IoT Integrated Air Quality Monitoring And Controlling Using 2nNaOH Chemical Bank

S.Prabhakaran[1], K.Sathish[2], R.Hari Haran[3], G.Karthikeyan[4], R.Yogeshwaran[5]
[1] Professor, Dept of EEE
[2, 3, 4, 5] Dept of EEE
[1, 2, 3, 4, 5] Nandha Engineering College, Erode, Tamilnadu, India

Abstract- *At present, disasters are basic in the environment because of the unpredictability of their regular habitat. Such regular debacles bring tremendous loss of ownership and life. To overcome these issues this project is proposed. The controller is utilized for controlling every one of the operations. Our framework comprises a wellbeing safety system and control room which is connected through the IoT beneficiary. Here we monitor the co2, methane, hydrogen sulfide using atmega328p with help of the IoT module to communicate the above parameter wirelessly and also here we add an automatic buffering system which helps to dilute the harmful full gas at instantly.*

Keywords- Gas sensor, IoT module, Microcontroller, LED display, Fan, Pump.

I. INTRODUCTION

Air pollution in India is a serious health issue. Of the 30 most polluted cities in the world, 21 were in India in 2019. As per a study based on 2016 data, at least 140 million people in India breathe air that is 10 times or more over the WHO safe limit and 13 of the world's 20 cities with the highest annual levels of air pollution are in India. 51% of the pollution is caused by industrial pollution, 27 % by vehicles, 17% by crop burning, and 5% by other sources. Air pollution contributes to the premature deaths of 2 million Indians every year. Emissions come from vehicles and industry, whereas in rural areas, much of the pollution stems from biomass for cook burning and keeping warm. In autumn and spring months, large-scale crop residue burning in agriculture fields – a cheaper alternative to mechanical tilling – is a major source of smoke, smog, and particulate pollution. India has a low per capita emissions of greenhouse gasses but the country as a whole is the third-largest greenhouse gas producer after China and the United States. A 2013 study on non-smokers has found that Indians have 30% weaker lung function than Europeans. Various studies were conducted to identify the reasons for the sing in pollution in-country including NCR of Delhi, especially during winter months. A study 'Comprehensive Study on Air Pollution and Green House Gases in Delhi, 2016' was conducted by the Indian Institute of Technology, Kanpur to identify major air pollution sources in NCT of Delhi, their contributions to ambient air pollution levels, and develop an air pollution control plan. The study confirms that Particulate Matter is the main source of pollution and levels of PM10 and PM2.5 are 4-7 times higher than National Ambient Air Quality Standards (NAAQS) in the summer and winter months. Based on the air quality measurements in the summer and winter months, it is inferred that the contribution of PM10 and PM2.5 from different sources is different in summer and winter. Sources of pollution during winter include secondary particles (25 -30%), vehicles (20 – 25%), biomass burning (17 – 26%), municipal solid waste burning (9 – 8%), and to a lesser extent soil and road dust. Sources of pollution during summer include, coal and fly ash (37 – 26%), soil and road dust (26 – 27%), secondary particles (10 – 15%), biomass burning (7 – 12%), vehicles (6 – 9%) and municipal solid waste burning (8-7%).

II. DOCUMENTARY RESEARCH

There are natural and human-induced factors that contribute to climate change. When you look back at the history of Earth, climate change has always happened. Methane (CH_4), Carbon monoxide (CO),Volatile organic compounds (VOCs), Sulphite (SO_4), Nitrogen oxide (N_2O), Chlorofluorocarbons (CFCs),Nitrate (NO_3). Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings or cause damage to the climate or materials. There is a certain percentage of gases present in the atmosphere. An increase or decrease in the composition of these gases is harmful to survival. This imbalance in the gaseous composition has increasedthe earth's temperature, which is known as global warming. Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution. Almost any toxic chemical could make its way into the atmosphere to pollute the air that we breathe. Aerosol particles (clouds of liquid and solid particles in a gas) that are found in the air may

