IOT BASED GAS LEAKAGE MONITORING AND ALERTING SYSTEM

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Abstract - Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The Internet of things (IoT) is the system of gadgets, vehicles, and home machines that contain hardware, programming, actuators, and network which enables these things to interface, collaborate and trade information. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed each and every second in the display. If these gases exceed the normal level, then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through user. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. Air pollution became the major problem in the world. The world is getting polluted because of emission of dangerous gases into air such as CO_2, SO_2, NO_2, and CO. These toxic gases are dissolved in air and cannot be predicted. Hence a tool is required to check the air quality. The air pollution can be monitor by using internet-based devices like IoT.

Internet of thing (IoT) devices can collect the data and based on data can analysis for prediction i.e., quality of air is good or not. Thus, the air quality of a particular area can be monitored using IOT based devices and sensors using node Microcontroller Unit (MCU). The purpose of this research study is to understand Information on environmental variables and also allowing integration into any other type of internet-based architecture (IoT) which allows the use of sensors capable of collecting information on sensors related to smart city environment measurements, with a view to providing data on which environmental pollution related information.

I.INTRODUCTION

In today's society, safety is essential because accidents can happen anywhere. Accidental flames are more likely to occur in places that use flammable, difficult-to-detect gases. The Internet of Things is a futuristic technology that proposes the interconnection of various gadgets. This frequently alters the automation of the numerous everyday tasks. As part of the suggested gas monitoring system, we'll use IoT to identify leaks, notify the user, and stop further gas leakage. One type of toxic gas that has negative effects on health but is also widely used in industry is toxic gas. These gases need to be monitored; if an increase in their normal amount is observed, appropriate precautions can be taken. By integrating a gas sensor, an LCD to display, an Ethernet shield to transmit an alert message to the user via an Android application, and a servo motor to turn on the window, Arduino will be able to complete the specified task. By using a gas sensor, the system will identify a gas leak and send a signal to the Arduino board, which can then take further action, such as opening a window or putting on a fan.In case of an emergency, the neighbourhood residents can also be included. For input, a MQ6 LPG gas sensor is used. The gas leaking incident could be dangerous at all times. Worldwide, gas leaks cause a large number of fatalities. As a result, there is no need to be concerned about the petrol leak becoming so severe and out of control that it endangers human life or the ecosystem around it. Additionally, the workers or residents will be informed and made aware of the leakage.When LPG, i-butane, propane, methane, alcohol, hydrogen, and smoke gas are detected, it produces a HIGH output. This module, known simply as "LPG Gas Sensor Module," is very simple to interface with microcontrollers and Arduino. Several different anthropogenic emissions, referred to as primary pollutants, are released into the atmosphere, where they undergo chemical reactions and create secondary pollutants. 90% of citizens' time is spent indoors, and in recent decades, developed cities' outdoor air quality has significantly improved. Yet, throughout the same time period, interior air quality declined due to a number of causes, including decreased ventilation, energy conservation, and the introduction of new sources and products that contribute to indoor pollution. Buildings that were designed to use less energy had less ventilation, which further reduced the quality of the air inside the structure. The need for good indoor air quality grows as a result.

II. LITERATURE SURVEY

A.Methane leakage monitoring technology fornatural gas stations and its application.

In this work, they attempted to get beyond the limitations of the leakage monitoring methods now in use in the natural gas stations. They have a high rate of false alarms, low stability, are susceptible to background gas interference, etc. Monitoring the leaking vibration and methane concentration simultaneously can significantly lower the false alarm rate. Results of laboratory experiments show that the monitoring method suggested in this study may be widely used for monitoring the methane leakage in natural gas stations and valve chambers of long-distance and collection pipelines and benefits from low cost, simple installation, and high reliability.

B. LPG monitoring and leakage detection system.

In this study, the leakage is detected by measuring the amount of gas dissolved in the air. The leakage is further confirmed by some sensors' reduced weight and pressure readings. LPG is present at amounts ranging from 200 to 10,000 ppm. The sensor has a Tin Dioxide-coated outer membrane ($SnO2$). This coating reacts with the propane and butane in LPG when it comes into touch with them, creating an output that can be turned into an electrical voltage. The alerting is then caused by this electrical voltage.

