# Smart IOT based Pollution Forecasting (PM2.5) System for Smart City

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***Abstract*- Today air pollution has arisen as a global public health problem and is identied as a major environmental health hazard by agencies such as the World Health Organization (WHO) . An increase in the concentration of pollutants-both gaseous and solid-is among the largest health risk in the world. Air pollution is responsible for 55 lakh deaths of people every year all over the world. Air pollution is the fourth main reason for large numbers of death and causing respiratory diseases all over the world. Recently, air pollution acquired critical dimensions and the air quality in the most cities that monitor outdoor pollution fail to meet WHO guidelines for safe level. The levels of PM2.5 and PM10 (Air-born particles smaller than 2.5 micrometers in diameter and 10 micrometers in the diameter). In existing system when device detect PM2.5 particle at that time device causes jam because this device totally depend on hardware in that pipe and filter papers are used to calculate how many particle was obtain for particular time. This system cannot work automatically. To overcome this problem in our project we have try to solve the real time problem In this we are using the sensor like MISC6814, MCM811,PM2.5 and used the AWS Cloud for data storage purpose, ESP32Microcontroller, OLED Display and power supply using that detects harmful gaseous and update on webapp also alert to the people.**

**Index Terms- MISC6814, MCM811, PM2.5, AWS Cloud, ESP32, OLED Display**

## I. INTRODUCTION

Today Air pollution is an environment problem not just real time problem but it automatically improved in all over world. Multiple factors contribute or support to the air pollution like smoke, fog, smoke are generating from the vehicles and industrial as well as the dust particle SO2,CO2,PM25 are the major components. Which are helps to making our pplution particular matter is the 30time less than the human hair so for that we use electronic microscope.it is very small particle that may be in air pollution present solid or liquid form[1]. In air pollution monitoring main advantage of IOT implementation is cost effective hardware in that main component of pollution is a pollutant sensor (PM2.5) and ESP32 controllers, MISC6814, MG811, AWS Cloud for detecting harmful particles [2]. Pollution level increasing day by day also increases the level of harmful gases. it affects on atmosphere in number of ways like global warming, acid rains and climate change. This level harmful to human, animals and plants. According to our survey environmental protection agency (EPA) six common air pollutants are obtained that is Ozone, Sulphar Oxides, Carbon monoxides, Nitrogen oxides, lead and Particulate matter. All these pollutants are harmful to human being and the environment [3]

## II. LITERATURE SURVEY

System contains the date and time when it detect high level pollutants or gases also provide the warning messages is based on google, minimum limit for Email messages, 2000 Emails per day send and received into 24 hrs period of time. this limit useful applicable in Web Browser or Mobile App[1]. We are think about the air pollution data how to show in creative and attractive way .People can not waste its valuable time to read the 100 pages of about system so for that deploy a screen that display the updation of pollution, in the form of graph and animation[2]. We have visit to the Maharashtra Pollution Control Board in Nashik and survey about the in that we observe and give information related to the pollution control so in this experts said to us when detect PM2.5 particle that time device jam because this device totally depend on hardware in that pipe and

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## III. EXISTING SYSTEM

The Existing System work manually hence they need special attention or in other words manual system require manpower to look after its efficient working. The drawback of these existing systems are focused on, and aimed to be overcome in our proposed system. In previous input as dust sensor and gas sensor used for processing values send to the Rpi and passed to Email as input so the output in existing only Email notification sent to the authorised person.
In existing detect pollution from vehicles is sensed by using MQ7 and for that use Arduino board

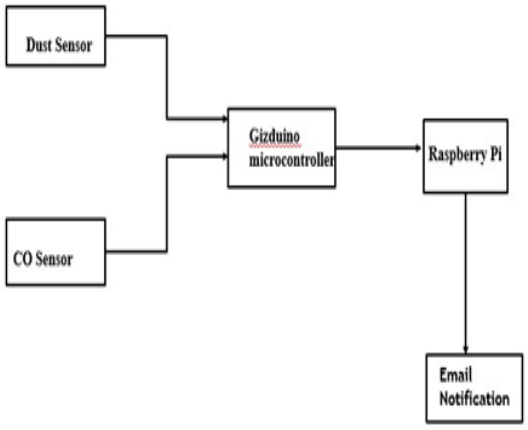



Figure 1:Existing System

## IV. PROPOSED SYSTEM

The main purpose of the project is to design IoT based pollution forecasting (PM2.5) alerting system. The hazardous gases like CO, CO2 and PM2.5, MOX, TVOC air pollutants were sensed and displayed each and every second on the system. If these gases exceed the high level then an alert is generated immediately and also an alert message is sent to the authorized person
In this system hybrid application implement for showing the details related to changed in environment. API design in our system because live updation are showing to each and every user as individually.

