In today's society, pollution is an ever-present environmental problem. Because automobile emissions are the leading cause of pollution, this approach can be viewed as a preventative measure. The goal of the module is to introduce a vehicle pollution monitoring system based on the Internet of Things (IoT). The sensors attached with the Arduino Uno monitors the level of pollutants from the vehicle exhaust. If the sensed value goes beyond the program's set value, which is the threshold value, an alert message will be issued to the car owner two or three times as a warning, and if they refuse to repair it, the message will be submitted to the authorities. Finally, the data is saved in the cloud for future study. The major goal is to create an innovative and time-saving method that will help to solve environmental pollution.

**Keywords**—Vehicle Emission Control, Engine Heat Monitoring, IoT, GPS Module, ARDUINO UNO, Microcontroller, Pollution Control.

## I. INTRODUCTION

Ecological contamination within the country has been a solemn problem of the current century. The primary source of contamination in India is because of car motors. Authorities of India made many guidelines to control ecological contamination triggered because of vehicle discharge, but most of them turn to be abortive. Government of India introduced a method referred to as Bharat stage Emission fashionable (BSES) to normalize the air pollution from motor cars. Since 2010 the people of India were using the Bs four engines in their automobiles. To speed up the green ingenuity, authorities made order to transport from bs-four to bs-6 in 2020. The Indian pollutants manipulate board has made fc (fitness certificates) and pollution below manage certificate is compulsory for business and public motors to reduce air pollutants. Carbon monoxide, hydrocarbon and nitrogen oxides are the gases discharged from the exhaust.

Carbon monoxide lowers blood’s ability to transport oxygen, and hydrocarbons in the atmosphere have an impact on the heart, brain, kidneys, and bone marrow. Nitrogen oxide irritates the lungs, resulting in respiratory problems. It's tough to evaluate each and every vehicle independently during a time of urbanization due to the fast rise of a motor vehicle. Inspection of each and every vehicle necessitates a significant amount of human labor.

In order to keep an eye on all the vehicles easily, we introduced a system known as vehicle pollutant control system using IoT. With the help of which we can keep an eye on all the automobiles very easily. It also monitors engine temperature and battery voltage continuously to protect them from any kind of damage. Internet of things is a vibrant part of this project, the sensors placed at the area of exhaust measures quantity of various pollutant gases that has been emitted, we can update the value on cloud using the internet of things, so that both automobile holder and the government officials can monitor the automobile easily.

## II. LITERATURE REVIEW

In past a lot of research papers have been published but the did not includes the battery voltage detection system and the engine temperature detection system.

Intelligent system for vehicle emission monitoring is reported in [1] which uses the microcontroller and RFID equipped with the carbon monoxide sensor and nitrogen dioxide sensor which measures the values and sends the alert to the user using the GPS module and the RFID sensors. The system is capable of monitoring the emissions from the vehicle and report them to the users and the transport authorities.

The author implemented an IoT based vehicle emission monitoring system which uses the Node MCU and the ESP8266 Wi-Fi module to continuously updating the values obtained to the cloud. Further it sends the information to the concerned authorities using the IoT as well. The of different gases are also displayed on the LCD display [2].

An IoT Based Vehicle Emission Monitoring and Inspection System was discussed in [3]. The system uses ZIGBEE to transmit the data. RFID (Radio Frequency Identification Tag) is being used for the data collection and for reading the data. The values of the pollutants are continuously stored in the database.

Ashita Jagasia at [4] designed a framework which uses the Bluetooth technology to monitor the various parameters of the vehicle. The main goal of this paper is to monitor the data obtained from the sensor which is obtained from the onboard vehicle monitoring system embedded in the vehicle.

It stores the data in the cloud which is obtained from the sensors.

D Arunkumar in [5] proposed a smart air pollution detection system which monitors the current air pollution level and update it inn the web server. The location is updated using the Global Positioning System (GPS). The proposed system uses the GSM technology to update the values in the cloud.
An IoT based carbon monoxide system was reported in [6] which notifies the user through an Android app regarding the dangerous carbon monoxide levels. If the vehicle is not turned off and the levels of harmful emissions are beyond the threshold values then the ignition system of the vehicle is being turned off automatically by the system itself.

Harish Bhashkar Domale [7] reported an IoT based vehicle emission monitoring system which uses Arduino Mega 2560 microcontroller and a GSM/GPRS module in the system.