C.Implementation of ammonia gas leakage detection & monitoring ystem using internet of things.

The Internet of Things is used in this research to implement the detection of ammonia gas leaks utilizing a monitoring system and an ammonia gas sensor (MQ135). A significant amount of ammonia gas is detected by an ammonia gas sensor (MQ135) in laboratories, businesses, factories, healthcare facilities, etc. Ammonia concentrations that are too high can cause death, lung damage, or blindness. The buzzer in the Ammonia Gas Sensor sounds to notify the authorities whenever ammonia gas reaches a threshold level specified in the MQ135 Sensor. Under ambient conditions, electrochemical sensors monitor the partial pressure of gases. The system gathers information on the various ammonia petrol levels throughout the course of the day.

D.Advanced monitoring system for gas density of gas.

The methods utilised to increase the accuracy of recorded gas pressure by reducing the impact of outside disturbances is described in this study along with an introduction to a high-performance gas pressure sensor with high sensitivity and stability. The system, which includes a new gas pressure sensor and calculating algorithms, was put to the test on an 84kV GIS in the field for a full year. The system proved to be capable of detecting a slow leakage of 0.5% per year, which is the highest permitted value for gas leakage.

III. BACKGROUND THEORY

A.MQ6 Gas sensor

A gas sensor module is the MQ6 gas sensor. The module features four pins for interfacing, two of which are for VCC and ground, one is for an analogue output, and the other is for a digital pin that connects to a comparator (LM358). The module's analogue output pin interfaces with the Arduino board's A0 analogue input pin to monitor the concentration level of gas leaking.

Fig 1: Mq6 Gas Sensor

The sensor calculates the spilled gas concentration in ppm using the following formulas:

Concen = 1036.5 * R 2.392 Where

Concen is the concentration of LPG in ppm

R is the ratio of Rs the resistance of sensor to the R0 which is the resistance at 1000ppm at 20 degree Celsius and 65% humidity.

B. Relay

An electronically controlled switch is a relay. Other operating principles are also used, but electromagnets are frequently used in relays to mechanically run a switching mechanism. Relays are used when multiple circuits need to be controlled by a single signal or when a low-power signal is required to control a circuit with complete electrical isolation between the control and controlled circuits. The first relays were utilized in long-distance telegraph circuits to repeat and retransmit signals from one circuit to another. To carry out logical processes, relays were widely used in early computers and telephone exchanges.

A contactor is a particular kind of relay that can manage the high power necessary to directly operate an electric motor or other loads. With no moving parts and switching performed by a semiconductor device, solid-state relays regulate power circuits. To safeguard electrical circuits from overload or faults, relays with calibrated operating characteristics and occasionally multiple operating coils are used; in contemporary electric power networks, digital instruments still go by the name "protective relays."

