



Automatic Gas Leakage Detection and Fire Protection System

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ABSTRACT

Gas Leakage and its effects are great concern throughout the world, especially in developing countries. Every year many people Die due to Gas leakage and also due to its explosion. The leakage of gas or explosion is not only harmful to human being but also its harmful to the climate or the surrounding of the affected area. Thus, a system to detect gas leakage and also to prevent the fire caught due to the leakage of the gas the preventive measure is very important.

In this project, we designed and implemented an system to detect gas leakage and the fire caught by the gas leakage. Our goal is to minimize the effect of gas leakage and also to protect it from the fire caught by taking some protective measures. When the gas sensor detects the gas leakage , the solenoid valve shuts off the gas line, and the exhaust fan starts running .Again when the flame sensor detects the fire , the pump gets started and hence sprinkler gets started and throw water on fire. The GSM SIM module sends an SMS notification to the user or to the safety department so, the next action can be taken. The buzzer sounds when the mishap occurs and the LCD monitor always shows the status of the system. In this way , we have efficiently designed and implemented a low-cost and a intelligent gas leakage and fire protection system.

INTRODUCTION

Gas leakage is a commonly observed problem that causes malicious effects on the environment and human health. The gases in a cylinder may leak in a gas or liquid form. If the liquid leaks, then it quickly evaporates and forms a relatively large cloud of gases that would drop to the ground, since it is heavier than air. Gas cylinder vapors can run for a long distance along the ground and can be collected in drains, floors, or grounds. When the gas approaches a source of ignition, it may burn or explode. The burning gases release carbon dioxide, a greenhouse gas . The reaction also produces some carbon monoxide . Greenhouse gas has severe environmental and health-effect.

Gas is an essential need of every industry and household, its leakage could lead to a disaster. . Gas leakage and explosion is one of the deadliest accidents in the world that happened mostly in developing countries like Bangladesh. The accident can be occurred by gas leakage or cylinder blast in industries or in households. Blasting the cylinder may cause a large fire accident where a lot of people may lose their lives and also get injured.

When the gas is leaked in an industry or in household, the gas sensor detects the leaked gas. The system informs the owner about the incident by sending a notification. The system shut off the gas supply and throws the leaked gas out of the chamber by an exhaust fan installed in an industry chamber. Unfortunately, if there catches fire, the system can automatically throw water through pumps or fire extinguisher ball to extinguish the fire and send a notification to the owner about the accident.

LITRATURE SERVEY

- Gas Detection Technologies:

Review articles on different types of gas sensors (e.g., electrochemical, infrared, semiconductor) and their applications in industrial environments.

Research papers comparing the performance and reliability of various gas detection technologies .

Studies evaluating the effectiveness of sensor placement strategies for early leak detection .

- Fire Suppression Methods:

Literature exploring different fire suppression techniques suitable for industrial settings , such as water-based systems, foam suppression, dry chemical systems, and inert gas systems.

Comparative analyses of suppression methods in terms of efficacy, environmental impact, and compatibility with different types of industrial hazards.

- **Integrated System Design:**

Research papers and case studies discussing the design principles and considerations for integrated gas detection and fire suppression systems.

Studies on the optimization of system architecture, including sensor placement, communication protocols, and control strategies.

- **Risk Assessment and Management:**

Literature on risk assessment methodologies for identifying and prioritizing potential gas leak and fire hazards in industrial facilities. Research on probabilistic modeling and simulation techniques for evaluating the likelihood and consequences of gas-related incidents.

Regulatory Standards and Guidelines: Review articles summarizing relevant industry standards and regulatory requirements pertaining to gas detection, fire protection, and emergency response planning. Studies examining the implementation challenges and compliance strategies for meeting regulatory mandates.

- **Case Studies and Best Practices:**

Case studies detailing real-world incidents involving gas leaks and fires in industrial settings, along with analyses of response strategies and lessons learned. Literature highlighting best practices and innovative approaches adopted by industry leaders to enhance gas safety and fire protection.

