Advanced River Trash Cleaning Robot Using Wireless Technology

A. P. Dahiphale[1] M. B. Haloli[2] M. R. Gaikwad[3] S. S. Dharwadkar[4] A. Baipadithaya[5]
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]Dhole Patil College of Engineering Pune, India

Abstract— This project emphasis on design and fabrication of the river waste cleaning machine. The work has done looking at the current situation of our national rivers which are dump with crore litres of sewage and loaded with pollutants, toxic materials, debris etc. The government of India has taken charge to clean rivers and invest huge capital in many river cleaning projects like "Namami Gange", ''Narmada Bachao'' and many major and medium projects in various cities like Ahmadabad, Varanasi etc. By taking this into consideration, this machine has designed to clean river water surface. Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. Automation plays an important role in mass production. In this project we have fabricated the remote operated river cleaning machine. The main aim of the project is to reduce the man power, time consumption for cleaning the river. In this project we have automated the operation of river cleaning with help of a motor and chain drive arrangement. Some needs of automation are described below. Here using RF transmitter and receiver are to control the cleaning machine. Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation.

Keywords: River Trash Cleaning Robot, Wireless Technology

I. INTRODUCTION

Lakes are an important feature of the Earth's landscape. They are extremely valuable ecosystems and provide a range of goods and services to humankind. They are not only a significant source of precious water, but extend valuable habitats to plants and animals, moderate the hydrological extreme events (drought and floods), influence microclimate, enhance the aesthetic beauty of the landscape and offer many recreational opportunities. Lakes have a very special significance in India.

Pollution: For the last two decades, there has been an explosive increase in the urban population without corresponding expansion of civic facilities such as adequate infrastructure for the disposal of waste. Hence, as more and more people are migrating to cities the urban civic services are becoming less adequate. As a result, almost all urban water bodies in India are suffering because of pollution and are used for disposing untreated local sewage and solid waste, and in many cases the water bodies have been ultimately turned into landfills.

Many existing solutions have much human interference which is not easy to use. Sea bin is one of the kinds. It has floating bucket like structure connected to a pump. The inner part of buckets covered with filter bag. It takes in water along with wastes, water passes through to the pump and then to the water source. Wastes are collected in the bag and must be disposed off.

II. OBJECTIVES

1) Collect many types of wastes: Our product should not be restricted to collect only one type waste. It must diversify its function to accomplish the given task. The mechanism made for to collecting wastes should be tough enough to collect plastic wastes, plastic bottles, organic wastes which include crop debris, food wastes and any type of wastes which is on beach area.
2) Less human interference: The very basic idea should be satisfied that is to avoid the interference of the operator. This will happen only by the adoption and sustained usage of technology in the workspace.
3) Collect more amount of waste: Very firstly it must collect around 5 kg of waste at a time when left on to the water.
4) Easy disposal of waste: Another important thing is easy removal of wastes which are collected in the collecting box.
5) It must be stable: To make the product stable it must get through with proper design calculations. It should withstand extreme conditions such as additional load exerted by the water waves and as well as by the wastes which are being collected.

III. SYSTEM DESIGN AND COMPONENTS

A. Design

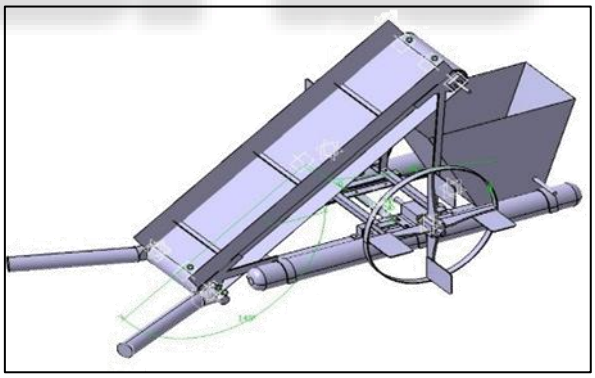

Fig. 1: software design

This setup is an all in one setup whose framework is fabricated and is floating on the water with the help of pvc pipe which contains thermacol granules and aligned with the wall with a suitable arrangement of links. In this machine, the gathering, churning and the collection process is done in a single unit which is driven by a motor 1490-1520 W AC. It has an inclined conveyor belt.

Which collects the floating trash, carries it up inside the machine and drops it in the rotating sharp edged rollers called the crushers, where the trash gets crushed or churned into tiny pieces or fragments which is easy to manipulate it at its later stage. This churned trash is then passed on to the collecting bin via a vibrating inclined pan.

This collecting bin is lifted up via a motor driven pulley when full and a new empty cart is dropped down till then.

