AIR POLLUTION: EFFECT ON HUMAN HEALTH AND LIVE REPORTING USING IOT TECHNOLOGY

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ABSTRACT

Air pollution is one of the significant reasons for disease, demise, and ailment across the world however the circumstance of air pollution in India is at its pinnacle. According to the recent survey, out of the list of 30 most polluted cities around the world, 21 are from India itself. It mirrors the plight of individuals living in the country who are compelled to breathe in the toxic gases regarding breathing air. It is stunning to realize that 140 million individuals of India inhale the air which is 10 times dirtier than the protected air limit endorsed by World Health Organization (WHO). Over half of pollution is delivered alone by the industries. [1] Our paper arrangements to distinguish the greatest contributors of air pollution and report it straightforwardly to the Central Pollution Control Board (CPCB). Till now the government has crude information about 51% of air pollution delivered by industries however, which industry is creating how much pollution is obscure. Our proposed work distinguishes the pollution created and the degree of pollution. If any industry is found producing above the threshold limit, those ventures are accounted for straightforwardly to the CPCB through IoT technology-based reporting system. We use the MQ7 sensor to identify the presence of carbon particles as the pollutants as they are the most abundant pollution-causing materials in the air. The framework is liberated from defilement and dependable for live revealing. We use Atmega 328P PU Microcontroller as the programmable smart device, MQ-7 as the pollution locator, ESP8266 based Internet of Things (IoT) as reporting framework, we even utilize Liquid Crystal Display (LCD) gadget to locally show the sensor readings.

Keywords: World Health Organisation (WHO), Central Pollution Control Board (CPCB), Atmega 328P PU Microcontroller ESP8266, Internet of Things (IoT), Liquid Crystal Display (LCD).

I. INTRODUCTION

Air pollution recently caused 16 lakh deaths in India as per the survey by news18. The infants are at the maximum risk due to air pollution. As per the State of Global Air (SOGA), if a person remains regular in contact with air pollution, it can be lethal and readily cause heart attack, lung disease, diabetes strokes, infections, and even cancer. The same report reveals the air pollution is the cause of largest risk factor of causalities and deaths across the country. Air pollution is identified as the biggest cause of infant deaths in India. [1]
The major cause of air pollution in India.

1. Industrial air pollution caused by chimneys

Petroleum refineries, steel plants, cement factories, stone crushers, food, and fertilizer industries cause at least five times air pollution than prescribed limits. The petroleum refinery installed in Mathura seriously cause a threat to the Taj Mahal. The air pollution produced by these industries causes the maximum damage. [4]

2. Automobile exhaust based air pollution

At present in India, the major transportation medium is fossil fuel-based transportation systems. Bus, Car, Train, Airplanes, Auto, Bike, Ship, etc. all are mostly diesel or petrol-based fuelled systems. Even though electrical vehicles are being promoted by the present government, still due to cost, feasibility, and efficiency negligible
number of electrical vehicles are on roads. The automobile also causes serious contributions towards air pollution in India. [4]

3. Agriculture waste burns

Agriculture is one of the most important occupations in India. Due to lack of awareness, instead of reusing the leftovers of crop yields, farmers burn them in fields. This causes a serious threat to the air quality index (AQI). The recent burning of stubble caused to reach 20 time’s higher value of AQI in Delhi and many other parts of the country than the safe value prescribed by WHO. There are several implications of rules and regulations on farmers about the safe handling of stubbles. [7]

II. LITERATURE SURVEY

[1]. Dr. B Annapurna et al. explained in their paper about the ongoing pollution produced by vehicles and their possible solutions based on sensors and IoT technology. Unlike our paper, their region of interest was on air pollution produced by vehicles. Automobile-based air pollution is also one of the major pollution causes in India due to the majority of vehicles being driven by fossil fuels. They explained that alone vehicle tailpipe emission nearly accounts for around 3,61,000 premature deaths. Their prime area of research comprised of finding the vehicle producing pollution more than permissible limits. Whenever the vehicle produced excess pollution than the threshold the system identified and reports to the RTO with all details of the vehicle. If the message is displayed on the RTO website repeatedly due to excess pollution, the vehicle owner is warned for the first time. This excess pollution identification can be of many reasons like due engine service, low quality or adulterated fuel, the engine getting old, etc. For minor issues offer servicing the sensor identifies the lower emission and stops updating the report but if the information about the same vehicle appears repeatedly then the vehicle is seized or heavily fined to save the environment against excessive pollution production. [8]

[2]. Goncalo Marques et al. researched in their paper about indoor air quality and how it helps for the enhanced living environment. They reviewed that people spend maximum time indoor, so the indoor air quality has a critical impact on the health of people. They used recent researches to identify which are the tools and techniques generally used to identify the air quality index values. The systems generally used microcontrollers for analysis purposes, sensors like O3 (Ozone), humidity, PM, CO2, Temperature, and light were popularly used. The most important communication unit was BLE, Wi-Fi, GSM, and 3G/4G. There is a data storage device to store all the obtained values. The analysis data is then provided for data consulting and notification over phones. A total analysis of five years is considered to reach the most accurate systems. They identified most systems only used the manual monitoring system but not the notification. We use this result to add notification as a must in our paper. [9]

