



# AN IOT BASED AIR POLLUTION MONITORING SYSTEM

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## **Abstract:**

In India, air pollution is increasing day by day at the rate. The major reasons for increasing in pollution level are crops remain burnt, smoke from the motor vehicle, open defecation of smoke in atmosphere from the industries and burning the garbage openly. Internet of Things (IoT) based pollution system mainly issued to detect the current level of harmful gases in the atmosphere. In our day to day lives the quality of air determines the most because every living organism needs fresh air to live. This IoT based pollution monitoring system will help us to collect the data from any of the location where device is being installed. All the data will be visible in the smart phone app. In this project we have used the mobile application called Blynk. By the concept of IoT we can use various pollution devices at different locations and get the data to the smartphone through the app.

**Keywords:** Internet of Things (IoT), Gas sensor, Smoke sensor, Humidity sensor, Arduino Uno, Blynk Smartphone app

## **1.Introduction:**

Air pollution occurs when harmful or excessive quantities of substances including gases, particulates, and biological molecules are introduced into earth's atmosphere. It may cause diseases, allergies and also death of humans, it may also cause some harmful reaction to other organisms such as animals and food crops and may destruct the natural environment. Human activities and natural phenomena can both generate air pollution in the environment. Basically, there are two types of air pollution exists; visible air pollution and invisible air pollution. The existence of all things living is due to the combination of gases that together form the atmosphere; the imbalance caused by the sudden increase or decrease in the percentage of these gases can be hazardous for survival. The ozone layer considered as the vital one for the existence of the ecosystems on the planet which is depleting due to increased pollution. This project provides a combination of process of sensing several gas levels in the air and also the ambient temperature and humidity, thus sensing the quality of the air. The levels of the gases and the temperature is displayed in a LCD display panel, which continuously shows the real time output values of the gas sensors, temperature and humidity sensor.

## 2.Objectives:

The project is an implementation of IoT (Internet of Things) Based Air Pollution Monitoring System Using Arduino. Air pollution is a growing issue and it is necessary to monitor air quality for a better future and healthy living for all. IoT is getting popular day-by-day and standards are on its way. Therefore, collection of air quality information is easier. Analysis of monitoring data allows us to assess how bad air pollution from day to day. Industrial operatives use air quality monitoring apparatus to cost effectively monitor and manage emanations on their perimeter, which helps them recover relationships with controllers and communities. Sensor based tools and air quality monitoring systems are used widely in outdoor ambient claims.

## 3.Methodology:

Air pollution monitoring system which can be installed in a specific locality and to enhance the system from the previously developed systems beating the earlier disadvantages by developing an android app available for the public. It uses Arduino integrated with individual gas sensors like carbon monoxide, ammonia along with particulate matter, humidity, and smoke which measures the concentration of each gas separately. The air quality index value is calculated and the nature of the air quality in that area is determined which is also displayed through the app. The users will not get disturbed with irrelevant data as the values displayed are location specific and help them stay tuned to the current status of air pollution.

It uses various sensors like gas sensor, humidity sensor, temperature sensor for monitoring the pollution in the particular area. The MQ-135 is used to measure air quality. The MQ series of gas sensors use a small heater inside with an electrochemical sensor. They are sensitive to a range of gasses and are used indoors at room temperature. The MQ-135 alcohol sensor consists of a tin dioxide (SnO<sub>2</sub>), a perspective layer inside aluminum oxide micro tubes and a heating element inside a tubular casing.

The MQ135 sensor can sense NH<sub>3</sub>, NO<sub>x</sub>, alcohol, Benzene, smoke, CO<sub>2</sub> and some other gases, so it is perfect gas sensor for Air Quality Monitoring Project. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million). The sensor MQ135 gas sensor gives the output in form of voltage levels and we need to convert it into PPM. Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. When the value will be less than 1000 PPM, then the LCD and webpage will display "Fresh Air". Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display "Poor Air, Open Windows". If it will increase 2000 then the buzzer will keep beeping and the LCD and webpage will display "Danger! Move to fresh Air". The other sensors like Temperature sensor LM35 and Humidity sensor SY-H5220 will analyse the level of temperature in the environment and moist present in the environment.

