# Air Quality Evaluator Using Micro Controller

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**Abstract: -** The aim of this study is to address Numerous factors, such as increased vehicle use, urbanization, industry, and population growth, have contributed to rising pollution levels over time. These factors all have an adverse effect on the health of people who are exposed to them, which has a detrimental effect on human well-being. It is recommended to use a wireless sensor network (WSN)-based system to gather and transport data to monitor air quality. The environment's parameters that need to be kept an eye on are temperature, humidity, CO and CO2 volumes, and the presence of any gas leaks (be it LPG, smoke, or alcohol). MQ135 is employed as an air quality pollution sensor, and its output, which is a variable DC voltage, varies in response to air pollution. For instance, higher levels of air pollution result in higher sensor output. The sensor's voltage generates a suitable AQI, which is then shown on the LCD.

***Keywords- Raspberry Pico,air evaluator,gas sensors,temperature.***

## I. INTRODUCTION

Air pollution refers to chemicals in the atmosphere that impact human health and the environment. Air pollutants include gases such as ammonia, carbon monoxide, sulfur dioxide, and methane. Smoke and other chemical vapors emitted by companies contribute significantly to air pollution. Air pollution can harm humans, animals, food crops, and the natural environment (e.g., climate change, ozone depletion, habitat degradation), as well as the built environment (e.g., acid rain). Both human activities and natural processes can cause air pollution. Air pollution poses a serious concern.
Maintaining proper air quality represents a global challenge for governments and communities. Global governments have invested billions of dollars to combat deteriorating air quality through regulation and solution strategies. Air pollution is caused. Particulate matter is emitted from industries, cars, machinery, waste recycling, industrial operations, and homes. Major pollutants include heavy metal dust, carbon monoxide, ozone, carbon dioxide, nitrogen dioxide, suspended particulate matter, hydrogen fluoride, sulfur oxides, and others.

It leads to numerous illnesses and fatalities among average people. In November 2017, Delhi's air pollution levels were as high as possible—many times higher. The air quality record spans from 0 to 50; nevertheless, over that time, the air quality index was 500 or higher. This talent is now known as the Incomparable Brown Haze of Delhi. Exposure to air that includes 500 or more pollutants might cause irreparable lung damage and other health issues. Appropriate measures must be implemented to avoid similar problems in the future. The internet, sensors, processors, and storage are key components of the Internet of Things (IoT).

## II. LITERATURE SURVEY

### 2.1AIR POLLUTION MONITORING SYSTEM USING ARDUINO WITH MQ135SENSOR:

Anand Kanti et al. Analyzing the data allows us to determine how awful the air pollution is on a daily basis.Air pollution has a negative influence on human health, ecosystems, and climate, making it a major environmental concern. Poor air quality in cities and metropolitan areas leads to increased disease occurrence.

### 2.2PROTOTYPE OF AIR QUALITY SENSOR FOR GAS POLLUTANTS MONITORING SYSTEM IN INDUSTRIL AND RESIDENTIAL ESTATES:

Enndi Chiu et al. The experiment, which involved displaying a table and graph for examination and summarization, was accomplished successfully. The measurement findings are then compared to the expected level of environmental air quality. As a result, typical industrial locations have ppm values of 30 ppm for CO2, 28.9 ppm for NH3, and 27.08 ppm of CO. The average CO2 concentration in a residential area is 21.32 ppm, 19.3 ppm for NH3, and 20.93 ppm for CO.

### 2.3 CLOUD -BASED AIR QUALITY MONITORING THROUGH WIRELESS SENSOR NETWORK USING NODEMCU:

This is implemented using a WIFI-enabled ESP8266 Node MCU microcontroller. It is connected to air quality monitoring sensors MQ135 and DHT11 (Humidity and Temperature), a geophone sensor to measure vibration levels in industrial settings, and a flame sensor to prevent fire accidents. The buzzer acts as an alerting mechanism.

### 2.4 Air Quality Monitoring Using Raspberry Pi

A prototype of an Environmental Air Pollution Monitoring System has been created to measure concentrations of main air pollutants. • The system utilizes low-cost air-quality monitoring.

The nodes consisted of a low-cost semiconductor gas sensor and a Wi-Fi module. This system uses semiconductor sensors to detect gas concentrations, including CO, CO2, SO2, and NO2.