B. Components

1) Sprockets
2) Connecting rod
3) Bearing
4) Shaft
5) Vehicle frame
6) Joints and Fixtures
7) Motors
8) Chain

C. Software design testing

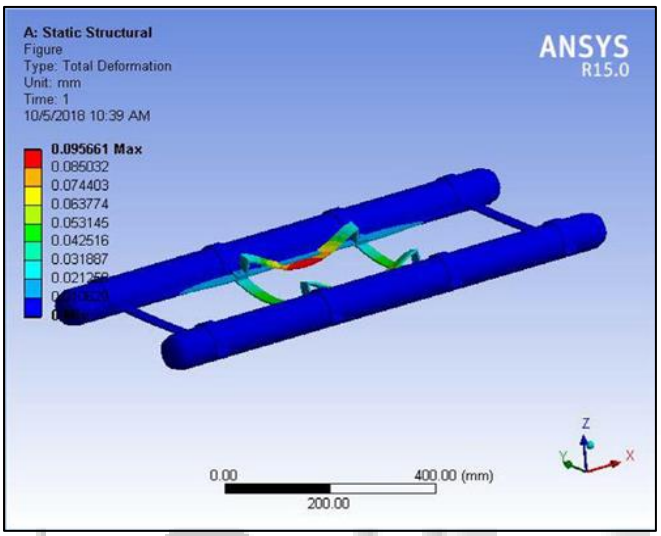

Fig. 2: Floating frame ANSYS testing

Above fig. shows when load of 250N is applied on the frame then we observe maximum deformation in the frame is about 0.095.

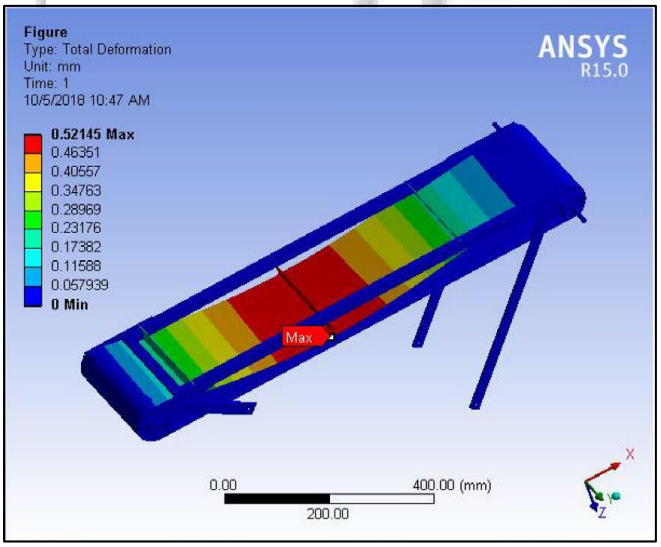

Fig. 3: Conveyor belt ANSYS testing

Above fig. shows when load of 250N is applied on the frame then we observe maximum deformation in the frame is about 0.52, we also observe that deflection in conveyor belt is gradually increasing from two ends of the conveyor belt.

D. Arduino circuit

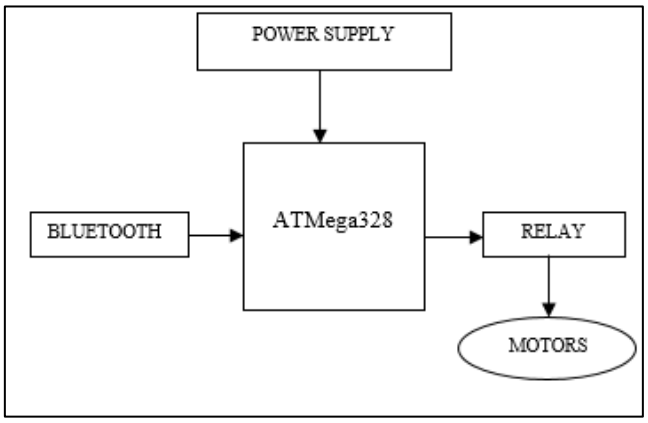

Fig. 4: Block diagram of Arduino circuit

IV. WORKING

The device is place across a lake and river so that 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 motor runs the chain starts to circulate making the lifter to lift up. The wastage material are lifted by lifter teeth and stored in collecting box. Once the collecting box is full, the waste materials are removed from the box. The material which we are going to use is M/S Mid-Grade which is easily Available in market with less cost compare to others .The two rollers are connected apart from each other through belt drive on which perforated buckets are mounted through riveting joint. As system is allowed into drainage, the roller starts rotating the buckets will move inside the drainage which will goes up to material inside the drainage block. The bucket will pick up the wastage material and floating material from drain block. The bucket allow water to flow out as being perforated and only waste part will collected into storage collector behind the chain drive.

