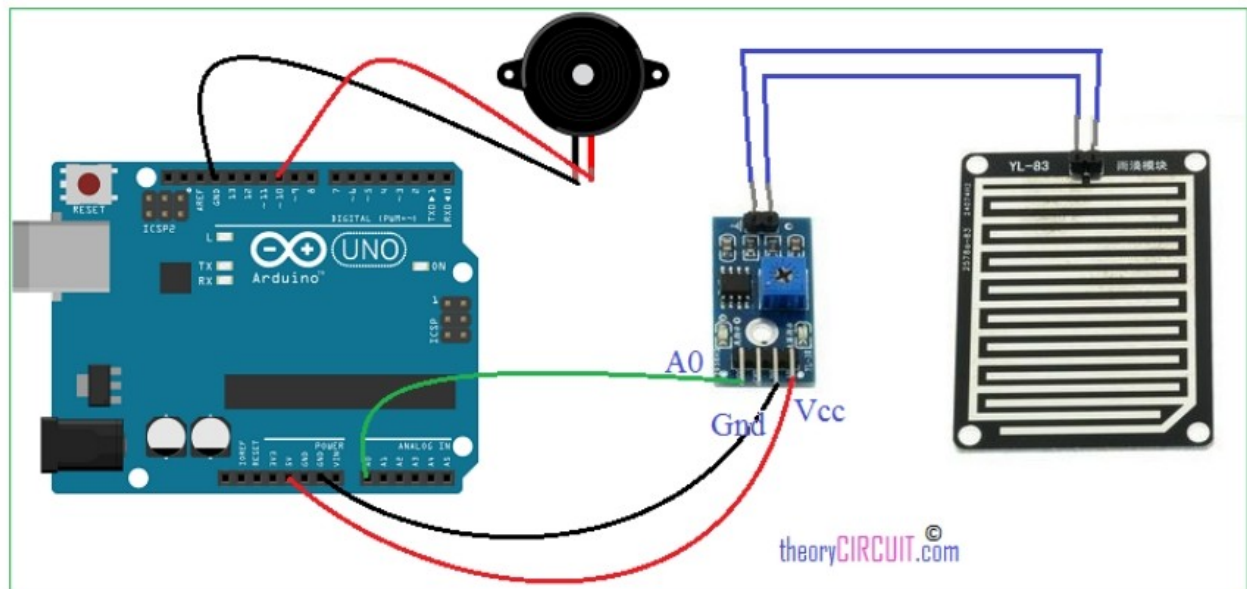


Fig 5.3.1 Arduino UNO setup

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.

5.4 ANALOG PORTS

In electronics, an analog-to-digital converter (ADC, A/D, A–D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement analog voltage or current to a digital number proportional to the magnitude of the voltage or current. In an embedded system, A/D conversion is very important as embedded systems deal with digital values; their surroundings usually occupy various analog signals. Analog signals need to be altered into digital before being treated by the microcontroller. At present, we can observe how to read an

external analog signal using PIC microcontroller and exhibit the digital o/p conversion on an LCD display. The i/p signal can be a varying voltage between 0 to 5v.

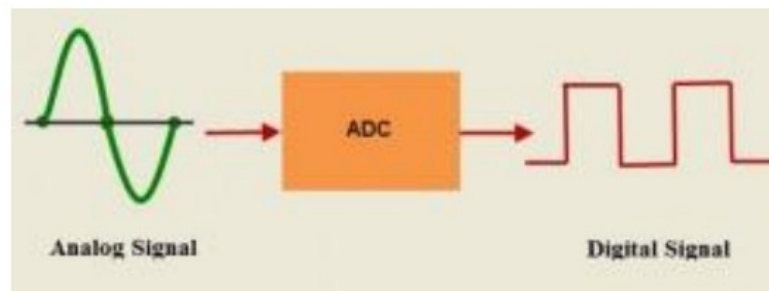


Fig 5.4.1 Analog Ports

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor. In the world of Arduino an Analog signal is simply a signal that can be HIGH (on), LOW (off) or anything in between these two states. This means an Analog signal has a voltage value that can be anything between 0V and 5V (unless you mess with the Analog Reference pin). Analog allows you to send output or receive input about devices that run at percentages as well as on and off. The Arduino does this by sampling the voltage signal sent to these pins and comparing it to a voltage reference signal (5V). Depending on the voltage of the Analog signal when compared to the Analog Reference signal the Arduino then assigns a numerical value to the signal somewhere between 0 (0%) and 1023 (100%). The digital system of the Arduino can then use this number in calculations and sketches.

5.5 NODE MCU

Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from espressif Systems, and hardware which is based on the ESP- 12 module. The term “Node MCU” by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the e Lua project, and built on the Express if Non-OS SDK for ESP8266.

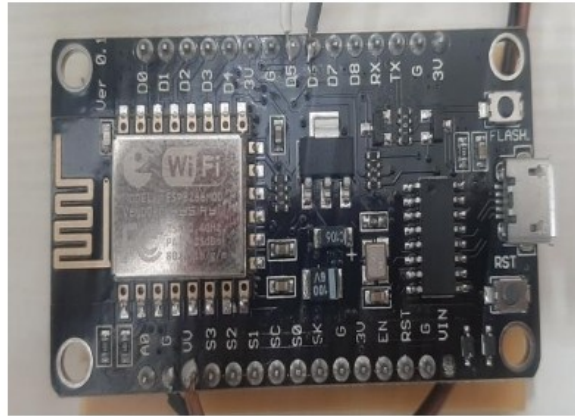


Fig 5.5.1 Node MCU

Node MCU was created shortly after the ESP8266 came out. On December 30, 2013, Express Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a 32-bit Xtensa LX106 core, [citation needed] widely used in IOT applications (see related projects). Node MCU started on 13 Oct 2014, when Hong committed the first file of node MCU-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the Gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to Node MCU project, then Node MCU was able to support the MQTT IOT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

5.6 LOAD CELL

A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. This electronic signal can be a voltage change, current change or frequency change depending on the type of load cell and circuitry used. The electrical signal output is typically in the order of a few milli-volts and requires amplification by an instrumentation amplifier before it can be used. The various types of load cells include hydraulic load cells, pneumatic load cells and strain gauge load cells. Here, we are using strain gauge load cells.