In [8] the author developed a vehicle monitoring system that particularly used for the detection of the emission levels from the vehicles. The two sensors placed at the exhaust collects the data and this entire setup is connected across the Arduino Uno. A threshold value is present in the programming of the Arduino Uno. If the emission level goes beyond the threshold value, then an alert message is delivered to the vehicle owner using the GSM module. Obtained information is stored in the cloud. By using this module an emission level of vehicle is analyzed.

The author worked up on to identifying and monitoring the individual vehicle emission level as well as alert the RTO of the vehicle exhaust exceeds the standard limit [9]. There is a smoke sensor that detect the harmful gases emitted from vehicle. This particular system is equipped with GPS module that informs the officials regarding the position of the defected vehicle. The GSM is also equipped with this system that transfer the data to the officials if the exhaust from vehicle exceeds the threshold limit. The acquired data is recorded in an area time basis in a PIC microcontroller, which is typically assessed using embedded C coding.

In [10] the author included a method to eliminate exhaust gases that affects the environment. The goal of this paper was creating an environmentally friendly model that can reduced the amount of pollution caused by vehicles. This system employed a valuable gas sensor that sensed the polluted emissions of the vehicles. The sensor keeps updating the system regarding the pollutant levels from the vehicle very quickly and in real time with very low cost. The goal of this paper is to develop a small pollutant detecting instrument that can be put on a vehicle to reduce the polluted emissions.

In this system the author is worked up on to controlled the vehicle pollution monitoring system using IOT [11]. The important objective behind this paper is to overcome the vehicle pollution level continuously of the individual vehicle. In this system, Gas sensors, a controller, and a wi-fi module are used to create an IOT kit. This kit can be physically installed in any vehicle’s exhaust system. Gas sensors deliver data about vehicle emissions to the controller, who then updates the data on the cloud using a wi-fi module. The information of each vehicle emission is stored on a web server, and only the vehicle authority has access to use the data.

According to Souvik manna and Co. in [12], Every vehicle running on the road that should be fitted with RFID sensor that contains the gas sensors and fitted at road side. Whenever the sensors sense the abrupt rise in the pollution then monitored with the help of RFID tag.

As taken Report from [13], Take a hardware setup, that should be consist of equipment like Arduino UNO, AT mega 328 microcontroller, MQ Gas sensors, EM-18 RFID reader and RFID tag.

AT mega 328 microcontroller is use for sending the data to server and it shows the how much pollution increases or decreases. RFID is used and it is used for finding the location of the vehicles.

As Sarita Jijal reported in [14], We make a device that contains many sensors like Gas sensors and particulate sensor. Gas sensor detect the various types of harmful gases like carbon mono oxide, nitrogen oxide, methane, sulphur dioxide and particulate sensor helps to monitor the dust that is available in the environment. Sensing unit collects the information and then send the data to the microcontroller via without wire. Microcontroller monitors and compares the data and then stores it to the cloud. If the emission level become greater than critical value then it sends the information to the computer screen and android phones.

As a report from [15], Mohamed Ghonein and co. uses an Air pollution detection system. It uses the green Internet of Things (IoT) system. It is powered by solar energy which uses the solar panel and rechargeable battery. It provides the constant energy for the module. It is very eco-friendly process.

Since this is green IOT based technology, it triggers information to the authority so that they know the levels of the pollutants at a given instant.

As the Ayushi Gautam and co. Said in [16], The MQ2 sensor is placed on the exhaust pipe with a wire. The buzzer and LCD are placed on the top and controls using raspberry pi via wire. The DC motor driver IC is making analogy of movement of vehicle, in place of a motor a relay is connected whose output is use for the on and off of the engine as per the ppm level of the gases. when the vehicle gets turned on this MQ2 sensors comes in action start and displayed on the screen.

According to the Content shown in [17], We use different devices like MQ 135 which senses like NH3, NOx, and many more gases when it is connected with Arduino monitors the levels of gases in PPM (parts per million).

As a Report from [18], We connect the Arduino in bread board with LCD display and interfaced gas sensor MQ7 to detect CO gas. Also, we connect the buzzer to give notification to the user, we take a connection with the
GSM Module to alert the user by sending massage. There is a code which is developed on the Arduino software. The GSM module sent the massage when CO cross its critical value, as the buzzer generates a beep sound the warning massage shows on the LCD Screen.

