**ANIRUDH S**

**EE18B073**

**INDIAN** **air quality index:**

Indian National Air Quality Standards (INAQS) considers 12 parameters:

1) carbon monoxide (CO) 2)nitrogen dioxide (NO2 ) 3)sulphur dioxide (SO2)

4) Particulate matter (PM) of less than 2.5 microns size (PM2.5) 5) PM of less than 10 microns size (PM10)

6) Ozone (O3 7) Lead (Pb) 8) Ammonia (NH3)

9) Benzo(a)Pyrene (BaP) 10)Benzene (C6 H6 ) 11)Arsenic (As) 12)and Nickel (Ni)]

The first eight parameters have short-term (1/8/24 hrs) and annual standards (except for CO and O3) and rest four parameters have only annual standards.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pollutant** | **SO2** | **NO2** | **PM2.5** | **PM10** | **O3** | **CO (mg/m3 )** | **Pb** | **NH3** |
| **Averaging time (hr)** | 24 | 24 | 24 | 24 | 1 8 | 1 8 | 24 | 24 |
| **Standard(ug/m3)** | 80 | 80 | 60 | 100 | 180 100 | 4 2 | 1 | 400 |

The permissible levels based on concentration levels:

The obtained values of concentrations are converted into particular numbers by multiplying by weighted means.

|  |  |
| --- | --- |
| **AQI category** | **AQI range** |
| Good | 0-50 |
| Satisfactory | 51-100 |
| Moderately-polluted | 101-200 |
| Poor | 201-300 |
| Very poor | 301-400 |
| Severe | 401-500 |

**AIR QUALITY MONITORING:**

1. **Online Monitoring network**:

These are automated air quality monitoring stations which record continuous hourly, monthly or annually averaged data. In India, ~ **40** automatic monitoring stations are operated where parameters like PM10, PM2.5, NO2 , SO2 , CO, O3 , etc. are monitored continuously. Data from these stations are available almost in real-time. Thus such networks are most suitable for computation of AQI sub-indices, as information on AQI can be generated in real time. For AQI to be more useful and effective, there is a need to set up more online monitoring stations for continuous and easy availability of air quality data for computation of AQI for more Indian cities.

**Manual Monitoring network:** The manual stations involve mostly intermittent air quality data collection, thus such stations are not suitable for AQI calculation particularly for its quick dissemination. In India, air quality is being monitored manually at **573** locations under National Air Monitoring Programme (NAMP). In most of these manually operated stations, only three criteria pollutants viz. PM10, sulphur dioxide (SO2 ) and nitrogen dioxide (NO2 ) are measured, at some stations PM2.5 and Pb are also measured. The monitoring frequency is twice a week. Such manual networks are not suitable for computing AQI, as availability of monitored data could have a lag of 1-3 days and sometimes not available at all. However, some efforts are required to use the information in some productive manner.

SENSORS USED TO MEASURE DIFFERENT GASES:

**Measuring using co2 sensor**:

Our CO2 sensors measure the CO2 concentration by means of non-dispersive infrared technology (NDIR) that ensures longer service life and maximum accuracy compared to chemical sensors. So they enable extremely energy and cost-saving ventilation on an as-needed basis for room climate being as draught-free and non-tiring as possible.

TELAIRE T6613/6615 CO2 SENSORS

SITE: AAS-T63172-003-091614-web.pdf

Average current :35 Ma

Average duration :6 months and avg 5hrs per day

Battery capacity required: 28-30 mah

MQ 131 is very similar to MQ7 and it requires two voltage inputs of Vh(5 V ac or dc +- 0.1v).) and Vc(5 V dc +- 0.1v). It will require a battery of about 20-25mah

**Link of website used**:

<https://www.spec-sensors.com/product-category/digital-gas-sensors-iot/>

<https://www.sensorsmag.com/components/particulate-matter-sensing-for-air-quality-measurements>

**Measuring co:**

1)

We can add Carbon Monoxide sensing to our IoT application with our digital CO sensor module that provides a calibrated and temperature compensated output. Our range of intrsests is around 10-200 ppm.It is dangerous if we are exposed to more than 100ppm.

0 to 1000 ppm Carbon Monoxide sensor with digital output Using this sensors.

Cost:$75.0

Sensor number: Sku: 968-034

Power consumption:

1 mW for 1 minute triggered samples

12 mW for continuous sampling 5, 10 30, 60 second intervals

2)

Instead we can also opt for cheaper sensors which would measure at lesser range and lower accuracy.one such sensor is MQ7.It works based on HMOS(hot metal oxide sensor). A hot metal oxide is heated till it becomes sensitive to ozone gas. Resistance changes according to concentration of ozone .

Cost: RS 200-300

* Advantages of using such a sensor is that 1) it has long life 2)Apt for ambient and portable ozone monitoring
* Few disadvantages include 1)high power consumption 2)Heating required

Voltage sources: Two 5v batteries

Resistance: average 10k ohms

Average current: 500Ma

Battery capacity reqd: 450 mah

Power consumption: About 350mW

**Measuring NO2,SO2,O3,H2S,ETOH,**:

ULPSM (ultra low powered sensor meters )NO2 sensors are used.

It has very low power consumption and a simple analog sensor signal output. The ULPSMconverts the sensors linear current signal output to a linear voltage signal , while maintaining the sensor at its ideal biased operation settings.

Spec sensors:

1. Sku: 968-047(NO2 alone)
2. sku: 968-045(costly, but measures all the above mentioned gases)

Cost: Rs 3000 (approx.)

Average current in the circuit: (10-20) Ma

Average time :180\*5 hrs

Battery capacity reqd: 10-20 mah

**Contents Includes:**

* **Digital Gas Sensor platform**
* **One sample of every SPEC Sensor – including NEW O3 and NO2 sensors!**
* **UART to USB Adapter**
* **Link to Setup and logging Utility**
* **Link to full design documentation**
  + **Parts List (BOM)**
  + **Gerber/Design files**

**Components Used in Design:**

* **Texas Instruments LMP91000**
* **Microchip PIC24F16**
* **SiLabs SI7021**
* **MicroChip MCP604**
* **Intersil ISD60002**

**Easily add any SPEC Sensor to your design with our Digital Gas Sensor Developer Kit.**

**MEASURING PARTICULATE MATTER**:

# Particulate Matter Sensor SPS30

COMPANY: SENSIRION

LINK : <https://www.sensirion.com/en/environmental-sensors/particulate-matter-sensors-pm25/>

Cost: $ 50(approx.)

This sensor has a sensitivity of 10ug/m3 .Its measurement principle is based on laser scattering .This enables accurate measurements throughout its lifetime Average lifetime is about eight years . Its small and easily portable and very much suited for compact devices used for measuring air quality.

Supply voltage:4-5 V

Avg supply current: 16 ma

Avg running time:180\*5 hrs

Battery reqd: 14400 mah