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DETECTION OF HARMFUL TOXICANTS IN PUBLIC TOILETS

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ABSTRACT

Nowadays harmful gas leakage in public toilets is the main reason for health sick. Pollutants released by public toilets into atmosphere is also a cause for the environmental pollution and such the reason greatly effects humans' health by minimizing the levels of oxygen and increasing the levels of harmful gases like (hydrogen sulphide, ammonia). The management only have an eye on profits and consider environmental safety as least priority which in turn effects of harmful gases are higher on public areas compared to normal living places. Mostly people don't prefer public toilets because of bacteria by inserting the toxic detector we can prevent bacteria. These are low expensive so government can afford for toxic detectors to keep in public toilets. We are advocating for the implementation of a toxic chemical alert system that would rapidly notify communities about threats to their health and safety during toilets getting toxic. By using gas detect sensor it can detect the harmful gases then the GSM can identify and notify by using LED or buzzer. A microcontroller integrated circuit designed to govern a specific operation in an embedded system. This can also be used widely by the government in the public toilets. It saves both time and manpower to the municipality. This is also very economical.

1.INTRODUCTION

Day-to-day life the way of our life and the development of technology is increased, But it leads to the least consideration of the surroundings in which we live. Harmful gas leakage in public toilets plays a virtual role in the health sick. Some chemicals are highly hazardous and can negatively affect our health and environment when improperly managed. In India, every commercial toilet cleaner contains about 10% HCl. Also known as muriatic acid, Hydrochloric acid (HCl). They have a corrosive effect on human tissues and can cause irreversible contact damage to the skin, eyes, lungs and other internal organs. A blend of acid-based toilet bowl cleaners and bleach is also very dangerous. Some people may add bleach to the bowl, but the combination of bleach with the acid releases chlorine gas. Therefore, we have decided to do a project on "Harmful Gas Detection" in public toilets. To address this challenge, our project focuses on the implementation of sensor-based technology for the detection of these elusive toxicants. In this project, a gas sensor was employed to detect potential harmful gas in public toilets. Gas sensors play a pivotal role in modern society, safeguarding human health, environmental quality, and industrial processes. The electrochemical sensors are designed to detect and measure various gases in the air, making them invaluable in a wide range of applications. This is for home safety systems industrial processes and environmental monitoring. By using the gas sensor we can detect "Invisible Harmful Toxicants" in public toilets or industries and send a notification for mobile. By utilizing an advanced sensor system, we aim to provide an efficient and detecting solution that can identify and alert to the presence of harmful invisible toxicants.

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Through the "GSM" module the sensor sends a notification to a mobile (or) system. The gas detection system not only monitors the surroundings continuously but also prevents the further gas in the environment which minimizes the chance of fire. A gas system makes use of an MQ2 sensor for detection. The primary objective of the Gas detection system is to detect the harmful gas. Firstly, the MQ2 gas sensor senses any gas. These sensors help send signals to the ARM secondly. After this, a signal of activation is sent to the externally connected devices with the help of the microcontroller. After this, a signal of activation is sent to the externally connected devices with the help of the microcontroller. Lastly, various functions by devices like an exhaust Light, buzzer, and are performed which activates the GSM module.

Overview of the Project

This project introduces 'Harmful Gas Detection in Public Toilets' using a gas sensor and a buzzer for real-time alerts. A gas detector is a device that detects the presence of gases in an area, often integrated into a safety system. A gas detector can sound an alarm to operators in the area where the harmful gas is present. Certain gases, when released into the atmosphere, can harm the environment and contribute to pollution. Gas detection technology helps identify and allowing for prompt repairs and preventing environmental damage. Toxic gases are gases with hazardous physiological effects when inhaled. Gas detection systems are designed to detect hazardous gases in the air, providing an instant alert to workers and allowing them to take immediate action. Preventing the escalation of potentially dangerous situations, this early warning is crucial.