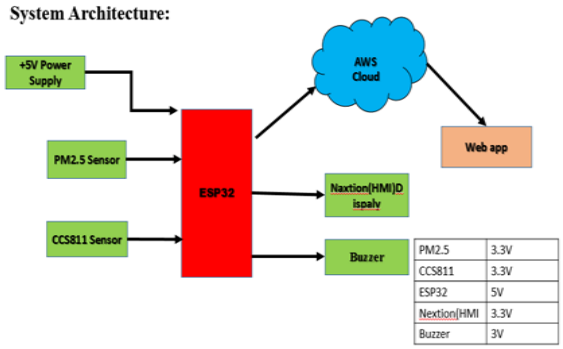
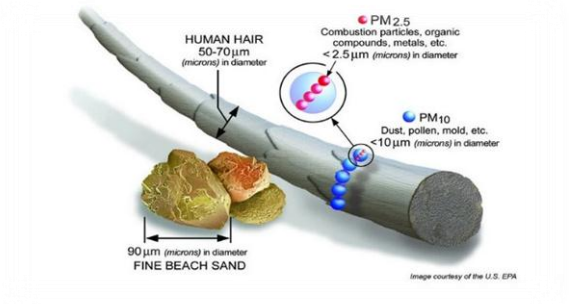



Figure2: Proposed System Architecture

1) PM 2.5:
particulate matter 2.5 (PM2.5), refers to tiny particles or droplets in the air that are two and one half microns or less in width. Like inches, meters and miles, a micron is a unit of measurement for distance. fine particulate matter (PM2.5), tend to penetrate into the gas exchange regions of the lung (alveolus), and very small particles (ultrafine particulate matter, PM0.1) may pass through the lungs to affect other organs. Penetration of particles is not wholly dependent on their size; shape and chemical composition also play a part




To avoid this complication, simple nomenclature is used to indicate the different degrees of relative penetration.. Inhalable particles penetrate no further than the bronchi as they are filtered out by the cilia. Thoracic particles can penetrate right into terminal bronchioles whereas PM0.1, which can penetrate to alveoli, the gas exchange area, and hence the circulatory system are termed respirable particles. In analogy, the inhalable dust fraction is the fraction of dust entering nose and mouth which may be deposited anywhere in the respiratory tract. The thoracic fraction is the fraction that enters the thorax and is deposited within the lung's airways. The respirable fraction is what is deposited in the gas exchange regions
2) ESP32:

Created by Espressif Systems, ESP32 is a low-cost, low-power system on a chip (SoC) series with Wi-Fi and dual-mode Bluetooth capabilities. The ESP32 family includes the chips ESP32-D0WDQ6 (and ESP32-D0WD), ESP32-D2WD, ESP32-S0WD, and the system in package (SiP) ESP32-PICO-D4. At its heart, there's a dual-core or single-core Tensilica Xtensa LX6 microprocessor with a clock rate of up to 240 MHz. ESP32 is highly integrated with built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. Engineered for mobile devices, wearable electronics, and IoT applications, ESP32 achieves ultra-low power consumption through power saving features including fine resolution clock gating, multiple power modes, and dynamic power scaling. The ESP32 Environment Sensor Shield provides sensors and hookups for monitoring environmental conditions. will show you how to connect your sensor suite to the Internet and post weather data online.

3) CCS811:

Breathe easy - we finally have an I2C VOC/eCO2 sensor in the Adafruit shop, Add air quality monitoring to your project and with an Adafruit CCS811 Air Quality Sensor Breakout. This sensor from AMS is a gas sensor that can detect a wide range of Volatile Organic Compounds (VOCs) and is intended for indoor air quality monitoring. When connected to your microcontroller (running our library code) it will return a Total Volatile Organic Compound (TVOC) reading and an equivalent carbon dioxide reading (eCO2) over I2C. There is also an onboard thermistor that can be used to calculate the local ambient temperature. The CCS811 has a 'standard' hot-plate MOX sensor, as well as a small microcontroller that controls power to the plate, reads the analog voltage, and provides an I2C interface to read from.

