IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2023.1205088 |

IoT Based Vehicle Emission Monitoring System

Gnanavel.M[1], Ashwin.B[2], Kaushik.S[3], Mohan.K[4], Mathanchandru.S[5]

Assistant Professor, Dept. of CSE., KGISL Institute of Technology, Saravanampatti, Coimbatore, TN, India[1]

UG Student, Dept. of CSE.,KGISL Institute of Technology,Saravanampatti, Coimbatore, TN, India[2345]

ABSTRACT: The increase in automobiles significantly contributes to air pollution through emissions of nitrogen oxides (NOx), carbon monoxide (CO), and hydrocarbons (HC). Vehicles are responsible for about half of NOx, CO, and a quarter of HC emissions, worsening global warming. Neglected maintenance and ignition defects exacerbate these emissions. To tackle this issue, a system is proposed exceeding government-set emission limits triggers an engine service alert and displays emission levels on an LCD which is placed in the instrument cluster using IoT. If ignored, a report is automatically sent to the transport office. Controlled by a Node MCU microcontroller, this system aims to mitigate pollution and extend vehicle lifespan.

KEYWORDS: smoke, IoT, gas sensor, LCD, Node MCU.

I. INTRODUCTION

Environmental pollution in India turns out to be a serious issue in the 21st century. The main source of pollution in India is due to automobile vehicles. Government of India made many regulations to control environmental pollution caused due to vehicle emission, but most of them turn to be unsuccessful. Government of India instituted a standard called Bharat stage emission standard (BSES) to regulate the air pollution from motor vehicles. BS- 4 standard is following in India since April 2010. To speed up the green initiative, government made order to move from BS-4 to BS-6 in 2020. The Indian pollution control board has made FC (Fitness certificate) and PUC (Pollution under control certificate) is compulsory for commercial and public vehicles to control air pollution. Carbon monoxide, hydrocarbon and nitrogen oxides are the gases emitted from the exhaust.

The CO in the atmosphere reduces the capability of blood in carrying oxygen, hydrocarbon in the atmosphere affects heart, brain, kidney and bone marrow. NOx affects the lung and causes a respiratory problem. In the era of urbanisation due to the rapid increase in an automobile vehicle, it is difficult to inspect all the vehicles. It requires a lot of man force to inspect all those vehicles. In order to monitor all the vehicles easily, we develop a system called IoT based emission monitoring system, through which we can able monitor all the vehicles easily. The IOT plays a vital role in this project, the sensors placed at the exhaust monitors the level of different gases, with help of IOT the value is updated to the cloud. Which makes both the vehicle owner and transport office to monitor the vehicle easily

II. LITERATURE SURVEY

Rende Wang, October (2016) proposed a paper for Real-Time Monitoring of Inherent System loss to improves the accuracy of FLRDS-based gas sensors. An important factor restricting the development of fiber loop ring-down spectroscopy (FLRDS) is that real-time continuous monitoring of the inherent system loss is inconvenient and time-consuming. [1] Wamadeva Balachandran (MAY/JUNE 2016) proposed a paper on Non-thermal plasma System for Marine Diesel Engine Emission Control, used in two 2.45_GHz microwave (MW) generators for the abatement of nitrogen oxides (NOx) and sulphur (SOx) contained in the exhaust gas of a 200_kW marine diesel engine and tested. It was founded that generating required MW plasma is a challenging task and requires further investigation.[2] Vijay Sivaraman and James carrapetta (2013) proposed a paper in which several low cost mobile sensor units attached to vehicles to measure air pollution concentrations, and users mobile phones to tag and upload the data in real time. But the potential of a low-cost crowd-sourced pollution monitoring system has been demonstrated, and might provide a more viable alternative to waiting for governments of the world to act on this important but ignored problem.[3] Joseph A. shaw and Rick L. Lawrence (may 2014) proposed a paper of comparison of long-wave Infrared Imaging and Visible/Near-Infrared imaging of vegetation for Detecting Leaking Co2 gas.In this paper controlled Co2 release experiment was conducting in Bozeman, Montana as study of method for monitoring carbon sequestration facilities. refective or emissive imaging alone can distinguish between regions with and without Co2 leak.[4] J.H.Visser(December 2001)proposed a paper on Automotive Exhaust Gas Sensing Systems.Gas sensors have become an integral component of control systems for internal combustion engine to provide information for feedback control IoT Based Vehicle Emission Monitoring System (IJIRST/Conf/NCNICS/2017/016) 81 of air-to-fuel economy as well as decreased levels of emission. The different sensing requirements, testing procedures, environmental parameters, and