Objective

The objective of detecting harmful invisible toxicants using sensors is to identify and quantify the presence of hazardous substances that may pose a threat to human health, the environment, or both. This can be crucial in various contexts, including industrial settings, environmental monitoring, and public safety. The goal is to create a safer and healthier living environment for both humans and ecosystems, while also supporting sustainable practices and regulatory compliance. The gasdetection prevents the harmful gas in the environment which minimizes alert the people. A gas detection system makes use of an MQ 2 sensor for detection of toxic gases. Toxic gas detectors are used in work places that use toxic gas in order to secure worker safety, detect the location of any harmful gases, and measure gasconcentrations.

Scope

The scope of a project focused on detecting harmful invisible toxicants using sensors is broad and multidimensional. The project can encompass various aspects, technologies, and applications. By defining the scope, project can be designed to effectively detect harmful invisible toxicants, contribute to environmental sustainability, and promote human well-being. High-precision gas sensors can accurately monitor data such as ammonia, hydrogen sulfide, temperature, and humidity in public restrooms. Gas detectors can be used to detect toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in Public Toilets.

Expected Output

By utilizing advanced sensor system, we aim to provide an efficient and detecting solution that can identify and alert to the presence of harmful invisible toxicants. In this work a clever framework for toxic gas and radiation discovery checking cautioning has been created to defeat the drawback looked in more established techniques by utilizing web of things. Consequently, the utilization of serial correspondence makes the framework with Arduino controller and IoT. Created additionally items utilized for checking gas and radiation in android portable. In this project, a gas sensor was employed to detect potential harmful gas leakages in public toilets. The sensors are acts as a input in this process. It senses the emission of toxic gas and sends an alert message to the concern person. LED or Notification or Buzzer acts an output. The LED light turns red to alert the concerned authority. By using GSM module, it sends notification to register number. It is displayed as "HARMFUL GAS". Other option is buzzer which have with low frequency for specific gases. For H2 gas is 50 ppm, CH4 is 1.01% vol, LEL is 10% LEL, PID is 100 ppm.

2. DISCUSSION

System Analysis

System analysis for toxic gas detection involves several key steps to ensure the effective design and implementation of a detection system. The concentration of the gas is indicated by the amount of current produced, which is determined by how much of the gas is oxidized at the electrode. Using a heated metal oxide semiconductor, the sensor can detect both toxic and combustible gases. The gas molecules adsorb onto the heated surface, causing an oxidation-reduction reaction that changes the electrical conductivity of the metal oxide. By following these steps, you can conduct a thorough system analysis for toxic gas detection and design a robust detection system that meets the requirements of your project.

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Existing System

In existing system of Home/domestic monitoring system all the temperature, humidity, pollution sensors monitor the data and display in LCD module. There is no automation. Only the manual mode of operation is going and it is very difficult to operate. No wireless technology used to transfer the data automatically alerts through buzzer. Due to no wireless data transmission it's very dangerous in Home/domestic application. So, we proposed new system using GSM for easy access and alert the data.

Disadvantage:

Lack of proper data collection. Specific harmful gas measurement.

False Alarms: Public toilets can have various sources of odors and gases (e.g., cleaning chemicals, air fresheners) that may trigger false alarms or misinterpretations by gas detectors, leading to unnecessary evacuations or interventions.

Cost and Maintenance: Installing and maintaining gasdetection systems can be costly. Regular calibration, maintenance checks, and sensor replacements are necessary to ensure accurate readings and reliable operation.

Privacy Concerns: Monitoring gases in public toilets raises privacy concerns. Users may feel uncomfortable or perceive it as an invasion of privacy if their presence or activities are monitored for gas detection purposes.

Response Time: Rapid response to detected gases is crucial for public safety. However, delays in detecting orresponding to gas leaks or harmful levels can occur due to system limitations or technical issues.

Public Perception: Public perception of gas detection in toilets can vary. Some may view it positively as a safety measure, while others may feel uneasy about constant monitoring or over-reliance on technology in private spaces.

