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The Green Breath for the Survival of Mankind in 21st Century using Sustainable Air Purifier

Mr. Juned Khan, Mr. Lokesh Sanjay Raut, Ms. Bhargavi Sanjay Hirulkar, Ms. Sakshi Jungade

Students, Department of Electrical Engineering Shri Sant Gajanan Maharaj College of Engineering, Shegaon, Maharashtra, India

Abstract: Air pollution, a concern both indoors and outdoors, necessitates effective solutions. While indoor air purifiers gain popularity, outdoor air quality remains crucial. Incorporating solar electricity into outdoor air purification systems offers a sustainable approach. These systems, powered by photovoltaic technology, filter contaminants from outdoor air, mitigating pollution and reducing reliance on nonrenewable energy sources. Solar-powered solutions not only enhance air quality but also combat climate change by curbing greenhouse gas emissions. HEPA filters in indoor appliances further improve air quality, especially beneficial for individuals with respiratory conditions like asthma.

Keywords: healthy lifestyle

I. INTRODUCTION

Air pollution, a concern both indoors and outdoors, necessitates effective solutions. While indoor air purifiers gain popularity, outdoor air quality remains crucial. Incorporating solar electricity into outdoor air purification systems offers a sustainable approach. These systems, powered by photovoltaic technology, filter contaminants from outdoor air, mitigating pollution and reducing reliance on non-renewable energy sources. Solar-powered solutions not only enhance air quality but also combat climate change by curbing greenhouse gas emissions. HEPA filters in indoor appliances further improve air quality, especially beneficial for individuals with respiratory conditions like asthma. Air pollution poses a significant health challenge amidst modernization, affecting both indoor and outdoor environments. Recent research highlights the adverse effects on health, with approximately 4 million premature deaths attributed to indoor air pollution. Increasing demand for air purifiers reflects the urgency to combat pollutants, especially in highly polluted areas like New Delhi or Patna. These devices, utilizing renewable energy sources like solar power, offer a sustainable solution, reducing reliance on non-renewable energy and curbing greenhouse gas emissions.

II. TECHNOLOGY USED

Air pollution, a concern both indoors and outdoors, necessitates effective solutions. While indoor air purifiers gain popularity, outdoor air quality remains crucial. Incorporating solar electricity into outdoor air purification systems offers a sustainable approach. These systems, powered by photovoltaic technology, filter contaminants from outdoor air, mitigating pollution and reducing reliance on non-renewable energy sources. Solar-powered solutions not only enhance air quality but also combat climate change by curbing greenhouse gas emissions. HEPA filters in indoor appliances further improve air quality, especially beneficial for individuals with respiratory conditions like asthma.

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The air purifier employs a multi-stage filtration system to effectively remove airborne contaminants.

1) Pre-filter: This initial filter captures large particles such as dust, hair, and pet dander, preventing them from clogging subsequent filters and extending their lifespan.

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2) Activated Carbon Filter: Next, the activated carbon filter adsorbs odors, gases, and volatile organic compounds (VOCs) from the air, trapping them within its porous structure.

3) HEPA Filter: The HEPA filter, or High Efficiency Particulate Air filter, is highly efficient in capturing microscopic particles like pollen, mold spores, bacteria, and viruses, ensuring clean and purified air.

4) UV Light: The UV light serves as an additional layer of protection by sterilizing the air, neutralizing bacteria, viruses, and other pathogens that may pass through the filters.

The air purifier is equipped with intake and outlet fans to facilitate airflow through the filtration system. The 40-watt solar panel harnesses sunlight to power the air purifier, while the 6Ah battery backup ensures uninterrupted operation, even during periods of low sunlight or at night, making it a sustainable and reliable solution for air purification

III. METHODOLOGY

Air Purifier Design Process:

Target Environment Analysis: We begin by studying the intended environment's air quality. This involves identifying dominant pollutants like dust, smoke, or allergens.

Filter Technology Exploration: We delve into various filter options - HEPA filters for fine particles, carbon filters for gases, and pre-filters for large dust particles.

Optimal Filter Selection: Based on the air quality analysis, we choose the most effective filter combination to target the primary pollutants in the target environment. 4) Modular Design: The air purifier's internal structure is designed to accommodate the chosen filters, ensuring optimal airflow and maximizing filter efficiency. 5) Fan Selection: High-quality fans are selected based on size, efficiency ratings, and compatibility with the designed module. Rating of fans at inlet & outlet is 27.6 watt, 12v DC, 2.30 Amp current ,Speed=4700Rpm

6) Sustainable Power Integration: To achieve a sustainable design, we incorporate a 40-watt solar panel for primary power. A backup battery will be sized to handle periods of low sunlight, rating of battery is 6Ah ,12v. 7) Prototype Assembly and Analysis: Finally, we assemble the air purifier prototype, integrating the chosen filters, solar panel, battery, and fan. The system's performance is then analyzed to ensure effectiveness.

IV. MODULE IMAGES



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V. CONCLUSION

This solar-powered air purifier cleans air and improves qual quality (red AQI to green). It passed tests (suction, air quality) and is user-friendly. Future upgrades include a virus-killing transducer and a mobile app for monitoring. Powered by a 12V solar panel and battery, it's efficient, affordable, and eco-friendly. This design helps people breathe easier and provides cleaner air for all.

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