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LPG GAS DETECTOR WITH AUTO CUT OFF USING ARDUINO

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Abstract: The problem of gas leakage and fire is often encountered in our day-to-day life. LPG, Liquified Petroleum Gas, is highly flammable gas used as fuel in heating appliances. Leakage of this gas raises the risk of building fire, suffocation or an explosion. Most of the fire-breakouts in industries are due to gas leaks. These cause dreadful damage to the equipment, human life leading to injuries, deaths, and environment. The mentioned problem can be solved with the development of reliable techniques to detect gas leakage. We proposed a system to detect gas leakage automatically with the help of gas sensor and Arduino microcontroller and alerts the person if there is gas leakage by buzzer alarm and auto cutoff regulator..

Keywords: Gas sensor,MQ-6,Ardunio.

I. INTRODUCTION

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. Analysing 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.

II. LITERATURE SURVEY

TOPIC	AUTHOR NAME & YEAR	INTERFERENCE
Automatic LPG Leakage Detector using Arduino	S.A. Thakare 2023	When the gas is sensed the warning signal and alarm sound will be activated.
Gas Leakage detector using Arduino	S. Lakshmi Lavanya 2023	The IOT based intelligent gas leakage detector using Arduino GSM module.
LPG Gas Leakage using Arduino	P. Manohar 2023	The led glows, buzzer sounds, LCD displays message, GSM sends notification to user then exhaust fan runs and neutralize.
LPG Gas Monitoring System using Arduino	A. Preeti Vinnarasi 2021	When gas is detected and sends the SMS to the user to take necessary action and activates the alarm.

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Sensor based GAS Leakage Detector system	Dr. M. Pushpavalli 2022	It detects the gas and turn on the alarm.
IOT based GAS leakage system using Arduino	A.P. Linge 2022	It incades the level of las leakage in the surrounding and indicates on lcd display and sends the alert by turn on the buzzer.
LPG Gas leakage Monitoring and alert system using Arduino	Ayesha Siddika 2020	The gas is detected led and buzzer are turned on and sends the message as 'GAS DETECTED' on the display.

III. METHODOLOGY

The LPG gas leakage detection system with an auto cutoff regulator using Arduino involves a detailed methodology where an MQ-6 gas sensor is used to continuously monitor the air for the presence of LPG gas. When the gas concentration surpasses a predefined threshold, the sensor sends a signal to the Arduino microcontroller, which processes the data. If a leakage is detected, the Arduino triggers an alarm system, such as a buzzer , to alert nearby individuals of the potential danger. Simultaneously, the Arduino sends a command to a relay module connected to an electric valve or regulator that controls the gas supply. The relay, upon receiving the command, activates the valve to automatically shut off the gas flow, preventing further leakage and minimizing the risk of fire or explosion. The system is powered by a suitable power supply and includes safety features like manual override and testing options to ensure reliable operation.