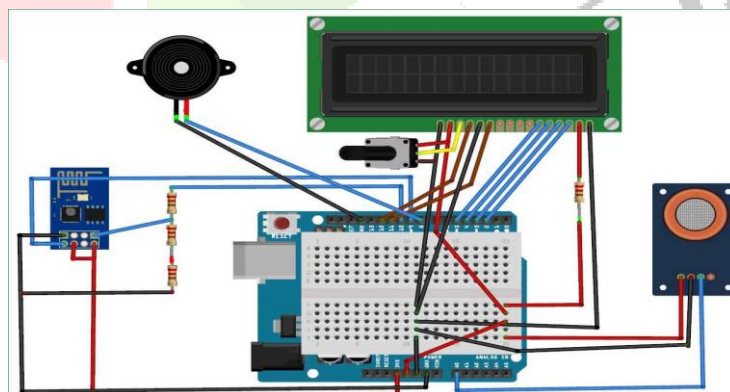
Blykk application is the most unique application which is designed to monitor the hardware components present in the project. Once the blyk application is installed the user can create a dashboard and arrange buttons sliders and graph on the screen. The users will get display of information about the quality of air through this application.

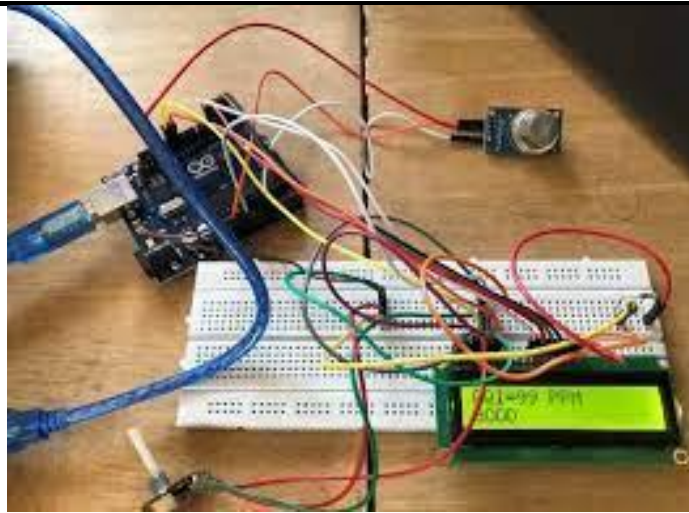


#### **4.Implementation:**

First of all we will connect the ESP8266 with the Arduino. ESP8266 runs on 3.3V and if you will give it 5V from the Arduino then it won't work properly and it may get damage. Connect the VCC and the CH\_PD to the 3.3V pin of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by connecting three resistors in series like we did in the circuit. Connect the TX pin of the ESP8266 to the pin 10 of the Arduino and the RX pin of the esp8266 to the pin 9 of Arduino through the resistors.ESP8266 Wi-Fi module gives your projects access to Wi-Fi or internet. It is a very cheap device and make your projects very powerful. It can communicate with any microcontroller and it is the most leading devices in the IOT platform. Learn more about using ESP8266 with Arduino here.

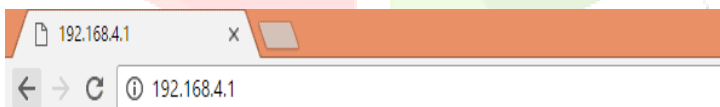
Then we will connect the MQ135 sensor with the Arduino. Connect the VCC and the ground pin of the sensor to the 5V and ground of the Arduino and the Analog pin of sensor to the A0 of the Arduino. Connect a buzzer to the pin 8 of the Arduino which will start to beep when the condition becomes true. In last, we will connect LCD with the Arduino. Before beginning the coding for this project, we need to first Calibrate the MQ135 Gas sensor. There are lots of calculations involved in converting the output of sensor into PPM value.





### 5.Output:

```
COM3 (Arduino/Genuino Uno)
OK
bBÖ†@eRcâüR%,#'BiyĒĒŲŲiyÁIO
[System Ready, Vendor:www.ai-thinker.com]
AT+CWMODE=2
no change
AT+CIFSR
192.168.4.1
OK
AT+CIPMUX=1
OK
AT+CIPSERVER=1,80
OK
```



## IOT Air Pollution Monitoring System

Air Quality is 977 PPM

Good Air



## **6.Conclusion:**

The IoT based air pollution system is the better method to measure the air quality in both outdoors and indoors. This device can be useful to measure the level and capacity of gases in a highly dense area like markets hospitals, railway station, bus stand, schools and colleges from the mobile app and webpage. If data is stored, we can use the data for further experimental purpose which can conclude to accurate and significant result. This system is IoT based so it can be used in the smart home for the purpose of cooling, ventilation and other purposes. IoT will enhance the artificial intelligence in the world, so the system can be used in automated systems in factories and industries. These systems can become very helpful for the society as the respiratory health issues are increasing day by day. Due to their high sensitivity these systems can be used in chemical industries. These can be also used by defence agencies to detect any chemical attack. The efficiency of these instruments can be increase by attaching the number of sensor to it. Due to the compatibility to multiple sensors the use of system will be also increased. In metropolitan cities system can be fitted on the top of the traffic signals due to their compact design. A number of systems can be operated from one controlling device, without any special arrangement.

## 7.References:

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