also contain pollutants. The chemical compounds that lower the air quality is usually referred to as air pollutants. These compounds may be found in the air in two major forms a gaseous form (as gases), in a solid form (as particulate matter suspended in the air). Souvik Manna et al. proposed a vehicle pollution monitoring device that coalesces WSNs with a distributed network. They integrated the use of the easily available RFID (Radio Frequency Identification) tags to identify the specific vehicle that violates the limits of pollution decided by the government. Srinivas Devarakonda et al. proposed a vehicular-based mobile system approach for analyzing the characteristics of air in real-time. They presented two models: one which can be tied up in public tra and the other one is a personal sensing equipment sport. They also claimed that both the prototypes are workable, cost-effective and also they can foretell the potential impacts on health postulated by the air quality.Yangyang Ma et al. made use of big data analytics to unveil real-time data for both interior and exterior constitution of air on high monitoring maps .h-quality architects designed sensor nodes that can swiftly make transitions between sleep mode and active mode and have positioned them indefinite order to convey the stored data to the server utilizing the Zigbee Wireless Protocol.

III. RELATED WORKS

Design Of Air Pollution Monitoring System Using Wireless Sensor Network"by Pratishtha Agnihotri,Sonam Tiwari, Dr.Devendra Mohan. Concept: The M2M consists of several sensors which analyse the number of different pollutants, process the data using Analog to Digital converters, microcontrollers, and the internet. The mobile interface and web are used to unveil the stored data.

Measurement of Air Quality Index using Internet of Things"byLalita Mishra, Vikash, harsh Varma.Concept:In the cloud, the data is first processed and then analyzed for obtaining the value of the air quality index. The generated results are then visualized by the graphical representation. Based onthis, an individual can take precautionary measures for a healthy life

Environmental Monitoring System for Control of Air Pollution by Motor Vehicles by Yurii Maslyiak, Andriy Pukas, Iryna Voytyuk, Mykola Shynkaryk 2018 XIV-the International Conference on Perspective Technologies and Methods in MEMS Design (MEMSTECH). Concept: The prediction of air pollution by harmful emissions from motor vehicles using mathematical models and visualization of modeling results using a website. Mathematical models are represented in the form of differential equations. They describe the dynamics and spatial distribution of harmful motor vehicles emissions.

"Air Quality Monitoring Using IOT: A Survey" by Hocine Mokrani, RazikaLunas, Mohamed T. Bennai, Dhai Eddine Salhi, and Rachid Djerbi 2019 IEEE International Conference on Smart Internet of Things (SmartIoT). Concept: This paper aims to answer these necessities by reviewing the existing works on air quality monitoring using IOT with the focus on lasted trends and challenges." Wireless sensor network-based air pollution monitoring" by S. Mansour, N. Nasser, L. Karim, and A. Ali in Proceedings of IEEE International Conference on Computing, Networking and Communications, February 2013,ppconcept:a simple Wireless Sensor Network (WSN)-based air quality monitoring system (WSN-AQMS) for industrial and urban areas. The proposed framework comprises a set of gas sensors (ozone, CO, and NO2) that are deployed on stacks and infrastructure of a Zigbee WSN and a central server to support both short-term real-time incident management and long-term strategic planning.

IV. ARCHEITECTURE FOR MONITORING AND CONTROLLING AIR POLLUTION

Air quality sensors are fixed in both inlet and outlet of the tube to monitor the environment chamber. The WSN, IoT(Internet of Things), cloud computing plays a very important role in monitoring and analysis of air quality in real-time. Air quality value is sensed by the corresponding sensors by the microcontroller using the ADC technique. The microcontroller reads the inlet and outlet MQ135 air quality sensors value by ADC technique. To control pollution, activate the inlet and outlet fan and then the pump is activated by PWM technique concerning the amount of polluted air present in the environment. And also input air quality value, output air quality value, the status of the environment are displayed over IoT cloud and web page using ESP8266 IoT module. And finally, the output was partially converted into oxygen. The gas sensor senses the moisture air and the data was given to the microcontroller and it has been sucked with help of the fan, and the chemical inside 2naoh reacts with the moist air and produce oxygen at the output, where the level of inlet and outlet will be digitally displayed through the LCD which can digitally be connected to the IoT module. Through this users can easily monitor and control the air by using 2NAOHchemicalbank. Air quality sensors are fixed in both inlet and outlet of the tube to monitor the environment chamber. The microcontroller reads the inlet and outlet MQ135 air quality sensors value by ADC technique The WSN, IoT(Internet of Things), cloud computing plays a very important role in monitoring and analysis of air quality in real-

