Dr. B. Ravi, 2023, 11:4
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Design of Beach Cleaning Machine

Dr.B. Ravi, Professor TVS. Krishna Saket, Sailaja Sreeya Nemani
Department of Mechanical Engineering
Sreenidhi Institute of Science and Technology, Hyderabad, India.

Abstract-This project is proposed to design and develop a working beach cleaning machine to clean the beaches. This machine enables the total work in cleaning the beaches. It reduces the cost and labor associated with cleaning the beach.Thefocus is on developing a machine in a pragmatic way which is both cheap and easy to use. The waste is collected through a conveyor blade. It consists of a belt that moves and collects the waste and the collected material will be drawn to the box. This system helps to keep the beach clean and saves the ocean life from garbage pollution. Beaches are the main attractive tourist places in the coastal areas of India. They are also the most polluted places.To clean the place, It takes up a lot of resources and time. The workers need to work manually in order to pick up the waste. The waste when thrown, gets covered with sand making it hard to spot the waste. Followed by the heat and humid climate of the beaches,the workers find it extremely difficult to collect the waste. We designed and fabricated a beach application which gives advantage to get rid of the difficulties.

Keywords- Beach Cleaning, Design, and fabrication

I. INTRODUCTION

Beach cleaners are machines that remove unwanted materials from beaches and make them comfortable and visually pleasing for beach-goers. Various beach cleaners can be used to effectively remove litter, sharp shells, glass, rock, and excessive seaweed from the beaches.

Beach cleaners come in all shapes and sizes. The most popular kinds are tractor-towed and powered by a tractor's hydraulic PTO shaft. Smaller walk-behind models are also manufactured for private beaches and sandy areas.

II.LITERATURE REVIEW

1.Eco Beach Cleaner–Amit Singh, Animesh Singh
The main objective of this project was to design a small confiscated machine that utilizes the power of solar energy via solar panels (making it eco-friendly) and help to collect the trash from the coastal areas i.e. sand beach in a well- organized way and store in the trash box & also minimizing the cost of labor. Some of the proposed drawbacks in the paper were that the machine uses solar energy to run. This leads to a question: what about the days without optimum amount of energy how can it be run. They proposed that it can be switched to manual mode. Also picking up all sizes of trash is also a problem that arises.

2.Design And Fabrication Of Automatic Beach Cleaning Machine -K.Sowjanya,Dr.K.Prahlada Rao
In this project the main aim of this machine is to lift the waste debris from the sand surface and dispose of them in the tray. The machine uses a simple sprocket-chain mechanism and is run using an Arduino uno board. This machine is a 4-wheel drive. The approach in this paper was a little different as they used the FEA (Finite Element Analysis) concept and ran the simulation and analysis in Ansys software. This approach helped them to give them the results of the total stresses induced and the deformations taking place in the machine and concluding that the machine is a safe design.

3.Design and Fabrication Of Beach Cleaning Machine–Ramachandran. N

International Journal of Science, Engineering and Technology

An Open Access Journal

This Machine is a proposed"THREE WHEELED HYBRID VEHICLE" where single power drive is the prime mover which is used to drive the vehicle.The beach cleaner works on the basis of rotation of the chain and sprocket set. The disadvantages as mentioned in the paper are that firstly the garbage collected in the trash bin must be manually disposed of, secondly the vehicle is not automatic it must be moved manually. They claim that it is a unique design in the market.

4.Design and fabrication of beach cleaning machine- C.Balasuthanagar, Dinesh Shanmugan

In this machine they have done the automation of a river cleaning machine with the use of a motor and a chain drive mechanism.It is operated remotely using radio frequency module receiver and transmitter. This might not be as like our model the purpose of it is a bit different but the ultimate construction and the use of the machine are like ours.

5.Design of Multi-Robot System for Cleaning Up Marine Oil Spill–T.V.Prasad, Mohamed M.Shanta

This machine's purpose is slightly different from our machine but the mechanism and its working similar in some ways. This machine is designed to clean the oil spills caused due to the leakages from the pipelines,submarines, tanks. This machine uses wireless technology to move and clean the oil spills. The common point between our machine and this machine is that both target the cleaning of the environment.

