



## Design and Fabrication of Beach Cleaning Vehicle

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### ABSTRACT:

The goal of this project is to design and create a functional beach cleaning device that can be used to maintain beaches. The entire beach cleaning process is made possible by this machine. It lowers the expense and work required to maintain the beach. Our primary goal is to create a machine that is both practical and affordable. Our device's ability to fit properly in a car's trunk is another one of its key features. The entire device is green, and local suppliers are available for replacement parts. The inspiration for this idea came from reading a newspaper article about how poorly the government maintains our beaches. We conducted research on the subject and discovered it to be true. According to the officials, cleaning the beach as a whole is a time-consuming and expensive task. To remove trash from beaches, the majority of governments employ the time-tested pick-and-drop technique. This is time-consuming and ineffective. We have created a device that is intended to make beach cleaning practical. Both large and small scale operations can use this machine. This makes it possible for the smaller NGO with less money to have an impact. trash collection, trash sorting, and garbage disposal make up the machine's three main tasks. A conveyor belt with spokes that is attached collects the trash. The cutting- edge locking system can gather and sort the trash. In a box behind the machine, the trash is kept. AutoCAD is software is used to design the project.

### I. INTRODUCTION

In the coastal regions of India, beaches are among the top tourist destinations. Additionally, they are the most polluted. The majority of governments neglected beach cleanup. The principal cause is because cleaning it is challenging. It consumes a lot of time and resources. The trash must be manually picked up by the employees. The waste is covered in sand when it is dumped in the sand by the strong coastal breezes. This makes it challenging to locate garbage. Cleaning is challenging for the staff because they must dig every cubic foot to gather the garbage. The labour conditions are worsened by the beaches' hot and muggy atmosphere. A few governments have purchased beach cleaning equipment. The primary disadvantage is that they are fairly pricey. and there are not many who can operate it. These machines break down far too frequently, necessitating the importation of spare parts. This prompts the government to stop using such devices. Due to their powerful fuel-based motors, these machines pollute the environment while cleaning the beaches. Thus, the goal of minimising pollution is defeated in its entirety. One sort of pollution is being transformed into another. A practical beach cleaning device that is inexpensive and simple to use has been created by us. There is not a steep learning curve. The machine's components were all found locally, so finding replacement parts shouldn't be too difficult. The machine can be powered by an electric motor or by people. Solar energy is used to power the electric motor. This provides a benefit over the current models on the market that are powered by fuel motors.

### II. LITERATURE SURVEY

1. Kusoun Prakoobkam et. al, [1] analysed the waste generated on the beaches of Thailand. A large quantity of waste had to be collected and transported to the waste dumping area. The cost required was very high. Between January and October of that particular year itself the authorities encountered wastes on the sand of about 10 cubic meter per day. During the time of rain and wind storms the wastes such as plastic, young coconuts, etc are washed to the sea. Waste came along with the flow of water from Bangapakong river and came to the coastal area of the Saensuk municipality. The waste that came here have been trapped and collected with the installation of the waste trap buoy which is situated 5 km away from the coastline. This waste trap buoy that helps in preventing some garbage from getting to the beach. But now the waste trap buoy has been used for long and most of it is critically damaged. Because of all the above reasons the Saensuk municipality decided and had imported several beach trash collection trailers. But unfortunately no more they cannot be used it because of the unavailability of the necessary spare parts. This was because the spare parts that was to be replaced should be ordered from abroad. For instance, the belt conveyor was damaged or worn out due to the constant rubbing and mating out on the side of the trailer joint. This was because the coastline had a slope and it was not smooth and even. Saensuk municipality authorities used the loader i.e. tractor. The tractor is then attached to the rake to remove and collect waste on coastal area in the morning time. But the price that has to be paid is really high compared to the output. On based upon the following given reasons, the beach cleaning trailer was designed and then it had been manufactured in such a way that it will be suitable for various beach terrains and also the materials used in the trailer are locally available that to in cheaper rates. Especially, after the test and study it was also found out that almost all the ball bearings used in the trailer were regularly damaged or worn out, so to solve this issue the

failures present in the ball bearing plumbing housing have been studied, considered and analysed properly using the Finite Element Method (FEM).

