

DESIGN AND FABRICATION OF BEACH CLEANING MACHINE

Vivek Dhole¹, Omkar Doke², Ajitkumar Kakade³, Shrishail Teradale⁴, Prof. Rohit Patil⁵

^{1,2,3,4}UG Students, Department of Mechanical Engineering, Suman Ramesh Tulsiani Technical Campus Faculty of Engineering, Pune, Maharashtra, India

⁵Assistant Professor, Department of Mechanical Engineering, Suman Ramesh Tulsiani Technical Campus Faculty of Engineering, Pune, Maharashtra, India

Abstract - Due to the difficulties faced in keeping the beach clean manually, we have come up with equipment which not only collects the waste (sticks, on degradable waste) but also separates, which is easy for waste disposal. The machine mainly consists of an engine which runs through a fossil fuel which drives the entire process. The waste is collected through conveyor blade along with the sand which falls of through the perforations on the conveyor back to the sand bed; separation of waste material takes place through principle of Density difference. It consists of two hoppers where the different waste gets collected which facilitates easy disposal of waste.

1. INTRODUCTION

The coastal area beaches are main attraction for tourism, so in attracting tourist the beach must be kept clean. For the purpose of cleaning the beach, some cleaning machine must be used so we have manufactured a cleaning machine which is helpful in cleaning the beaches.

The motor is responsible for driving mechanism of conveyor. The strainer attached to the conveyor will collect the wastages from the surroundings and transferred to storage bucket through conveying belt.

As today's era is moving towards being digitalized and automated with a great speed, the youth want everything very easily and smart. Not only the youth but the people of all generation are finding it very easy to be smart effort and more and more being healthy and are getting attracted or joined towards latest technology of being "smart work". Anywhere you go, you get this technology available. So we thought of using this technology and adding more to it for our final year project. Nobody likes to suffer and wait for our long waiting hours just to get good surrounding or so. To avoid this and to save time of our management of waste we are creating a application called "Smart cleaning system". For that we are using system by which beach cleaner can do his work smartly using communication through application. Smart Cleaning System proposed to overcome the real time problems. With the continued expansion of industries, the problem of sewage water must be urgently resolved due to the increasing sewage problems from industries of the surrounding environment. The wastes produced from the industries are very harmful to human beings and to the environment. Second Important thing is waste

management system by which worker can maintain all his health and work good through application maintain that reporting worker don't need to wait and get in to drainage. One more very useful and important advantage of our system is that the worker to replace the manual work in beach cleaning by semi mechanical beach cleaner. And can access them very easily

1.1 Background

A , beach cleaner, is a vehicle that drags a raking or sifting device over beach sand to remove rubbish and other foreign matter. They are manually self-pulled vehicles on tracks or wheels or pulled by quad-bike or tractor. Seaside cities use beach cleaning machines to combat the problems of litter left by beach patrons and other pollution washed up on their shores. A chief task in beach cleaning strategies is finding the best way to handle waste matter on the beaches, taking into consideration beach erosion and changing terrain. Beach cleaning machines work by collecting sand by way of a scoop or drag mechanism and then raking or sifting anything large enough to be considered foreign matter, including sticks, stones, litter and other items. Similar applications include lake beaches, sand fields for beach volleyball and kindergarten and playing field sandpits. The word "sand bone" is a back-formation referencing the ice-surfacing machine Zamboni.

1.2 Type of beach cleaning machine

1. Manually Method

2. Automatic

a) Raking technology

b) Sifting technology

c) Combined raking and sifting technology

a. Raking technology: - can be used on dry or wet sand. When using this method, a rotating conveyor belt containing hundreds of tines combs through the sand and removes surface and buried debris while leaving the sand on the beach. Raking machines can remove materials ranging in size from small pebbles, shards of glass, and cigarette butts to larger debris, like seaweed and driftwood. By keeping the sand on the beach and

only lifting the debris, raking machines can travel at high speeds

- b. Shifting technology :-**It is practiced on dry sand and soft surfaces. The sand and waste are collected via the pick-up blade of the vehicle onto a vibrating screening belt, which leaves the sand behind. The waste is gathered in a collecting tray which is often situated at the back of the vehicle. Because sand and waste are lifted onto the screening belt, sifters must allow time for the sand to sift through the screen and back onto the beach. The size of the materials removed is governed by the size of the holes in the installed screen
- c. Combined raking and sifting technology:-** The differs from pure sifters in that it uses rotating tines to scoop sand and debris onto a vibrating screen instead of relying simply on the pick-up blade. The tines' position can be adjusted to more effectively guide different-sized materials onto the screen. Once on the screen, combined raking and sifting machines use the same technology as normal sifters to remove unwanted debris from the sand.
- d. Sand sifting by hand:-** It is used for smaller areas or sensitive habitat. Sand and debris is collected into a windrow or pile and manually shoveled onto screened sifting trays to separate the debris from the sand. While effective, it requires the movement of sand to the site of the tray, and then redistribution of the sand after sifting. A more efficient method is the use of a screened fork at the place where the debris is located. The effort to manually agitate the sand can become tiresome; however, a recent development of a battery-powered sand rake combines the spot cleaning effectiveness of manual screening with the ease of an auto-sifting hand tool.