IV. BLOCK DIAGRAM

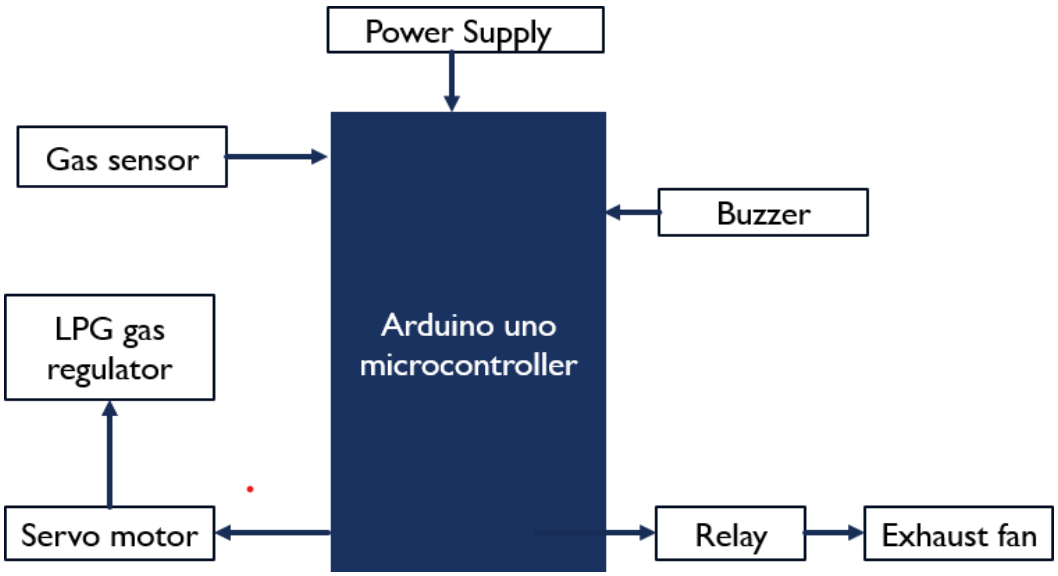

Fig1:LPG gas auto detection system with auto cutoff regulator using Arduino

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V. FLOW CHART

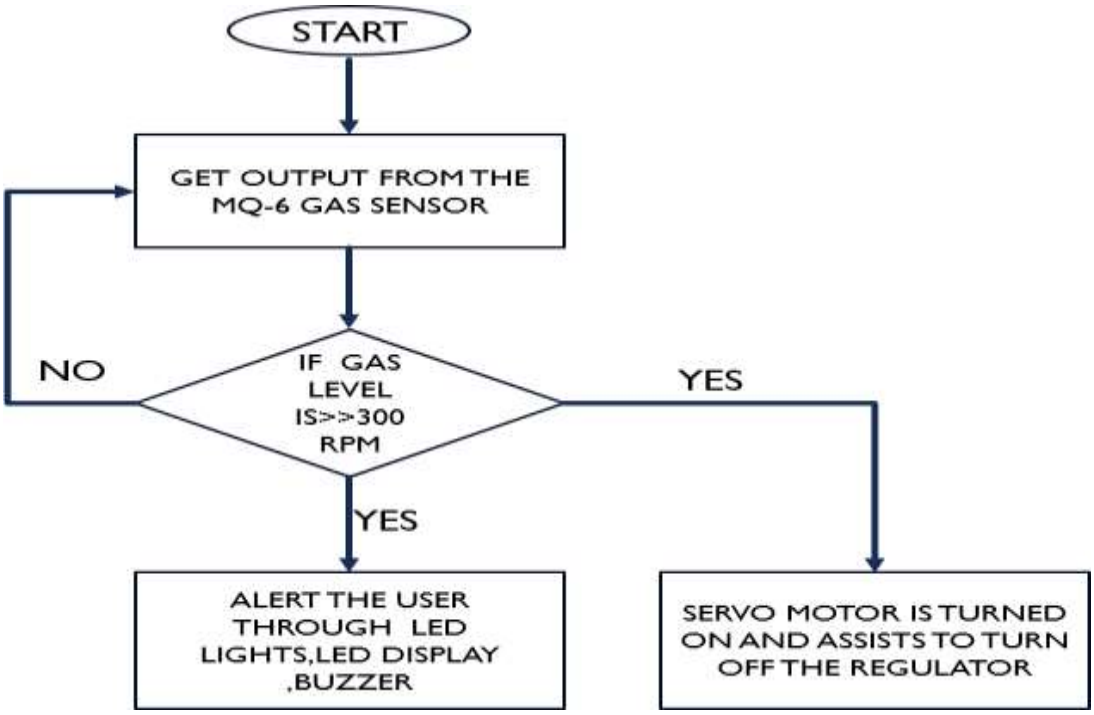

Fig 2: Flow chart of LPG gas detection and auto cutoff regulator using Arduino

VI. CIRCUIT DIAGRAM

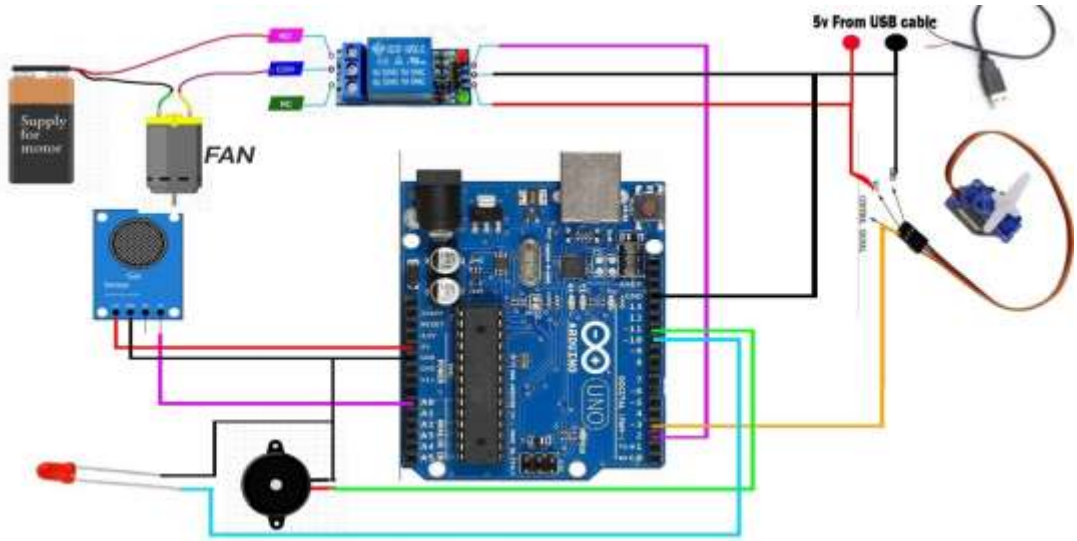

Fig 3: Circuit diagram of LPG gas detector with auto cut off using Arduino

HARDWARE USED

1. **Arduino UNO board:-** Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins .It allows users a simple pathway to creating interactive objects that can take input from switches and sensors, and control physical outputs like lights, motors.