6.HAIWF-based fault detection and classification for industrial machine condition monitoring - T.Satish and Karthik Suyambu

This is mainly for the detection of any faults in the rotating parts of the machine. As our machine has many rotating parts hence, we need a method for detecting faults.Weuse the "INERTIA WEIGHT FIREFLY SYSTEM." The IWF based ANN is used in this work to detect rotating machine faults; it overcomes the drawbacks like data deficiency and training difficulties in ANN using the backpropagation algorithm. In this ANN, the weight is considered as the input data. In this proposed technique, the separate neural network is used for each weighted input. In this method by using an individual neural network for individual input weight makes the training process more efficient and also the issue of data deficiency can be reduced to an extent.

III.OBJECTIVE

To design and fabricate a portable beach cleaning machine.The objective in this can be split into two parts, the designing part, and the fabrication part.

1. Designing

This involves of mainly 2 steps. The first step is to come up with the dimensions of the machine in such a way that it is portable as we mentioned above. After coming up with the dimensions we must come up with a rough sketch of the machine so that we will have idea of how it is going to look. The second step is to design the machine in a software. We need to develop a CAD model first and then analyse it in order to get the stresses that are acting so that we can proceed into the fabricating part.

2. Fabrication

All common fabrication techniques such as welding, drilling, cutting, buffing,and bending were used. The primary tubular frame structure required the applications of welding and cutting techniques. Metal fabrication is the process of manufacturingsheet metal and other flat metals to make them conform to specific shapes.

III.WORKING & METHODOLOGY

The beach cleaner works based on rotation of the chain and sprocket set. A low-speedhigh torque motor is attached to the upper shaft that drives the sprockets. The liftermechanism consists of a chain sprocket arrangement coupled to the motor to drive thecleaning mechanism. The device is placed across a beach and sea so that only sand can getthrough the lower basement. Floating waste like bottles, plastic cans, other waste, etc. is liftedto the conveyor. The chain revolves with the sprocket wheel which is driven by the motor.When the motor runs the chain starts to circulate making the machine to lift. The wastagematerial is stored in the collecting box. Once the collecting box is full, the waste materials areremoved from the box.

International Journal of Science, Engineering and Technology

An Open Access Journal

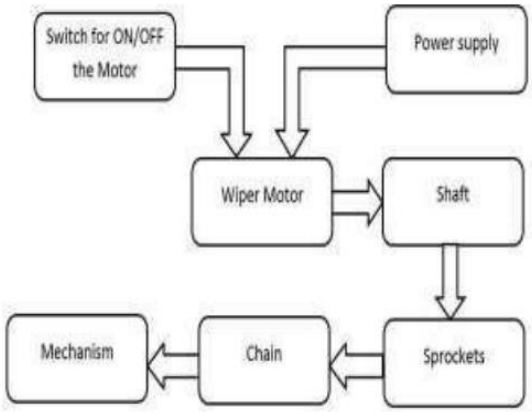

Fig-1 Workmap Of the System

The essential objective of the beach cleaning machine is to clean the beaches at a depth asfast and efficient. To reduce the cost of machine and to be able to transport it to most remotebeaches. To procure spare parts locally and should be able to fix by any person who knowsbasic mechanics.

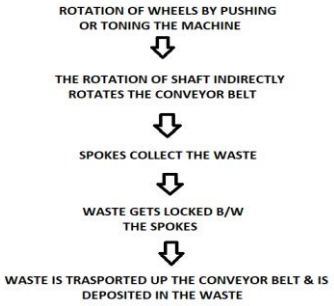

Fig:2 Working Mechanism

IV.DESIGN AND CALCULATIONS

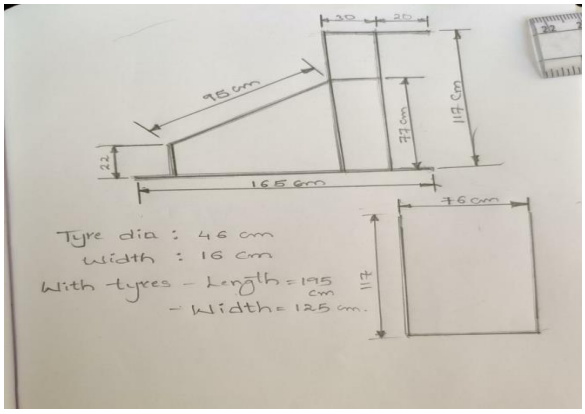

Fig.3 Shows The Rough Diagram Of A Machine

Description-From the fig-3, we did a rough diagram of the machine using the dimensions required for various parts of the machine. This rough diagram gave a brief outcome of the machine.