Proposed System

In this proposed system a low-cost, easily-installable and scalable Home/domestic sensor monitoring system is developed with GSM technology after researching lots of recently published papers and considering the reality of it. In this section, the setup and experiment block diagrams are illustrated. The proposed system needs to collect the gas intensity of particulate inputs from sensors used for home/domestic monitoring. The monitoring data inputs are collected by the Arduino micro processor control unit, and then Arduino forwarded the monitoring signal conditionally to the arduino control unit, after that arduino WiFi module upload the transmitted data. Data transferring between Arduino. After that the signals are sent to the cloud to reserve through the Internet. The Home/domestic sensor detecting information could be send through a web page. The system architecture of an automated IoT-based smart harmful toxic gases and environment monitoring system measures the concentration of certain gases in the air to monitor toxic gases and environmental conditions. This system is designed for dangerous gas detection using sensor. Globally, air quality is deteriorating, and indoor air pollution poses asevere hazard to the health of humans particularly those with low molecular weights. This system using limited gases sensor and limited radiation sensor the MQ 2 gas sensors are 8 collecting data transmitting using internetof things module. The IoT module for transmitting and receiving data has a high and extendable range. In this we are adding some more indications are two more admins, if one admin has not responded then another admin will notice the notification. LED light, Buzzer will help to identify the poisonous gas through monitoring. The process of the system marked with the importance of real-time detection and monitoring system for real time utilization. By employing a microcontroller and an MQ2 sensor, the system detects harmful gases such as ammonia, carbon dioxide, carbon monoxide, and methane, as well as monitors temperature and humiditylevels.

Advantages:

Improved Safety**:** Early detection of harmful gases can prevent potential health hazards, ensuring the safety of the public using the facilities.

Preventive Measures**:** Timely alerts allow for immediate action to be taken, such as evacuating the area or increasing ventilation, reducing the risk of exposure to toxic gases.

Data Collection and Analysis**:** Continuous monitoring provides valuable data that can be analyzed to improve ventilation systems, cleaning schedules, and overall facility management.

Enhanced Facility Management**:** Integrating gas detection systems with other IoT devices allows for more efficient and automated facility management, optimizing resources and improving overall operational efficiency.

A system study for the detection of harmful toxicant gases in public toilets involves analyzing various aspects including system requirements, components, operation, integration, and performance. The specific requirements of the detection system based on factors such as Targeted toxic gases (e.g., ammonia, hydrogen sulfide, VOCs), Sensitivity and detection limits, Environmental

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Vol. 20, Issue 3, 2024

conditions. Evaluate different types of gas sensors based on their suitability for detecting target toxicants in public toilets. Consider factors such as sensor sensitivity, selectivity, response time, power consumption, and cost. Select sensors that meet the requirements identified in the system analysis phase and integrate them into the detection system. Design a user- friendly interface for interacting with the detection system. Develop visualizations to display real-time gas concentration levels, trends over time, and alerts for abnormal conditions. Include features for configuring alarm thresholds, setting up notifications, and accessing historical data for analysis and reporting. Implement interfaces or protocols for seamless communication and coordination between the detection system and sensor.

Feasibility Study:

In this phase, the feasibility of the project is analyzed, and a business proposal is put forth with a general plan for the project and some cost estimates. The feasibility study of the proposed system is carried out during system analysis to ensure that it is not a burden to the company. For feasibility analysis, it is essential to understand the major requirements of the system.

There are three key considerations involved in the feasibility analysis.

Operational Feasibility:

Assessing operational feasibility in project compatibility with current operations involves evaluating how well the proposed project aligns with existing processes, workflows, and resources within an organization. This includes considering factors such as integration with current systems, minimal disruption to ongoing activities, training requirements for staff, and any necessary adjustments to accommodate the new project within the existing framework.

Economic Feasibility:

Assessing the economic feasibility and financial sustainability of a project in toxic gas detection involves unique considerations due to the specialized nature of the industry. By carefully considering the factors, you can assess the economic feasibility and financial sustainability of your project in toxic gas detection and position it for success in the market.

Market Demand Analysis: Investigate the market demand for toxic gas detection solutions. Consider industries such as manufacturing, gas, and environmental monitoring. Understand the regulatory requirements driving the need for gas detection systems.