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2023.1205088 |

need for Microsystems-based realizations are discussed. [5] Souvik manna (May 2014) proposed a paper on vehicular Pollution Monitoring Using IoT. This paper is to monitor the air pollution on roads and track vehicles which cause pollution. Here IoT is used to address this problem. Then combination of wireless Sensor Network and Electrochemical Toxic Gas Sensors and the use of a Radio Frequency Identification (RFID) tagging system is used to monitor the car pollution records anytime anywhere.But RFID reads only at the LOS.[6] Daryl G.Beetner (NOVEMBER 2006) proposed a paper on Detection and Identification of Vehicles Based on Their Unintended Electromagnetic Emissions. It investigates a procedure for detecting and identifying vehicles based on their RF emissions. Artificial neural network (ANN) was trained to identify the vehicle that produces the emissions.[7]

III. EXISTING SYSTEM

The Emission of the vehicles are checked using emission control stations built in some cities only when the fitness certificate (FC) is obtained from the RTO office. For private vehicles, fitness certificates are valid for fifteen years and renewed every five years. For transport vehicles, a fitness certificate for a new vehicle shall be issued for 2 years and subsequently renewed annually. The testing can only be done at the emission station.

Demerits of Existing System

- In the years between, vehicles can generate more pollution. The release of emission cannot be tracked in real time.
- Time consuming process and high maintenance cost.
- Ample space needed to place large machines, which were used in the emission control station.
- The pollution under control certificate is valid only for certain years depending on the vehicles
- It cannot detect emission until or unless when the vehicle is tested at the station.

IV. PROPOSED SYSTEM

In this system mq2, mq7, mq135 sensors placed at the vehicle exhaust, monitor the hydrocarbon, carbon monoxide and nitrogen oxide value emitted from the exhaust. The analog value received from the sensors is processed by the controller with wifi connection to the internet. The value obtained from the sensors is continuously updated to LCD and cloud. When the value obtained from the sensor reaches the threshold limit, the controller will alert to the user through LCD and database of the vehicle owner. Io T helps the system to update the value to the cloud. The Node MCU connected to the sensors helps to update the value obtained from the sensors to cloud when wifi is connected to the internet. The value is continuously updated to vehicle owners cloud storage. when the value reaches the threshold limit set by the government, it will indicate it to the vehicle owner. When the vehicle owner ignores the alert, the entire details will be shared with the transport office.

