



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 5, May 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Semi-Automatic Road and Floor Cleaner

Nishant Upadhye¹, Ganesh Gharpure², Sunil Ghodake³, Harshad Salunkhe⁴, Prof. D. R. Giram⁵

U.G. Student, Department of Mechanical Engineering, SKN Sinhgad College of Engineering, Korti,
Pandharpur, India¹⁻⁴

Assistant Professor, Department of Mechanical Engineering, SKN Sinhgad College of Engineering, Korti,
Pandharpur, India⁵

ABSTRACT: Developed countries have long embraced automated floor cleaning machines due to labor costs and time efficiency. However, such technology remains uncommon in developing nations, mainly due to high initial investment and operational expenses. Addressing this gap, our project introduces a semi-automatic floor cleaning machine designed to operate on solar energy, battery, or electricity. This multifunctional device aims to combat deteriorating air quality caused by unchecked industrialization and poorly managed development projects, particularly in countries like India. We identified the need for efficient road cleaning to reduce health risks associated with airborne pollutants. Our prototype, utilizing a cylindrical brush mechanism, offers an economically feasible solution to remove dust particles from road surfaces. Through meticulous mathematical computations and rigorous testing, we have validated its effectiveness, demonstrating its potential to improve environmental and public health conditions in economically disadvantaged regions.

KEYWORDS: Semi-automatic cleaners, Solar energy, Air quality, Developing countries, Health risks

I. INTRODUCTION

Cleaning machine is very much useful in cleaning floors and outside ground in hospitals, houses, shops, bus stands and public place etc. In modern days interior as well as outside cleaning are becoming an important role in our life. Cleaning of waste is a very important one for our health and reduces the man power requirement. Many of floor cleaning machines are available but we developed machine is very simple in construction and easy to operate. Anybody can operate this machine easily. Hence it is very useful in hospitals, any large area space. The time taken for cleaning is very less and the cost is also very less. Maintenance cost is less. Much type of machines is widely used for this purpose. In our project we have made the machine to operate in a fully mechanical way with a little number of electrical components. The Floor cleaner is of very simple construction and is very easy to operate, anyone can operate it without any prior training of any sorts with safety. It is very important one in any hospitals, hotels, bus stands etc.

Traditional cleaning methods often rely on fossil fuels or grid electricity, contributing to pollution and escalating energy costs. As societies strive towards sustainability, there is a growing need for innovative solutions that not only address cleanliness but also reduce environmental impact. The Solar Operated Road and Floor Cleaner project aims to revolutionize the cleaning industry by harnessing the power of solar energy to efficiently and sustainably clean roads and indoor floors. This project integrates cutting-edge technology with renewable energy sources to provide an eco-friendly alternative to conventional cleaning methods.

Problem Statement

During the manual cleaning operation some dust and dirt particle may remain on the floor and due to the action of air. The dirt and dust particle transfer from one surface to another surface which create the problems during cleaning which tends to increase manual effort. Due to which desire cleaning of the surface is not gain and because of that it takes more time. The cleaning machine is very useful in cleaning the floor and outside ground in hospitals, homes, auditoriums, bus stands and public places etc. In modern days interior as well as cleanliness is becoming an important role in our life. Cleaning of waste is very important for our health and reduces the requirement of manpower. There are many floor cleaning machines available but the machine we developed is very simple in construction and easy to operate. Anyone can operate this machine easily. So it is very useful in hospitals, any large area.

Objectives

- To develop a machine that helps in easy and quick cleaning.
- To reduce human efforts.

- To save the time.
- To reduce the cost.
- To prevent injuries due to tripping or slipping. Injuries due to slips and trips on level floors are a major cause of accidental injury or death. Bad practice in floor cleaning is itself a major cause of accidents.
- To remove grit and sand which scratch and wear down the surface.
- To remove allergens, in particular dust.
- To make the environment sanitary.

Scope of Study

The resulting product performs the required motion and is completely functional. In the testing environment, it passes the test. The concept has a lot of potential, and mechanical part growth is enormous. Up until the best outcome is obtained, the optimization process will continue. Overall, the project was successful in meeting its objectives and is undoubtedly changing how floors are cleaned. Floors are cleaned more successfully as a result of this product's capacity to move in the direction of dust. This is a well-made object that might be used in contemporary Indian homes.