Competitive Landscape: Analyze competitors offering similar products or services. Identify their strengths, weaknesses, pricing strategies, and market share. Differentiate your offering by focusing on innovation, accuracy, reliability, or cost-effectiveness.

Funding Strategy: Determine how you'll finance the project, whether through equity investment, debt financing, government grants, or partnerships. Consider the cost of capital and the impact of financing options on the project's profitability and long-term sustainability.

Cost-Benefit Analysis: Evaluate the total cost of implementing and maintaining your toxic gas detection system, including equipment, installation, and maintenance. Compare these costs with potentialbenefits such as risk mitigation, regulatory compliance,and operational efficiency improvements.

Continuous Improvement: Invest in research and development to continually improve your toxic gas detection technology. Innovate to address emerging customer needs, improve accuracy, reduce false alarms, and enhance user experience.

Health Risks: Toxic gases like carbon monoxide (CO) or hydrogen sulfide (H2S) can pose significant health risks, especially in enclosed spaces like public toilets. If there's a potential for these gases to accumulate due to faulty ventilation systems or other factors.

Technical Feasibility:

Assessing the technical feasibility of a project in toxic gas detection involves evaluating whether the proposed solution can effectively meet the technical demands of the application.

Understanding Requirements: Begin by thoroughly understanding the technical requirements of toxic gas detection in the specific industry or application. Consider factors such as the types of gases to be detected, detection limits, response times, environmental conditions, and regulatory compliance standards.

System Integration: Consider how the sensors will be integrated into a complete detection system, including hardware components such as gas sampling systems, signal processing units, data acquisition systems, and user interfaces. Ensure compatibility and seamless integration of all components to achieve optimal performance.

Environmental Factors: Take into account environmental factors that may impact the performance of the detection system, such as temperature extremes, humidity levels, atmospheric pressure, dust, and other contaminants. Ensure that the system can operate reliably in the intended operating environment.

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Power Requirements: Assess the power requirements of the detection system, including energy consumption during normal operation, standby mode, and alarm conditions. Determine the most suitable power source or sources (e.g., battery, mains power, solar power) based onthe application's needs and constraints.
By carefully assessing these technical aspects, you can determine the feasibility of implementing a toxic gas detection project and identify any potential challenges or limitations that need to be addressed.

System Requirements
The gas detector must activate an audible and visual alarm inside the machinery room and outside each entrance to the machinery room. The mechanical ventilation system must be activated by the gas detector. To ensure that corrective action can be promptly initiated, the alarm device must be placed in a location that is frequently visited by people. The smart public toilet environmental monitoring system consists of parts: transmission part, management platform, including temperature sensor, hydrogen sulfide sensor, ammonia sensor, environmental monitoring host, and network. In the context of toxic gas detection systems, system requirements may include both hardware and software specifications tailored to the specific needs of detecting and monitoring toxic gases.

System Architecture

This architecture provides a framework for designing a toxic gas detection system. Depending on the specific requirements and constraints of your application, you may need to customize and expand upon these components. Designing an architecture for toxic gas detection involves several components, including sensors,communication systems, and a user interface.

GSM Module and an ARM-based microcontroller are used by the gas detection system for end-to-end communication. Also, Arduino, a low-cost microcontroller is programmed in such a way that it receives the input data from sensors and hence controls a number of electrical appliances which are connected to output peripherals. Regular communication between Arduino and a smartphone using Bluetooth is crucial for monitoring the indoor environment. The Gas detection system uses an ATmega 32 microcontroller which has an MQ-2 sensor attached to it along with a thermostat. The MQ-2 sensor is an easy-to-use which helps in sensing. The sensor can detect gas concentrations ranging from 200 to 10,000 ppm and operates at temperatures from -10 to 50 degrees Celsius. Wherever this system is integrated, these two devices sense the gas level and record the temperature of the surroundings. Once the gas level increases above a predefined level then the device sends an alert notification to the user and accordingly the user can control the devices with the help of relay for closing the gas value.