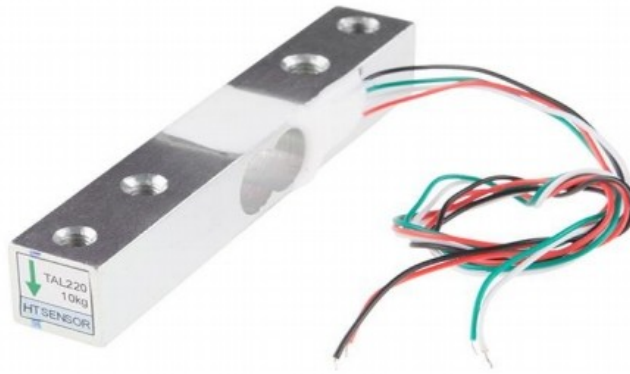


Fig 5.6.1 Load cell

5.7 LPG SENSOR (MQ2)

The MQ2 sensor is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Metal oxide sensors are also known as semi resistors because sensing is based on the change in resistance of the sensing material when exposed to gasses.



Fig 5.7.1 LPG Gas sensor

5.8 GSM MODEM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. This tutorial will explain how to interface a GSM modem with Toradex modules.



Fig: 5.8.1 GSM Modem

SIM Com Wireless Solutions is a subsidiary of SIM Technology Group Ltd (stock code: 2000. H.K). It is a fast-growing wireless M2M company, designing and offering a variety of wireless modules based on GSM/GPRS/EDGE, WCDMA/HSDPA and TD-SCDMA technical platforms by partnering with third parties, SIM Com Wireless provides customized design solutions in M2M, WLL, Mobile Computing, GPS and other applications. SIM Com Wireless also provides ODM services for customers. According to ABI Insight report, SIM Com Cellular Module was number two provider of wireless modules worldwide in 2008 with 20% acquisition of global market share. The GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface; the SIM800 delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM800 can fit almost all the space requirements in your applications, especially for slim and compact demand of design.

5.9 BUZZER

A buzzer or beeper is a signaling device, usually electronic, typically used in

automobiles, household appliances such as a microwave oven, or game shows.



Fig: 5.9.1 Buzzer

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".

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 keystroke. It generates consistent single tone sound just by applying D.C voltage. Using a suitably designed resonant system, this type can be used where large sound volumes are needed. At Future Electronics we stock many of the most common types categorized by Type, Sound Level, Frequency, Rated Voltage, Dimension and Packaging Type.

CHAPTER 6

RESULTS & DISCUSSION

6.1 RESULTS

The benefits of this proposed system are, accurate gas leak detection in which, the combination of gas sensors and load cells can provide accurate detection of gas leaks, ensuring the safety of residents. Automatic ventilation in which the system can automatically turn on the ventilation system to dissipate hazardous gases from the affected area, minimizing the risk of accidents. Real-time alerts in which the system can send alerts to concerned authorities and residents, enabling them to take immediate action to prevent any potential risks. IoT connectivity in which the system can be accessed and controlled remotely, providing convenience and flexibility.

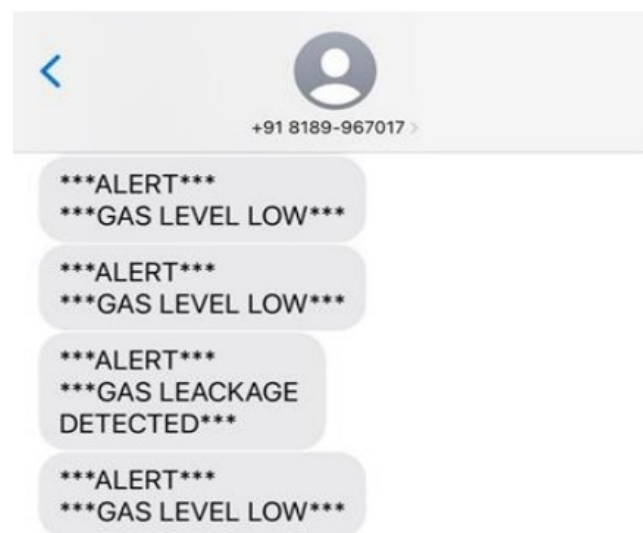


Fig 6.1.1 Alert Message

The challenges include maintenance in which the system will require regular maintenance to ensure that the sensors and other components are working correctly. Data privacy and security in which the system will collect and store sensitive data, so it will need to be designed with appropriate data privacy and security measures to prevent unauthorized access or data breaches.

In summary, while the proposed system can provide an advanced and comprehensive solution for gas leak detection and management, there are potential

challenges that need to be addressed to ensure the system's effectiveness and reliability. Further research and development are required to optimize the system's design and implementation, considering the cost, maintenance, and security challenges.

