## **IOT Based Air quality Monitoring**

## **PROBLEM DEFINITION:**

- Air pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all.
- The AQI is an index that tells you how clean or polluted your air is, and what associated health effects might be a concern for you.
- The level of pollution has increased with times by a lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on humans by directly affecting the health of the population exposed to it.
- So, we need to monitor the Air Quality Index. In this project, we are going to make an IoT Based Air Quality Index Monitoring System in which we will monitor the Air Quality Index over a Thingspeak server using the internet.
- We will use MQ135 Air Quality Sensor that can detect the level of various air pollutant.
- The sensors interact with micro controller which processes this data and transmits it over internet. This allows authorities to monitor air pollution in different areas and take action against it.

#### → Objectives of Air Quality Monitoring

→ The major objectives for air quality monitoring are as below:

## (i) Background Data

In order to generate background data, air quality monitoring is conducted to assess existing level of contamination and to asses possible effects of air contamination occurring in future.

### (ii) Status and Trend Evaluation

The objective is to determine air pollution status and trend information from any continuous air quality monitoring programme. The information is used to determine, whether pollution control strategies as advised by implementing authority are giving acceptable values that is lowering of pollution levels or new or additional control are required to achieve acceptable levels.

#### (iii) Environment Exposure Level Determination

The air quality monitoring and survey concern itself with systematic study of considerable segment of environment to define

inter-relationship of source of pollution, atmospheric parameter and measurable manifestations in order to evaluate the character and magnitude of existing problem.

#### (iv) Scavenging Behaviour of Environment

To understand natural scavenging or cleansing process undergoing in the environment through pollution dilution, dispersion, wind movement, dry deposition, precipitation and chemical transformation of pollutants generated

### (v) Air Quality Management

To assess the present status to judge effectiveness of air pollution contr

### **DESIGN THINKING:**

- 1. The sensors in the system can be calibrated more so that we can get more accurate and get data for more harmful gasses such as Ammonia, oxides of nitrogen, etc.
- Our work can demonstrate vast opportunities to work on the device, on the app and also
  on the field using the device that we have worked with the device can be used any time
  efficiently in different locations of a city and then research with the achieved data for that
  particular area in that city.

## **Design to Innovation:**

#### 1. Personal Design:

To measure the quality of air that is present in atmosphere and can maintain the limited content of air quality and take measures regarding the levels of quality.

The air quality is reported based on the Air Pollution Index (API) computed from five criteria parameters, namely, PM10, carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide.



#### **Description**:

The level of pollution has increased with times by a lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on humans by directly affecting the health of the population exposed to it. So, we need to monitor the Air Quality Index. In this project, we are going to make an IoT Based Air Quality Index Monitoring System in which we will monitor the Air Quality Index over a Thingspeak server using the internet. We will use MQ135 Air Quality Sensor that can detect the level of various air pollutant.

To make this project more advanced you can add PM5003 PM2.5 Particulate Matter Sensor to this project. The detail of this project can found here: IoT Based PM2.5 & PM10 Air Quality Monitoring with ESP8266

## **Air Quality Index:**

The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air.

EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country.

To support reducing air pollution levels and to protect populations from health risks, WHO's Air Quality and Health Unit works in three cross-cutting areas:

- 1. knowledge, evidence and measuring progress
- 2. institutional capacity building and technical support
- 3. leadership and coordination.

	US AQI Level	PM2.5 (μg/m³)	Health Recommendation (for 24 hour exposure)
	Good 0-50	0-12.0	Air quality is satisfactory and poses little or no risk.
-	Moderate 51-100	12.1-35.4	Sensitive individuals should avoid outdoor activity as they may experience respiratory symptoms.
	Unhealthy for Sensitive 101-150 Groups	35.5-55.4	General public and sensitive individuals in particular are at risk to experience irritation and respiratory problems.
	Unhealthy 151-200	55.5-150.4	Increased likelihood of adverse effects and aggravation to the heart and lungs among general public.
	Very Unhealthy <sup>201-300</sup>	150.5-250.4	General public will be noticeably affected. Sensitive groups should restrict outdoor activities.
	Hazardous 301+	250.5+	General public at high risk of experiencing strong irritations and adverse health effects. Should avoid outdoor activities.

## **Components:**

- → NodeMCU ESP8266
- → 0.96" I2C OLED Display
- → Connecting Wires
- → Breadboard
- → MQ-135 Air Quality Sensor

## Working model:

IOT Based Air Pollution Monitoring System monitors the Air quality over a web server using Internet and will trigger an alarm when the air quality goes down beyond a certain threshold level, means when there are sufficient amount of harmful gases present in the air like CO2, smoke, alcohol, benzene, NH3, LPG and NOx.

## **Steps involved in Air Testing Service:**

Collecting air samples from the site. Battery operated instruments for real-time measurements of Temperature, Humidity, Wind direction, Wind speed, PM2. 5, PM10, CO, CO2, NOx, etc. Monitoring human exposure to harmful pollutants.

# **Testings & Results**

Once the code is uploaded you can open serial monitor. The Nodemcu will first start connecting to wifi network. All the happening can se observed on Serial Monitor.