2. PROBLEM STATEMENT

To minimize the problem of wastage in river, lake, sea due to the plastic, electronic items, thermocol, metal etc. This causes huge amount of water pollution which effects on aquatic animals as well as human life. It is also used in small scale industries to remove the solid wastage from water with minimum cost.

3. SCOPE

The objective of this work is to develop a New Automatic operated Machine of Beach Cleaning.

This concept allows us to achieve our goal as well as better space management.

The new model takes into account all the real time conveying system and provides solution over their short coming.

The New model will get good efficiency compare to old method

4. LITERATURE REVIEW

ECONOMICS ASPECTS OF BEACH CLEANING TRAILER [1]

Beach litter collection is a concern for Bang Sane beach, one of the popular tourist attractions of Thailand. In order to solve this problem, a beach cleaning trailer was designed and fabricated with emphasis on the use of local materials and local production. The design trailer prototype 3.7x1.6meters was carried out using a three dimensional solid modeling computer program. This paper explores the economics of the beach-cleaning trailer in terms of payback period, charging rate to customer, working areas. The research provided some positive results on economics aspects. The design trailer prototype has been developed and fabricated with emphasis on the use of local materials and local production. The machine has been tested at Bang Saen beach in Thailand. We have explored the economics of the beach-cleaning trailer in terms of payback period, charging rate to customer, working areas. The research provided some positive results on economics aspects. We hope to further design and develop the fully mechanized beach cleaning trolley.

DESIGN AND CONSTRUCTION OF BEACH CLEANING TRAILER BY FINITE ELEMENT METHOD [2]

The design of a beach cleaning trailer is presented. The basic design principle of a foreign beach cleaning machine was taken into consideration. Apart from the tire and hydraulic hoses, all components of the beach cleaning trailer were made from steel. This study focuses on stress analysis in the ball bearing housing by the finite element method. Actual tests have been carried out in fields. This study aims to report the performance of the beach cleaning trailer. Stresses in the ball bearing housing are calculated by FEM. A stress analysis made using the forces acting on the ball bearing housing showed the maximum Von Mises stress of the ball bearing housing to be 63.0 MPa. The safety factor was 3.94. It showed that it was very durable to use. For the future work, economic analysis should be performed to develop and design a fully mechanized beach cleaning machine. The designed and developed beach cleaning trailer was quite appropriated to be used due to utilizing of local materials, with reel of blade enhancement

BEACH CLEANING EQUIPMENT"PROJECT REFERENCE NO. : 37S0546 [3]

Due to the difficulties faced in keeping the beach clean manually, we have come up with equipment which not only collects the waste (sticks, no degradable waste) but also separates, which is easy for waste disposal. The machine mainly consists of an engine which runs through

a fossil fuel which drives the entire process. The waste is collected through conveyor blade along with the sand which falls of through the perforations on the conveyor back to the sand bed; separation of waste material takes place through principle of Density difference. It consists of two hoppers where the different waste gets collected which facilitates easy disposal of waste.

SAND SCREENING AND WASHING MACHINE [4]

In recent years the foundry industry has been showing an increased interest in Screening and washing of sands. Deposits of sand and gravel, the unconsolidated granular materials resulting from the natural disintegration of rock or stone, are generally found in near-surface alluvial deposits and in subterranean and subaqueous beds. Sand and gravel are siliceous and calcareous products of the weathering of rocks and unconsolidated or poorly consolidated materials. Grain shape, screen analysis, chemical characteristics, as well as thermal characteristics, must be uniform to get uniform properties in today's sand mixes. We are in a process of developing a concept which has the capability to bring revolution in the field of construction in most developing nations of the world. We present here our concept of "sand screening and washing". This project is a combination of basic principles called as screening and washing which is being used for many centuries in the field of construction all around the world. Through this present investigation following some important conclusions are made which are discussed below Considering the present case study, the screened and washed sand is obtained by combining two different processes. The labor cost of operation can be reduced with less time taken. It requires less area and it is portable