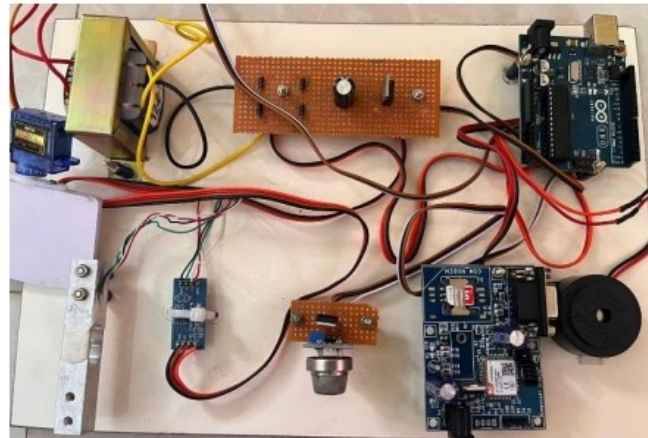


Fig 6.1.2 COMPLETE HARDWARE CIRCUIT

Sensors: Gas sensors will be installed to detect the presence of LPG gas and the ambient gas levels. A temperature sensor will also be installed to monitor the temperature of the gas.

Load cell: A load cell will be installed to accurately measure the weight of the LPG gas cylinder and monitor the gas level.

Microcontrollers: Microcontrollers will be used to interface with the sensors, load cell, and actuators, and to control the auto-ventilation system.

Auto-ventilation system: An auto-ventilation system will be installed to activate when the gas sensor detects any abnormality or gas discharge, preventing any dangerous build up of LPG gas.

IoT integration: The system will be integrated with IoT to enable real-time monitoring and control of the system, as well as remote access through a cloud-based service and web application.

CHAPTER 7

CONCLUSION & FUTURE WORK

7.1 CONCLUSION

In conclusion, the proposed work for detecting the discharge of LPG gas with auto ventilation and advanced system using IOT is an effective solution for ensuring the safety of residents and minimizing the risk of gas leaks. By combining gas sensors, load cells, and IoT connectivity, the system can accurately detect gas leaks and provide real-time alerts to concerned authorities and residents. The automatic ventilation system ensures that the hazardous gases are dissipated from the affected area quickly, minimizing the risk of accidents. The smart management system provides an efficient way to control and monitor the entire process remotely, enabling users to access the system from anywhere using a mobile app or web interface. Overall, this proposed system is a reliable and comprehensive solution for gas leak detection and management.

7.2 FUTURE WORK

The future improvements will include the incorporation of artificial intelligence and machine learning algorithms to improve the accuracy and reliability of the system, and the development of a mobile application for remote monitoring and control.

Data privacy and security in which the system will collect and store sensitive data, so it will need to be designed with appropriate data privacy and security measures to prevent unauthorized access or data breaches.

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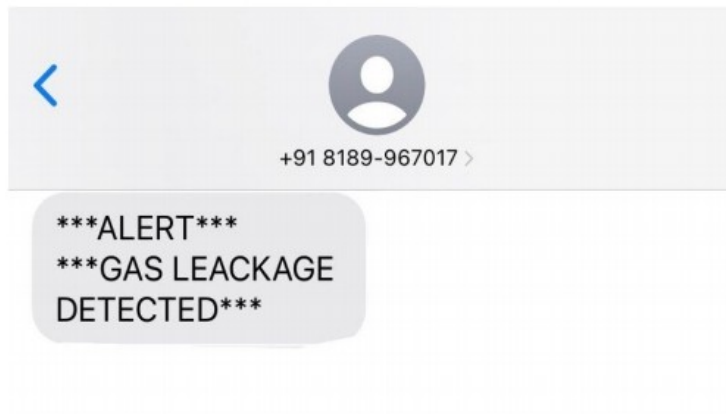
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APPENDIX