In [19] the author worked to controlled the pollution on roads and tracks in several countries and regions that impact highly in our environment. To controlled the pollution within permissible value. The IoT concept is suggested in this system, which uses the RFID technology which is very cheap and has wireless communication approach to acquire and communicate car emission data. Furthermore, RFID sensors must be installed on traffic lights so that reliable readings of a vehicle's emissions signals must be queried when vehicles have stopped there.

### III. PROPOSED METHODOLOGY

This system uses mq2, mq7, mq135 sensors sited on the vehicle exhaust, to monitor the carbon monoxide, nitrogen oxide and hydrocarbon value released through the exhaust of the vehicle. Lm35 sensor measures the engine temperature. The value given by the sensors is managed by the microcontroller provided by wi-fi connection to the internet. Data from sensor is regularly updated on the liquid crystal display and in the cloud. If the sensor's value exceeds the threshold limit, the controller will notify the user via LCD, and the car owner's database will be updated. The Internet of Things (IoT) enables the system to update the value in the cloud. When wi-fi is linked to the internet, the node MCU associated with the sensors assists in updating the value collected from the sensors to the cloud. The information is constantly updated on the owner's cloud storage. If the pollutants exceed the government-set limit, the car owner will be notified. If the vehicle owner ignores the notice, the information will be forwarded to the transport office.

![Block Diagram of the Module](image)

Fig. 1. Block Diagram of the Module

### IV. WORKFLOW ANALYSIS

The workflow model is shown in the Fig. 2. The model is capable of detecting the harmful emissions from the vehicles exhaust by performing some necessary system checks and executes different operations based on different conditions. The mq2 sensor measures the hydrocarbon levels in the smoke of the exhaust and if the value is beyond the threshold limit, then it notifies the user regarding it and also display it on the 16X2 LCD display. Similarly, the mq7 (Carbon Monoxide) sensor and mq135 (Nitrogen Oxide) sensor measures the respective gases levels and if the levels exceed the desired value, then it notifies the user to rectify the problem as soon as possible. The lm35 sensor attached to the module is a temperature sensor which continuously monitors the engine temperature and if the engine temperature rises very much then it sends a notification to the user. The battery voltage sensor monitors the battery voltage levels of the vehicle.
If the emissions values are not maintained by the user, then the GPS module along with the IoT esp8266 module sends the location of the vehicle to the transport officials. The data provided by the sensors are continuously monitored on the display of the module. The thing speak webserver stores the data to the database. So that the stored data can be referred later for the monitoring.

V. RESULTS AND DISCUSSIONS

The project is combined and feature loaded with the many futuristic ideas to reduce the pollution problems caused due to the emission from the vehicles.

The module is powered by Arduino Uno which is a microcontroller. The Arduino Uno provides an interface between the exhaust gases and the sensors equipped to the module. The sensors detect the emission of the different gases and the microcontroller compares it with the threshold values and performs the necessary actions regarding it.

The LCD display attached to the module displays the various levels of the emission and notifies the user if the cross a desired level. If the problem is resolved by the user, then the module keeps on checking for new values of the pollutants but if the user ignores the warnings then it notifies the transport office regarding it.

The temperature of the engine is monitored by the temperature sensor and the battery voltage sensor monitors the battery voltage of the vehicles which ultimately enhances the life of the vehicle engine.

The amount of the air pollution caused by the vehicle has been reduced as the result of the adoption of this smart vehicle pollutant control system using IoT, and there is also the battery voltage detection system and the temperature detection system that enhances the life of the vehicle engine.

VI. CONCLUSION

By using an advanced method which is efficient and effective in reducing the air pollution caused due to the gases emits from the vehicles, the overall air pollution would be decreased to an enormous level. The traditional methods of the air pollution checking system of the vehicles must be replaced by this smart, efficient and effective model. Not only it helps in reducing the vehicle pollution but it also helps the user to monitor the battery voltage and the temperature of the engine. This approach enhances the vehicle life as well.

Fig. 2. Flow Chart Describing the Workflow

Fig. 3. Working Model of the Project
approach is a great initiative towards reducing air pollution and monitors the engine as well as the battery life as well. This ultimately reduces the diseases caused due to the air pollution and enhances the battery life as well.

VII. REFERENCES


