



International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Fabrication of Industrial Air Pollution Controller by Smart ESP

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ABSTRACT

Our daily activities and quality of life are both impacted by air pollution. The biosphere and the standard of living on the globe are at risk. Since there have been more industrial operations in recent years, there is a very obvious necessity to check the quality of the air. People need to be aware of how much their actions have an impact on the quality of the air. This project illustrates how an air pollution detection system is shown and used. The innovation understood here is a practical application of the Internet of Things concept. This in-depth study examines the consumption options for this innovation in a world where natural safety is evolving into a real issue. The job is completed using an Arduino microcontroller board. In this project, I'm going to build an Internet of Things (IoT)-based air pollution detection and monitoring system. I'll use an ESP8266 Wi-Fi device to monitor the air quality over a web server, and an alarm will go off when the air quality reaches a certain threshold, which is when there are several dangerous gases like CO₂ present. On the LCD and website, it will display the air quality in PPM (Parts Per Million) as "Fresh Air," "Poor Air," and "Danger Air" so that I can easily monitor it.

Keywords: Internet of Things, Pollution, Air, Parts per Million, Quality and Metrics.etc.

INTRODUCTION

Air is one of the essential elements of man's surroundings. The earth's atmosphere is full of air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Humans need an atmosphere of air that is free from contaminants. This is very crucial for human life and health. Any change in the natural composition of air may cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant [1]. Air pollutants are measured in Parts per Million (ppm) or ug/m³ [2]. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary pollutant reacts with other atmospheric chemicals [3]. Air quality affects public health.

The Air Excellence Guide (AEG) may be a common indicator of air quality. The Air Quality Indicator (AQI) is calculated and supported on air pollutants like CO and NO₂ compounds that consume opposing possessions happening the atmosphere and human health.

The Air Quality Indicator may be a range that represents the very finest meditation of a specific air unused matter at a particular time. I propose an air quality as well as air pollution monitoring system that allows us to monitor and check live air quality as well as air pollution in an area through Internet of Things (IoT). It uses air sensors (Gas Sensor MQ135) to sense presence of harmful gases/compounds in the air and constantly transmit this data. In addition, system keeps measuring air level and reports it. The sensors interact with Arduino Uno (Microcontroller) which processes this data and transmits it over the application.

OBJECTIVES

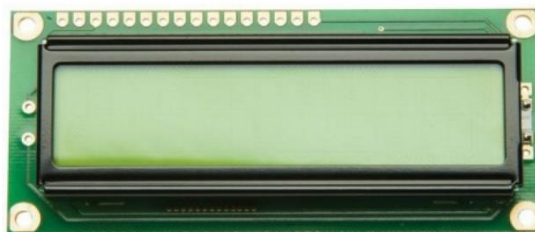
Develop abatement strategies. Supply data for research and investigation. Enable comparison for the air quality data from different areas and countries. Inform the public about air quality and raise the awareness. Detect the importance of individual sources. Facilitated the source apportionment and identification. quality of air can be checked indoors as well as outdoor. Detecting a wide range of physical parameters. Indoor air quality monitoring. Industrial perimeter monitoring. Roadside pollution monitoring. To make this data available to the common man.

COMPONENTS REQUIRED

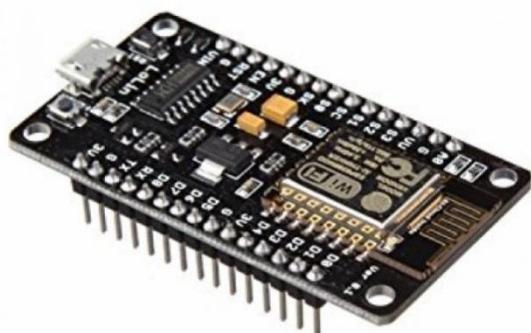
1. MQ-135 Sensor



2. 16X2 Character LCD



3. ESP8266 Wi-Fi Module



4. Arduino UNO



WORKING PRINCIPLE

The device developed in this project can be installed near any Wi-Fi hotspot in a populated urban area. As the device is powered, the Arduino board loads the required libraries, flashes some initial messages on the LCD screen and start sensing data from the MQ-135 sensor. The sensitivity curve of the sensor for different combustible gases is already mentioned above. The sensor can be calibrated so that its analog output voltage is proportional to the concentration of polluting gases in PPM. The analog voltage sensed at the pin A0 of the Arduino is converted to a digital value by using the in-built ADC channel of the Arduino. The Arduino board has 10-bit ADC channels, so the digitized value ranges from 0 to 1023. The digitized value can be assumed proportional to the concentration of gases in PPM. The read value is first displayed on LCD screen and passed to the ESP8266 module wrapped in proper string through virtual serial function. The Wi-Fi module is configured to connect with the Thing Speak IOT platform. Thing Speak is an IOT analytics platform service that allows to aggregate, visualize and analyse live data streams in the cloud. Thing Speak provides instant visualizations of data posted by the IOT devices to Thing Speak server. With the ability to execute MATLAB code in Thing Speak one can perform online analysis and processing of the data as it comes in.

