ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 12, Issue 4, April 2025

Eco-friendly Cleaning Machine

. SUJIT KUMAR GARAI, RAJDEEP MODAK, RAHUL BARMAN, ANKUSH CHATTERJEE

Lecturer (Senior Grade – I), Department of Mechanical Engineering, Technique Polytechnic Institute, Hooghly, West Bengal, India
2024 pass out Student, Technique Polytechnic Institute, Hooghly, West Bengal, India
2024 pass out Student, Technique Polytechnic Institute, Hooghly, West Bengal, India
2025 pass out Student, Technique Polytechnic Institute, Hooghly, West Bengal, India

ABSTRACT: Cleaning is the main basic need for all human beings, and it is necessary for daily routine process. The conventional road and floor cleaning machine is most widely used in many applications such as example roads, railway stations, airports, hospitals, bus stands, in multi-buildings, colleges etc. also this machine uses human energy for its working operation. It is user-friendly as well as eco-friendly. In this paper the aim is to use easily available material at low cost, it can be easily fabricated, easy to use and control. It is the better alternative for conventional machines. The manually operated eco-friendly road and floor cleaner can work very efficiently with respect to covering area, time and cost of road cleaning process compared with the existing machinery. Also, it is economical to use.

KEY WORDS: cleaning, design, ecosystem, economical

I.INTRODUCTION

Open defecation free behaviours are sustained, and no one is left behind. Solid and liquid waste management facilities are accessible and reinforcing ODF behaviours and focus on providing interventions for safe management of solid and liquid waste in villages. To encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation. To develop, wherever required, community managed sanitation systems focusing on scientific Solid & Liquid Waste Management systems for overall cleanliness in the rural areas. To create significant positive impact on gender and promote social inclusion by improving sanitation especially in marginalized communities.
Stop the litter. Keep clean. Keep safe. Be clean.
1) Cleanliness starts from your home. 2) God gave us green, let's keep it clean. 3) Don't litter. It makes the world bitter. 4) Wash your hands, spread the word and stop the germs.
Cleaning is a necessary at factor in a daily routine process. Effective cleaning and sanitizing help and protect the health of human beings directly and indirectly. The Road cleaner is used to keep our surroundings clean. So that we feel fresh while walking on the streets. Generally, in the era of modern technology, different devices such as electric motors, diesel engines, and robots are being used to clean the floor and road. But such processes create abundant pollution, maintenance and are very tough to carry out. So, to save energy and save nature, there is a need to develop user-friendly road and floor cleaning machines. A machine which should be operated manually so that it can be used as an alternative for conventional electric cleaning machine. The dust cleaning machine system is fixed with a pair of wheels which relate to the help of shaft. The shaft makes the wheels connected to one and other. The wheels are moved to the desired position with the help of manual force, which can handle is provided to move. The handle can be adjusted for a required height and are provided three adjusting holes for it. A chain drive is connected to the wheels and gear at each side. The chain is moved according to the wheel and gear. The brush moving the alternative direction of the wheels move and the brush brooms the waste present on the road also it dumps the waste into the waste-collecting box. The waste collection box is removed to dump the waste into desired places.

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II. SIGNIFICANCE OF THE MECHANISM

The paper mainly focuses on how cleaning of our environment can be done easily & effectively by applying less human effort, less cost.

III. LITERATURE SURVEY

The global concern for environmental sustainability has led to a growing interest in eco-friendly technologies across various industries. Road cleaning machines play a crucial role in maintaining cleanliness and hygiene in urban and rural areas. This literature review explores existing research and developments in eco-friendly road cleaner machines, emphasizing their environmental impact, energy efficiency, and technological innovations.

Environmental Impact of Traditional Road Cleaners: Traditional road cleaning machines often rely on fossil fuels and generate emissions, contributing to air pollution and environmental degradation. Studies (Smith et al., 2018; Green Baum & Johnson, 2019) highlight the adverse effects of conventional road cleaning methods, emphasizing the need for sustainable alternatives.

Transition to Eco-Friendly Technologies: Researchers have explored alternative technologies to reduce the environmental impact of road cleaning. Electric-powered Road sweepers have gained attention, with studies (Chen et al., 2020; Kumar & Singh, 2021) showcasing their potential to decrease carbon emissions and reliance on non-renewable energy sources.

Innovations in Eco-Friendly Road Cleaning: Solar-Powered Road Cleaners: Recent developments have focused on integrating solar panels into road cleaning machines, allowing them to harness renewable energy for operation (Wang & Li, 2022). This approach aligns with the global shift towards sustainable energy solutions.

Advanced Filtration Systems: Efficient waste separation and filtration systems are critical for eco-friendly road cleaners. Advances in filtration technology (Gupta et al., 2020) contribute to improved waste management and recycling, minimizing the environmental impact of waste disposal.

