Engine Oil Alert System with Pollution Control Measures

[1] *Dr. Umamaheshwari,*
Assistant Professor
Dept of ECE, DMI College of Engineering,
umaece82@gmail.com

[2] *K. Sharan,*
Department of Electronics and communication Engineering, DMI College of Engineering,
sharansharan0022@gmail.com

[3] *T. Sathya Priyan,*
Department of Electronics and communication Engineering, DMI College of Engineering,
12115.sathiyapriyan@gmail.com

[4] *R. Vimal Raj,*
Department of Electronics and communication Engineering, DMI College of Engineering,
vimalraj4465@gmail.com

[5] *S.I. Ajjas,*
Department of Electronics and communication Engineering, DMI College of Engineering,
syed252001@gmail.com

ABSTRACT

Project addresses the critical issue of engine oil level monitoring and exhaust emission control in two-wheelers, aiming to enhance vehicle reliability and reduce environmental impact. Current systems lack real-time oil level alerts, leading to engine failures and increased pollution. This proposed system integrates advanced sensors to continuously monitor engine oil levels, detect the need for oil changes, and analyze exhaust emissions. Real-time data is presented via an onboard module, while a GSM-based IoT system sends immediate alerts to users. Visual indicators provide supplementary low oil level warnings. The system employs ultrasonic sensors for oil level detection, temperature sensors for oil viscosity monitoring, and gas sensors for CO, HC, and NOx emission analysis.

I. INTRODUCTION

The increasing reliance on two-wheelers as a primary mode of transportation in urban and semi-urban regions has raised significant concerns

regarding vehicular maintenance and environmental pollution. Engine oil plays a critical role in ensuring optimal engine performance by reducing friction, dissipating heat, and preventing component wear. However, traditional oil level monitoring methods are manual, unreliable, and offer no predictive insights, often leading to engine failures and increased maintenance costs. Concurrently, inefficient engine operation contributes to elevated levels of harmful emissions such as carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx), thereby exacerbating air pollution and posing severe health risks. Existing systems lack the integration of real-time monitoring for both oil condition and emission levels. To address these challenges, this paper proposes a novel embedded system that utilizes ultrasonic sensors for precise oil level detection, temperature sensors for oil viscosity monitoring, and gas sensors for emission analysis. Real-time data is processed and displayed on an onboard module, while a GSM-based IoT framework enables remote monitoring and alert generation. This integrated system not only enhances engine health and operational safety but also contributes to sustainable transportation by minimizing environmental impact.

II. MODELLING OF THE SYSTEM

The proposed engine oil alert and pollution control system is modeled as an integrated embedded solution utilizing a sensor-based feedback mechanism, data processing unit, and wireless communication interface. The system architecture includes ultrasonic sensors for real-time oil level detection, temperature sensors for monitoring oil viscosity, and gas sensors for analyzing exhaust emissions including CO, HC, and NOx levels. These sensors form the core of the data acquisition subsystem, continuously feeding parameters into a microcontroller-based processing unit. The logic layer employs threshold-based algorithms to interpret sensor data, identify anomalies such as low oil levels or emission spikes, and trigger appropriate alerts. This real-time information is displayed via an onboard user interface and simultaneously transmitted to a cloud platform using a GSM module, enabling remote diagnostics and predictive maintenance. The split-level design—comprising local (on-vehicle) and remote (cloud-based) components—ensures system responsiveness and scalability. By modeling the system as a closed-loop control structure with feedback and alert generation, the design supports robust engine performance and environmental compliance, thus forming a comprehensive framework for smart vehicle health monitoring.

WORKFLOW:

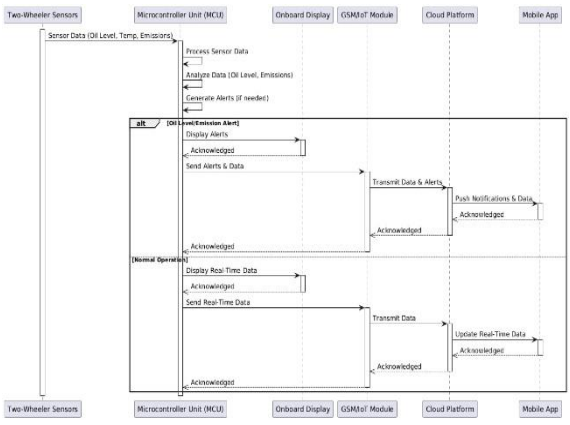

Fig 1: Workflow

III. BLOCK DIAGRAM

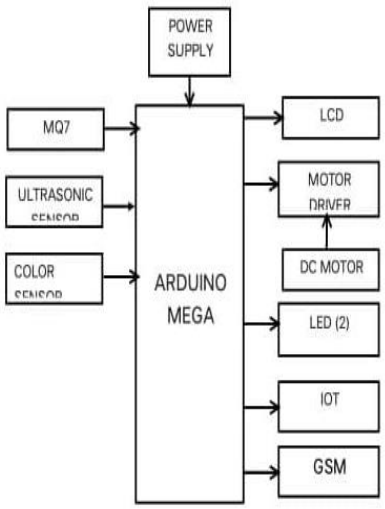

Fig 2: Block Diagram

BLOCK DIAGRAM DESCRIPTION

The block diagram of the proposed system illustrates a comprehensive engine monitoring and pollution control framework centered around the Arduino Mega microcontroller. The system is powered by a dedicated power supply that ensures stable operation of all modules. Sensor inputs include an MQ7 gas sensor for detecting carbon monoxide (CO) levels, an ultrasonic sensor for accurate engine oil level measurement, and a color sensor for assessing oil quality based on visual characteristics. These sensors continuously transmit data to the Arduino Mega, which serves as the main control unit. Based on the sensor readings, the Arduino processes the information and initiates appropriate actions. An LCD display is used to present real-time data to the user, while LEDs provide quick visual alerts for abnormal conditions such as low oil or high emissions. A motor driver is connected to operate a DC motor, simulating mechanical responses like cooling or oil circulation. For remote monitoring and alerting, the system incorporates both an IoT module and a GSM module. The IoT module enables data access via cloud platforms, whereas the GSM module sends SMS alerts to the user in case of critical events. This architecture ensures reliable, real-time monitoring of engine health

and supports proactive maintenance while contributing to environmental sustainability.

IV. LITERATURE REVIEW

In reference[1] Y. Dubey, K. Damahe, U. Ambule, S. Alone, T. Deshpande and P. Sule, "Real Time Monitoring of Engine Parameters for Enhanced Vehicle Performance," 2024 4th International Conference on Intelligent Technologies (CONIT), Bangalore, India, 2024,pp.1-5,doi: 10.1109/CONIT61985.2024.10626298.

In reference[2] L. De Palma et al., "Low-cost capacitive sensor for oil-level monitoring in aircraft," 2022 IEEE International Instrumentation and Measurement Technology Conference (I2MTC), Ottawa, ON, Canada, 2022, pp. 1-4, doi: 10.1109/I2MTC48687.2022.9806667

In reference[3] M. S. A. khan, T. Akter, M. M. Y. Hossain, M. S. Hossain, S. Mazumder and M. K. Alam, "Design and Business Modeling of an IoT Based Cost-Effective Vehicular Monitoring System for Next Generation Smart Vehicle," 2020 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE), Bhubaneswar, India, 2020, pp. 440-443, doi: 10.1109/WIECON-ECE52138.2020.9398003.

In reference[4 G. N. R. Prasad, L. K. Kanulla, V. Ijjagiri and S. S. C. Mary, "Implementation and Health Monitoring System of Vehicle by using IoT and Cloud Computing," 2022 6th International Conference on Electronics, Communication and Aerospace Technology, Coimbatore, India, 2022, pp. 518-521, doi: 10.1109/ICECA55336.2022.10009432.

In reference[5] M. Simov, K. Nikolov and M. Streblau, "Impact of Hydroxy Gas for CO2 Emission Reduction in Diesel Car Engine," 2021 17th Conference on Electrical Machines, Drives and Power Systems (ELMA), Sofia, Bulgaria, 2021, pp. 1-3, doi: 10.1109/ELMA52514.2021.9503070.

V. RESULT AND DISCUSSION

The engine oil alert system is designed to monitor the condition of engine oil in real-time, detecting potential issues before they become major problems. The system uses advanced sensors to track oil quality, temperature, and pressure, sending alerts to the driver or maintenance team when anomalies are detected. Early detection of oil issues helps prevent costly repairs and reduces downtime. Regular oil monitoring ensures optimal engine performance and extends engine life. By implementing an engine oil alert system with pollution control measures, organizations can reduce maintenance costs, improve engine performance, and minimize environmental impact.