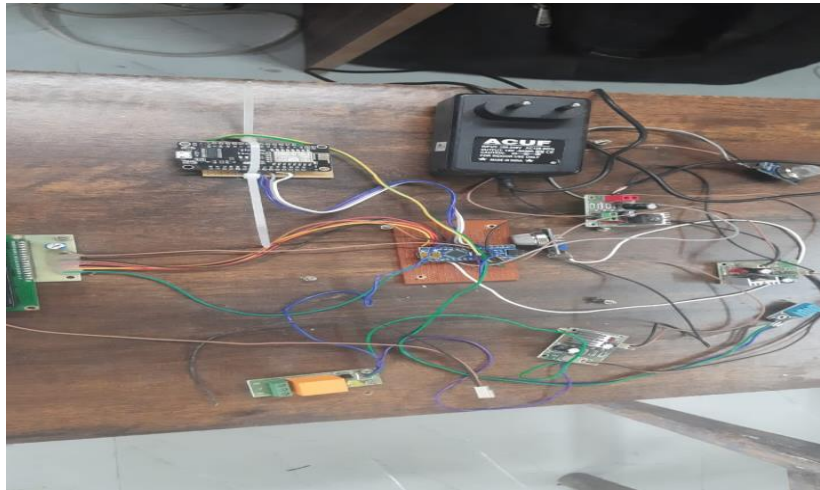


Fig:- Working model of Design And Fabrication of Industrial Air Pollution Controller By Smart ESP



Fig:- Block Diagram of the Proposed Air Pollution Measuring System

RESULT AND DISSCUSSION

The MQ135 sensr can sense CO₂ and some other gases, so it is perfect gas sensor for my Air Quality Monitoring Detection System Project. When I connect it to Arduino then it senses the gases, and I get the Pollution level in PPM (parts per million). MQ135 gas sensor gives the output in form of voltage levels and I need to convert it into PPM [15]. So for converting the output in PPM. Sensor is giving me value of 0.1 when there was no gas near it and the safe level of air quality is 0.5 PPM and it is not exceeding 0.5 PPM. When it exceeds the limit of 0.5 PPM, then it starts cause Headaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond PPM then it can cause increased heart rate and many other diseases. When the value less than 0.5 PPM, then the LCD and webpage will display “Fresh Air”Whenever the value increase 0.5 PPM, then the LCD and webpage will display “Poor Air, Open Windows”. If it increases 1 PPM, then the buzzer keeps beeping and the LCD and webpage will display “Danger! Move to fresh Air”.

Mathematical Analysis of Proposed Model

The level concentration of pollutants in the air is measured in parts per million (ppm) or percentage.

Conversion factors include the following:

$$1 \text{ ppm} = 1.145 \text{ mg/m}^3$$

$$1 \text{ mg/m}^3 = 0.873 \text{ ppm}$$

$$1\% = 1/100$$

$$1 \text{ ppm} = 1/1000000$$

1 ppm = 0.0001%

Table shows PPM to percentage conversion.

Table PPM to Percentage conversion

Parts per Million (ppm)	Percent (%)
0	0
5	0.005
50	0.005
500	0.05
1000	0.1

CONCLUSION

The system to monitor the air of environment using Arduino microcontroller, IoT Technology is proposed to improve quality of air. With the use of IoT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this paper. Here, using the MQ135 gives the sense of different type of dangerous gas and Arduino is the heart of this project. Which control the entire process, Arduino module connects the whole process to LCD and serial monitor is used for the visual Output.

The authors gracefully acknowledge Prof. Aman Dhanvijay for their guidance, support and direction.

Advantages

- 1.Portability:** - It is a compact device which consists of many sensors including cloud which are all combined by using internet of things (IoT).
- 2.Safety:** - One can avoid from going to particular location by redirecting themselves or by taking safety protections such as wearing mask and can reduce over dumped wastages in a particular locality area [4].
- 3.Cost:** - Compared to others it's efficient and low cost because sensor is clubbed by using internet of things (IoT) and Arduino microcontroller.

Application

1. Indoor air quality monitoring.
2. Industrial perimeter monitoring.
3. Roadside pollution monitoring.
4. To make this data available to common man.

ACKNOWLEDGMENT

The authors gracefully acknowledge Prof. Aman Dhanvijay for their guidance, support and direction.

REFERENCES

- [1] Ch.V.Saikumar, M.Reji, P.C.Kishoreraja, "IoT Based Air Quality Monitoring System", International Journal on Information Theory (IJIT), Vol-117, No.-9, 2017;
- [2] Riteeka Nayak, Malaya Ranjan Panigrahy, Vivek Kumar Rai and T Appa Rao "IoT based air pollution monitoring system", International Journal on Information Theory (IJIT) Vol-3, Issue-4, 2017;
- [3] Poonam Pal, Ritik Gupta, Sanjana Tiwari, Ashutosh Sharma, "Air Pollution System Using Arduino", International Journal on Information Theory (IJIT), Vol-04, Issue-10, 2017;
- [4] D.Arunkumar, K.Ajaykanth, M.Ajithkannan, M.Sivasubramanian, "Smart Air Pollution Detection And Monitoring Using IoT", International Journal on Information Theory (IJIT) Vol-119, No.-15, 2018;
- [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;