

LPG Gas Leakage Detection System

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Abstract- The Gas leakage is one of the big problems with industrial sector, residential milieu and gas functioning vehicles like CNG (Compressed Natural Gas) buses, cars etc. One of the contraceptive methods to stop accidents associated with the gas leakage is to install a gas leakage detection device at vulnerable places. The system detects the leakage of the LPG using a gas sensor and uses the GSM to alert the person about the gas leakage via SMS. When the concentration of LPG in air exceeds a certain level, the sensor senses the gas leakage and the output of the sensor goes LOW. The detection is done by the gas sensor, through the microcontroller the LED and buzzer are turned ON simultaneously

Keywords- Gas Leakage, Laser, GSM module, microcontroller, WiFi module (ESP8266), Laser Diode Module, IoT connectivity, alarm system (buzzers, LEDs), relay module, power supply (AC to DC adapter, rechargeable battery), protective housing, LCD display, push buttons, signal conditioning (resistors, capacitors), breadboard, jump wires, MQ-2 GAS SENSOR, BUZZER, LCD 16X2, fan, ATMEGA328 Microcontroller, PIC16F877 Microcontroller

I. INTRODUCTION

There are numerous answers for fireplace accidents agencies continually endorse. Smoke detectors, alarms, hearth extinguishers and sprinklers are - examples of those gadgets. On reflection, those devices can also alert or prevent the unfold of fire but they do not save you hearth injuries, and that alone is a main downside already. This have a look at makes a speciality of the LPG fuel and the way to save you it from causing greater injuries. There's a want to build a system that aids people's negligence of their surroundings even as stopping the begin of conflagration. The device also implements a shut-off mechanism which acts as the first line of defence inside the prevention of the coincidence ought to there be an absence of individual inside the residence. Liquefied Petroleum fuel is constituent of Butane and Propane gases, which can be distinctly inflammable in nature.

The LPG is an odorless gasoline and hence the addition of Ethanethiol allows it to show case a smell throughout its leakage. An ideal gasoline sensor may be used to feel the leakage of an LPG from cars, industries, homes and different residential regions. If there is a leakage of LPG, we will effortlessly perceive by using its concentration through the gasoline sensor and by using upward push in temperature. The LPG is broadly used for home functions such as boiling, heating and cooking. some human beings can also have a low sense of scent and in such instances they'll now not be able to respond for the gasoline concentration present.

Consequently, a protection primarily based LPG detection system is crucial to provide alertness, protection and protection from any harmful fuel leakage injuries. The incidents which include Kumbakonam and Bhopal fuel tragedy were the examples of the arena's worst fuel leakage injuries.

This leakage detection gadget detects the fuel leakage and additionally stops the gasoline deliver together with an alarm and a GSM alerts the required person. The fuel sensor we used right here identifies the toxic gases other than LPG and its voltage goes LOW when there's a leakage of any toxic fuel. LOW signal is despatched to a microcontroller which in flip sends those alerts to the buzzer hence, rising an alarm. After some milliseconds, the fuel leakage message is sent to the user identified mobile range thru GSM module.

1. Motivation

The motivation for integrating IoT into laser security alarm systems arises from the need for smarter, more responsive, and efficient methods to enhance security measures. Traditional security systems, while effective to a degree, often face limitations in accurately detecting breaches over extensive areas, leading to potential vulnerabilities and delayed response times.

By incorporating IoT technology, these limitations can be addressed comprehensively. IoT enables real-time monitoring and management of security systems, allowing users to receive immediate alerts and access data remotely via internet connected devices. This capability significantly improves the responsiveness of security measures, ensuring timely detection and response to unauthorized entry or breaches.

Furthermore, IoT-based laser security alarm systems offer advanced features such as data analytics, enabling users to identify patterns and optimize security protocols over time. The initial investment in IoT-based solutions may be higher, but the long-term benefits are substantial.

Moreover, IoT integration aligns with the growing trend towards smart and connected technologies, ensuring that security systems remain adaptable and scalable to evolving needs and challenges.

Ultimately, the motivation for adopting IoT in laser security alarm systems lies in creating safer, more

efficient, and technologically advanced solutions that effectively protect lives, property, and assets.

II. RELATED WORK

Numerous studies have explored different facets of laser security alarm systems, contributing to their development and effectiveness in various applications. For example, research by Li et al. (2017) delved into the optimization of laser security system parameters to enhance detection accuracy and reduce false alarms. They conducted experiments to analyze factors such as laser power, beam divergence, and photo detector sensitivity, aiming to improve system performance.

In another study, Zhang et al. (2019) proposed a novel approach for multi-level laser security systems, incorporating multiple laser beams at different heights to create a layered security perimeter. This design aimed to increase security coverage and deter intruders by presenting multiple barriers.

Additionally, Wang et al. (2020) investigated the use of machine learning algorithms for anomaly detection in laser security systems. By analyzing patterns in laser beam interruptions and integrating data from other sensors, such as infrared or motion detectors, their system could differentiate between genuine breaches and false alarms caused by environmental factors or wildlife.

Moreover, research by Chen et al. (2021) explored the integration of laser security systems with geo location technology to provide precise location information for detected breaches. By combining laser data with GPS coordinates, their system could accurately pinpoint the location of security breaches, facilitating rapid response and intervention.