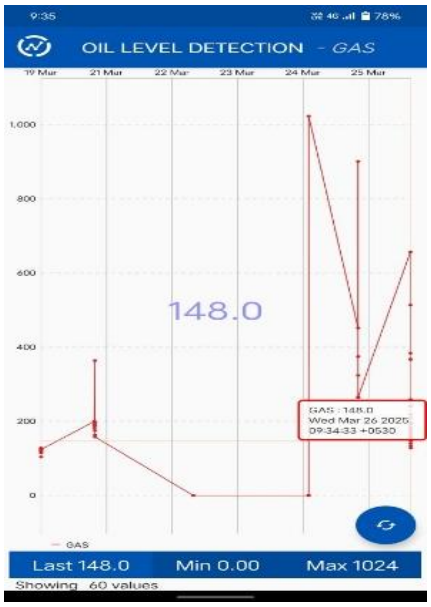

Fig 3: Real-Time Data Visualization Graph

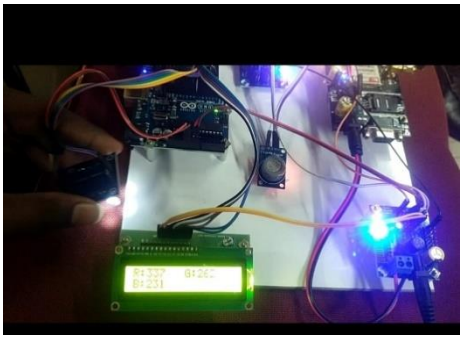

Fig 4: Real-Time KIT

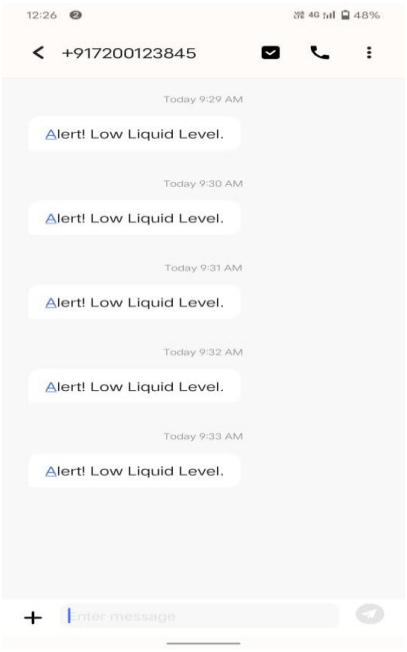

Fig 5: Mobile SMS Output

VI. FUTURE SCOPE

This project successfully achieved its objectives, several potential enhancements and future research directions can further improve the system's capabilities and impact. By Exploring the integration of onboard emission control systems, such as catalytic converters or particulate filters, with real-time feedback from the emission sensors. Develop adaptive emission control algorithms that adjust engine parameters based on real-time emission data. The system should support the diagnosis of complex exhaust system issues. By pursuing these future enhancements, the engine oil level monitoring and exhaust emission control system can evolve into a more comprehensive and impactful solution for enhancing vehicle reliability, promoting environmental sustainability, and improving user experiences

VII. . REFERENCES

1.Y. Dubey, K. Damahe, U. Ambule, S. Alone, T. Deshpande and P. Sule, "Real Time Monitoring of Engine Parameters for Enhanced Vehicle Performance," 2024 4th International Conference on Intelligent Technologies (CONIT), Bangalore, India,2024,pp.1-5,doi: 10.1109/CONIT61985.2024.10626298.

2.L. De Palma et al., "Low-cost capacitive sensor for oil-level monitoring in aircraft," 2022 IEEE International Instrumentation (I2MTC), Ottawa, ON, Canada, 2022, pp. 1-4, doi: 10.1109/I2MTC48687.2022.9806667.

3.M. S. A. khan, T. Akter, M. M. Y. Hossain, M. S. Hossain, S. Mazumder and M. K. Alam, "Design and Business Modeling of an IoT Based Cost-Effective Vehicular Monitoring System for Next Generation Smart Vehicle," 2020 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE), Bhubaneswar, India, 2020, pp. 440-443, doi: 10.1109/WIECON-ECE52138.2020.9398003.

4.G. N. R. Prasad, L. K. Kanulla, V. Ijjagiri and S. S. C. Mary, "Implementation and Health Monitoring System of Vehicle by using IoT and Cloud Computing," 2022 6th International Conference on Electronics, Communication and Aerospace Technology, Coimbatore, India, 2022, pp. 518-521, doi: 10.1109/ICECA55336.2022.10009432.

5.M. Simov, K. Nikolov and M. Streblau, "Impact of Hydroxy Gas for CO2 Emission Reduction in Diesel Car Engine," 2021 17th Conference on Electrical Machines, Drives and Power Systems

(ELMA), Sofia, Bulgaria, 2021, pp. 1-3, doi: 10.1109/ELMA52514.2021.9503070.

6.C. Hickenbottom, "Proactive Approaches for Engine Health Management and a High Value Example," 2022 IEEE Aerospace Conference (AERO), Big Sky, MT, USA, 2022, pp. 1-6, doi: 10.1109/AERO53065.2022.9843255.

7.M.A. Ansari, M. K. Siddiqui, A. Shahama and M. A. Siddiqui, "Age Prediction of Transformer Oil Using Soft Computing Method," 2024 Second International Conference Computational and Characterization Techniques in Engineering & Sciences (IC3TES), Lucknow, India, 2024, pp. 1-5, doi: 10.1109/IC3TES62412.2024.10877589.

8.Xia, "Condition Monitoring and Evaluation of Marine Machinery Based on Support Vector Machine Algorithm," 2023 International Conference on Mechatronics, IoT and Industrial Informatics (ICMIII), Melbourne, Australia, 2023, pp. 275-279, doi: 10.1109/ICMIII58949.2023.00058.

9. Pan, T. Wu, Y. Jing and P. Wang, "Multiattribute Modeling for Oil Condition Assessment Considering Uncertainties," in IEEE Transactions on Instrumentation and Measurement, vol. 71, pp. 1-8, 2022, Art no. 3509908, doi: 10.1109/TIM.2022.3161707.

10. A. M. Kosim, S. L. M. Hassan, I. S. A. Halim, N. E. Abdullah and A. A. A. Rahim, "Air Quality Monitoring System using Arduino and Matla Analysis," 2022 IEEE 13th Control and System Graduate Research Colloquium (ICSGRC), Shah Alam, Malaysia, 2022, pp. 225-230, doi: 10.1109/ICSGRC55096.20