SCREEN SHOTS

ALERT MESSAGE

a) ALERT – Gas leakage detected

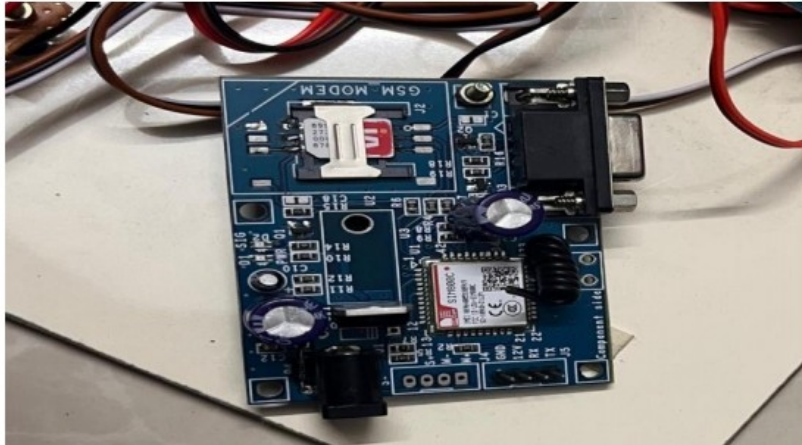


b) ALERT – Gas level low

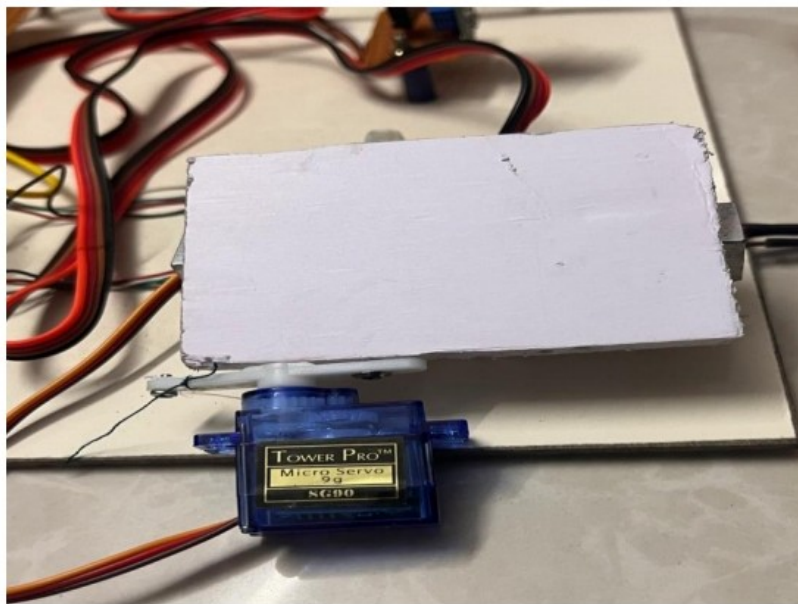


HARDWARE COMPONENTS

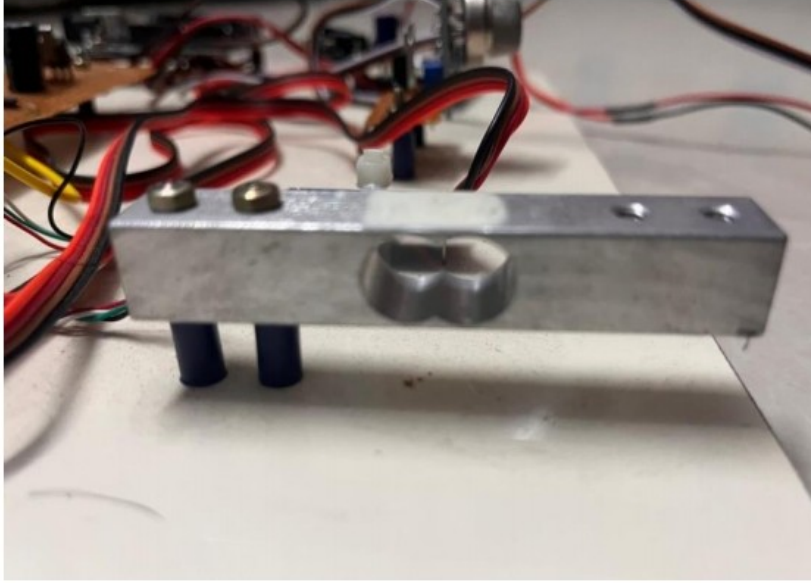
a) GSM MODEM



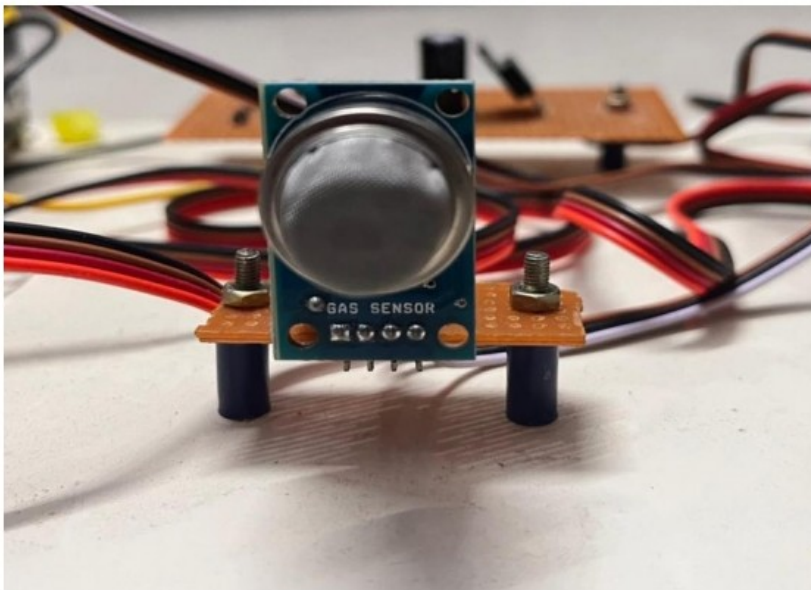
b) SERVO MOTOR



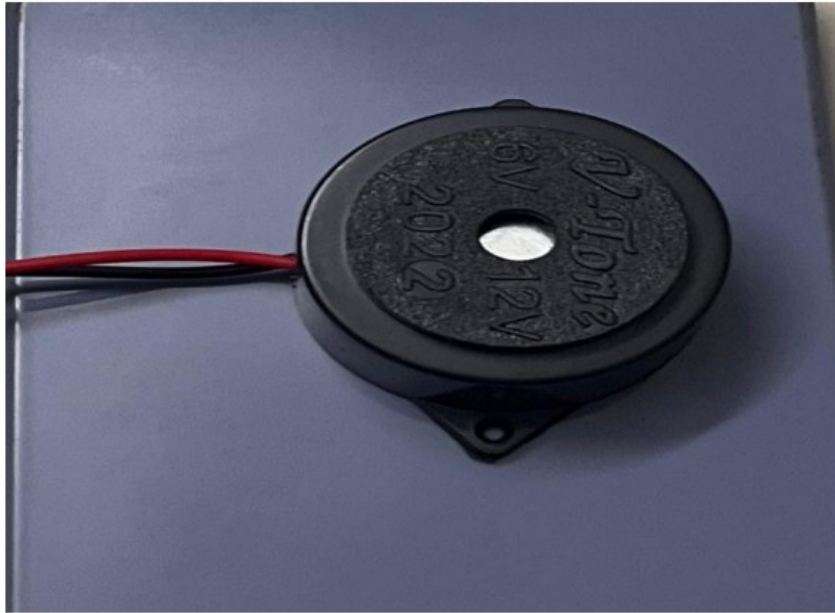
C) LOAD CELL



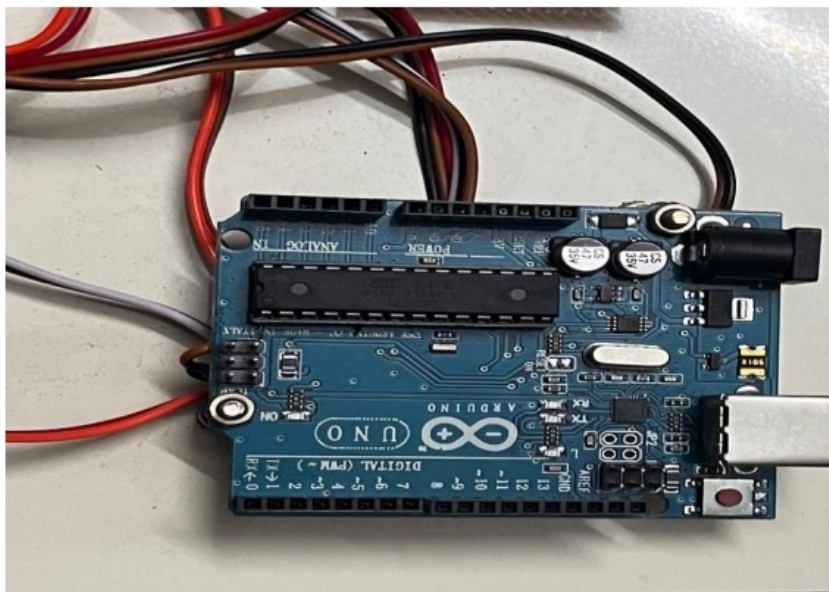
c) GAS SENSOR



d) DF PLAYER



e) ARDUNIO UNO



SOURCE CODE

SERVO MOTOR

```
#include <Servo.h>

Servo myservo;

int load;
int c = 0;
int pos = 0;
int gas;

void setup() {
  pinMode(A0, INPUT);
  pinMode(12, OUTPUT);
  myservo.attach(8);
  Serial.begin(9600);
  myservo.write(pos);
}

void loop() {
  gas = analogRead(A0);
  Serial.print("G : ");
  Serial.println(gas);
  delay(300);

  if (gas > 750 && c == 0)
  {
    digitalWrite(12, HIGH);
    for (pos = 0; pos <= 90; pos += 1) { // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos);           // tell servo to go to position in variable 'pos'
      delay(15);
```

```

    c = 1;
}
delay(5000);
}

else if (gas < 750 && c == 1) {
    digitalWrite(12, LOW);
    for (pos = 90; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
        myservo.write(pos);           // tell servo to go to position in variable 'pos'
        delay(15);
        c = 0;
    }
}
}
}

```

GAS LEVEL

```

#include <LiquidCrystal.h>
LiquidCrystal lcd(7, 6, 5, 4, 3, 2);
#include <SoftwareSerial.h>

SoftwareSerial mySerial(9, 10);

int gasValue = A0; // smoke / gas sensor connected with analog pin A1 of the
arduino / mega.
int data = 0;

void setup()
{
    randomSeed(analogRead(0));
    mySerial.begin(9600); // Setting the baud rate of GSM Module
    Serial.begin(9600); // Setting the baud rate of Serial Monitor (Arduino)

```

```

lcd.begin(16,2);
pinMode(gasValue, INPUT);
lcd.print (" Gas Leakage ");
lcd.setCursor(0,1);
lcd.print (" Detector Alarm ");
delay(3000);
lcd.clear();
}

void loop()
{

data = analogRead(gasValue);

Serial.print("Gas Level: ");
Serial.println(data);
lcd.print ("Gas Scan is ON");
lcd.setCursor(0,1);
lcd.print("Gas Level: ");
lcd.print(data);
delay(1000);

if ( data > 500) //
{
SendMessage();
Serial.print("Gas detect alarm");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Level Exceed");
lcd.setCursor(0,1);
lcd.print("SMS Sent");