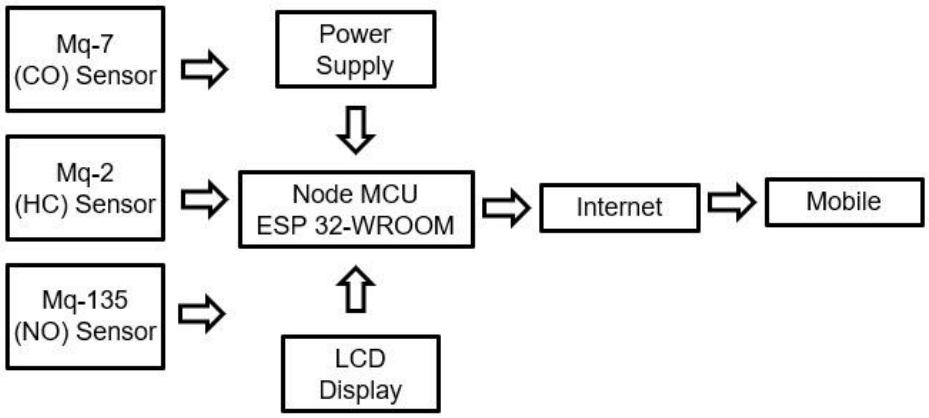


Fig. 1 Block Diagram of the circuit Model

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2023.1205088 |

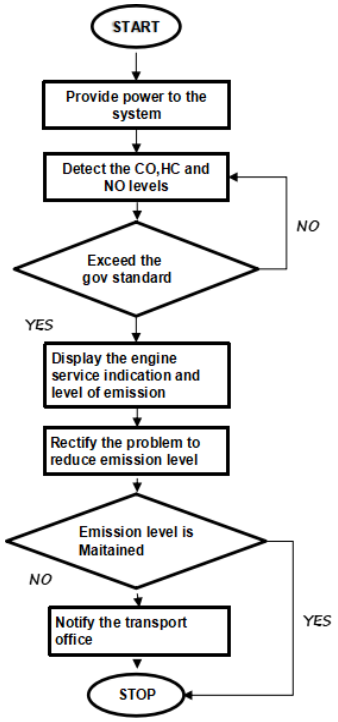


Fig. 2 Flow of the process in Flowchart

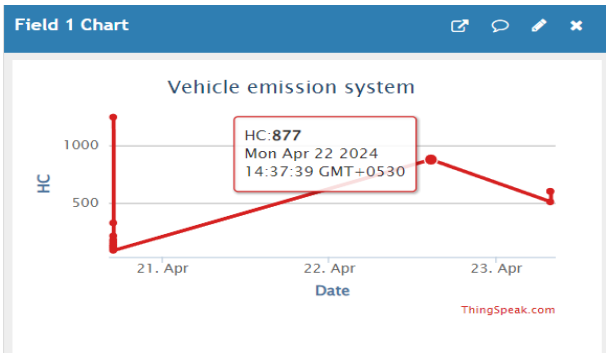


Fig. 3 Thingspeek reading of HC

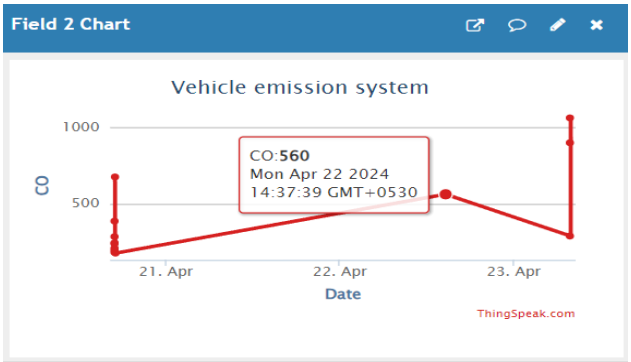
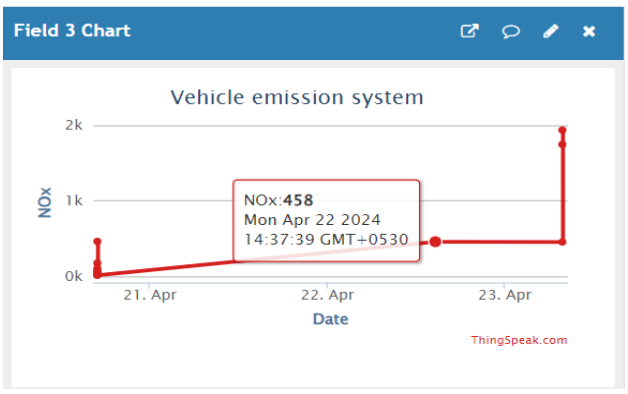


Fig. 4 Thingspeek reading of CO



created_a	entry_id	HC	CO	Nox
2024-04-2	1	1245	674	462
2024-04-2	2	328	384	176
2024-04-2	3	215	282	107
2024-04-2	4	181	242	78
2024-04-2	5	160	236	62
2024-04-2	6	139	207	45
2024-04-2	7	124	193	38
2024-04-2	8	108	179	16
2024-04-2	9	90	174	16
2024-04-2	10	877	560	458
2024-04-2	11	510	286	454
2024-04-2	12	601	1061	1742
2024-04-2	13	602	898	1931