4)Nextion Display:

NEXTION is a Human Machine Interface HMI solution combining a TFT touch display with an onboard processor and memory, developing by a free and downloadable NEXTION Editor software. Using the NEXTION Editor software, you can quickly develop the HMI GUI by drag-and-drop components (graphics, text, button, slider etc.) and ASCII text based instructions for coding how components interact at display side. With just 2 wires (RX,TX), NEXTION display quickly connects to MCU via 5V TTL Serial to provide event notifications that MCU can act on, and utilizes simple ASCII text based instructions so the MCU can easily provide progress and status updates back

MIT App Inventor is an intuitive, visual programming environment that allows everyone even children to build fully functional apps for smartphones and tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilitates the creation of complex, to your HMI user. The Nextion display is the opposite. The display has its own microcontroller, memory, etc. and the arduino communicates with it through a serial interface. All of the buttons, text, gauges, etc. are prebuilt in the Nextion editor. The application doesnt know where they are on the screen. It just has a name such as button1 that is associated with a button on a particular screen for instance. The application just sends a command to the display to change the text of button1 to abcd. It would require a significant rewrite of the JackAl UI code to make it work with a Nextion display.high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

RESULT

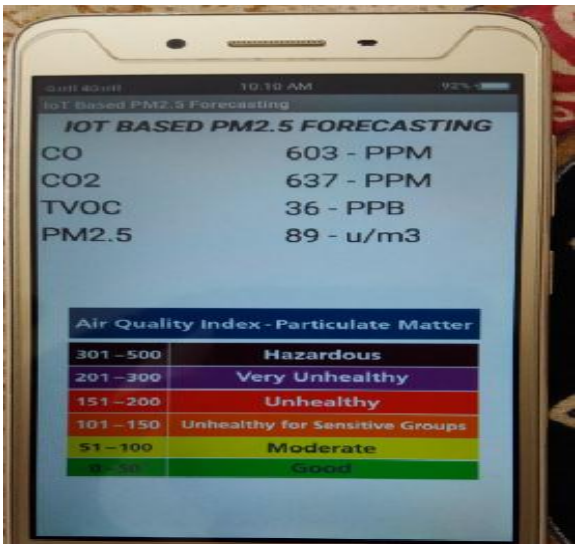



Figure3 :Android Application Photo

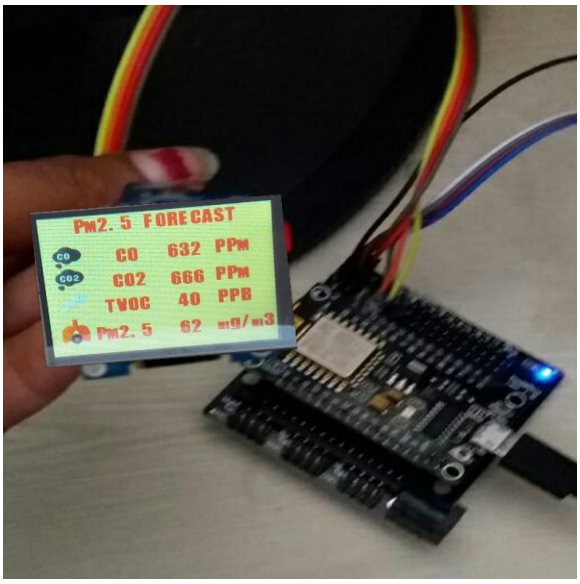


Figure 4: Internal Architecture

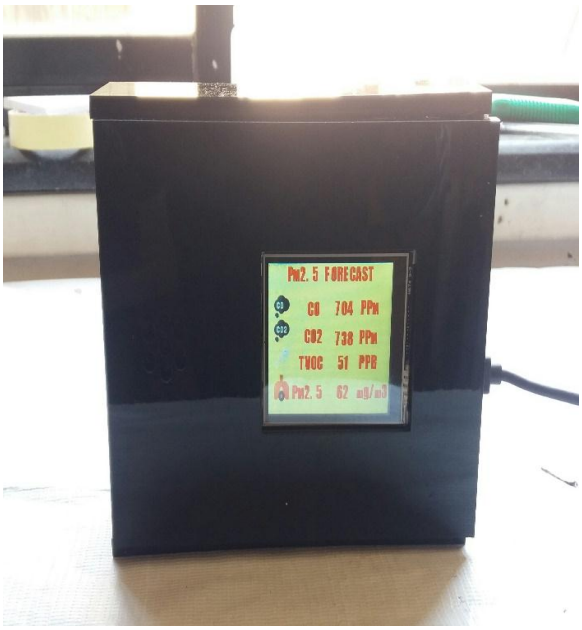


Figure5: Actual Device Photo

## V. CONCLUSIONS

This Proposed System introduces a Wireless Sensor Network (WSN) based air quality monitoring system using IOT central server and gases sensors. This Proposed System is also used for pollution monitoring purpose in cites. The Proposed system provides mechanism sending sensor data wirelessly. In this System provides IOT Based notification through Webapp, Email, API and also display live updating .If harmful gases detect then it will be provide alert to people, society using buzzer

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