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Eco Friendly Floor Cleaning Machine.

Under Assistant. Prof.MohdBahauddin, 1Mohammed Sajid Ali Shaad, 2Syed Mujahed, 3Abdul KhaderHussain,
Bachelor OfEngineeringInMechanicalEngineering.
Isl Engineering college,Hyderabad,Telanagana,India.

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ABSTRACT: In order to address this problem, we have designed, fabricated and tested a mechanically Operated Road sweeper prototype that is financially viable and socio-economically beneficial. This machine works on simple principle of centrifugal motion of cylindrical brush throwing dust particles from road surface in the container, uses local materials and is cheap with respect to other machines and is efficient as well. This can be used in the side area of roads where dust has been piled up in maximal amount.
We have performed detailed mathematical calculation and analysis for design specification of each and every part of the machine components and made a prototype design in Solid works. Then after we successfully fabricated using conventional fabrication tools and tested its performance.

I. INTRODUCTION

This venture manages the outlining and manufacture of Floor Cleaning Machine.
The point of this undertaking work is to create and modernized process for cleaning the floor with innovative mechanism and its alignemnets.
It is extremely valuable for cleaning the floors. It can be utilized wet and dry; henceforth it is generally utilized as a part of houses, doctor's facilities, theater, shops, PC focuses, and so forth.
In present day days inside improvements are turning into a vital part in our life.
Cleaning of a floor is a critical one for our wellbeing and diminishes the labor prerequisite.
Subsequently, our task is exceptionally valuable in our everyday life.

II. LITERATUREREVIEW

The dust on the road can be collected using various techniques. According to this report, methods that can be used to control dust spread on the roads are limiting the creation or presence of dust-sized particles, reduce wind speed at ground level, bind dust particles together, capture and remove dust from its sources (Jeth, 1999).

Street sweeping either manual or mechanical has been a normal operation for most municipalities for hundreds of years. The earliest sweepers were manual efforts using a broom, shovel with either push or horse-drawn carts. Street sweeping materials consisted of trash, dirt and vegetation. Thus, aesthetics and sanitation were the two driving forces for municipalities to keep streets clean and protect the citizens. The first motorized sweeper was developed in the early 20th century pollutants. Today, street sweeping materials have changed, with gross pollutants including more plastics and paper products than would.

III. METHODOLOGY

Anyone can work this machine effortlessly.
It comprises of dampness cotton brush, the brush cleans the floor and dried with help of the little blower. Subsequently, it is extremely valuable in healing facilities, houses, and so on.
The time taken for cleaning is less and the cost is additionally less.
Upkeep cost is less. Many sorts of machines are generally utilized for this reason.Be that as it may, they are working under various standards and the cost is likewise high.

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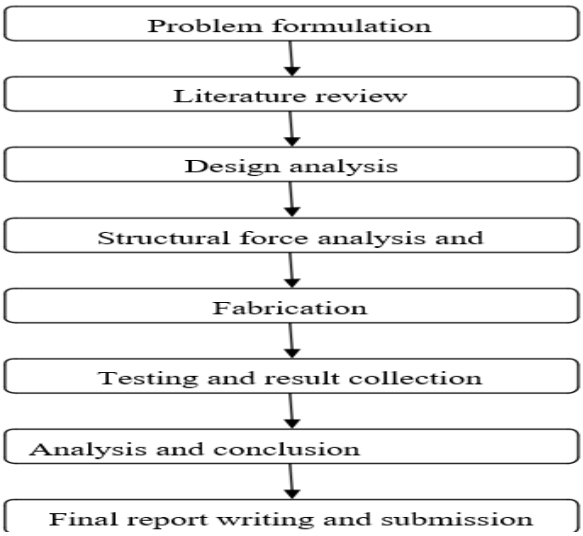
IV. METHODOLOGY



V. DATA COLLECTION AND MECHANISM OF MACHINE

For primary data collection related to dust accumulation on the road, we visited various road section including Mid-hilly region road section (Chitre-Basantapur) of Terhathum district and the ring road of Kathmandu valley and will also be visited more roads. Various workshops, labs, junkyards and hardware shops will be visited. Yantrasala was and will be visited for fabrication purpose.