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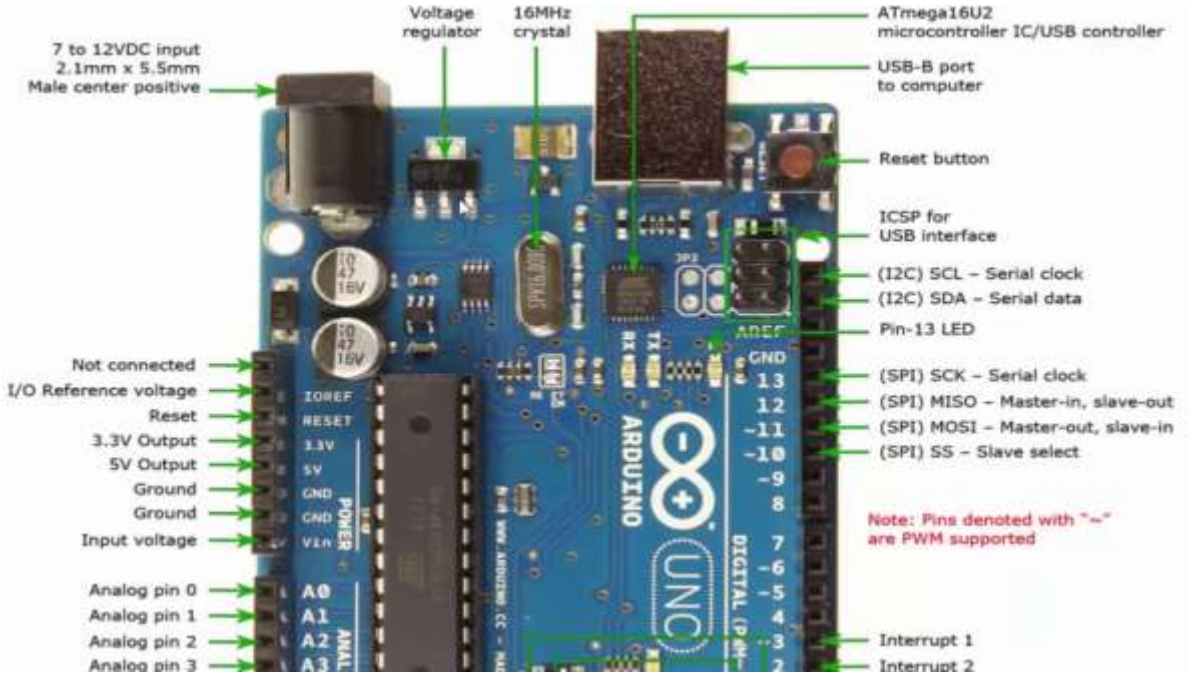

Fig 4 : Arduino Uno

2. Exhaust fan:- These exhaust fans are very effective as they expel stale air The exhaust fan is used exhaust the leaked gas from closed room to outside air .incorporated out in the These exhaust fans are very effective as they expel stale air directly outdoors. The exhaust fan is used exhaust the leaked gas from closed room to outside air**.**

Fig 5 : exhaust fan

3.Gas sensor (MQ-6): MQ-6 Methane LPG Liquid Propane Gas Sensor Module is widely used in gas leakage detecting pieces of equipment in family and industry, are suitable for detecting of LPG The sensor could be used to detect lpg gas.

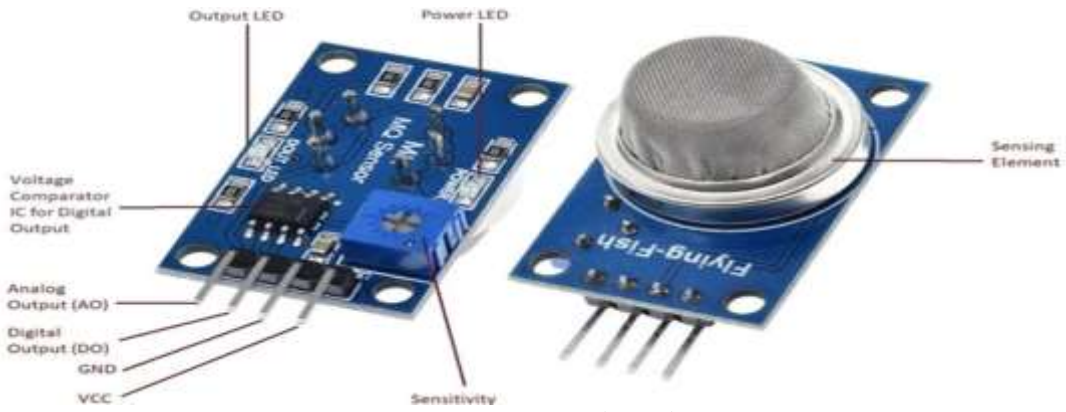

Fig 6 : gas sensor(MQ-6)