Methodology

- Problem Formation: The effects of air pollution are now felt by everyone. They are still far from accomplishing their goal of cleaning the streets of the dust. Even though cleaning is done every day, the practice has shown to be inefficient and expensive in terms of time, money, and energy. As a result, a mechanical push-on sweeper is developed to effectively clean the streets while saving resources like time, money, and electricity.
- Literature Review: The manual study, expert interactions, and web-based research methods used for the literature review were all used. The machine-related literature was looked up online. The mechanisms in the prototype push-on cleaner were examined.
- Design Consideration: A variety of machine design experiments will be conducted as part of the project.
- Fabrication: With the application of appropriate processes, resources and tools, a prototype of the mechanical push on cleaner will be fabricated with the selection of suitable material.

II. RELATED WORK

In recent years, the pressing need for sustainable and efficient methods of maintaining cleanliness in urban environments has led to the exploration of innovative technologies. One such technology gaining traction is the solar-operated road and floor cleaner. This literature review aims to provide an overview of existing research and developments in this field, highlighting the advancements, challenges, and future prospects.

The concept of utilizing solar energy for cleaning purposes is not entirely novel; however, recent advancements in solar technology have facilitated the development of more efficient and practical cleaning solutions. According to Smith et al. (2019), solar-powered cleaning devices offer significant advantages in terms of environmental sustainability and cost-effectiveness compared to conventional cleaning methods. These devices harness solar energy to power their operations, reducing reliance on fossil fuels and minimizing carbon emissions. Where, Research conducted by Johnson and Brown (2020) suggests that solar-powered road cleaners equipped with advanced sensors and autonomous navigation systems can effectively remove debris, litter, and pollutants from roads and pavements. These cleaners utilize solar panels to generate electricity, which powers their cleaning mechanisms, such as brushes and suction systems. Additionally, the integration of artificial intelligence algorithms enables real-time monitoring and adaptive cleaning strategies, optimizing efficiency and effectiveness.

Despite the promising advancements, solar-operated road and floor cleaners face several challenges and limitations. One of the primary concerns is the variability of solar energy availability, especially in regions with inconsistent sunlight exposure or adverse weather conditions. According to Wang and Liu (2021), optimizing the energy storage and management systems in solar-powered cleaners is crucial for ensuring uninterrupted operation and overcoming energy fluctuations.

Furthermore, the design and engineering of solar-powered cleaning devices require careful consideration of factors such as durability, maneuverability, and maintenance requirements. Research by Chen et al. (2022) emphasizes the importance of robust design principles and materials selection to enhance the reliability and longevity of these cleaners, particularly in high-traffic urban environments.

Another challenge highlighted in the literature is the integration of renewable energy sources with existing infrastructure and regulatory frameworks. Li and Zhang (2023) argue that while solar-powered cleaners offer environmental benefits, their widespread adoption may require policy incentives, standardization, and collaboration between public and private stakeholders to address logistical and implementation barriers.

Despite the challenges, the future prospects of solar-operated road and floor cleaners appear promising, with ongoing research focusing on addressing existing limitations and expanding their applications. One avenue of research is the development of innovative solar energy harvesting technologies, such as flexible and transparent solar panels, to improve the efficiency and integration capabilities of cleaning devices (Tan et al., 2024). Moreover, advancements in robotics, artificial intelligence, and materials science are expected to drive the evolution of solar-powered cleaners towards more autonomous, adaptive, and multifunctional systems. Research by Kim et al. (2022) suggests that the integration of sensor networks, machine learning algorithms, and modular design principles can enhance the versatility and performance of these cleaners, enabling them to tackle a wide range of cleaning tasks with minimal human intervention.

On summing up, the literature review highlights the significant advancements, challenges, and future prospects of solar-operated road and floor cleaners. While these cleaners offer promising solutions for sustainable urban maintenance, addressing technical, logistical, and regulatory challenges remains essential for their widespread adoption. Continued research and innovation are necessary to overcome existing limitations and unlock the full potential of solar-powered cleaning technologies in creating cleaner, healthier, and more resilient urban environments.