The data handbook and design books were reviewed and will be used for the proper selection of machine elements required for the project. Different supporting reports, journals and other data reports will be visited and studied to get data and information. Others mechanical projects relevant to our project will also be visited and studied.

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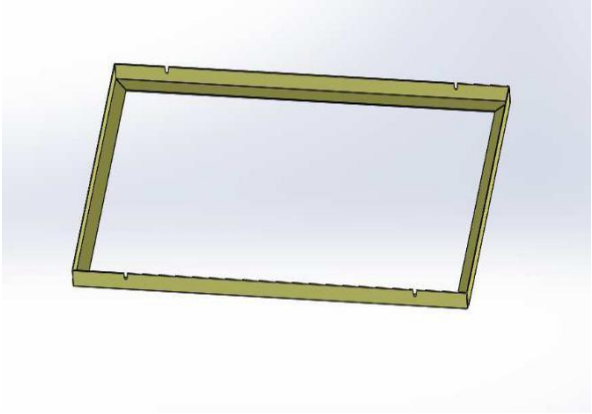
FACTOR RATING METHOD

Mechanism	Safety	Cost	Material Availability	Fabrion	W	Total	Eff	R
Bevel gear mechanism	3	2	4	4	4	17	60 %	10.2
Universal joint mechanism	3	5	4	4	4	20	60 %	12
Spur gear parallel brush	3	7	7	8	7	32	50 %	16
Vacuum suction with brush with roller	7	2	3	6	3	21	70 %	14.7
Belt drive mechanism	3	5	5	6	5	24	50 %	12

CHASSIS



Specifications	**length bar**	**breadth bar**
Material	M.S.	M.S.
Length	1200 mm	750 mm
Breadth	40 mm	40 mm

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Height	40 mm	40 mm
thickness	3 mm	3 mm
Mass	1300 gm	700 gm
Number	2	2

WHEEL

WHEELS SPECIFICATIONS

Material of the tire	nylon
Material of the rim	Cast iron
Diameter of the wheel	350 mm
Diameter of the central bore	11 mm
Diameter of the tire	50 mm
mass of the wheel	2 kg
Number of the wheel	2

BRUSH

The brush has been manufactured by our team in the workshop of our own campus. The brush was made using materials available in the markets. The brush consists of the brush tool, ring and brush support. The brush support supports the brush in a groove holding it tightly. The brush support is welded to the ring fixing it. The ring is a circular structure made using flat bar which has central bar having bore to fix to the shaft which rotates to brush.

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SPECIFICATIONS OF BRUSH

Brush ring	Material	Mild steel
	External diameter	146 mm
	Internal diameter	140 mm
	Thickness of flat bar	3 mm
	Breadth of the side bar	40 mm
	Thickness of side bar	3 mm
	length of side bar	140 mm
	Bore diameter	40 mm
Brush support	Material	
	Numbers	15
	Breadth	10 mm
	Height	20 mm
	Gap between side bars	5 mm
brush	Material	Polypropylene bristles
	Length of brush base	250 mm

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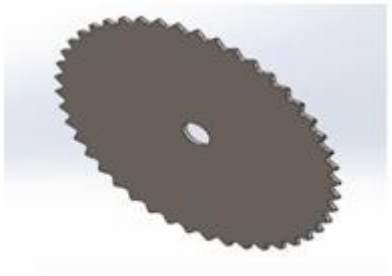
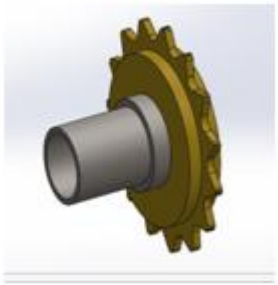
	Diameter of thread	1.5 mm
	Length of the thread	110 mm

SPROCKET

The sprockets of different diameter have been used to transmit the power acting as a spur gear varying speeds and torque to transmit to further shafts with the help of chain drives... Sprocket of the rickshaw was selected. The smaller sprocket was selected.