AUTOMATIC WHITEBOARD CLEANER USING MICROCONTROLLER BASED RACK AND PINION MECHANISM [5]

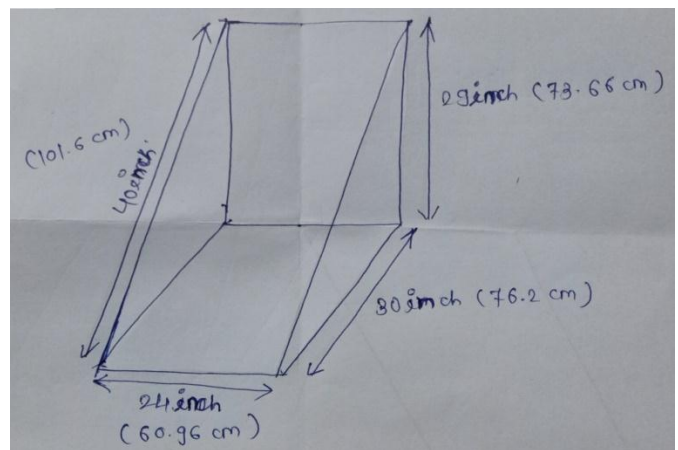
At recent years whiteboard has become a crucial element at almost every educational institute. They are large in size, for that reason it is very time consuming and tedious process to erase the writings from the board with duster manually. It breaks concentration of both lecturers and listeners. Automatic Whiteboard Cleaner can solve these problems. Automatic whiteboard cleaner will reduce the time and also the effort. It takes around 6 secs to clear the board smoothly. This paper represents the design and construction of automatic whiteboard cleaner. The system consists of Adriano microcontroller, driver module, dc gear motor, rack and pinion mechanism, sonar sensor, supports, and a cleaner bar to give that an automation figure. When the switch is on, it moves across the full width of the board and its direction is reversed automatically in order to clean the board. So, this "Automatic Whiteboard Cleaner" is a great replacement of "duster" and it can be suggested to use this to reduce the

effort of the board user as well as to introduce the classroom with an automation system.

DRAINAGE SYSTEM CLEANER A SOLUTION TO ENVIRONMENTAL HAZARDS [6]

The Drainage system cleaner is a machine which helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. These wastes when not removed end up settling in residential places where these wastes are burnt thereby causing climate change otherwise these wastes block the drainage systems thereby causing flooding. The machine is designed in such a way that it generates motion for its functions by itself through the action of running water thereby cutting out the dangers of the powering the machine by other sources of power because of the harshness of the rain on these other sources. The drainage system cleaner has three major parts which are the Propeller, the Cleaner and the Pan all make up for its effective functioning. The Drainage system cleaner was tested on three different days in the first day it rained in the months of September, October and November 2012 respectively. Based on the findings made after the test the Drainage system functioned well when there is maximum load. I therefore recommend the use of this system by various individuals, government companies and waste recycling companies for prevention of environmental hazards and also encouraging waste management

5. Model Design Image:-



Dimension of machine

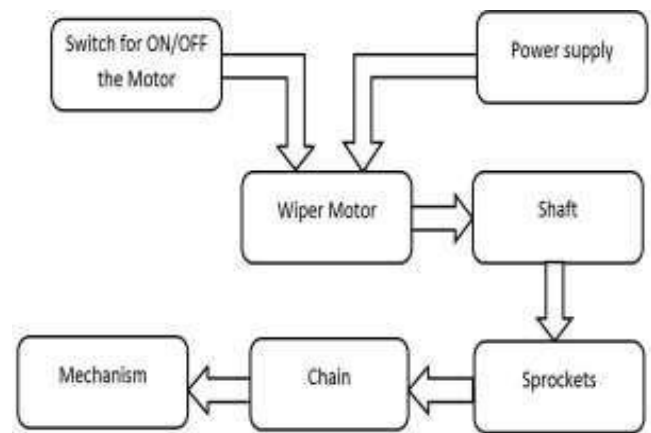


Cad model of drain cleaning machine

6. Working Principal

The device is placed across a beach and sea so that only beach sand can get through the lower basement. Floating waste like bottles, plastic cans, covers any kind of waste, etc. is lifted by lifters which are connected to the chain. The chain revolves with the sprocket wheel which is driven by the motor. The energy provided to the motor is electrical energy. When the motor runs, the chain starts to circulate, making the lifter to lift up. The waste material is lifted by lifter teeth and stored in a collecting box. Once the collecting box is full, the waste materials are removed from the box. There is a 45 to 50 degree bend plate which is assembled at the bottom of the box. It is mainly used for leveling the beach surface. The material which we are going to use is M/S Mid-Grade which is easily available in the market with less cost compared to others.