Smart Sensor Integration: Some studies (Zhao et al., 2021) have explored the incorporation of smart sensors to optimize the cleaning process. These sensors can detect and target specific areas, reducing energy consumption and improving overall cleaning efficiency.

Challenges and Opportunities:

While progress has been made in developing eco-friendly road cleaners, challenges persist. Limited infrastructure for renewable energy charging stations, initial costs of adopting new technologies, and the need for standardized regulations are areas that require attention (Li & Wang, 2023).

To accelerate the efforts to achieve universal sanitation coverage and to put focus on sanitation, the Prime Minister of India had launched the Swachh Bharat Mission on 2nd October 2014. The mission was implemented as nation-wide campaign/Janandolan which aimed at eliminating open defecation in rural areas during the period 2014 to 2019 through mass scale behavior change, construction of household-owned and community-owned toilets and establishing mechanisms for monitoring toilet construction and usage. Under the mission, all villages, Gram Panchayats, Districts, States and Union Territories in India declared themselves "open-defecation free" (ODF) by 2 October 2019, the 150th birth anniversary of Mahatma Gandhi, by constructing over 100 million toilets in rural India. To ensure that the open defecation free behaviours are sustained, no one is left behind, and that solid and liquid waste management facilities are accessible, the Mission is moving towards the next Phase II of SBMG i.e ODF-Plus. ODF Plus activities under Phase II of Swachh Bharat Mission (Grameen) will reinforce ODF behaviours and focus on providing interventions for safe management of solid and liquid waste in villages.

Vision:

The aim of Swachh Bharat Mission (Gramin) phase II is to ensure the open defecation free behaviours are sustained.

Objectives:

1) Open defecation free behaviours are sustained, and no one is left behind. 2) Solid and liquid waste management facilities are accessible and reinforcing ODF behaviours and focus on providing interventions for safe management of solid and liquid waste in villages.3) To encourage cost effective and appropriate technologies for ecologically safe and sustainable sanitation. 4) To develop, wherever required, community managed sanitation systems focusing on scientific Solid & Liquid Waste Management systems for overall cleanliness in the rural areas. 5) To create significant positive impact on gender and promote social inclusion by improving sanitation especially in marginalized communities.

3. Problem Statement & Solution: Design, cost estimation & fabrication of eco-friendly semi-automatic road & floor cleaning machine less human effort.

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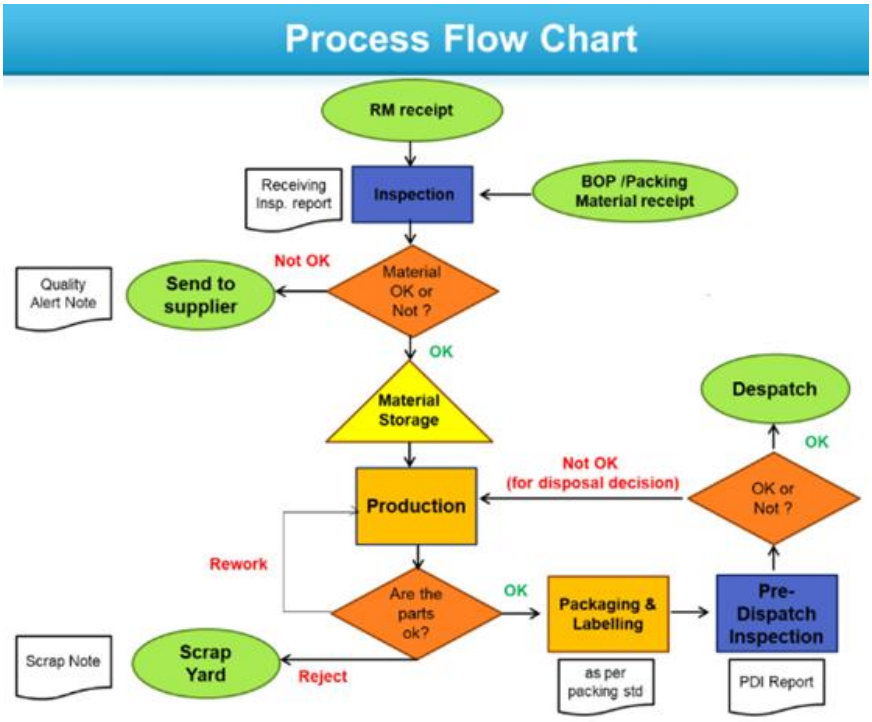
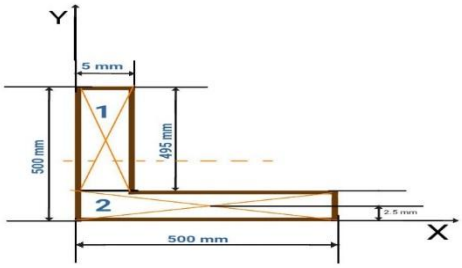
IV. METHODOLOGY