delay(1000);

}

```

```

else
{
  Serial.print("Gas Level Low");
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Gas Level Normal");
  delay(1000);
}

lcd.clear();
}

void SendMessage()
{
  Serial.println("I am in send");
  mySerial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
  delay(1000); // Delay of 1000 milli seconds or 1 second
  mySerial.println("8189967017"); // Replace x with mobile number
  delay(1000);
  mySerial.println(" **ALERT** GAS LEAKAGE DETECTED"); // The SMS text
  you want to send
  delay(100);
  mySerial.println((char)26); // ASCII code of CTRL+Z
  delay(1000);
}

```

ALERT SMS

```
#include <LiquidCrystal.h>
```

```
LiquidCrystal lcd(7, 6, 5, 4, 3, 2);
```

```
#include <SoftwareSerial.h>
```

```
SoftwareSerial mySerial(9, 10);
```

```
int gasValue = A0; // smoke / gas sensor connected with analog pin A1 of the arduino  
/ mega.
```

```
int data = 0;
```

```
void setup()
```

```
{
```

```
  randomSeed(analogRead(0));
```

```
  mySerial.begin(9600); // Setting the baud rate of GSM Module
```

```
  Serial.begin(9600); // Setting the baud rate of Serial Monitor (Arduino)
```

```
  lcd.begin(16,2);
```

```
  pinMode(gasValue, INPUT);
```

```
  lcd.print (" Gas Leakage ");
```

```
  lcd.setCursor(0,1);
```

```
  lcd.print (" Detector Alarm ");
```

```
  delay(3000);
```

```
  lcd.clear();
```

```
}
```

```
void loop()
```

```
{
```

```
  data = analogRead(gasValue);
```

```
  Serial.print("Gas Level: ");
```

```
  Serial.println(data);
```

```
  lcd.print ("Gas Scan is ON");
```

```
  lcd.setCursor(0,1);
```

```
  lcd.print("Gas Level: ");
```

```
  lcd.print(data);
```

```

delay(1000);

if ( data > 500) //
{
SendMessage();
Serial.print("Gas detect alarm");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Level Exceed");
lcd.setCursor(0,1);
lcd.print("SMS Sent");
delay(1000);

}
else
{
Serial.print("Gas Level Low");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Level Normal");
delay(1000);
}

lcd.clear();
}

void SendMessage()
{
Serial.println("I am in send");
mySerial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
delay(1000); // Delay of 1000 milli seconds or 1 second
mySerial.println("8189967017"); // Replace x with mobile number
delay(1000);
mySerial.println(" **ALERT** GAS LEVEL LOW ");// The SMS text you want to send