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4.LPG gas regulator:- A gas regulator is used to maintain a uniform gas supply pressure to an appliance they ensure the appliance is not over or under pressurized.

Fig 7: LPG gas regulator

5. Servo motor:- A servo motor is a rotary actuator that allows for precise control of angular position. It consists of a motor coupled to a sensor for position feedback. It also requires a servo drive to complete the system. The drive uses the feedback sensor to precisely control the rotary position of the motor

Fig 8:-Servo Motor

6.Buzzer:- A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices.

Fig 9 :-Buzzer

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7.Relay: A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts in multiple contact forms, such as make contacts, break contacts, or combination.

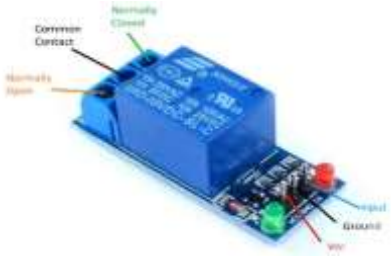


Fig 10 : Relay Module

SOFTWARE USED

1. 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 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.

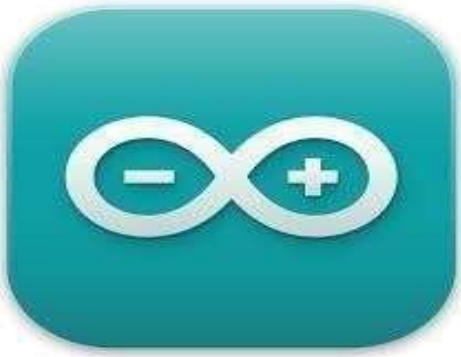
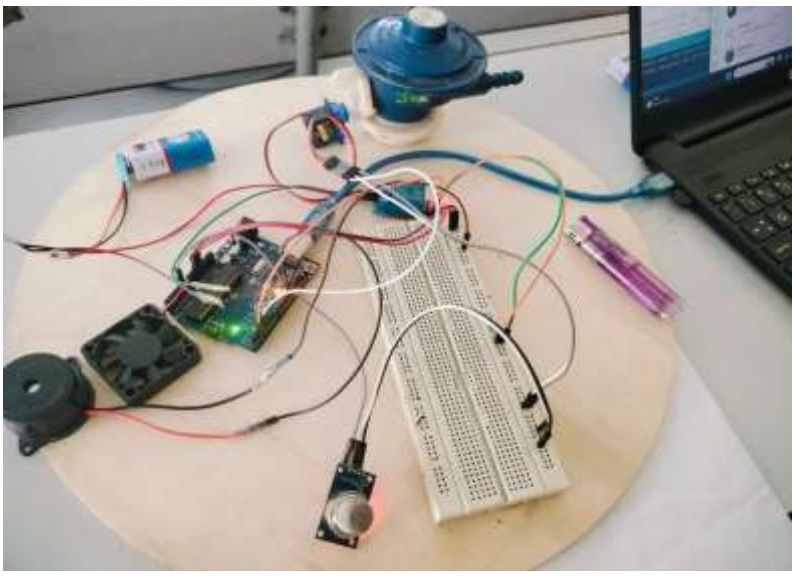


Fig 11:Arduino IDE Tool

VII. RESULTS



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VII.APPLICANTIONS

- Domestic gas leakage detection.
- Industrial gas leakage detection.
- food and beverage to chemical production and wastewater treatment.
- Residential Buildings.
- Commercial Kitchens.
- Industrial Facilities.
- Laboratories.
- Hotels and Hospitality.
- Warehouses and Storage Facilities.
- Public Transport Vehicles.

CONCULSION

This project presented an Arduino-based gas leakage detection system utilizing Arduino UNO, MQ- 6 sensor, buzzer, exhaust fan. The system effectively detects gas leaks and provides real time alerts through both local alarms, ensuring a quick response to hazardous situations. It combines hardware and software tools such as Arduino UNO, MQ-6 gas sensor, relay operated exhaust fan, buzzer and servo motor to enable automated action in case of any detected gas leak. activates the exhaust fan towards clearing that area. In addition a servo motor is used for closing off the gas valve which prevents excessive gas from escaping and turning into a dangerous incident

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