- **Emerging Technologies and Trends:**

Research articles and conference papers on emerging technologies, such as advanced sensor networks, artificial intelligence, and IoT-enabled solutions, for improving gas detection and fire protection. Reviews of future trends and developments in industrial safety systems, including predictive analytics, remote monitoring, and autonomous emergency response capabilities.

PROPOSED SYSTEM

In this proposed system by using the Intelligent gas leakage detector using Arduino it detects the gas leakage and alert the people, in addition to this it also gives an acknowledgement to the owner.

“Gas Leakage Detector with SMS Alert using ARDUNIO and GSM module”, will be a great help in terms of preventing any danger caused by gas leakage. The purpose of this project is to detect the presence of Gas leakage in the homes and working places. Apart from sound alarm and SMS alert it will call the owner. which is used in case of the nobody is present when the leakage occurs and to prevent accidents and property damage. It is cost efficient and reduce damage caused by the gasleakage.

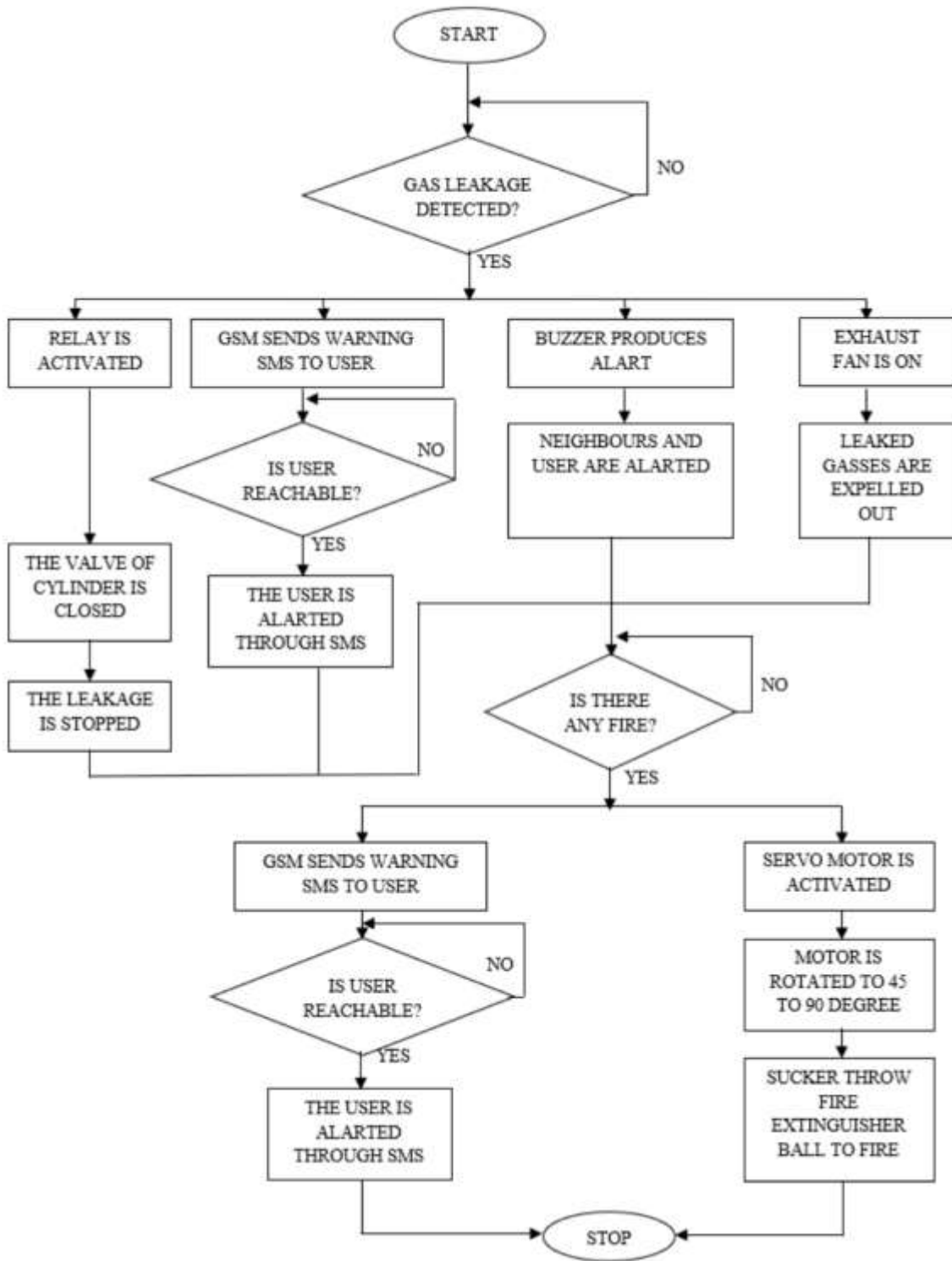
PROPOSED METHODOLOGY

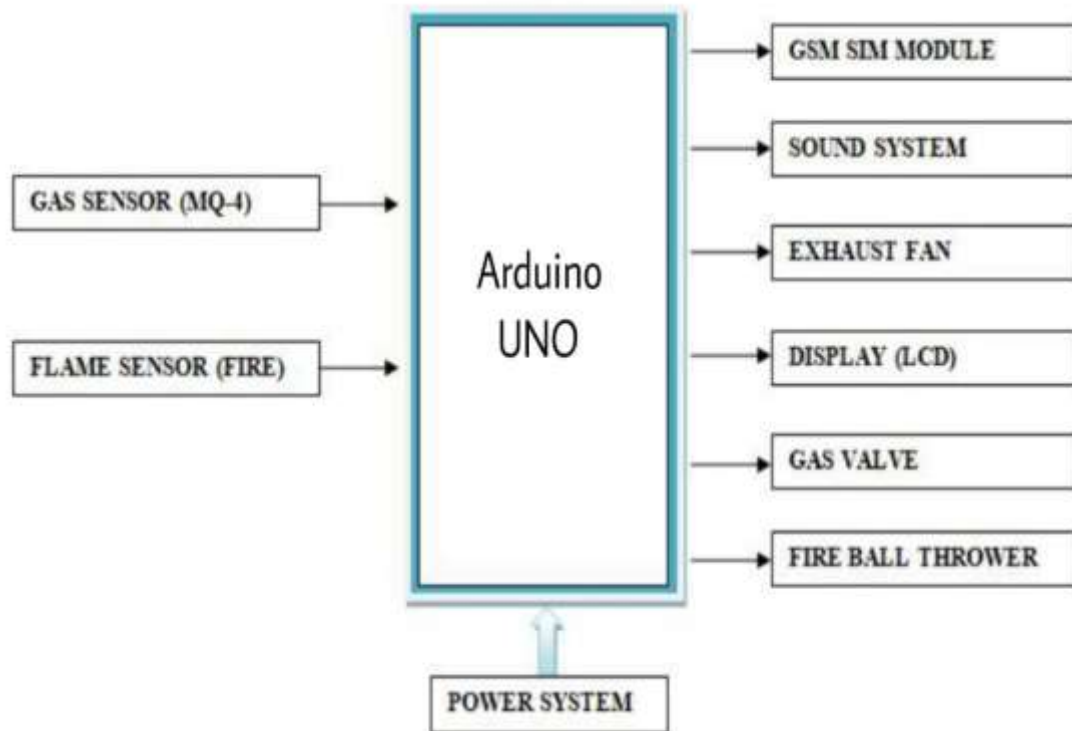
The idea behind of this project is to detect the Gas Leakage that can be detected by using Sensor. The presence of hazardous gas leakage (like LPG leak, Butane leak, Methane leak) or any such gaseous substance in a domestic Volume: Produces a sound alarm upon gas leak. The usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquefied petroleum gas (LPG), which is excessively used in the house and at work places.