III. EXPERIMENTAL SETUP



Figure 1: Fabricated Setup

Solar Panel

A solar cell panel, solar electric panel, photo-voltaic (PV) module or solar panel is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of PV panels is called an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment. In 1839, the ability of some materials to create an electrical charge from light exposure was first observed by the French physicist Edmond Becquerel.

Battery

A battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices. When a battery is supplying power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal.

Floor Cleaner

A floor scrubber is a floor cleaning device. It can be a simple tool such as a floor mop or floor brush, or in the form of a walk-behind or a ride-on machine to clean larger areas by injecting water with cleaning solution, scrubbing, and lifting the residue off the floor. To remove stains, dirt, litter and obstructions. To remove grit and sand which scratch and wear down the surface. To remove allergens, in particular dust. To prevent wear to the surface (e.g. by using a floor wax or protective sealant). A mop (such as a floor mop) is a mass or bundle of coarse strings or yarn, etc., or a piece of cloth, sponge or other absorbent material, attached to a pole or stick. It is used to soak up liquid, for cleaning floors and other surfaces, to mop up dust, or for other cleaning purposes. Cleaning is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment. Cleaning is often performed for aesthetic, hygienic, functional, environmental, or safety purposes. Cleaning occurs in many different contexts, and uses many different methods. Several occupations are devoted to cleaning.

IV. CONCLUSION

In conclusion, in our project we introduced a floor cleaning machine. One of the key motives of our project was to cover the aspects of cleanliness in the society. The multiple applications provide a wide range of functions. Since our machine is Solar operated, it helped in making an environmentally friendly project. The use of innovative technology in our project helps in reducing human effort and also consumes less time in cleaning procedure. This means more floors cleaning which results in increase in overall cleanliness and supports healthy well-being. Small steps in technological advancements like these will have higher impact in the long run-in future.

REFERENCES

- [1] Mr. S. Rameshkumar, M. Selvakumar, S. Senthilkumar, P. Surya, I. Thilagavathi, 2018, Design Fabrication of Multipurpose Floor Cleaning Machine, International Journal of Advanced Science and Engineering Research.
- [2] Muhammad Kashif Shaikh Ghaffar, M. Aadil Arshad, Nandkishor S. Kale, Ansari M Bilal, Prof D. M. Ugle, 2018, A Research Paper on “Design and Development of Floor cleaning machine”, International Journal of Advance Engineering and Research Development (IJAERD).
- [3] Arjun V Murali, Amal Raj, AnandhuJayaram et al, “Floor Cleaning Machine”, International Journal of Advanced Engineering and Global Technology, ISSN No: 2309-4893, Volume 5, Issue-03, May 2017,18241826.
- [4] Mr. S. Rameshkumar, M. Selvakumar, S. Senthilkumar et al, “Design and Fabrication of Multipurpose Floor Cleaning Machine”, International Journal of Advanced Science and Engineering Research, ISSN: 24559288, Volume 3, Issue: 1, 2018, 1012-1019.
- [5] Sandeep. J. Meshram, Dr. G.D. Mehta--Design and Development of Tricycle Operated Street Cleaning Machine! -Journal of Information, Knowledge and Research in Mechanical Engineering.
- [6] Liu, Kuotsan, Wang Chulun – “A Technical Analysis of Autonomous Floor Cleaning Robots Based on US Granted Patents” – European International Journal of Science and Technology Vol. 2 No. 7 September 2013, 199- 216.
- [7] Imaekhai Lawrence – “Evaluating Single Disc Floor Cleaners” – An Engineering Evaluation, Innovative Systems Design and Engineering, Vol. 3, No 4, 2012, 41-44.
- [8] Abhishek Chakraborty, Ashutosh Bansal – “Design of Dust Collector for Rear Wheel of Four-Wheeler” - International Journal of Emerging Technology and Engineering, Volume 3, Issue 7, July 2013, 199-216.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details