```

```

delay(100);
mySerial.println((char)26);// ASCII code of CTRL+Z
delay(1000);
}

```

LOAD CELL

```

#include "HX711.h"

// HX711 circuit wiring
const int LOADCELL_DOUT_PIN = 2;
const int LOADCELL_SCK_PIN = 3;

HX711 scale;

void setup() {
  Serial.begin(57600);
  scale.begin(LOADCELL_DOUT_PIN, LOADCELL_SCK_PIN);
}

void loop() {

  if (scale.is_ready()) {
    scale.set_scale();
    Serial.println("Tare... remove any weights from the scale.");
    delay(5000);
    scale.tare();
    Serial.println("Tare done...");
    Serial.print("Place a known weight on the scale...");
    delay(5000);
    long reading = scale.get_units(10);
    Serial.print("Result: ");
    Serial.println(reading);
  }
}

```

```
else {  
    Serial.println("HX711 not found.");  
}  
delay(1000);
```

BUZZER – DIGITAL WRITE

```
digitalWrite(buzzerPin, HIGH);  
delay(500);  
digitalWrite(buzzerPin, LOW);  
delay(500);
```

ANALOG WRITE

```
analogWrite(buzzerPin, 127);  
delay(500);  
analogWrite(buzzerPin, 127);  
delay(500);
```

```
const int buzzerPin = 9;  
void setup(){  
    pinMode(buzzerPin, OUTPUT);  
}
```

```
void loop(){  
    analogWrite(buzzerPin, 127);  
    delay(500);  
    analogWrite(buzzerPin,0);  
    delay(500);  
}
```

ARDUINO – BUZZER

```
const int buzzerPin = 9;
void setup(){
  pinMode(buzzerPin, OUTPUT);
}
void loop(){
  tone(buzzerPin, 500, 500);
  delay(1000);
}
```

Detecting the discharge of LPG gas with auto ventilation and advanced system using IoT

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Abstract - This paper presents a system for detecting the discharge of LPG gas using IoT and load cell technology. The system incorporates an advanced ventilation system that is automatically activated when LPG gas is detected, preventing the accumulation of dangerous gas concentrations. The load cell technology is used to accurately measure the weight of the LPG gas cylinder, providing real-time information about the amount of gas remaining in the cylinder. The IoT technology allows remote monitoring and control of the system, providing alerts and SMS notifications to users in the event of gas leaks or abnormal readings. This system provides a reliable and effective solution for ensuring the safe use of LPG gas in residential and commercial settings. The proposed system provides an effective solution for ensuring the safe use of LPG gas in homes and commercial settings, and the added notification feature enhances its usability and safety measures.

Keywords – LPG gas, gas cylinder, auto ventilation.

I. INTRODUCTION

To ensure the safe use of LPG gas, it is essential to have a reliable system for detecting gas leakage and preventing gas buildup. In this regard, IoT (Internet of Things) technology has emerged as a powerful tool for monitoring and controlling various aspects of daily life, including gas safety. By integrating IoT technology with load cell and auto ventilation systems, it is possible to create an effective solution for detecting the discharge of LPG gas and preventing accidents. This paper proposes a system that incorporates IoT technology, load cell, and auto ventilation systems for detecting LPG gas discharge. The load cell technology is used to measure the weight of the gas cylinder

accurately and provide real-time information on the amount of gas remaining. The auto ventilation system is triggered when gas is detected, preventing gas buildup and reducing the risk of accidents. The IoT technology enables remote monitoring and control of the system, providing alerts and notifications to users in the event of gas leaks or abnormal readings. Additionally, the proposed system is equipped with an SMS notification feature, which alerts users in case of gas leakage, enabling prompt action to be taken to prevent accidents. The proposed system presents a reliable and effective solution for ensuring the safe use of LPG gas in homes and commercial settings. By incorporating IoT technology, load cell, and auto ventilation systems, it enables real-time monitoring and control of gas safety, enhancing its usability and safety measures. The SMS notification feature also adds an extra layer of safety, ensuring that users are promptly alerted in case of gas leakage. The challenges include maintenance in which the system will require regular maintenance to ensure that the sensors and other components are working correctly. Data privacy and security in which the system will collect and store sensitive data, so it will need to be designed with appropriate data privacy and security measures to prevent unauthorized access or data breaches. Overall, this paper presents a valuable contribution to the field of gas safety and provides a blueprint for creating safe and effective gas safety systems.

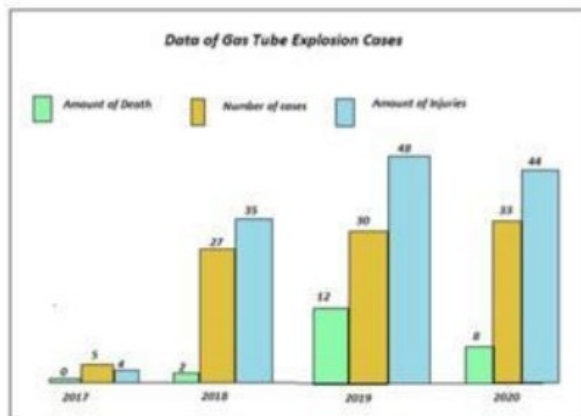


Fig1.1 Data of gas tube explosion

LITERATURE SURVEY

[1] Author S. Jamadagni,'s paper is about determining the discharge of gas and fire in an industry and to notify the user through SMS for awareness. There is a high chance of fire accidents due to the discharge of gas in industries, to determine such discharge of gas, the author have proposed this system. Two sensors have been used for designing this system which is gas sensor and fire sensor. If the sensors detect fire, smoke or gas, the user will be notified in form of SMS and the user have to take the necessary precautions, thus, preventing possible damages. The drawback of this project is that, it doesn't have auto ventilation, the user has to manually take action to avoid incident, and also the message alert will be sent to the person individually rather than a buzzer to alert everybody.