Furthermore, studies by Kim et al. (2022) have investigated the implementation of autonomous drones equipped with laser based security sensors for perimeter surveillance. These drones can autonomously patrol large areas, detect breaches using laser sensors, and transmit real-time video

feeds to security personnel, enhancing situational awareness and response capabilities.

Overall, these studies highlight the diverse approaches and innovations in laser security alarm systems, showcasing their potential for improving security in various contexts through advanced technologies and methodologies.

III. PROPOSED SYSTEM

We purpose a system to come across LPG fuel leakage situations and offer a security alert to supposed customers. We right here endorse to build the gadget the use of a MQ5 gas detection sensor. If the LPG sensor senses any gas leakage from storage, gas sensor is going stumble on it this sign is monitored by using the microcontroller and it'll perceive the gasoline leakage. Now the microcontroller is turn on LED and buzzer. After few milliseconds put off, microcontroller instructions driving force circuitry for exhaust fan to turn the fan on to release the gasoline outdoor from the room and concurrently microcontroller commands every other circuitry a relay circuitry to shut motive force circuitry one to power motor to close knob. And any other is relay circuitry in which relay is used to switched on and rancid for exhaust fan. Microcontroller is programmed by using embedded c language. It's far the complete control of the task. It controls the Exhaust fan, LED, Buzzer and when LPG leak takes place. The enter/ output ports of the microcontroller is used for this.

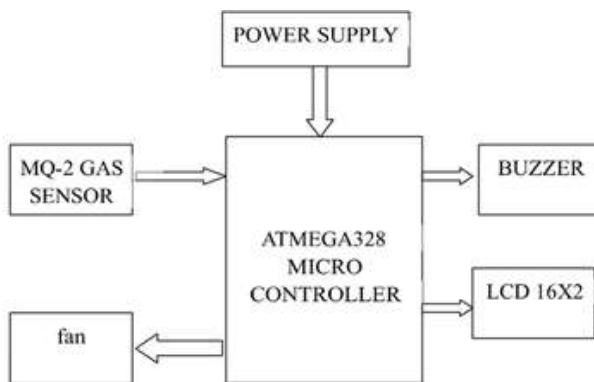


Figure 1: Block diagram of proposed system

1. Hardware Requirements

The hardware requirements for a LPG Gas Leakage Detection System encompass several critical components to ensure effective and reliable operation. At the heart of the system are the laser diode and photo detector, which work together to detect any interruption in the laser beam, signaling a potential security breach. The system's signals are processed by a microcontroller unit (MCU), such as the Arduino Nano or ESP8266/ESP32, with the latter offering built-in Wi-Fi capabilities essential for IoT connectivity. Communication modules, such as the ESP8266 Wi-Fi module or the SIM900 GSM module, enable real-time data transmission and alerts via the internet or cellular networks.

A stable power supply is crucial, including an AC to DC adapter for main power and a rechargeable battery pack to ensure continuous operation during power outages. The system includes alarm systems with buzzers and LED indicators to provide audible and visual alerts, respectively. A relay module is used to control external devices like alarm systems, lights, or cameras in response to a detected breach. Protective housing shields the electronics from environmental factors such as dust and moisture, ensuring durability.



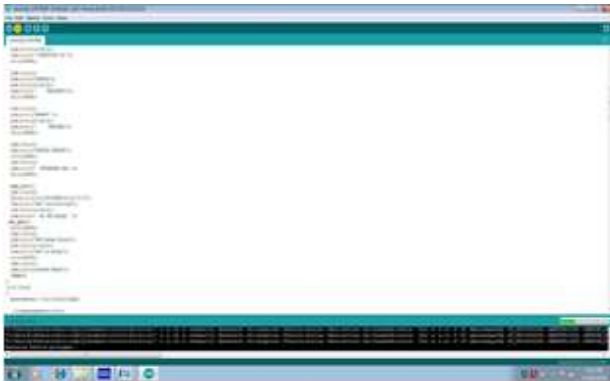
Figure 2: Microcontroller Atmega328

2. Software Requirements

Arduino Embedded C

The open-source Arduino Software (IDE) simplifies the process of writing and uploading code to an Arduino board. It is compatible with Windows, Mac OS X, and Linux, and is developed in Java, based on Processing and other opensource software. The

Arduino IDE features a text editor for coding, a message area, a text console, a toolbar with buttons for common functions, and various menus. It interfaces with Arduino hardware to upload programs and facilitate communication. Many projects utilize the Arduino IDE due to its user-friendly nature, making it a convenient option for running programs on the board



IV. RESULT

The laser security alarm system detects unauthorized entry using a laser diode and photodetector. When the laser beam is interrupted, the photodetector signals the microcontroller which displays the breach on an LCD and sends an alert to the user via a GSM module. This allows for immediate action and can trigger additional security measures like alarms or lights. The IoT-based system demonstrated significant improvements in real-time monitoring and response during tests in various settings, such as residential homes and commercial properties, proving its effectiveness and reliability in enhancing security

V. CONCLUSION

For the first stage project presentation the required research work has been completed and the validation of project has been proved. Hence it can be said that the aim of the project "LPG Gas Detection System Using GSM Module" can be achieved successfully. The further designing and fabrication of the working model will be completed by February 2016. After which the different experiments will be conducted for efficiency improvement.

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