

DESIGN AND DEVELOPMENT OF TRICYCLE OPERATED STREET CLEANING MACHINE

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Abstract— This paper presents the design and fabrication of Tricycle operated street cleaning machine with the related search. At present we have few automated machines which are foreign made and can be used in our country. But the fact is that those machine are designed keeping in mind that their road condition. Here, in Indian market, the conditions are very different. On other hand in ruler area the road cleaning is done by an manual operation which renders fatigue hazards like asthma, bronchitis etc to the worker. This basically instigates to thing for an alternative mechanism called Street cleaning process.

Key words: Human Powered, Street Cleaning

I. Introduction

The present state of the street cleaning process is described below. There are two ways for street cleaning 1) Manual process 2) Machinated process. In manual process, the street cleaning is done with the help of broom and shovel to clean off the debris, waste etc. A person continuously does a swiping action by a broom in the hand to clean the street by spreading the dust all over in the air. While in the Machinated process, a vehicle containing broom at bottom continuously rotating, clean the street as well as sucks the dust spread by the rotating broom. If one carefully observes the first process, then he could find the following limitations which are given below:

1. This process renders fatigue to the hand and even it cause damage to the shoulder.
2. As it is a continuous process, it produces mental fatigue and hazardous to the health of sweeper.
3. It is time consuming, and laborious process so, no one wants to do it.

On the other side, in the second process following limitations have been found out, which are discussed below:

1. The requirement of petrol is prerequisite for this process and today, the prices of petrol are rising continuously.
2. The cost of machine is quite high cost and the rural people could not afford it to buy.

II. Background of Present Work

These are the different Street Cleaning techniques used worldwide, which are shown in the figure.



The manual operated machines are time consuming and laborious, on other side of the flip, the diesel operated machines are very costlier. These problems actually instigate to think an alternative arrangement which would nullify the limitations of former said processes.

Further its initial cost is also less. The new evolved concept is a street cleaning machine operated by human power. To accomplish this new idea, the present work is well carried out which is as under.

1. Firstly, the complete market review and literature survey based on the Street Cleaning processes been done.
2. On the basis of the demand power the machine component are designed.
3. On the basis of obtained designed dimensions the fabrication work of the proposed Tricycle operated street cleaning machine is carried out.
4. At last, the testing and trails have been taken to ascertain the load capacity of the machine and its viability.

III. Main Objective Of The Present Work

1. To provide the alternative method for street cleaning.
2. To Design Semiautomatic Machine for Rural and Urban Areas.
3. To reduce human efforts.
4. To save the Time.

IV. Proposed Solution Over The Present State Of Art

A proposed solution over the present state of art is being explained through this article. A solution is the evolution of a unique machine, which would run with the help of human power. A schematic diagram is shown in Figure.

A chain drive 'CH1' will be used to speed the Shaft S1. A smaller sprocket Fr1 and Fr2 will be placed on this shaft. On the other hand bigger sprocket SP1 will be placed with the pedal arrangement. The speed of the shaft S1 will further amplify to the speed of the shaft S2 on which bigger sprocket SP3 and Fr4 are mounted. Through shaft S2 with the help of CH3 speed the brush, through the same chain idler sprocket is provided which run the blower. When a rider will pedal, the human energy will be converted into the rotational kinetic energy. This energy will be pass to the shaft S1, S2, brush and finally to the blower.

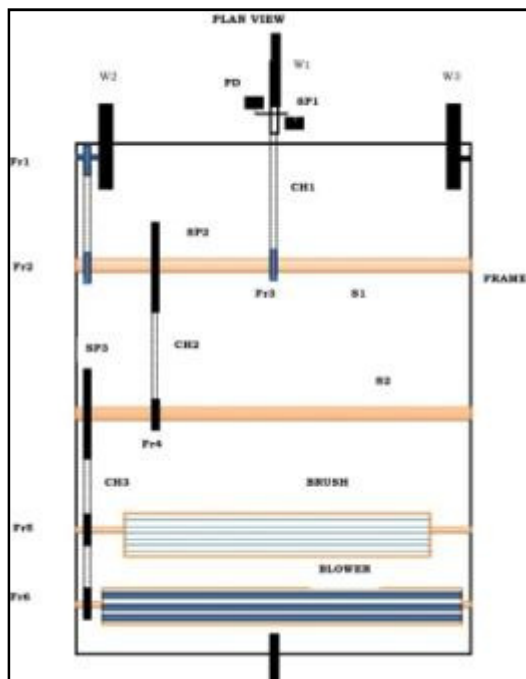
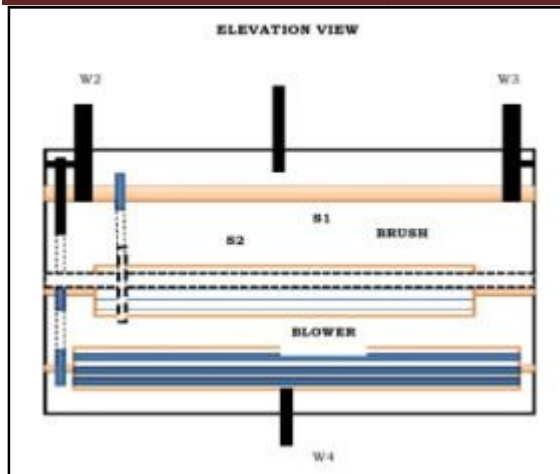