[2] The author L. Jinfeng focuses on indoor safety, as these days a lot of people are adapting to smart kitchens, leakage of gas could become a threat for human and as well as the property. This paper focuses mainly on detecting the discharge of gas and alerting the user in sound or light, so that the user could take the precautions needed. If no action is taken by the user, using civil gas alarms, the valve, which is the gas source will be cut off using a remote switch. NB-IoT which is real time monitoring is used to update the concentration of the gas, hereby, monitoring the system. In the future, some changes can be done to this existing project, like a notification can be sent to the user's phone, temperature of the room can be determined, etc.

[3] The author S. M. Zinnuraain's paper is based on monitoring and detecting the leakage of gas for ensuring safety. It is specifically designed for household purposes. It is designed in such a way, that if the cylinder is about to get empty, the user will be notified, so that the user can pre book the cylinder without any inconvenience. The main goal is to alert the user if there is a gas leakage and to prevent from explosion, thereby sending data through wifi communication. Hence possible damages to the human lives, as well as the property can be prevented. This project can be carried out in the future by adding certain features like auto ventilation, determining room temperature, determining the amount of gas that has been leaked.

[4] The author A. M. Anika's proposed system is an intelligent LPG gas leakage detection system that uses IoT technology to provide real-time monitoring and control of gas safety. The system incorporates a gas sensor, microcontroller, Wi-Fi module, and buzzer. The study found that the proposed system effectively detected gas leakage and alerted users through a mobile application. The important advantage is that it has auto ventilation through ventilation fan and water flow through solenoid valve. By implementing this system, the chance of fire accidents can be prevented. Certain features like calculating the weight of the gas cylinder, identifying room temperature, can be added to this existing project.

[5] The author B. Zhu's paper is focused on detecting the leakage of natural gas with real time monitoring, considering the transfer of heat and friction. The leakage is identified by electro conductors which is wrapped in a material, that enlarges when hydrocarbons are present. To estimate the parameter, the genetic algorithm is used. Therefore this system is effective in detecting the gas.

[6] The author Z. Tasnim proposes an IoT-based smart gas leakage detection and auto ventilation system for home safety. The system uses a gas sensor, Arduino board, Wi-Fi module, and fan for auto ventilation. The study found that the proposed system effectively detected gas leakage and prevented gas buildup through auto ventilation. The system

allows for remote monitoring and control of gas safety through a mobile application. The study found that the proposed system effectively detected gas leakage and provided real-time monitoring and control of gas safety.

[7] The author M.A.Subramanian's paper is based on the study of a smart LPG gas leakage detection and control system that uses IoT technology to provide real-time monitoring and control of gas safety. The system incorporates a gas sensor, Raspberry Pi, Wi-Fi module, and relay for gas valve control. The study found that the proposed system effectively detected gas leakage and controlled the gas valve in case of gas leakage. The article highlights the importance of gas leakage detection systems and their components, such as gas sensors, microcontrollers, and communication protocols. The article also discusses various IoT-based gas leakage detection systems and their features, including notifications using pushbullet.

[8] The author R. K. Kodali says that IoT technology can be effectively integrated with gas safety systems to provide real-time monitoring and control of gas safety. The proposed systems incorporate gas sensors, microcontrollers, Wi-Fi modules, and other components to detect gas leakage and prevent gas buildup through auto ventilation or gas valve control. The studies show that the proposed systems effectively detected gas leakage and alerted users through mobile applications or buzzers. Overall, the integration of IoT technology with gas safety systems presents a promising solution for ensuring the safe use of LPG gas in homes and commercial settings.

[9] The author S. Unnikrishnan's proposed paper is based on gas leakage detection systems to provide real-time monitoring and notifications using IOT. The proposed systems incorporate gas sensors, microcontrollers, Wi-Fi modules, and notifications. The studies show that the proposed systems effectively detected gas leakage and notified the users through notifications. The studies highlight the importance of developing efficient LPG monitoring and leakage detection systems to ensure the safety of individuals and properties. The proposed systems effectively detect LPG leakage and send notifications to the

users through different means, including mobile applications, SMS, and LCD displays. Overall, the integration of IoT technology with gas leakage detection systems and notifications presents a promising solution for ensuring the safe use of LPG gas in homes and industries.

[10] The author V. Suma proposes an IoT-based LPG gas leakage detection and notification system that uses an MQ-2 gas sensor, NodeMCU, and a mobile application for notifications. The system effectively detects LPG leakage and sends notifications to the users through the mobile application. The studies highlight the importance of developing efficient LPG monitoring and leakage detection systems to ensure the safety of individuals and properties. The proposed systems effectively detect LPG leakage and send notifications to the users through different means, including mobile applications, SMS, and LCD displays. Overall, the literature survey presents a promising solution for developing efficient LPG monitoring and leakage detection systems.

