ISSN [Online]: 2583-2654

Carbon Ink through Mitigation of Air Pollution

Dr. Palaniswamy K M,Deepika.B,Maha.R,Rafana Susmiya,Ramya.V
Department of ECE,Dr.T.Thimmaiah Institute of Technology

Abstract: Incorporates a Smoke Absorber strategically placed along roads equipped with an IR Sensor module.Whenever a vehicle, be it a truck or any other, passes by, the IR Sensor detects its presence, triggering the activation of the Smoke Absorber.This device then draws in the pollutants emitted by the vehicle, effectively cleaning the air.The captured pollution is directed to a series of Carbon Filters, where it is collected and stored. Once the filters accumulate a sufficient amount of pollution, the collected residue undergoes a transformation process. We convert this pollutant material into ink.

Keywords:CarbonFilter,IR-SensorModule,Capacitor(1000µF,25v),5v Relay moduleTIP 32 Transistor,Resistor(1KΩ),DC Motor,Battery,Smoke Absorber.

I. INTRODUCTION

As vehicles traverse the road, their emissions are swiftly captured and drawn into the Smoke Absorbs chamber. Here, the pollutants are contained and channeled towards a secondary absorber unit, which directs them through a series of carbon filters. These filters, meticulously designed and implemented, efficiently trap the harmful pollutants while allowing clean air to pass through. The pollution mitigation system operates with optimal efficiency and minimal energy consumption. By employing intelligent sensor technology, it remains dormant until a vehicle's presence activates it, ensuring that energy resources are utilized sparingly and effectively. The captured pollutants, now securely confined within the carbon filters, undergo a transformative process. Through innovative techniques, these pollutants are converted into a valuable resource: ink. This ink, derived from the very emissions that once south-east Asia, and the western pacific region and another 1 million deaths have occurred in the Africa

II. PROBLEM IDENTIFICATION

Environmental pollution is one of the alarming global concerns in the present situation, and it exists everywhere in the air, water, and land. People inhale about 10,000 liters of ambient air on a daily basis, which is in direct contact . So, if the air is polluted and people have to get exposed in that air unintentionally, it will create a more devastating effect on them. Around 92% people of the world reside in the areas, where the air quality exceeds the limit, which is approved by the WHO, according to a recent model of WHO air quality, Every year, 7 million deaths occur globally, due to the exposure of the people in the outdoor and indoor polluted air. Over 2 million deaths have occurred in region, reported in 2018 by WHO . So, air pollution is a silent killer. For this reason, the focus on this pollution is one of the primary concerns. Air pollution can be classified into categories, (a) outdoor, and (b) household air pollution. Deaths from the exposure to ambient (outdoor) air pollution each year is 4.2 million. The sources of outdoor air pollution are industry, energy production plant, transport, waste management, dust, agricultural waste management practices, and household energy plants . Among them, transport sector is widely recognized as a significant and growing source of worldwide air pollution . In the transportation sector of the cities of many developing countries, the unsustainable population of on-road vehicles has increased the air pollution

ISSN [Online]: 2583-2654

emissions level tremendously, resulting in extreme health risk issues . The primary reasons behind a large number of on-road vehicles are rapid urbanization in many developing countries' cities and socioeconomic growth among the people. Emission from the transport sector is a significant contributor to outdoor air pollution, which is the leading risk factor for the environmental safety of the world. Vehicular emissions from both mega-cities and rural areas are responsible for alarming outdoor air quality deterioration.

III. METHODOLOGY

Methodology defines the outline of the project that takes place and also it represents Steps that should be followed one after the other to achieve the desired output. This particular project involves a systematic approach to designing, developing, and deploying an effective Carbon Ink Through Mitigation of Pollution" .

1.Research and Analysis:

Conducted comprehensive literature review to understand existing pollution mitigation technologies and their limitations. Analyzed data on vehicular emissions, traffic patterns, and air quality to identify key areas for intervention. Researched sensor technologies and filtration methods suitable for integration into road infrastructure.

2. Conceptualization and Design:

Brainstormed conceptual designs for a pollution mitigation system integrated into roadways. Collaborated with engineers and environmental experts to refine conceptual designs based on feasibility and effectiveness. Developed detailed schematics and blueprints for the Smoke Absorber unit, incorporating IR Sensor modules and carbon filters.