2. Vivek Dhole et. al, [2] designed and fabricated a beach cleaning machine due to the difficulties in beach maintenance of cleaning manually, they came up with the equipment that not only collects waste like sticks, non-degradable waste, etc but also separate them, which is easy for the waste disposal at the end. The machine mainly consists of a motor that runs through an engine fossil fuel that drives the whole process of the machine. The garbage is then collected along with the sand through the conveyor sheet which falls through the perforations on the conveyor back to the sand bed. Separation of waste material decreases place by principle of density difference. It consists of two funnels in which the various wastes are collected which facilitates easy disposal of waste. The beaches of the coast are the main attraction for tourism, to attract tourists, the beach must be kept clean. To serve the purpose of cleaning the beach, some cleaning machine must be used by us to have a cleaning done, this machine is really helpful in cleaning the beaches. The motor is responsible for the drive mechanism of the conveyor. The filter attached to the conveyor is collecting the waste from the environment and the transferred via a conveyor belt in the storage bin. Today's era is moving towards digitization and with a great speed. Today's youth wants everything very easy and smart. Not just the youth, but also the people of all generations find it very easy to make smart efforts and becoming and becoming more and more healthy energized or connected to the latest technology of being "Smart work". Wherever you go, you get this technology available every time. So they thought about using this technology and add more to their project. Nobody likes that suffer and wait for long wait, just to be in good environment or something. To avoid this and save time for waste management they created an application called as an "Intelligent cleaning system". For this we use the system of which beach cleaner can use the work skilfully and the communication is by application. Smart and intelligent cleaning systems which were proposed to actually overcome the real-time problems faced by everyone. With the large number of continuing expansion of industries, the problem arises are many as compared to previous time. Wastewater must be solved urgently due to the waste that is greatly increasing sewage problems from industries which affect the environment.

### III. MATERIALS USED

- i. Frame: Rectangular sections of mild steel are used for the frame. Numerous advantages exist for rectangular tubing. They offer a pleasing look, great strength to weight ratios, consistent strength, cost effectiveness, and recyclability. The benefits of using rectangular tubing are. They offer a higher ratio of strength to weight. Rectangular tubing reduces the weight of the steel required to complete a task, which lowers the cost. Rectangular tubes are particularly well suited to all types of applications because to its high resistance, excellent compression and support qualities, and exceptional durability. Steel, one of the most reusable and recyclable materials in the world, is used to create rectangular steel tubes. Steel rectangular tubes are a great option for bear resistance and consistency due to their torsional strength.



- ii. Spokes: It is employed to remove trash from the sand. It is created by first cutting lengthy steel construction-related rods, then bending them on a vice. The spokes were made of stainless steel for the following reasons: Have High Strength, Resist Corrosion, Heat Damage, Chemical Damage.



- iii. Wheels: Wheels are used for moving the vehicle forward and backward. A rubberised wheel are used for extra grip and to provide a small level of shock absorption. The wheels are fitted with a bearing so as to smoothen the rotation.



- iv. Chain: With the aid of a nut and bolt, the spokes and plate are fastened to the unique sort of chain being employed here to transmit power. Sprockets operate chains. It uses a simplex mechanism. Because there is little energy loss, the chains are utilised. This machine's conveyor was made specifically for the job. It has a unique protrusion on the chain that the bolted-on plates are attached to. This was done to ensure that the motion of the plates and spokes would not hinder the chain's motion. A conveyor type chain is used in this project.



- v. Sprocket: They are employed to transmit power via chains from one component to another. A sprocket is a wheel with a patterned pattern of teeth that meshes with a chain, track, or other material that has holes or indentations. Any wheel with radial projections and a chain running over it is referred to as a "sprocket" in general. It varies from a sprocket in that sprockets never mesh directly with one another and that the rollers are smooth while sprockets have teeth.



- vi. Bearings : A spinning shaft is supported by pedestal bearings with the aid of accessory parts that are compatible with the bearings. Cast iron or cast steel is generally used as the housing material for a pillow block. Steel balls are within it for rotation. Rotation is made smoother by greasing the bearing.



- vii. Hand Lever : A "z"-shaped hand lever made of mild steel is available. The sprocket and chain conveyor system's shaft is attached to the hand lever, which is manually operated by the hand. The conveyor system and the spokes are both rotated simultaneously when the hand lever is turned.

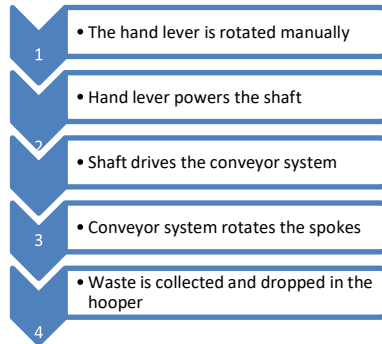


#### IV. METHODOLOGY

The beach cleaning machine's main goal is to quickly and effectively clean the beaches at a depth. to make the equipment more affordable and to make it portable to the most remote beaches. Locally available spare parts that anyone with a basic understanding of mechanics should be able to obtain.

- a) Motion provided to the wheels by manually pushing or towing the machine.

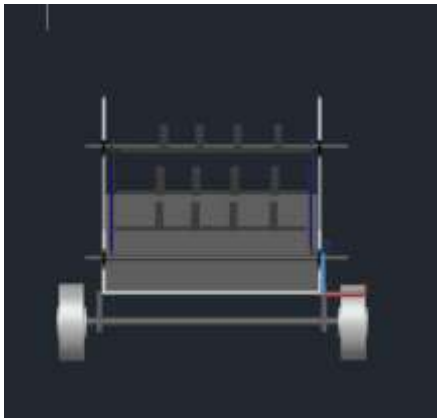
- b) The shaft is rotated by means of a hand lever.
- c) Rotation of cleaning conveyor belt.
- d) Waste collected from depth and is filtered.
- e) Waste is deposited in the bin.