Data Collection
Collecting data for toxic gas detection in public toilets involves several steps to ensure accuracy and effectiveness.
Identify Target Gases: Determine which toxic gases commonly occur in public toilets. This may include methane, hydrogen sulfide, ammonia, carbon monoxide, and volatile organic compounds (VOCs).
Sensor Selection: Choose appropriate sensors capable of detecting the identified toxic gases. These sensors should be sensitive, reliable, and able to detect low concentrations of the gases.
Placement of Sensor: Strategically place sensors in key locations within the public toilets to ensure thorough coverage. Sensors should be placed near potential sources of toxic gases such as urinals, toilets, and drains.
Data Logging System: Implement a data logging system to continuously record sensor readings. This system should be able to store and analyze the collected data over time.
Alert System: Implement an alert system to notify relevant authorities or maintenance personnel when toxic gas concentrations exceed predefined thresholds. This can include visual alerts, audible alarms, or notifications sent to mobile devices.
Placement: Install the sensors strategically within the public toilet to ensure comprehensive coverage. Place sensors near potential sources of gas emissions, such as toilets, urinals, drains, and ventilation systems. Consider both high and low locations to account for the tendency of some gases to rise or accumulate near the ground.
Maintenance and Monitoring: Regularly inspect and maintain the sensors to ensure their proper functioning throughout the data collection period. Monitor the data logging system for any anomalies or deviations from expected gas concentrations.
Reporting: Prepare reports summarizing the findings ofthe data analysis, including any recommendations for improving ventilation, plumbing systems, or other measures to mitigate the risk of toxic gas exposure in public toilets. Share these reports with relevant stakeholders, such as facility managers, maintenance staff, and regulatory authorities.
Continuous Monitoring: Implement a system for ongoing

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ISSN 2319-5991 www.ijerst.com
Vol. 20, Issue 3, 2024

monitoring of toxic gas levels in public toilets to ensure continued compliance with safety standards and prompt detection of any potential hazards.

By following these steps, you can effectively collect datafor toxic gas detection in public toilets and help ensure the safety and well-being of individuals using these facilities.

System Testing

Unit Testing:

Testing for Sensor: Unit testing for sensors in toxic gas detection systems for public toilets is critical to ensure the reliability and accuracy of individual sensor components. you can effectively conduct unit testing for sensors in toxic gas detection systems for public toilets, ensuring the safety and well-being of occupants.

Function Testing: Test sensor to verify its functionality. This may involve exposing the sensor to known concentrations of test gases and observing its response. Ensure that the sensor detects the target gases accurately and triggers alarms at the appropriate thresholds.

Response Time Testing: Measure the response time of sensor by introducing test gases and recording the time it takes for the sensor to detect the gas and trigger an alarm. Compare the response time to the manufacturer's specifications.

Environmental Testing: Assess the sensor's performance under different environmental conditions such as temperature and humidity variations. Ensure that the sensor operates reliably under typical conditions found in public toilets.

Sensor Testing: Verify that each sensor accurately detects toxic substances within the expected range. This includes testing for sensitivity, specificity, and response time.

Data Transmission Testing: Ensure that data from the sensors are transmitted correctly to the IoT platform. Test for data integrity, packet loss, and latency.

Integration Testing:

Integration testing for toxic gas detection in public toilets involves verifying that all components of the detection system work together correctly to ensure accurate and reliable monitoring of gas concentrations. Here's a detailed plan for conducting integration testing.Test Environment Setup: Set up a test environment that closely resembles the conditions of a public toilet, including the placement of sensors and simulated gas sources.

Functional Testing: Verify the functionality of each component individually before testing their integration.Ensure that sensors accurately detect toxic gases, data logging devices record measurements correctly, and alarm systems respond appropriately to predefined thresholds.

Integration Testing: Conduct integration testing to assess how the different components interact with each other. Test communication between sensors, data logging devices, and alarm systems to ensure seamless data transfer and alarm triggering.

Data Validation: Validate the accuracy and consistency of data collected by the detection system. Compare measurements recorded by sensors with expected values and verify that data logging devices store information correctly.