FIG: - Plan View of Street Cleaning Machine



SP 1: Bigger Sprocket, SP2: Smaller Sprocket,
CH: Chain, S1-S2-S3: Shafts, B1 - B10: Bearings,
Fr1-Fr6: Freewheel Frame: F, W1-W4: Wheels
Blower: BL, Brush: BR

V. Literature Review

Jialei Cheng and Diniece Peters [1]

In this paper the authors Jialei Cheng and Diniece Peters [1] had identify new strategies to address severe urban delivery challenges resulting from congested roads and inadequate loading space. One solution with the potential to achieve benefits for the city, for carriers, and for shippers while making use of the city's rapidly growing bicycle infrastructure is freight distribution from an urban micro-consolidation center (UMC) via human-powered or electrically-aided freight-tricycle. UMCs have been successfully implemented in Paris and London; this study details the results of a comparative analysis evaluating economic, infrastructure, and regulatory conditions in the three cities for the purpose of identifying opportunities and challenges for future implementation in Manhattan.

Renaekuehl, Michael Marti and Joel Schilling [2]

In this paper [2] authors Renaekuehl, Michael Marti and Joel Schilling has given the information to assist an agency in developing a best practice in street cleaning.

This information includes:

1. Reasons for sweeping (air quality, water quality, safety, appearance, maintenance clean-up)
2. Types of roadways to be swept.
3. Type of debris to be swept (dust, small particles, large particles).
4. Vegetation, packed dirt, etc.
5. Available equipment.
6. How the equipment can be used.
7. Budgets – capital, operations and maintenance costs.

P. U. Asnani[3]

In this research paper P. U. Asnani author [3] has given the views about Sanitary Landfill at Nagpur. Nagpur city generates approximately 564 tonnes of municipal solid waste per day which has been dumped for the last 30 years at the Bhandewadi dumpsite located about 12 km east of Nagpur. It is estimated that 30–40 per cent of the waste consists of organic material. The site is spread over an area of 22 hectares with waste distributed at heights ranging from 1 to 2.5 meters. USAEP/USAID through its western region offices provided the Nagpur Municipal Corporation (NMC) technical assistance to develop this site as a 'Model Municipal Landfill Site'. The technical Assistance (TA) study carried out by National Productivity Council and AILSG on the existing dumpsite revealed that the waste was spread unevenly over the entire area and almost seventy per cent waste was accumulated on the eastern side. It was therefore recommended that the existing solid waste be accumulated on one side of the dumpsite and then that area be scientifically closed. The remaining area could then be utilized to develop a model sanitary Landfill for receiving new loads of solid waste. Consequently; the NMC is now implementing a US\$230,000 project to close the existing dumpsite. This project envisages the Screening,

sifting, and encapsulating of the waste. The waste mound will be provided with appropriate lining for leachate control and gas vents to capture the methane generated. The gas collected will either be used for generating heat/power or flared dependent on techno-economic viability.

Field Survey:-

As there is no such machine available yet anywhere this can save human energy, time, and money. Therefore it is essential to know what people are requiring practically in the field. So interaction with some villagers has been made which helps us to identify the actual requirement of them. Following are some important suggestion to be noted given by highly experienced persons.

a. Interaction with a person having experience of more than 25 Years at NMC Street Cleaning.

According to him one should develop a machine which can reduce the human efforts while street cleaning. He said after cleaning street continuously for five to six hours a day, it is very painful to their hand and shoulders.

b. Interaction with a Women having experience of more than 20 Years in Street Cleaning at WadiGramin in Nagpur District in Street Cleaning.

According to her after working five years she gets suffered from the asthma due to the dust scattered in the air due to broom, so she gives the views that if any automated or semi automated machinery if available to clean the street it will be benefited to her health as well as to the others people's health also.

After doing interaction with all above people it is observed that every one facing common problem in Street Cleaning which are given below.

- a. Manpower shortage
- b. Very Hectic job
- c. Time consuming job
- d. High wages of labor
- e. Consumption of kerosene, diesel etc.

On concentrating these main points, it is found that rural as well as urban people requires a semiautomatic machine which can be operated by only single person with very less efforts and also it should be cheap and less time consuming so that one can save not only his energy but also money.

VI. Research Methodology

The research methodology will cover as follow –

1. Identification of design parameters.
2. Design of Street Cleaning Machine.
3. Fabrication of Street Cleaning Machine.
4. Testing of machine.

The approach will be Design, Modelling, Fabrication and Testing of the machine.



Conclusion

1. It is found that the existing street cleaning machines uses petrol and diesel. It can cause pollution and also the vibration produced in the machine causes noise pollution. While manual cleaning may cause health problem as the person directly comes in contact with dust. Also, the shoulder problem due to continuously sweeping occurs.

2. A tricycle operated street cleaning machine seems an alternative concept for avoiding such problems enlisted in first point.
3. The tricycle operated machine can work very efficiently with respect to covering area, time and cost of street cleaning process compared with the existing machineries. Also it is economical.
4. It was seen while testing of machine, that the cleaning is less effective where the street seems to be very rough and damaged.
5. It can provide job to the uneducated person who is in need for such jobs as human energy is needed to drive the machine.

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