Design of components:

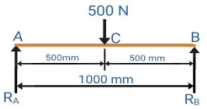


1) Design of Frame:

$\bar{X} = \frac{(a_1 * x_1) + (a_2 * x_2)}{a_1 + a_2}$ =123.88 mm

$\bar{Y} = \frac{(a_1 * y_1) + (a_2 * y_2)}{a_1 + a_2}$ =126.88 mm

2) Design of transmission shaft:



Motor Power = 5 KW $P = \frac{2\pi N T_m}{60\ X\ 1000}$ KW $5 = \frac{2\pi\ X\ 100\ X\ T_m}{60\ X\ 1000}$

T_{max} = 1.25 * 477.46 = 596.82 N-m

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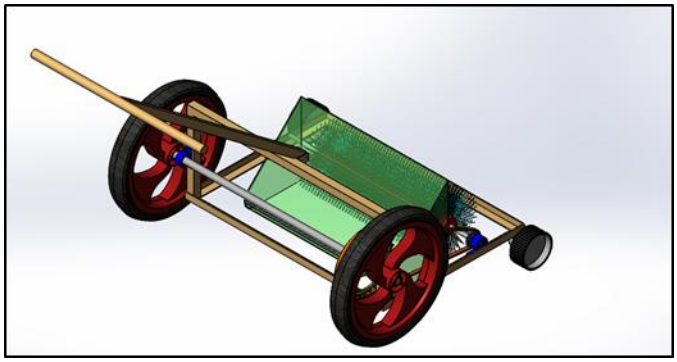
V. EXPERIMENTAL RESULTS

Materials cost analysis Table:

Sl no.	Name of the component	Quantity	Price
1.	Frame	1	3000/-
2.	Shaft	2	500/-
3.	Rear Wheel	2	500/-
4.	Front Wheel	2	100/-
5.	Collector Tray	1	200/-
6.	Sprockets	2	200/-
7.	Chain	1	100/-
8.	Swipe	1	500/-
9.	Bearing	6	600/-
10.	Screw, Nut Bolt	-	100/-
11.	Paint	-	200/-
12.	D.C.Motor	-	2500/-
Total			**8500/-**

Table – 1



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VI. CONCLUSION AND FUTURE WORK

From this work a sound information about health & hygiene, design procedure & cost analysis and manufacturing process of the automatic road cleaner can be obtained. There are more future scope to develop modern machine in this field by researchers, for human being.

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ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 12, Issue 4, April 2025

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AUTHOR'S BIOGRAPHY

1. Mr. Sujit Kumar Garai received his **AMIE** that is equivalent to **Bachelor of Engineering** from the INSTITUTION OF ENGINEERS, India {IEI(I)} in 1997 and **M .Tech** from the INDIAN INSTITUTE OF ENGINEERING & SCIENCE (IIEST), Shibpur, Howrah, West Bengal, India in 2014. In addition to that he participated a lots of short term training program at National Institute of Technical Teacher Training & Research (NITTTR,) Kolkata, West Bengal, India and National Institute of Rural Development (NIRD), Hyderabad, Andhra Pradesh India.

Presently working as Lecturer (Senior Grade – I) in Mechanical Engineering Department at Technique Polytechnic Institute, Panchrokhi, Sugandhya, Dist. Hooghly, West Bengal, India since August 2012. Earlier he worked as lecturer in Mechanical Engineering Department at Kingston Polytechnic College, Barasat, Kolkata, West Bengal, India He started his career in academic line as Part Time Lecturer at I.C.V. Polytechnic, Jhargram, West Bengal, India from 2001. Earlier to that have a working experience at Automobile Industry more than 6 Years.

He is in the academic arena for last 23 years having lots of publication at national and international Journals and Conferences. His area of interest is Engineering Materials, Automobile Engineering, Fluid Mechanics & Fluid Power, Machine Design and Industrial Engineering.

2. **RAJDEEP MODAK** pursuing B.Tech, a passionate mechanical engineer with a deep fascination for technology, machinery, and manufacturing industry. My interest lies in understanding the intricate mechanics behind powerful machines and exploring advancements in engineering that drive innovation. With a strong foundation in mechanical principles, keen interest on applying his knowledge to develop efficient and high-performance systems. His enthusiasm for cutting-edge technology and precision engineering to continuous learning and problem-solving in the ever-evolving world of mechanical engineering

3. **RAHUL BARMAN** pursuing Diploma in Mechanical at Technique Polytechnic Institute, Hooghly, W.B., India

4. **ANKUSH CHATTERJEE** Pursuing Diploma in Mechanical at Technique Polytechnic Institute, Hooghly, W.B., India