Alarm Triggering: Test the alarm triggering mechanism to confirm that alarms are activated promptly when gas concentrations exceed predefined thresholds. Verify that alarms are audible, visible, or communicated through appropriate channels (e.g., SMS).

User Acceptance Testing (UAT): If applicable, involve end-users or stakeholders in UAT to validate that the integrated system meets their requirements and expectations.

There are several flaws in traditional methods for evaluating and identifying the presence of numerous different types of gases in a sample. To address this issue, we designed an IoT-based dangerous gas monitoring system that will employ several sensors and components, including AQ2 gas sensors.

Acceptance Testing:

Testing for toxic gas detection in public toilets is crucial for ensuring the safety of occupants.

Testing Criteria: Start by defining the criteria that the toxic gas detection system must meet. This could include detection thresholds for specific gases, response times, and alarm functionalities.

Gas Simulation: Use gas generators to simulate the presence of toxic gases such as Carbon monoxid(CO), Hydrogen sulfide(H2S), Ammonia(NH3). These gases should be released in controlled amounts to mimic potential real-world scenarios.

Placement Verification: Ensure that the gas detectors are installed in appropriate locations within the public toilets to effectively detect the presence of toxic gases.Verify that there are no obstructions that could impedegas detection.

Function Testing: Test each gas detector individually to ensure that it responds appropriately to the simulated gas concentrations. This includes checking alarm activation, notification to building management systems, and any other specified functionalities.

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Vol. 20, Issue 3, 2024

Regular Maintenance and Testing: Establish a schedule for routine maintenance and testing of the toxic gas detection system to
ensure ongoing reliability and compliance with safety regulations.
Review requirements: Review the requirements and specifications for the toxic gas detection system, including functionality, performance criteria, and regulatory compliance.
User Interface Testing: Evaluate the user interface of the detection system to ensure that it is intuitive, user-friendly, and provides relevant information to end-users. Test functionalities such as viewing gas concentrations, setting alarm thresholds, and accessing historical data.

Preprocessing Technics
Data Cleaning: Removing or correcting any inaccurate, incomplete, or irrelevant data collected from sensors. This could involve handling missing values, outliers, or noise in the sensor data.
Data Integration: Combining data from multiple sensors or sources into a single dataset. This ensures a comprehensive view of the smart bin's operation and environment.
Data Transformation: Converting raw sensor data into a more usable format or scale. For example, converting temperature readings from Celsius to Fahrenheit or aggregating sensor readings over specific time intervals.
Data Synchronization: Ensuring synchronization among different components of the smart bin system is essential for accurate data analysis.
Data Formatting and Encoding: Standardizing data formats and encoding schemes facilitates interoperability and compatibility across different IoT devices and platforms. Smart bins may preprocess data to adhere to specific data formats or protocols for seamless integration with other systems.
Data Storage Optimization: Optimizing data storage is crucial for managing the large volumes of data generated by IoT devices like smart bins. Preprocessing may involve techniques such as data deduplication or data summarization to reduce storage requirements while preserving essential information.

Real-time Monitoring: Continuously monitor the preprocessed data in real-time to quickly detect any signs of toxic gas emissions. Real-time monitoring allows for prompt response and mitigation measures toensure public safety.
Sensor Placement: Strategically place gas sensors in key areas with in the public toilet to ensure comprehensive coverage. Sensors should be located near potential sources of toxic gas emission such as urinals, toilets, sinks, and air vents.
Limitations:
This proposed article will enhance home security and provide improved monitoring of emergencies by the naked eye. The limitations requires interdisciplinary collaboration between experts in sensor technology, data science, and environmental engineering to develop integrated solutions that leverage the strengths of ML algorithms, sensor networks, and database systems while mitigating potential risks and challenges. By overcoming these limitations, future enhancements in toxic gas detection systems can facilitate early warning and response to environmental hazards, thereby safeguarding public health and promoting sustainable development.
Technologies Used:
Technologies used in the public toilets as detector.
The MQ2 sensor is a versatile and widely used gas sensor that can detect a variety of harmful gases, making it suitable for use in public toilets. Here are some key points about the MQ2 sensor and its application in this context:
Features of the MQ2 Sensor:
1. Gas Detection Range: The MQ2 sensor can detect gases such as methane, propane, hydrogen, carbon monoxide, and smoke.
2. Sensitivity: It has a high sensitivity to a wide range of gases and a fast response time.
3. Cost-Effective: The MQ2 sensor is relatively inexpensive, making it a cost-effective solution for gas detection.
4. Analog and Digital Output: The sensor provides both analog and digital outputs, allowing for flexible integration with various microcontrollers and alarm systems.