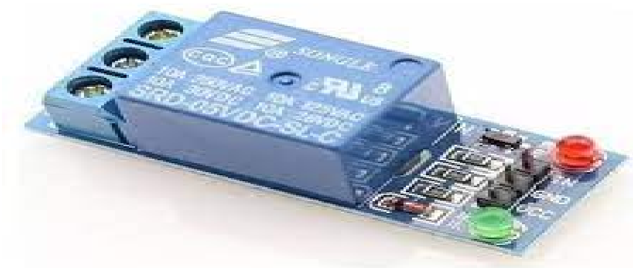


Fig 2: Relay

IV. EXISTING SYSTEM

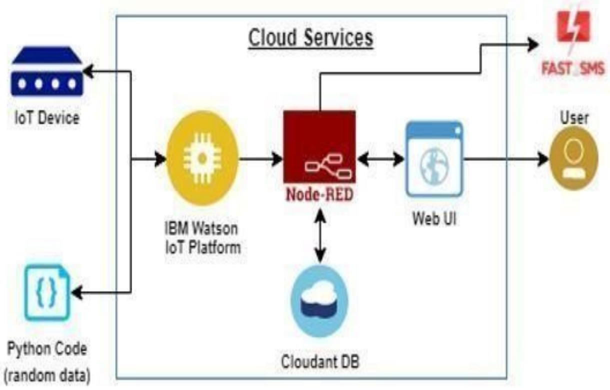
In the current setup, the device makes use of an Arduino microcontroller coupled with MQ135 and MQ6 gas sensors to detect various gases.Different kinds of gases that are in the atmosphere. It was then linked to the Wi-Fi module, which makes an internet connection, displays the output for the user, and sounds an alarm when the ppm exceeds a predetermined threshold. Industrial perimeter monitoring, indoor air quality monitoring, site selection for reference monitoring stations, and data dissemination were some of their uses. IoT by using a variety of sensors to measure gas concentrations, which were seen on an Arduino serial display. Through the use of Ethernet shield, which is accessible in real time for additional processing, this data is gathered in the thing talk channels. These analyzed results were viewed through thing speak in a graphical format. The average pollution level was then determined using MATLAB analysis, and the findings were time-controlled and displayed via an Android app. The air quality index value was also acquired using the location using the android app. Additionally, the negative impacts on health were demonstrated in this app, so that users can remain informed of the levels of pollution.

V. PROPOSED SYSTEM

The suggested system's air quality microcontroller requires digital input, so the analogue output of the sensor was converted to digital form using an ADC and provided as an input to the microcontroller. On the screen, these numbers are shown continuously. The critical number was entered using a switch pad. The buzzer will beep and a notification will be sent to the webpage on the mobile phone by the microcontroller via the GPRS module if the number of pollutants in the air surpasses the critical value entered. The website, which is accessible from anywhere in the world, is constantly being updated with this information. When the pollution level exceeds the critical threshold, a notification was also sent to the website. The information is received by the mobile phone from the modem and forwarded to the server and the internet. the server analyses the info from the smartphone. It draws conclusions from the data it has gotten and then sends those conclusions via the internet.

The wireless connection between the base station and the distant sensing node has been made possible by IOT modules. A MCU was used to manage every operation on the sensor node while the IOT modules interact via cellular networks. The MCU uses an internal ADC to sample the sensor outputs before computing the gas concentrations and sending the results as messages over the IOT**.**

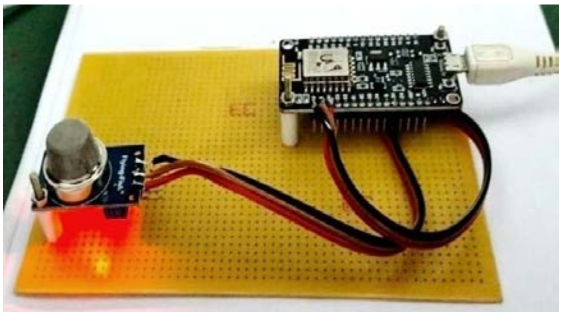
VI. SYSTEM ARCHITECTURE



VII. IMPLEMENTATION AND RESULT

A coil of wire wound around a soft iron core, an iron yoke that acts as a low resistance route for magnetic flux, a movable iron armature, and one or more pairs of contact points. The yoke and one or more pairs of moving contacts are mechanically connected to the armature, which is hinged to it. It is secured in position by a spring so that there is an air gap in the magnetic circuit when the relay is de-energized. One of the two sets of connections in the relay shown in this situation is closed, while the other set is open.