time.The microcontroller reads the inlet and outlet MQ135 air quality sensors value by ADC technique. To control pollution, by activating the inlet and outlet fan, and then the pump is activated by PWM technique concerning the amount of polluted air present in the environment. And also input air quality value, output air quality value, the status of the environment are displayed over IoT cloud and web page using ESP8266.There are a lot of sensing devices installed in the WSN system, each having its functionalities. The sensors should have a high sensitivity and measurement accuracy and low power consumption and small size.

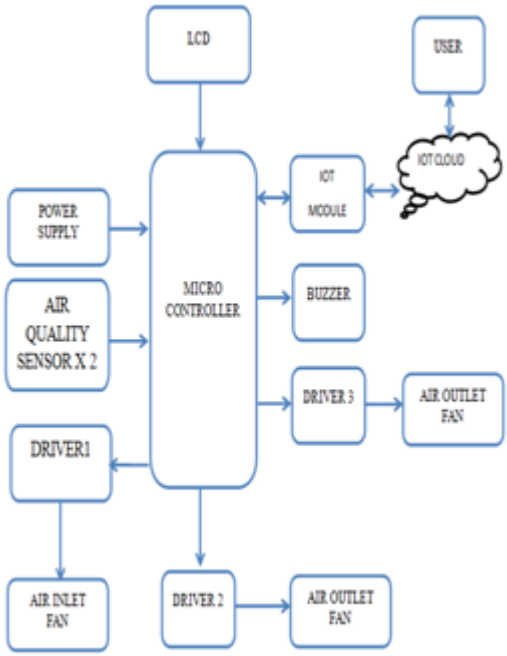

Fig. 1 Architecture For Monitoring And Controlling Air Pollution

V. DETAILS OF THE COMPONENT

There are a lot of sensing devices installed in the WSN system, each having its functionalities. The sensors should have a high sensitivity and measurement accuracy and low power consumption and small size. The listed components are given below.

A.AIR QUALITY SENSOR

The air quality sensor is here we used to sense the toxic gases. Air Quality has Digital as well as Analog output. There are a lot of sensing devices installed in the WSN system, each having its functionalities. The sensitive material of the MQ135 gas sensor is SnO2, which with lower conductivity in clean air. There are a lot of sensing devices installed in the WSN system, each having its functionalities. The sensors should have a high sensitivity and measurement accuracy and low power consumption and small size. When the target is higher along with the gas concentration rising. MQ135 gas sensor has a high sensitivity to Ammonia, Sulphide, and Benze steam, also sensitive to smoke and other harmful gases. Example: Methane, sulfide, etc

Fig.2air Quality Sensor

B.BUZZER:

Here we use the buzzer to alarm if the air was abnormal the controller gives a signal to the buzzer to alert the alarm. Then the fan and pump get ON. So that buzzer is used to alert the user. And it helps us to alert the user. It acts as a beeping in this project. It is also known as piezoelectric speakers. The sound that is generated using the power supply the sound tone can be altered as our wish required. The tone is generated by interfacing the microcontroller with proper coding.

Fig. 3 Buzzer

C.GPS MODULE:

The microcontroller gives a signal to the GPS that receives the signal from the controller. The GPS sends the signal to the user through the IoT cloud. This module communicates with the using TX and RX pins. The PPM value is transmitted by the sensor to the controller and it is received by the GPS and transmits data to the user.