3. Prototype Development:

Procured necessary materials and components for building the prototype. Assembled and tested individual components, including IR sensors, relay modules, motors, and carbon filters. Integrated components into a functional prototype of the Smoke Absorber unit, ensuring compatibility and efficiency.

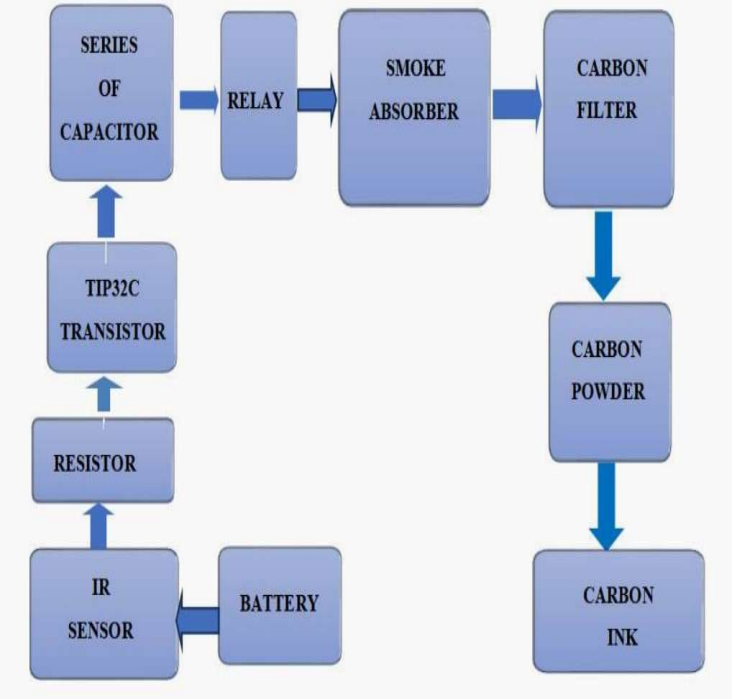
4. Testing and Optimization:

Conducted controlled tests to evaluate the performance of the prototype in capturing vehicular emissions. Analyzed data collected during testing to identify areas for optimization and improvement. Fine-tuned sensor sensitivity, motor speed, and filter efficiency to enhance
the system's effectiveness

5. Integration with Road Infrastructure:

Collaborated with civil engineers and transportation authorities to identify suitable locations for installing the Smoke Absorber units along roadways. Developed installation guidelines and protocols to ensure proper integration and functionality. Installed prototype units at selected test sites for real-world validation and
Monitoring.

6. Block Diagram



ISSN [Online]: 2583-2654

IV. IMPLEMENTATION

1.Effective Pollution Mitigation:

The system effectively captures and mitigates vehicular emissions, thereby reducing air pollution and improving overall air quality in urban environments.

2.Resource Recovery:

By converting captured pollutants into ink through carbon filtration, the system transforms a harmful waste product into a valuable resource, promoting sustainability and circular economy principles.

3.Energy Efficiency:

The system operates selectively, activating only in the presence of vehicles through intelligent sensor technology. This minimizes energy consumption and reduces operational Costs

4.Integration with Urban Infrastructure:

The system seamlessly integrates pollution mitigation mechanisms into existing urban infrastructure, such as roads and highways, providing a scalable and cost-effective solution for pollution control

5.Health and Environmental Benefits:

By reducing vehicular emissions, the system contributes to mitigating the adverse health effects associated with air pollution, improving public health outcomes and enhancing overall environmental quality

6.Innovative Approach:

The use of carbon filtration technology to convert pollutants into ink represents a creative and innovative approach to pollution control, demonstrating the potential for repurposing waste materials for beneficial use.

V. ADVANTAGE OF THE SYSTEM

1. Effective Pollution Mitigation:

The system effectively captures and mitigates vehicular emissions, thereby reducing air pollution and improving overall air quality in urban environments.

2.Resource Recovery:

By converting captured pollutants into ink through carbon filtration, the system transforms a harmful waste product into a valuable resource, promoting sustainability and circular economy principles.