Depending on how they are used, other relays may have more or fewer pairs of contacts. Additionally, the relay in the image has a cable joining the armature to the yoke. Through the yoke, which is soldered to the printed circuit board (PCB), this guarantees circuit continuity between the moving contacts on the armature and the circuit track. The movement of the movable contact(s) as a result of the armature being activated by an electric current flowing through it either creates or destroys (depending on the design) a link with a fixed contact. The movement opens the contacts and breaks the connection if the pair of contacts was closed when the relay was de-energized, and vice versa if the contacts were open to its relaxed position by the magnetic field.When the coil's current is turned off, the armature is returned by a force that is roughly half as powerful as the original force to its relaxed position by the magnetic field. Gravity is also frequently utilised in industrial motor starters, although a spring is typically used to provide this power. The majority of relays are made to work quickly. This lessens disturbance in low-voltage applications and arcing in high-voltage or current application. This suggested approach includes an alert system, microcontroller, IoT module, weight measuring module, and system for detecting gas leaks. The primary Arduino Mega2560 microcontroller requires a power supply spanning from 7 to 12 volts, which may be created using several modern adapter-available parts such a step-down transformer, rectifier, filter, and regulator. An ac to dc adapter or a battery can provide power. The board can be powered via 7 to 12 volts. Voltage below 7V causes board instability. Board gets destroyed if voltage is higher than 12V.



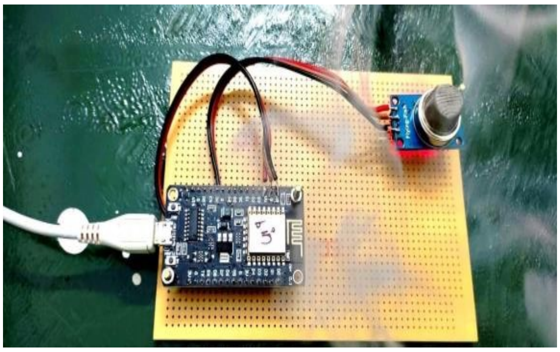


Fig 3&4: Implementation

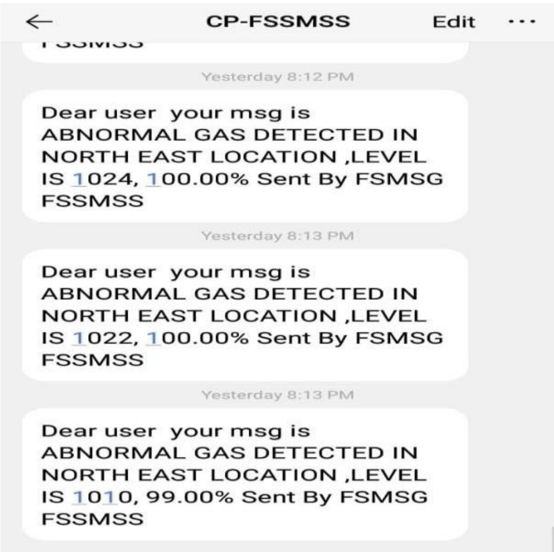


Fig 5:Result

VIII. CONCLUSION

As overall conclusion, IOT technology has come a long way since it was conceptualized two decades ago. It has become more efficient, more applicable to today's applications. The work presented in this project was directed towards pushing IOT technology to the next level. The principle of operation of IOT based gas leakage monitoring and alerting system was shown by operating the Arduino model attached with embedded system with required input and output gas level with the help of gas sensors. This results in a more efficient operation because it is connected to a common web page specially built to notify the responsible authority automatically so reduces the stress of constant monitoring. The choice of using a real time gas leakage monitoring and sensing the output levels of gas has been clearly observed by the help of this system.

IX. FUTURE SCOPE

Major cities of India are pushing Smart Home application gas monitoring system is a part of Smart Home application.

Enhancing Industrial Safety using IoT. This system can be implemented in Industries, Hotels and wherever the gas cylinders are used. This system can be used in industries involving applications such as Furnace, Boilers, Gas welding, Gas cutting, Steel Plants, Metallurgical industries, Food processing Industries, Glass Industries, Plastic industries, Pharmaceuticals, Aerosol manufacturing. As hospitals require to provide maximum possible safety to patients, this system can be used to keep track of all the cylinders used in it. Some of the cylinders used are Oxygen cylinder, Carbon dioxide cylinder, Nitrous oxide cylinder.

As many students are naive the risk of causing accidents is high. Hence, our system can also be used in schools, colleges. Many colleges have well established labs including chemistry lab and pharmaceutical labs where gas burners are used. Several medical equipment requires gas cylinders.

X. REFERENCES

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