The two rollers are connected apart from each other through a belt drive on which perforated buckets are mounted through a riveting joint. As the system is allowed into drainage, the roller starts rotating, the buckets will move inside the drainage, which will go up to material inside the drainage block. The bucket will pick up the waste material and floating material from the drain block. The bucket allows water to flow out as being perforated and only waste part will be collected into a storage collector behind the belt drive.



Working Flow Chart

ACKNOWLEDGEMENT

On the very outset of the review paper we would like to extend our sincere and heartfelt obligation to words Prof. P.V. Bute (H.O.D), Prof M.A. Mane, Prof. R.R. Patil and all staff of mechanical engineering Department SRTTC Kamshet. Without their active Guidance, help, co-operation and encouragement we would not have made headway in this paper.

CONCLUSION

This system helps to clean beaches so it keeps the sand clean and saves the ocean life from garbage pollution. This system does not need more human labor for the waste water cleaning and this can reduce the direct contact of the human labor with the waste water, so there is no hazard for the human labor. Also, this method is automatic, so the working time is less as compared to the conventional method. Because of this project, as there is no direct contact of the worker with garbage, the health of the worker will be good and he will be able to work for a longer duration. This system is fabricated with emphasis on the use of local materials and local production.

REFERENCES

- [1]. D. Smith, Harris Pearson. (1955). Farm machinery and equipment. Tata McGraw-Hill, India, 519p.
- [2]. Hunt, D. (2002). Farm Power and Machinery Management, Laboratory Manual and Workbook, 7th Ed., Iowa State University: AMES IOWA.
- [3]. Campbell, Joseph K. (1990) Dibble sticks, Donkeys and Diesels. International Rice Research Institute, Philippines.
- [4]. RNAM Test Codes & Procedures for Farm Machinery (1955) Technical Series No 12 Economic and Social Commission for Asia and the Pacific Regional Network for Agriculture Krissanaerane, Suravej.

(2005) Farm machinery and crop production management. Co-opthai printing, Bangkok.

- [5]. Kratzer, Donald. (1979) US Patent number 4241792: Groundsweeper. Available Source: <http://www.google.com/patents/US4241792>. December 2012.



He is now pursuing Bachelor of Mechanical Engineering in final year at Suman Ramesh Tulsiani Technical Campus Faculty of Engineering , Pune ,Maharashtra, India

- [6]. Prakobkarn, K., B. Saitthiti, S. Intaravichai, (2012) Design and Construction of Beach Cleaning Trailer by Finite Element Method. *INT TRANS J ENG MANAG SCI TECH*, Vol. 3(2), Available Source: <http://www.TuEngr.com/V03/111-123.pdf>, February 2012.



He is now pursuing Bachelor of Mechanical Engineering in final year at Suman Ramesh Tulsiani Technical Campus Faculty of Engineering , Pune ,Maharashtra, India

- [7]. Gilmour, Richard (1976) US Patent number 4050518: A beach cleaning apparatus. Available Source:<http://www.google.com/patents/USPAT4050518>. December 2012\.



Assistant Professor, Department of Mechanical Engineering, Suman Ramesh Tulsiani Technical Campus Faculty of Engineering, Pune, Maharashtra, India

- [8]. ASAE. (2000) (American Society of Agricultural Engineers, Standards. Agricultural Machinery Management.

- [9]. Logan, Daryl L. (2002). A first course in the Finite Element Method. Third Edition Brooks/Cole, United States of America.

- [10]. Rao, Singiriresu S. (2005) the Finite Element Method in Engineering. Fourth Edition. Elsevier Butterworth-Heinemann. United States of America. 663 p.

- [11]. Chou, P.C. and Pagaro, J.N. (1967) Elasticity tensor, Dyadic and Engineering Approaches. Over publication, Inc., 290 p. New York.

- [12]. Beer, Gernot. (2001) Programming the Boundary Element Method An Introduction for Engineers. John Wiley & sons Ltd. Great Britain.457

BIOGRAPHIES



He is now pursuing Bachelor of Mechanical Engineering in final year at Suman Ramesh Tulsiani Technical Campus Faculty of Engineering , Pune ,Maharashtra, India



He is now pursuing Bachelor of Mechanical Engineering in final year at Suman Ramesh Tulsiani Technical Campus Faculty of Engineering , Pune ,Maharashtra, India