Fig.4 Gps Module

D.IOT MODULE:

The ESP8266 WiFi Module is a self-contained SOC with an integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever-growing, community. These devices range from ordinary household objects to sophisticated industrial tools.

Fig.5 IoT Module

E. INTERNET OF THINGS:

The Internet of Things (IoT) describes the network of physical objects "things" that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. Oracle has a network of device partners.

VI. RESULT COMPARISON

S NO	EXISTING SYSTEM			PROPOSED SYSTEM		
	I/O AIR LEVEL	BUZZER	AIR QUALITY	I/O AIR LEVEL	AIR QUALITY	OUTPUT(PARTIAL O2 LEVEL
1	25	OFF	NORMAL	25	NORMAL	28
2	28	OFF	NORMAL	28	NORMAL	32
3	35	ON	ABNORMAL	31	ABNORMAL	41

VII. CONCLUSION

The IoT monitoring system can also be implemented for other types of pollution. The WSN monitoring system can also be implemented for other types of pollution such as water pollution, soil pollution, or radioactive contamination. Using high-efficiency communication protocol along with sensor network to achieve accurate data in real-time and processing of data will be achieved. The IoT integrated air quality monitoring and controlling using a 2NAOH chemical bank simulation was shown. The above simulation shows that the gas sensor senses the air quality and gives the data to the pic and data transfer through the IoT module and the display shows the quality of air in the surrounding. If the air was abnormal that was shown by the display and it automatically turns on the pump and filters the abnormal air and output shows that air was abnormal switching on the fan and pump and which partially converting to oxygen at the output.

REFERENCES

[1] S. Nagaraj, B. Rajashree, "Applications of Wireless Sensor Networks in the Real-Time Ambient Air Pollution Monitoring and Air Quality in Metropolitan Cities –A Survey", in Proceedings of IEEE International Conference on Smart Technology for Smart Nation,2017,pp.1393-1397.

[2] Y. Mehta, M.M. Pai, S. Mallissery, S. Shwetanshu, "Cloud-enabled Air Quality Detection, Analysis and Prediction-A Smart City Application for Smart Health", in Proceedings of 3rd MEC International Conferenceon Big Data and Smart City,2016.

[3] National ambient air quality standards. [Online]. Available: http://www.cpcb.nic.in/National AmbientAirQualityStandards.php.

[4] S. Mansour, N. Nasser, L. Karim, and A. Ali, "Wireless sensor network-based air pollution monitoring," in Proceedings of IEEE International Conference on Computing, Networking and Communications, February 2013,pp. 1-5.

[5] Shanzhi Chen, Hui Xu, Dake Liu, Bo Hu, and Hucheng Wang, "A Vision of IoT: Applications, Challenges, and Opportunities with China Perspective", IEEE INTERNET OF THINGS JOURNAL, VOL.-1, NO.-4, August 2014;

[6] S. Chen, H. Xu, D. Liu, B. Hu, and H. Wang, "A Vision of IoT: Applications, Challenges, and Opportunities with China Perspective," in IEEE Internet of Things Journal, Vol-1, No.-4, 2014;

[7] Ms. Sarika Deshmukh, Mr.Saurabh Surendran, and Prof.M.P. Saturday, "Air and Sound Pollution Monitoring System using IoT" International Journal on Information Theory (IJIT), Vol-5, Issue-6, 2017;

[8] Navreetinder Kaur, Rita Mahajan, and Deepak Bagai, "Air Quality Monitoring System based on Arduino Microcontroller", International Journal on Information Theory (IJIT), Vol.-5, Issue-6, June 2016;
[9] PalaghatYaswanth Sai, "An IoT Based Automated Noise and Air Pollution Monitoring System", International Journal on Information Theory (IJIT), Vol.-6, Issue-3, March 2017;
[10] L.Ezhilarasi, 2 K.Sripriya, 3 A .Suganya, 4 K.Vinodhini, "A System for Monitoring Air and Sound Pollution using Arduino Controller with IoT Technology", International Journal on Information Theory (IJIT), Vol.-3 Issue-2, 2017;