[3]. Harsh N. Shah et al. explained another air pollution monitoring system that used MQ-135 based air quality sensor. The PPM values are calculated in the air to predict its purity level. The combined approach of air quality measurement and reporting using multiple sensor models and ESP8266 based Wi-Fi system is incorporated. MQ-135, LPG sensor, Humidity, and Temperature sensors are combined implemented for accurate reading of presence of pollutants in the air to predict the overall air quality in the paper. The ESP8266 based IoT system is used to update the information to the concerned dedicated page. The buzzer is used to alert the people once the dangerous limit of parts per million limits. This makes the overall system reliable and usable in real-time. The LCD is used to display the overall reading locally. [10]
III. OPERATION AND WORKING PRINCIPLE

In this framework, the idea is that the exhaust from vehicles can't be totally stopped away, yet it unquestionably is controllable for pollution emission. For that, we have planned an astounding system that can control the pollution coming out of faulty vehicles. The primary pollutants from vehicles are the oxides of carbon and nitrogen, which can be effortlessly identified these days with the assistance of semiconductor gas sensors. Subsequently, in this venture, we set up a system valuable in decreasing the measure of pollution from vehicles. The proposed programmable microcontroller utilizes IoT and Arduino interfacing with the MQ7 Carbon Monoxide Sensor. We deploy CO (MQ7) sensors to recognize the toxins. IoT innovation is utilized to update warning messages once the upper threshold in vehicles is reached on the RTO site to make an essential move against the vehicle delivering high pollution level.

3.1. Circuit Diagram

The circuit diagram represents the overall system connection and pin configurations. The components and their assembling with a line diagram are drawn in the figure. It represents the Atmega microcontroller as the central intelligence core and thinker of logic controls. The relay connection, IoT page, display, and sensing unit is well labelled and demonstrated in the circuit diagram.

3.2. Block Diagram

Block diagram represents the overall system functionality and working. The components and their schematics are drawn in the diagram. It represents the Atmega microcontroller as the brain of the overall functionality. The IoT updates on the page demonstrate the working of the reporting system as well.
3.3. Microcontroller Program

```c
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
int mq7=A0;
int buz=7;
int rel=6;
int a;
float p;

LiquidCrystal lcd(13, 12, 11, 10, 9, 8);
void setup()
{
  Serial.begin(9600);  // Initialise Serial Communication with the Serial Monitor
  pinMode(rel,OUTPUT);
  pinMode(buz,OUTPUT);
  digitalWrite(rel,LOW);
  digitalWrite(buz,LOW);
  lcd.begin(16,2);
  Serial.println("*");
  delay(500);
  Serial.println("VEHICLE POLLUTION MONITORING SYSTEM ACTIVATES AT ");
  delay(500);
  Serial.println("#");
  digitalWrite(rel,HIGH); //ENGINE ON
}
void loop()
{
  a=analogRead(mq7);
  lcd.setCursor(0,0);
  lcd.print("POLLUTION LEVEL");
  if(a<60)
  {
    p=0;
  }
```
```c
} else
{
  p=(a-35)/9.64;
}
lcd.setCursor(0,1);
lcd.print(" Value- ");
lcd.setCursor(8,1);
lcd.print(p);
//Serial.println(p);
lcd.setCursor(12,1);
lcd.print("%");
if(p>=25)// threshold value
{
  Serial.println("Dangerous Air");
digitalWrite(buz,HIGH);
lcd.setCursor(0,0);
lcd.print("HEAVY POLLUTION");
lcd.setCursor(0,1);
lcd.print("DETECTED WARNING");
delay(500);
Serial.println("*");
delay(500);
Serial.println("WARNING !! HEAVY POLLUTION DETECTED !! ");
delay(500);
Serial.println("#");
delay(500);
Serial.println("*");
delay(500);
Serial.println("VEHICLE NO - PY01 BB 4006 OWNER NAME – Mr. R.K Singh ");
delay(500);
Serial.println("#");
delay(500);
Serial.println("*");
delay(500);
Serial.println("M NO - 9751503097 PLEASE TAKE IMMEDIATE ACTION ");
delay(500);
Serial.println("#");
delay(500);
lcd.setCursor(0,0);
lcd.print("ENGINE OFF IN --");
lcd.setCursor(0,1);
lcd.print("---2 MINUTES----");
delay(120000);
digitalWrite(rel,LOW);//ENGINE OFF
digitalWrite(buz,LOW);//BUZZER OFF
lcd.setCursor(0,0);
lcd.print("ENGINE STATUS--");
lcd.setCursor(0,1);
lcd.print("--IGNITION OFF--");
delay(3000);

lcd.setCursor(0,0);
lcd.print("COMPLAINT SENT 2");
lcd.setCursor(0,1);
lcd.print("---RTO OFFICE---");
delay(3000);
```

3.4. System Development and Implementation

![Development and Implementation System](image)

Figure 7. Development and Implementation System

3.5. Major Advantages

- Directly Implementable System (Real-time Approach)
- Total Hardware based system no need of any laptop or PC
- High Reliability and Real-time Detection
- An idle system for commercial implementation

IV. DISCUSSION AND CONCLUSION
In this manner, we built up a system that mostly centres around two tasks. The first is we built up an embedded system to identify the pollution limit which afterward control pollution exiting out from the vehicles. In this system, we utilized Atmega 328 P PU Microcontroller, CO MQ7 sensor for identifying the toxins. The system is tried in different ecological conditions. Thus, our installed system will be profoundly valuable in controlling this issue. The sensor and system planned during the interaction are feasible to be carried out progressively. The principal piece of the system is the Atmega328P Microcontroller which is planned by simple installed C programming. The detecting unit is the carbon dioxide, methane, butane, and petroleum unit while the correspondence unit is the IOT web system. This makes the system reachable throughout the world. Future enhancement can be helpful in reducing the pollution automatically thus making the environment pollution-free.

REFERENCES