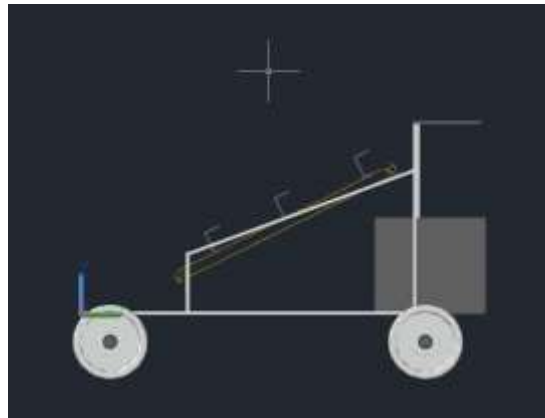
### ***SOFTWARE USED***

AutoCAD is a software program used to design, form, and shape the 2-D and 3-D images using a computer. AutoCAD provides a set of tools that we can use to complete a detailed design of the product. It also provides an option to create a detailed design layout, which can be automatically drawn using a source model. Autodesk developed this software and first released it in 1982. Uses of variants in AutoCAD:

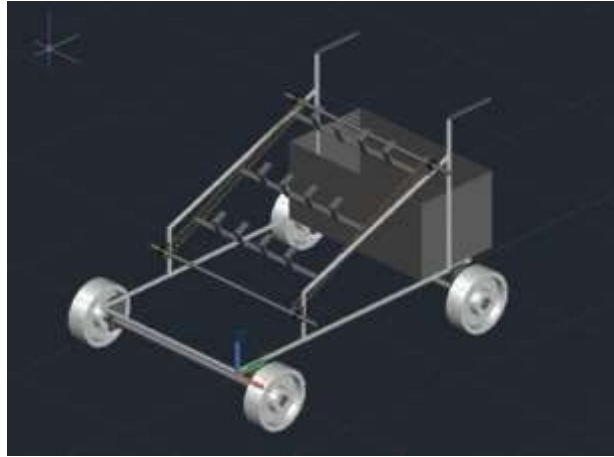
- AutoCAD uses a lot of variants and releases that provide capabilities to build an application.
- AutoCAD provides 3D capability that gives fewer rises to the releases of the applications.
- Variants are also used to increase the variations present in the application or the package used in a particular program.
- The AutoCAD's variants also help create, visualize, and render the 3D models that provide the 3D printing.
- Variants facilitate us to use different functionalities of the function in the application and execute it according to the needs.



a) Front view



b) Side view



c) Isometric View

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## V. RESULT

Hence, Design and fabrication of beach cleaning vehicle is done with the following features;

1. It can collect waste and safely dispose it.
2. Due to the long and strong spokes it is able to go deep into the soil and collect waste.
3. Applicable for all types of beach.
4. Can also be driven if the sand is wet.
5. Is operable under any weather condition.
6. Variable with dimensions and farming specifications.
7. Spare parts can be sourced locally.
8. Economical and can be transported easily.
9. Speed can be varied accordingly.

Hence, Design and fabrication of beach cleaning vehicle is done with the following advantages:

1. Significant reduction in numbers of labour
2. Gradual decrease in time consumed.
3. Very economical as compared to conventional methods.
4. Flexibility in defining the distance and area of cleaning.
5. Avoiding human errors in picking and disposing the waste.
6. Cleaning in greater depth which is impossible by conventional tools.
7. Can be transported easily.
8. Ease of maintenance as the parts have been sourced from locally.
9. Economic gain as less workers are required for cleaning.
10. Cheaper alternative to the current machines available in the market.

11. Does not require fossil fuel, so can be used in remote location



## VI. CONCLUSION

The following conclusions were drawn from this study:

- 1) Beach cleaning equipment that is inexpensive, simple to use, and multipurpose is designed and manufactured.
- 2) Particularly made for cleaning beaches.
- 3) The environmental impact is almost nonexistent by using renewable energy as a tool for the goal.
- 4) The government and the NGO will be encouraged to use the machine because it saves time when cleaning the beach.
- 5) Preventing human mistake in waste collection and disposal.
- 6) It is easily transportable, which lowers the cost of transportation.
- 7) Can be utilised in remote locations because it doesn't need fossil fuel.

## VII. FUTURE SCOPE

It is possible to attach solar panels so it can charge itself while moving .using hydraulics to the process of raising and lowering the conveyor system's height. Adding AI intelligence to the device will allow it to analyze the various beaches and adjust the conveyor as necessary.

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