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Implementation of Ammonia Gas Leakage Detection & Monitoring System using Internet of Things

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ABSTRACT

The Internet of things is the way we connect various components with internet connectivity and achieve communication. Through an embedded computing system, everything is uniquely identified and can form a world-wide interactive network which performs various functionalities. This paper implements the ammonia gas leakage detection via a monitoring system with the help of ammonia gas sensor (MQ135), using the concept of the Internet of Things. Ammonia Gas sensor (MQ135) sense and detect a large amount of ammonia gas present in the lab, industries, factories, health care, etc, High concentration of Ammonia results in blindness, lung damage or death. Whenever ammonia gas reaches a threshold level provided in the MQ135 Sensor, the buzzer in the Ammonia Gas Sensor goes off alerting the officials. The Electrochemical principle on which the system operates. Electrochemical sensors measure the partial pressure of gases under atmospheric conditions. The ambient air is monitored and diffused with the help of a membrane by the liquid electrolyte in the sensor. The system we implement collects data about the various levels of ammonia gas at various times daily and also it is possible to generate graph whenever is needed with the data sensed. The system we propose can be easily made a working model anywhere. The model we propose is much cheaper and efficient as combined with leading IT technology. This paper implements the use of a gas monitoring system in labs to detect the ammonia levels present in the air, processed and notified through the Internet Of Things.

Keywords: IoT, MQ 135, Ammonia gas, buzzer, Electrochemical Sensor.

I. INTRODUCTION

The proposed system is making use of Ammonia Sensor (MQ 135) and it is integrated and automated using software to store ammonia gas level detected or sensed by the sensor. The Arduino board is the heart of our system which is widely used for the experimental and modern application of its direct ability to load the programs into the device with no help from any hardware programmer to execute the program. Arduino also enables the use of the Internet Of Things which forms the core of our system. The application we develop for the system takes current values present from the sensor stores it in the local database and this can be graphically plotted for representation whenever needed.

Gas values from every location are brought to one final location by the Hybrid Cloud concept. Graphical representation of gas value for various purposes can be viewed separately in the mobile phone which helps prevent Ammonia gas leakage. The main idea of this Ammonia Gas Leakage Detection and Monitoring system is to send alert messages to the people's mobiles through the Internet of Things when the Ammonia gas level exceeds. The user can keep track of the gas that is coming out, using the system. Brutal Gases are sensed as part of every individual life.

II. COMPONENTS

2.1 Arduino Microcontroller

The **Arduino** board is connected to a computer via USB, which helps us perform the needful actions. Developed code is embedded in the Arduino IDE of the **Arduino board**, which is uploaded to the microcontroller. The responsibility of microcontroller is to execute the code, interacting with input devices and output devices such as sensors, lights and motors. In our proposed system the Arduino inputs the values do the required processing as per the knowledge provided in prior.

2.2 Gas Sensor – MQ 135 (Ammonia sensor)

MQ135 gas sensor is the most sensitive to SnO2, which with lower conductivity in clean air, detects the target combustible gas existence. The sensor's conductivity value increases as the concentration of the gas rises. The electronic circuit converts the

change of conductivity to the corresponding output signal concentration.

MQ135 gas sensor (shown in Figure 1) is much more sensitive to Ammonia, Sulphide and Benz steam, also sensitive to smoke and other harmful gases.

Figure 1. MQ135 Sensor

2.3 Buzzer

A buzzer or beeper is a device that produces the sound, which alerts the officials by the sound it makes. This includes alarm devices, timers, and confirmation of the user can also be identified.

The vibrating disk in the **buzzer** is attracted to the pole by the magnetic field when the specified condition is met as provided by the user's requirement or need. The main purpose of the buzzer in our Ammonia gas sensing System is to sound the officials with its noise.

Figure 2. Buzzer

2.4 Ethernet Shield

This is the reason for the connection of the internet. This provides the network connection that is needed to alert the user outside the premises.

This also helps us provide a secure connection with the cloud with which we can also manage or even control the most important parts of the system from anywhere.

2.5 System

The system is a physical device which may be a laptop or a personal computer or sometimes even a mobile phone which is connected to the Arduino. It is used to display and store the gas value and generate a graph.

2.6 ADC Process

The analog sound is converted into the respective digital values and stored in the cloud for the next step analysis. The digital information can also be stored easily for any future references which are not possible with the analog data.

This provides data for future predictions and features with ease of maintenance. Thus provides better decision support and achieve a better environment and safeguard the natural life of the individuals.

This is considered as the most important process of the system functionality.

III EXISTING SYSTEM

3.1 Literature Survey

Recent industrial accidents have raised for the need for the safety precautions that will ensure the accident-free running of industries. The gas that stands out as the most dangerous disease is Ammonia, which is almost used by most companies for building blocks or to purify the water supplies. In this paper, Ammonia gas leakage monitoring and detection system using the Internet of Things – the drifting technology, has been proposed which is an advanced and efficient solution to connect with the Internet. Immediate and severe irritation occurs if the concentration is 700 **ppm**. Respiratory spasms and rapid suffocation occurs if the concentration is 5,000 **ppm**. Pulmonary edema and potentially fatal accumulation of liquid in the lungs would occur if the concentration is 10,000 **ppm**. Using the Wi-Fi module, the values of ammonia gas measured during leakage are uploaded to the cloud, which is sensed using MQ135. The user is alerted about the leakage in the industry, by the cloud services automatically and required actions are taken (like switching off the motor, silencing the ringing bells, providing safety measures, etc.) immediately. In this paper, the steps to overcome the situation after the accident are presented elaborately.