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2023.1205088 |

Fig. 5 Thingspeek reading of NOx

Fig. 6 Messages readings in LCD Display

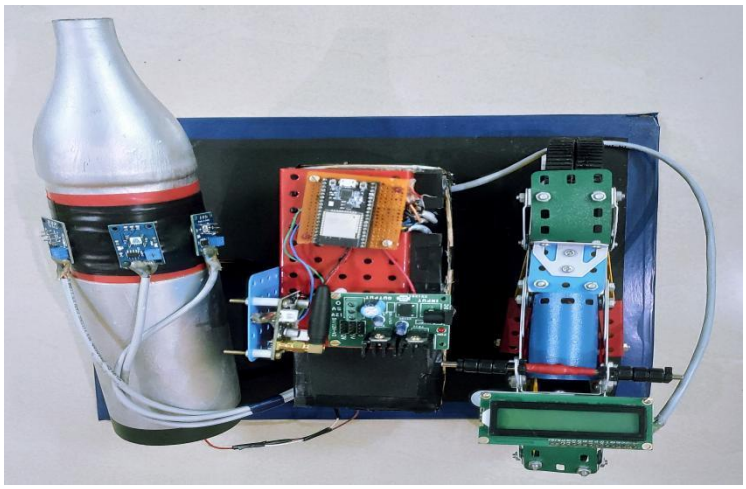


Fig. 7 IOT Based Vehicle Emission Monitoring System

Fig. 8 LCD Display

Fig. 9 Level of Carbonmonoxide in LCD Display

Fig. 10 Level of Nitrogen oxide in LCD Display

Fig. 11 Level of Hydro Carbon in LCD Display

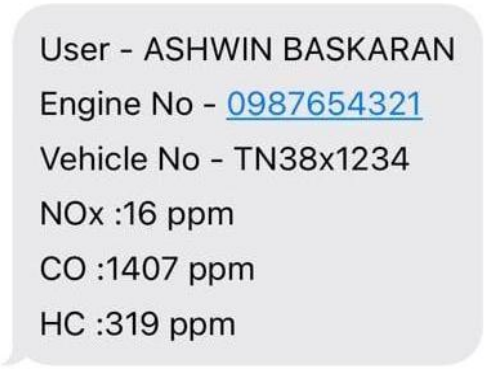


Fig. 12 Message received by RTO Through GSM

IX. CONCLUSION AND FUTURE WORK

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 5, May 2024 ||

| DOI: 10.15680/IJIRCCE.2023.1205088 |

The environmental pollution caused due to the emission of gases like carbon monoxide, hydrocarbon and nitrogen oxide emitted from vehicle exhaust need to be reduced in order to save our environment. The proposed system provides the best solution to monitor the gases emitted from the vehicle exhaust to increase the life of the vehicle and to reduce environmental pollution. The proposed system is low cost and easy to maintain. In future GPS can be added to send the details to the regional transport office and to calculate the amount of gases emitted from vehicles in a particular region.

REFERENCES

1. Li, Xiang, et al. "Recent Advances in Vehicle Emission Detection Technologies: A Review." IEEE Transactions on Intelligent Transportation Systems, vol. 22, no. 3, 2021, pp. 1517-1532.
2. Wang, Xiaoxue, et al. "A Comprehensive Review of Gas Sensors for Vehicle Emission Detection." Sensors, vol. 20, no. 6, 2020, pp. 1-27.
3. Mitra, Sayantan, et al. "Design and Implementation of an IoT-based Vehicle Emission Monitoring System." International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 5, no. 2, 2020, pp. 75-82.
4. Zhang, Yifan, et al. "Development of a Low-cost Vehicle Emission Detection System Based on IoT Technology." Journal of Cleaner Production, vol. 278, 2021, p. 123515.
5. Bansal, Avinash, et al. "Intelligent Emission Monitoring and Control System for Automotive Vehicles Using IoT." IEEE Transactions on Industrial Informatics, vol. 16, no. 10, 2020, pp. 6425-6432.
6. Sreelal, K. N., et al. "Implementation of an IoT-based Real-time Vehicle Emission Monitoring System." IEEE Access, vol. 8, 2020, pp. 97202-97213.
7. Meena, P., et al. "A Review on Emission Monitoring Systems in Automotive Vehicles." International Journal of Vehicle Structures & Systems, vol. 12, no. 1, 2020, pp. 1-9.
8. Tiwari, Anshuman, et al. "Performance Analysis of Gas Sensors for Automotive Emission Detection." IEEE Sensors Journal, vol. 21, no. 1, 2021, pp. 1409-1420. 75
9. Kumar, Manish, et al. "Design and Development of an IoT-based Vehicle Emission Monitoring and Reporting System." International Journal of Emerging Trends & Technology in Computer Science, vol. 9, no. 5, 2020, pp. 376-380.
10. El-Sayed, Ahmed, et al. "Smart City IoT-based Vehicle Emission Monitoring and Control System." Sustainable Cities and Society, vol. 67, 2021, p. 102767

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details