The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, by keeping it in the concept of the project we have determined to develop an examining system which finds the leak of gas and protects the work places by taken correct precaution at correct time. According to ABS-CBN news 2017 that from January to June last 2017, the BFP has recorded a total of 2,522 fire incidents. It was traced that Gas is one of the major causes of fire during that year where half of the total which is 1,253 beside from the electrical causes. "

The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people around by buzzer beep sound and an SMS & Call has been send to the responsible person for preparatory safety calculations. More than the lifetime Arduino has been a reason that thousands of projects from everyday bodies to complicated scientific mechanism.

FLOW CHART



BLOCK DIAGRAM**➤ ADVANTAGES**

- High Sensitivity
- Quick Response Time
- Detection and prevention of any sort of gas leakage.
- Widely Detects Flammable and Toxic gases
- Improves the Safety
- Light Weight
- Portable System
- Cost Efficient

➤ APPLICATIONS

- Gas Storage Areas
- Homes & Factories
- Hotels & Industries
- Fire Hazard Prevention
- Harmful Gas Detection
- Domestic Gas Leakage Detector
- Portable Gas Detector
- Industrial Combustible Gas Detector

WORKING PRINCIPLE

- **Gas Detection:**

Gas sensors are strategically placed throughout the industrial facility to continuously monitor the air for the presence of hazardous gases.

These sensors can detect a wide range of gases, including combustible gases, toxic gases, and oxygen depletion.

Upon detecting a gas leak, the sensors trigger alarms to alert personnel and initiate emergency protocols.

- **Alarm and Notification:**

When gas sensors detect a hazardous concentration of gases, they activate alarms, alerting personnel to the presence of a potential hazard.

Alarms can be audible, visual, or transmitted electronically to control centers or mobile devices for immediate response.

- **Automated Shutdown:**

Upon detection of a gas leak, automated shutdown mechanisms may be activated to isolate the affected area and prevent the spread of gas.

Shut-off valves or dampers may be closed automatically to cut off the gas supply to the affected equipment or area, reducing the risk of ignition.

Real-time Monitoring and Control:

- **Automated water sprinkler:**

When fire is detected the sprinkler throws the water through the help of Pump.

RESULT

Industrial gas leakage and fire protection systems are crucial for ensuring the safety of personnel, property, and the environment in industrial settings where gases are used or produced. These systems typically include gas detection sensors to detect leaks, alarm systems to alert personnel, and suppression systems such as sprinklers or gas suppression agents to extinguish fires.

The result of an effective system is early detection and rapid response to gas leaks or fires, minimizing the risk of injury, damage, and production downtime.

CONCLUSION

In conclusion, implementing a robust industrial gas leakage and fire protection system is essential for safeguarding personnel, facilities, and the environment from potential hazards. By integrating advanced detection technologies and efficient suppression methods, such systems can effectively mitigate the risks associated with gas leaks and fires, ensuring a safer working environment and minimizing the impact of emergencies on operations.

FUTURE SCOPE

The future scope for industrial gas leakage and fire protection systems is promising, with ongoing advancements in technology and safety protocols. Potential areas for development include:

Integration of AI and IoT:

Utilizing artificial intelligence and Internet of Things (IoT) technology to enhance real-time monitoring, predictive analytics, and automated response mechanisms.

Enhanced Sensing Technologies:

Continued improvement in gas detection sensors for increased sensitivity, accuracy, and broader coverage of gas types.

Remote Monitoring and Control:

Development of remote monitoring and control systems, allowing operators to oversee safety systems from anywhere and enabling prompt intervention in case of emergencies.

Green Solutions:

Emphasis on eco-friendly suppression agents and systems to minimize environmental impact while ensuring effective fire suppression.

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