### 2.5 AIR QUALITY MONITORING USING IOT:

Suresh Babu et al The purpose of this research was to create an Internet of Things-based air quality system to evaluate local air quality. The equipment monitors air rates for compounds like O3, SO2, CO, and particulate matter using sensors. View sensor information for the Arduino microcontroller. The data was sent to the cloud system and then accessed via an Arduino WIFI module.

### 2.6 IOT BASED SOUND AND AIR POLLUTION MONITORING SYSTEM:

Karthikeyan Sengunthar et al. This article proposes a wireless embedded computing system for monitoring noise and air pollution levels in industrial settings. The Internet of Things (IoT) is a technology developed by integrating computer science and electronics. In this scenario, sensors are attached to the embedded computing system to monitor deviations from average levels of parameters.

### 2.7 A COMPREHENSIVE REVIEW ON INDOOR AIR QUALITY MONITORING SYSTEMS FOR ENHANCED PUBLIC HEALTH:

Jagriti Saini et al This article explains how wireless technology can be used to build cyber-physical systems that can track activity in real time. This article analyzes the challenges of developing real-time monitoring systems and using microcontrollers in system architecture.

Additionally, this study provides researchers with new viewpoints and paths to investigate in the realm of IAQ monitoring.

### 2.8 LOW COST AIR QUALITY MONITORING SYSTEM USING LORA COMMUNICATION TECHNOLOGY:

The test results show that the system's architecture can read and report air pollution levels to the Thingspeak server. An interior gateway can reliably receive data from exterior sensor nodes up to 32 meters away.

### 2.9 AIR QUALITY MONITORING IN INDUSTRIAL ESTATE:

Filson M. Sidjabat et al. Due to a lack of trend in AAQ and meteorological data, this research could not appropriately estimate local air quality. To improve the JIE AAQM System, we evaluated AAQM and management in various industrial estates. The AAQ data can be analyzed using an open-air model.

### 2.10 REAL-TIME AIR QUALITY MONITORING SYSTEM USING MQ135 AND THINGSBOARD:

Shola Usha Rani et al. Real-time air quality monitoring necessitates a technological method. Manual sampling to monitor pollution levels is not practicable. As a result, an Internet of Things (IOT)-based solution that can be implemented in real time will accomplish the targeted goal.

## III. EXISTING SYSTEM

The air quality monitoring system uses Arduino Mega to improve safety. Minor eye irritation can cause users to lose concentration, leading to major mishaps. Where the dust sensor and temperature are capable of detecting cloudy days that trigger the buzzer.Air quality monitoring systems using microcontrollers use sensors and microcontrollers to measure pollutants such as particulate matter, gases (CO, NO2, SO2), and VOCs. These systems process sensor data and display it locally on an LCD or OLED screen. They can calculate air quality indices (AQI) and issue alarms via LEDs, buzzers, or wireless messages if air quality exceeds safe limits. Data can be saved locally or sent wirelessly to a cloud server for real-time monitoring and analysis. These systems are efficient, cost-effective, and adaptable to a variety of contexts, including urban, industrial, and isolated settings.

## IV. PROPOSED SYSTEM

Air pollution surveillance systems collect and record data on air quality in a specific area, which is then stored and accessible online. Parts-per-million measurements were utilized to quantify pollution levels, and the findings were analyzed in Microsoft Excel. The system successfully monitored air quality as predicted. The results were shown on the unique hardware's user interface and kept in the cloud, accessible via a smart phone.

## V. BLOCK DIAGRAM

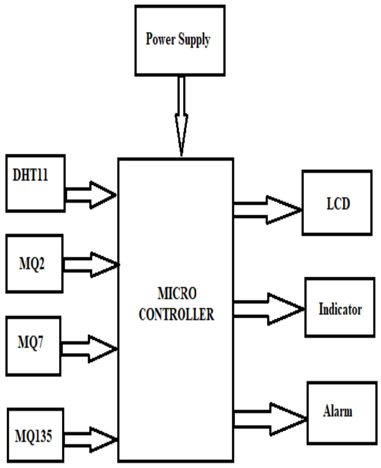


**Figure 1 Block Diagram**

The diagram illustrates a system designed for **environmental monitoring**. Here are the key components:

Input Devices:

**Microcontroller**:

### VI. HARDWARE DETAILS

**Power Supply**: This provides electrical energy to the entire system. It ensures that all components receive the necessary voltage and current to operate.