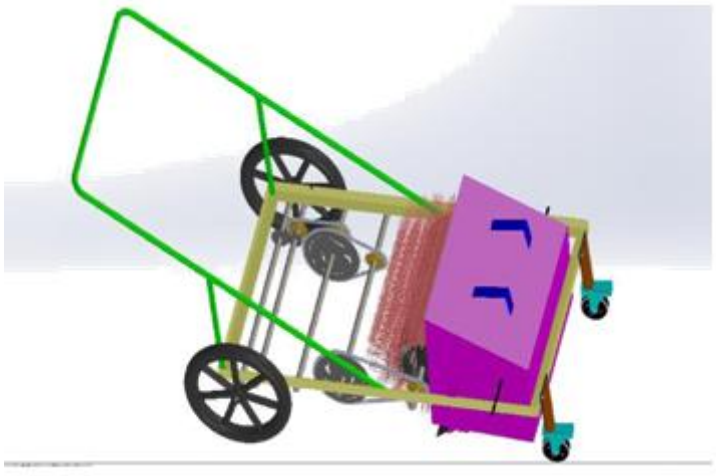
Larger sprocketsSmaller sprockets





MECHANISM OF MACHINE

When an operator pushes the handle, the back wheel rotates in clockwise direction and the larger spur gear attached to the shaft drives another smaller spur gear mounted on front shaft. This increases the speed of that smaller spur gear. Smaller sprocket compounded with the smaller gear rotates with the same speed of that smaller gear. This compounded sprocket is linked with another sprocket of same diameter with the help of chain drive which rotates with same speed to that of previous sprocket. The larger sprocket compounded with the latest shaft rotates with the speed to that of the shaft fixed to it.



This larger sprocket rotates the smaller sprocket linked to it with the help of chain drive further increasing speed. The next similar compounded chain drive mechanism consisting of larger sprocket and smaller sprocket further increases the speed of the shaft to which the brush is attached for the rotation.

VI. RESULT

a) Bevel Gear Mechanism

The bevel gear mechanism was to be used in order to make the position of the brush in an angle of 37 degrees. Bevel gear was also to be used in order to reverse the direction of rotation of brush

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with respect to the direction of rotation of the wheel. We thought of this concept in order to increase the cleaning efficiency of the brush.

b) Universal joint Mechanism

In this mechanism, a pair of spur gears were to be used to reverse the direction of rotation of brush and universal joint to keep the brush at an angle of 37 degrees. The main reason to keep the brush at this angle is that it would provide the high quality surface cleaning.

c) Belt Drive mechanism

The belt is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel. Belt is used where center to center distance between two shafts is very large which can't be meshed by using a gear.

In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts), or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to carry a load continuously between two points.

d) Spur gear and parallel brush with Chain Sprockets

Spur Gear is used to reverse the direction and transmit the required torque whereas chain sprockets are solely used for increasing the angular velocity and the brush is kept parallel to the other shafts. The tangential force is used to propel the dust into the container.

e) Vacuum suction with brush with roller

The roller brush will not collect all the dust but blow half of the dust all around which would be solved by keeping centrifugal fan behind the brush. This fan would create a suction pressure but which would suck the dust particles inside.

f) Brush with wetted cloth strip

The wetted cloth strip is arranged is circular frame and dust gets attached to the cloth. The collected dust gets bulky and is collected in container by hitting to a rod placed at the end of the cloth strip.

VII. CONCLUSION

In conclusion, design, fabrication and testing of manually operated road sweeper was achieved with our laborious work. However, we came to the understanding that the range in the numerical data of size, shape and other variables is not permissible. The design data must be accurate and must have an alternative as well. Next, the fabrication process became very complex than we have estimated during design phase. The most important factor that affected and forced us to change some concepts in our design was the material availability and the manufacturability of the machine. After that, the testing was done and we learned that this machine have better performance level than manual traditional sweeping method and found that the benefit in the social level is very high and rewarding in terms of its cost. However, some design discrepancies were observed through our testing results. Some amount of dust spread and hovered in the air. Passing all these challenges we managed to complete this project and learned where the problems are likely to occur during design phase and fabrication phase. Moreover, we also learned about the significance of the material availability, skills and machine availability to design and fabricate the machine and get output

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