The commonly used systems to prevent the accidents earlier are using MQ-137Sensors, Internet Of Things Technology and framing suitable reflexive actions as per every industry needs but not globally.

This paper proposes a solution for the industrial ammonia gas leakage through the Gauss method of Leakage Localization. The system we develop is hosted in the industrial field. The purpose is to prevent losses earlier took place. Using the monitoring and detection system the exact location of the leak is found by the location simulation measurement experiment, which provides using the wireless sensors and networking as well as connect the live actions with the users. This solves the wiring issues in the traditional system with ease of maintenance and immediate remedy to the event.

3.2 Disadvantages

a. Precaution steps are not possible.
b. No alert notification.
c. Long monitoring time.
d. Lot of manual work.

IV PROPOSED SYSTEM

In this paper, we develop a smart system for monitoring the ammonia gas values in the laboratories that as been proposed about the safety

levels. The gas sensor is connected to the microcontroller to detect the accurate values present in the environment we monitor. Internet Of Things is used for transmitting the data from controller to mobile, if the gas values increases. The Cloud analyses the data to make better decisions.

4.1 SYSTEM ARCHITECTURE

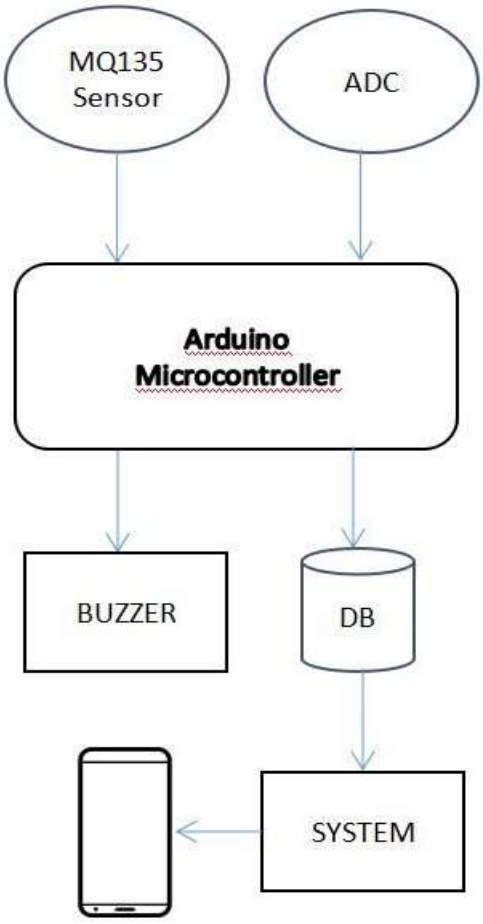

Figure 3.System Architecture

V IMPLEMENTATION

This system has an Arduino microcontroller which is used to connect the sensor MQ-135 (Ammonia Sensor). The sensor senses the ammonia gas, convert into digital output and send the value to the physical system through Arduino microcontroller. The system collects the output and stores those output values into a database based on date and time, then the graph (shown in Figure 5) will be generated according to the values in the database. So the user can easily monitor the leakage of ammonia gas. If the level is increased more than 107 the buzzer will produce the sound (shown in Figure 4).

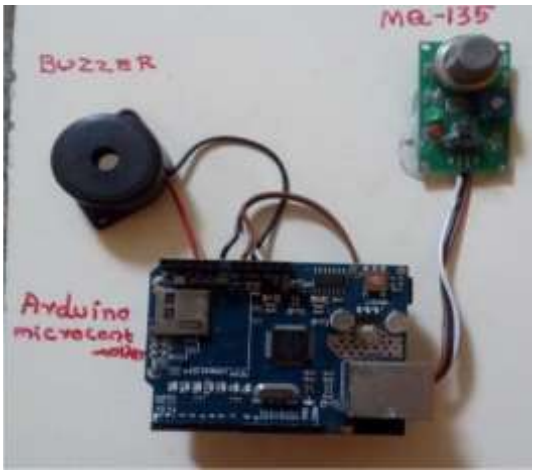

Figure 4. Implemented System

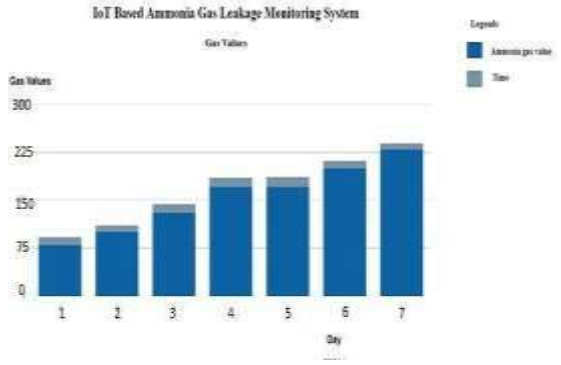

Figure 5. Leakage Analysis Graph

VI CONCLUSION

In this work, ”Ammonia Gas Monitoring System Using Ammonia Sensor Technology” the leakage analysis is done. Ammonia gas is a major factor that affects human being health. The ammonia sensor technology system is used to detect the ammonia gas leakage, using this system human beings health is protected from ammonia gas. The system will display the ammonia gas level that exceeds its threshold level and provide a comparison on a graphical representation based on the present gas level and historical data in the final report.

In the future, the system can be further improved by considering other factors, such as the mobile app to operate maximization precaution level.

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