3.Energy Efficiency:

The system operates selectively, activating only in the presence of vehicles through intelligent sensor technology. This minimizes energy consumption and reduces operational costs.

4.Integration with Urban Infrastructure:

The system seamlessly integrates pollution mitigation mechanisms into existing urban infrastructure, such as roads and highways, providing a scalable and cost-effective solution for pollution control

VI. LIMITATIONS OF THE SYSTEM

1. Initial Investment Cost:

The implementation of the system may require a significant initial investment in infrastructure, sensor technology, and carbon filtration systems, which could pose financial challenges for some municipalities or organizations.

2. Maintenance Requirements:

The system may require regular maintenance to ensure proper functioning of sensors, motors, and filtration units, adding to operational costs and potential logistical challenges

3. Limited Effectiveness in Remote Areas:

In remote or less densely populated areas with lower vehicular traffic, the system may have limited effectiveness in capturing and mitigating pollution, potentially reducing its overall impact.2C0arbon Ink Through Mitigation Of Pollution

4. Dependence on Vehicle Activity:

The system relies on the presence of vehicles to activate its pollution mitigation mechanisms. As

Swanirman Sunirmit
Explore Technology advancements for Sustainable Ecosystem of Society

ISSN [Online]: 2583-2654

such, periods of low or intermittent traffic may result in reduced system efficiency and effectiveness.

5. *Technological Dependencies:*

The performance of the system is contingent upon the reliability and functionality of its technological components, including sensors, motors, and filtration systems. Technical malfunctions or failures could impact system performance and require prompt maintenance or repairs.

6. Regulatory and Policy Considerations:

The implementation of the system may necessitate compliance with regulatory standards and policies governing air quality management, waste disposal, and environmental protection, which could entail additional administrative burdens and regulatory requirements. Overall, while the system offers significant advantages in terms of pollution mitigation and resource recovery, careful consideration of its limitations and potential challenges is essential for successful implementation and long-term sustainability.

VII. CONCLUSION

In conclusion, the development of a pollution mitigation system that converts vehicular emissions into ink represents a significant step forward in addressing the pressing environmental challenges posed by vehicular pollution. Through the integration of innovative technologies such as sensor systems, carbon filtration, and intelligent activation mechanisms, this system offers an effective and sustainable solution for reducing air pollution and improving By integrating the innovative technologies such as sensor systems, carbon filtration, and intelligent activation mechanisms, this system offers an effective and sustainable solution for reducing air pollution and improving overall environmental quality in urban environments. However, it is essential to acknowledge the limitations and challenges associated with the implementation of such a system, including initial investment costs, maintenance requirements, and technological dependencies.

REFERENCES

[1]. Chen, X., Yang, L., Zhang, J., et al. (2018). Health risk assessment of vehicular particulate pollution in urban environments: a case study of two cities in China. Environmental Pollution, 238, 253-262.

[2]. Johnson, K. C., Samaras, C., & Van Der Zwaan, B. (2018). Future cost-competitive electricity systems and their impact on US CO2 emissions. Nature Climate Change, 8(10), 848-854.

[3]. Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. Journal of Cleaner Production, 175, 544-552.

[4]. Li, Z., Wang, S., Fu, H., et al. (2019). Review on mobile sensor nodes for real-time air quality monitoring. Sensors, 19(3), 528.

[5]. Liu, B., Chen, J., Wang, Y., et al. (2020). techno-economic evaluation of carbon capture and utilization technologies: A case study of China. Applied Energy, 265.

[6]. Liu, J., Wu, Q., Liu, G., et al. (2021). A comprehensive review on the atmospheric pollution of heavy metals in China: From sources and concentrations to impacts. Science of the Total Environment, 768.

[7]. Peng, Z., Zhang, Y., & Jin, Q. (2021). Recent advances in electrochemical sensors for in-situ detection of air pollutants. Trends in Analytical Chemistry, 134.

[8]. Wang, S., Qiao, Y., Jin, H., et al. (2019). A review on techno-economic analysis of CO2 direct air capture systems. Greenhouse Gases: Science and Technology, 9(6).

[9]. Yan, C., Liu, Y., Wang, X., et al. (2021). A review on the global status and prospects of carbon capture and utilization from industrial processes. Journal of Cleaner Production, 292.

Swanirman Sunirmit