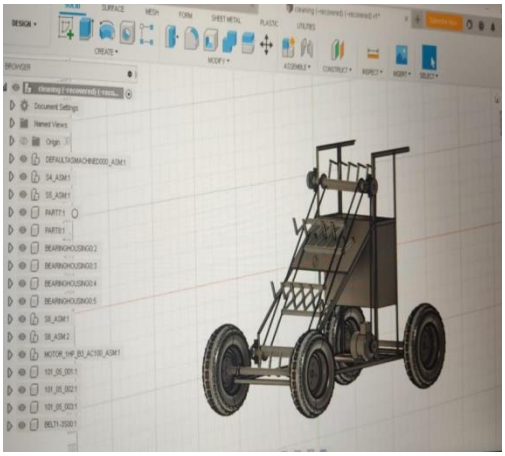

Fig-4 Assembled Machine

Description- Using the dimensions mentioned in fig-3, we did 3D drawing in solidworks software. We ran a stimulation test in this software. This stimulation gave us a report of how the machine can handle the stress and deformation.

Calculation:

CONVEYOR DESIGN :
TRANSMISSION RATIO i =1
No of teeth =Z1 = 14
Z2= i*Z1=14 (As i =Z2/Z1)
Assume centre distance = 650mm
Minimum pitch = 650/50 = 13
Maximum pitch = 650/30 = 21
Length of the chain, Lp= 2aP+(Z1+Z2)/2ap+(Z2-Z1/2Dπ)2/aP = (2*43+14+14)/2 =
100
Length of chain, L= 100*15 = 1500mm

Radius of sprocket = 33.5m
MOTOR:
Assumed weight =2kg Torque,
T=f*r =2*9.81*33.5 = 657.29Nmm = 0.657Nm
P=2*3.14*NT/60 = 2*3.14*1500*0.657/60
= 103.14 watt

V.RESULTS AND DISCUSSION

From the above experimental setup, we obtained a reliable, efficient, and desired beachcleaning machine design suitable for humid beaches of India. Various parts of themachine dimension are calculated above. The waste is collected through the conveyorblade

International Journal of Science, Engineering and Technology

An Open Access Journal

along with the sand which falls off through the perforations on the convey or back to the sand bed; separation of waste material takes place through the principle ofdensity difference. Also, with the help of the calculation of the chain and sprocket, wehave got the optimum value for which the work of our beach cleaning machine will beefficient and work under theenvironments of Indian beaches.Since the cost of this system is less due to local materials, the machine can be widelyused for all the beaches. As the system works on a basic chain and sprocket system maintenance will be very low. It works on both wet and dry sand.

VI.CONCLUSION

To conclude, there are numerous other projects like the Beach Cleaner project.The studied articles that were presented were from different companies, organizations,and universities worldwide. It was observed from the reviewed articles how eachgroup of designers strategized their development.

Many remarkable features wereobserved that can be added to our project to further develop it. The literature reviewwas successfully helpful in improving the knowledge of how to develop and designthis project.Our design uses a mix of different features from different projects around the worldwe used the chain sprocket arrangement from a certain project and the structure ofanother, the trash picking technique from one and trash deposition method fromanother hence our design is a successful innovative combination of several beachcleaner devices that have been invented and designed in the past. Our designed machine consists of 11 parts including a chain sprocket arrangement. It can be used with or without a motor. We believe that this is the perfect solution to the pollution at the beach. We have successfully designed a beach cleaner that can be implemented easily.

REFERENCES

1. ECO BEACH CLEANER https://wwchgate.net/publication/333396256_Eco_Beach_Cleaner
2. WHEELED HYBRID VEHICLE https://www.ijitee.org/wpcontent/uploads/papers/v8i12/L31461081219.pdf
3. BEACH CLEANING MACHINE https://www.researchgate.net/publication/344214979_Design_and_fabrication_of_beach_cleaning_machine
5. MULTI ROBOT SYSTEM FOR OIL CLEANING https://www.researchp_Marine_Oil_Spill
6. FAULT DETECTION USING IWF SYSTEMttps://www.reseate.net/publication/328411477_HAIWF based_ monitoring