**DHT11 Sensor**: The DHT11 is a **temperature and humidity sensor**. It measures the ambient temperature and relative humidity in the air. This data is crucial for assessing comfort levels and detecting changes that could impact health or equipment.

**MQ2 Sensor**: The MQ2 is a **gas sensor** that detects various gases, including **LPG, propane, methane, hydrogen, and smoke**. It's commonly used for gas leak detection and fire prevention.

**MQ7 Sensor**: The MQ7 sensor specifically detects **carbon monoxide (CO)**. Elevated CO levels can be harmful to health, so monitoring it is essential.

**MQ135 Sensor**: The MQ135 sensor is used to detect various harmful gases, including **ammonia, carbon monoxide, and benzene**. It helps ensure air quality by alerting when pollutant levels rise, enabling timely action to protect health and the environment.

**LCD (Liquid Crystal Display)**: The LCD provides a visual interface for displaying information. In this context, it likely shows real-time data such as temperature, humidity, and gas levels.

**Indicator/Alarm**: An indicator or alarm is used to notify users when certain conditions are met.

### VII. DESCRIPTION OF SOFTWARE

The identification and detection of defects in industries utilizing a Raspberry Pi Pico bot combined with embedded C, MicroPython, and Arduino UNO provides a complete solution for real-time monitoring and analysis. Taking advantage of the Raspberry Pi Pico's microcontroller capabilities and compatibility with embedded C and MicroPython, the system can effectively process data from numerous sensors to detect anomalies and potential hazards in the air. Arduino UNO provides an additional platform for interacting with specialized sensors and actuators, increasing the system's adaptability.

This software solution provides enterprises with a cost-effective and adaptable method for defect diagnosis and detection. The identification and detection of problems in industries utilizing a Raspberry Pi Pico bot integrated with embedded C, MicroPython, and new sensors and functions as required. This technology, which can continually monitor temperature and gases, enables preventive maintenance strategies, optimizes productivity, and ensures that air monitoring runs smoothly.

### VIII. SIMULATION RESULT

In short, simulation results for an air quality evaluator system reveal details on its performance, such as accuracy, response time, and sensitivity to changes in pollutant concentrations. They evaluate how well the system analyzes data and calculates air quality indices, as well as how consistently it sends alarms as needed. Simulations also assess the effectiveness of wireless data transmission and power consumption, guaranteeing that the system is ready for real-world use. Finally, they assess the user interface's effectiveness and usefulness in efficiently displaying data to users.

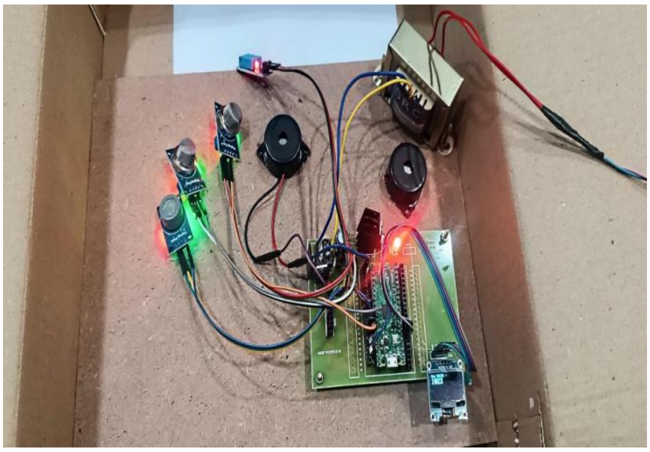

**Figure 2 Hardware**

## CONCLUSION

In conclusion, air quality evaluator systems using microcontrollers are effective tools for monitoring and assessing air pollution levels in various environments. They combine advanced sensors, data processing capabilities, and wireless communication to provide real-time insights into air quality. These systems help raise awareness of pollution levels and can trigger timely alerts when air quality deteriorates, aiding in health and safety decisions. Their affordability and adaptability make them suitable for use in a wide range of applications, from urban to industrial and remote areas. As technology advances, these systems will continue to play a vital role in promoting cleaner and safer environments for communities worldwide.

## Acknowledgment

We would like to convey our heartfelt gratitude to everyone who contributed to the successful implementation of the Air Quality Evaluator utilizing Micro Controller project. This attempt would not have been feasible without the dedication and experience of our team members, whose collective efforts resulted in the creation of unique defect detection technologies.

Our device performed admirably in keeping track of the sensors and indicating whether or not the fumes were toxic to us.

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