Application in Public Toilets:
1. Smoke and Fire Detection: In case of a fire, the MQ2 sensor can detect smoke, allowing for early warning and evacuation.
2. Carbon Monoxide Detection: Carbon monoxide, a potentially deadly gas, can be detected by the MQ2 sensor, preventing poisoning incidents
Implementation:
1. Placement: Install the MQ2 sensor in strategic locations within the public toilet to ensure comprehensive coverage.
2. Integration with Alarms: Connect the sensor to an

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Vol. 20, Issue 3, 2024

alarm system to alert users and maintenance staff in case of gas detection.
3. Regular Maintenance: Ensure the sensor is regularly calibrated and maintained for accurate detection.

Using the MQ2 sensor in public toilets enhances safety by providing reliable detection of multiple harmful gases, thereby preventing potential hazards and ensuring a safer environment for users.
Each technology offers different advantages in terms of sensitivity, specificity, and suitability for various types of harmful gases.
Hardware Requriments:
For effective harmful gas detection in public toilets, the following hardware components are typically required:
1. Gas Sensors
MQ2 Sensor: Detects a variety of gases including methane, propane, hydrogen, carbon monoxide, and smoke.
2. Microcontroller/Processor
Arduino/ESP8266/ESP32: Popular microcontrollers for integrating sensors, processing data, and controlling outputs.
3. Power Supply
DC Power Supply: Provides the necessary voltage and current for sensors and microcontrollers.
4. Display Units
LED Indicators: For visual alerts (e.g., green for safe levels, red for danger).
5. Alarm Systems
Buzzers: Audible alarms to alert users of dangerous gas levels.
6. Communication Modules
Wi-Fi Module (ESP8266): For remote monitoring and alerts via internet.
GSM Module: For SMS alerts in areas without Wi-Fi connectivity.
MQ2 Sensor: Installed in the public toilet for gas detection.
Arduino Board: Connected to the MQ2 sensor for data processing.
Wi-Fi Module: Integrated with the Arduino for remote monitoring.
LCD Display: Mounted on the wall to show real-time gas levels.

3. RESULTS

Detection of harmful toxicants in public toilets involves several methods and technologies to identify the presence of toxic substances. These can include chemical, biological, and physical agents that pose health risks. Here's an overview of the methods and technologies usedfor this purpose.

4. CONCLUSION

Regular monitoring and detection of harmful toxicants in public toilets are essential for ensuring public health and safety. The choice of detection method depends on the specific toxicants of concern, the required sensitivity, and the available resources. Implementing these technologies can help in maintaining a safe and hygienic environment in public restrooms. An effective GSM based Toxic gas detection in Home/domestic sensor Monitoring structure to monitor sensor parameters using GSM is implemented. The developed device monitored the Home/domestic sensor monitoring and an alert on GSM server when the harmful gases like smoke, temperature, fire crosses the threshold level. We designed and implemented internet of things based Home/domestic security system we obtained efficient results. Integrated all sensors to arduino and monitor the display and post into Internet we can monitor anywhere in the world. This Home/domestic security system enhance the previous system provides high effective secured. Proposed system uses smoke, Toxic gas, in domestic applications and toxic gas is monitoring and data will process by Arduino Microcontroller. All the sensor data will post into IOT-WEB server GSM SMS and LCD which inbuilt in Arduino. Buzzer module used to alert at home for security and alert through GSM SMS.

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Vol. 20, Issue 3, 2024

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