II. PROPOSED WORK

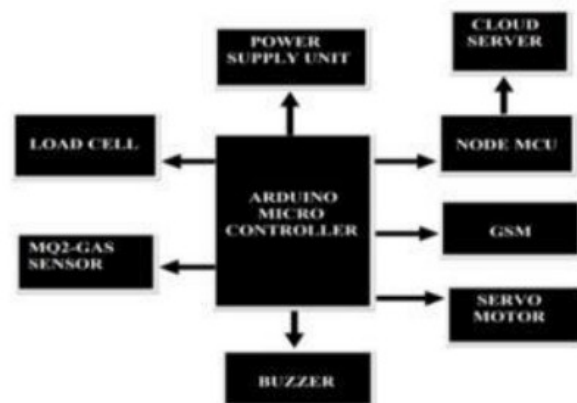


Fig 1.2 System Architecture

Gas Leakage Detection: The first step would be to detect the gas leakage using gas sensors such as MQ-2. This sensors will be connected to a microcontroller, such as Arduino, which will be responsible for processing the sensor data. In addition to gas sensors, load cells will also be

installed to detect any changes in weight, which could indicate a gas leak.

COMPONENT	DESCRIPTION
Gas sensors	MQ-2 sensors that detect the presence of LPG gas
Ventilation system	Servo motor for windows to open automatically to remove gas from the area
Smart information system	An IoT-enabled system that collects data from gas sensors and ventilation devices and provides real-time updates and alerts to users.
Load cell	A sensor that measures the weight of the LPG cylinder to track how much gas has been consumed and alert users when it needs to be replaced.
Communication network	A network of IoT-enabled devices that allow the system to transmit and receive data and alerts in real time.

Table 1.1

Alert System: When the leakage of gas is detected, the alert system will be triggered to notify the concerned authorities and residents about the gas leakage. The alert system could be in the form of an audible alarm or a notification sent to a mobile device.

Auto Ventilation: To prevent the buildup of hazardous gases, the smart system will automatically turn on the ventilation system, which will help in dissipating the gas from the affected area. The ventilation system could be controlled using a motor or a fan, which can be operated using a relay module.

Smart Management System: The smart management system will be responsible for controlling and monitoring the entire process. It will collect data from the gas sensors and the ventilation system and analyze it to provide insights on the gas leakage trends. The system will also be responsible for sending alerts, controlling the ventilation system, and generating reports.

IoT Connectivity: The entire system will be connected using IoT connectivity, allowing remote access and control of the system. Users will be able to monitor and control the system using a mobile app or a web interface.

Power Management: The system will be designed to consume minimum power. The gas sensors and ventilation system will be turned off when not in use, ensuring efficient power management.

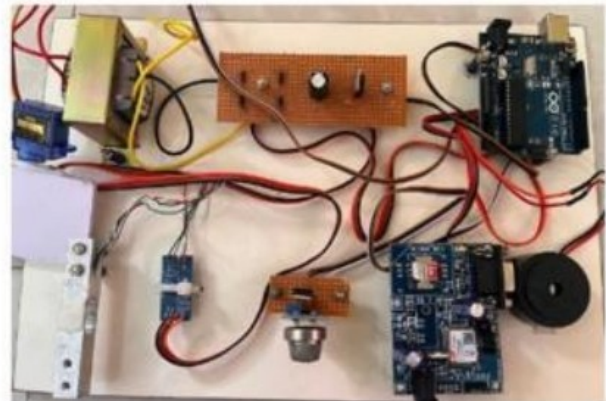


Fig 1.3 System Setup

The full setup of the system has been given in the fig 1.3 . Here the power supply of 230 V has been reduced into 12 V and 16 V in the form of AC. Bridge rectifier is used to convert the AC inputs to DC outputs. A constant power of 12 V is being stored in the capacitor which supplies power to arduino followed by other components. Overall, the system works by constantly monitoring the area for gas leaks using the gas detector. If a leak is detected, the microcontroller triggers the ventilation system that is the servo motor to remove the gas from the area and sends an alert message to the user using GSM module and the buzzer will be turned on . The load cell measures the weight of the

gas cylinder and sends data to the microcontroller, which can be used to trigger alerts when the cylinder needs to be refilled. The system can be connected to the internet using an IoT device to enable remote monitoring and alerts.

III. RESULT AND DISCUSSIONS

The benefits of this proposed system are, accurate gas leak detection in which, the combination of gas sensors and load cells can provide accurate detection of gas leaks, ensuring the safety of residents. Automatic ventilation in which the system can automatically turn on the ventilation system to dissipate hazardous gases from the affected area, minimizing the risk of accidents. Real-time alerts in which the system can send alerts to concerned authorities and residents, enabling them to take immediate action to prevent any potential risks. IoT connectivity in which the system can be accessed and controlled remotely, providing convenience and flexibility.



Fig 1.4 Alert Notification

The challenges include maintenance in which the system will require regular maintenance to ensure that the sensors and other components are working correctly. Data privacy and security in which the system will collect and store sensitive data, so it will need to be designed with appropriate data privacy and security measures to prevent unauthorized access or data breaches.

In summary, while the proposed system can provide an advanced and comprehensive solution for gas leak detection and management, there are potential challenges that need to be addressed to ensure the system's effectiveness and reliability. Further research and development are required to optimize the system's design and implementation, considering the cost, maintenance, and security challenges.

IV. CONCLUSION

In conclusion, the proposed work for detecting the discharge of LPG gas with auto ventilation and advanced system using IOT is an effective solution for ensuring the safety of residents and minimizing the risk of gas leaks. By combining gas sensors, load cells, and IoT connectivity, the system can accurately detect gas leaks and provide real-time alerts to concerned authorities and residents. The automatic ventilation system ensures that the hazardous gases are dissipated from the affected area quickly, minimizing the risk of accidents. The smart management system provides an efficient way to control and monitor the entire process remotely, enabling users to access the system from anywhere using a mobile app or web interface. Overall, this proposed system is a reliable and comprehensive solution for gas leak detection and management.

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