V. DESIGN CALCULATION

Superimposing of applied moment and torque for design of machine elements. It is assumed that machine would at times be required to test some mild steel and medium strength steel at the stress level in the neighbour of the yield stress. The shear stress theory is reasonably good agreement, it is often used by engineer to obtain quick estimates.

Mechanical properties of Steel,
Ultimate strength = 400 Mpa
Yield strength = 240 Mpa
Shear Strength= 200Mpa

Chakli machine which is operated by DC motor which has its own features. Motor Torque and Speed of the thread conveyor calculation as shown below:

1) Torque:

In the case of our Gear, the force exerted is due to the mass being accelerated by gravity:

T=(Mass[kg] x g) x Radius[m]
where g = 9.81ms2

We want to lift a 0.63 kg mass using a 0.05 m diameter pulley. We can find the torque load created by the mass using equation T [Nm] =Mass [kg] x g x Radius
=0.63 X 9.81 X 0.025 T
= 0.1545 Nm

2) Speed of the threaded screw:

No. of teeth on DRIVEN Gear (T2) = 75
No. of teeth on DRIVER Gear (T1) = 21

Smaller driver gear must turn three times to get the larger driven gear to make one complete turn Gear ratio= T2/T1=75/21=3.57 or 1:3.5
Motor Speed= 30 RPM
Therefore,
No. of teeth on Driven Gear = Speed of Motor No. of teeth on Driver Gear
75/21=30/X
X= 8.5 rpm
Speed of thread Conveyor =8.5 RPM

Driven (75-tooth) and driver (21-tooth) sprocket gear ratio 1:3.5 which controls the speed of the thread rod lead to uniform extrusion of Chakli.

Gears are made of hardened carbon steel to avoid greasing to ensure quality of the nutrients.

3) Design of motor power required

P = 2×π×n×t/ 60 watts
= (2x3.14x8.5x0.1545) / 60 watts
= 0.1374 watt

4) Tube

Length=47.5 inch =1206mm
Diameter = 9cm (90mm)

VI. ADVANTAGES AND APPLICATIONS

A. *Advantages*

1) Fully Automatic Cleaning.
2) It's initial & maintenance cost is low.
3) It covers more area in less time.
4) Environment friendly system.
5) Reduces human efforts.

B. *Applications*

1) It is applicable to reduce water pollution in rivers & ponds.
2) It is useful to remove the sediments present in swimming pool to keep it clean.

VII. CONCLUSION

Environmental water cleaning is social issue. Presently it is carried out manually, which is slow and hazards, to worker. While machine operating cleaning is expensive and not user friendly. So, in this regard for Floating trash collection machine is found an good alternative solution,

So our Float trash collection was designed with an intention of cleans the water debris / wastage flowing with the water. This wastage is collected without any human interference. The major advantage is the safety water. It just needs one person to remove wastage from back storage and dispose it. The machine is socially helpful for the labourers who clean the lake and economically viable.

VIII. FUTURE SCOPE

1) In future this project can be improved to sort more categories of waste.
2) We can use advance conveyor system and conveyor material for increasing the efficiency of collection of garbage.
3) We can use the solar panel for providing power to the machine instead of battery operation.
4) We can also modify the size of boat according to its waste collecting capacity is increases.
5) This project is made only for small lake by doing some modification in its size and capacity it can use in big lake and big rivers.

REFERENCES

[1] M. Mohamed Idhris, M.Elamparthi,C. Manoj Kumar, Dr.N.Nithyavathy, Mr. K. Suganeswaran, Mr. S. Arunkumar, "Design and fabrication of remote controlled sewage cleaning Machine", IJETT – Volume-45 Number2 -March 2017
[2] Mr.Abhijeet.M. Ballade, Mr. Vishal.S. Garde, Mr.Akash.S. Lahane and Mr.Pranav.V.Boob, "Design & fabrication of river cleaning system", IJMTER Volume 04, Issue 2, [February– 2017] ISSN (Online):2349–9745.
[3] A. Daniyan, A. O. Adeodu and O. M. Dada," Design of a Material Handling Equipment: Belt Conveyor System for Crushed Limestone Using 3 roll Idlers," journal of advancement in engineering and technology, Voume1 issue1 ISSN: 2348-2931January 16, 2014.
[4] Yadav, D. (2009). Garbage disposal plant mired in controversy. India Times, TNN, 19 Feb 2009. 61 Bharat,K. and G.A. Mihaila, when experts agree: using non-a liated experts to rank populartopics. ACM Trans. Inf.Syst., 20(1), (2002), pp.47-58.
[5] Prof. N.G.Jogi1,Akash Dambhare, Kundan Golekar, Akshay Giri, Shubham Take "Efficient Lake Garbage Collector by Using PedalOperated Boat" ijrter-2016.

