

Lake Cleaning Machine

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Abstract- Water is a basic need for all living being, therefore, it is very important to maintain the cleanliness and hygiene of water. Water gets polluted due to many reasons such as waste from industry, garbage waste, sewage waste etc. water from lakes and ponds are cleaned by traditional methods. In this paper, a technology has been incorporated technology which can ease the lake water cleaning work. The main aim of the project is to reduce the man power and time consumption for cleaning the lakes and river. In this research work, operation of river cleaning has been with the help of portable lever to collect and dispose the floating garbage. For this purpose, Lake Cleaning Machine has been proposed.

Index Terms- Cleanliness, Conveyor belt arrangement, Floating garbage, Garbage disposal, Hygiene, Lake cleaning machine, Man power, Paddle Mechanism.

I. INTRODUCTION

The “Lake cleaning machine” can be used to clean water in places where floating waste is present. This machine shall reduce water pollution and subsequently reduce the aquatic animals death.

This machine consists of Paddle driven waterwheel which collect waste (garbage & plastic wastages) and reduces human efforts involved in collection of debris manually.

This mechanism can be comfortably used in rivers, ponds, lakes and other water bodies for cleaning surface water waste debris.



Fig.1- Plastic waste found in river Ganga

II. ROBLEM STATEMENT

The statement of the project is Design & Fabrication of “Lake Cleaning Machine” to remove the waste debris, plastic waste & garbage from river & lake. Proposed work focuses on retrieving the beauty of the lakes by cleaning the water and reduces water pollution

III. STUDY OF COMPONENTS

Component used for the construction of Lake Cleaning Machine are as follows:

1. Water wheel - The waterwheels are driven by paddle system of bicycle.
2. Shaft- The shaft is the main rotating component on which the direction fin is to be mounted.
3. Pedestal Bearings - The pedestal bearing is made in use to give rotary motion & support to the shaft.
4. Direction fin –A direction fin is used for the navigation and direction changing.
5. pontoons (02)– The whole base frame structure will be assembled on the chassis welded between the pontoons mounted on by circular sockets.
6. Buckets–For the collection of garbage & waste

IV. LAKE CLEANING MACHINE



Fig.2 -Side View



Fig.3- Front View

V. WORKING

Driver has to do the paddling which in return rotate the water wheels and provide motion to the machine. While navigation, the driver dump the garbage and plastic waste to the bucket which is attached on machine frame with the help of portable lever. Further, the waste may be dragged and trapped in the metallic net attached at the front bottom of frame structure. This may increase the power requirement to drag the machine but still the motion can be controlled by regular pick and drop of waste from metallic net to buckets with the help of driver. This way through this machine waste debris from the water surface can be collected and dispose at some specified location.

The propeller that moves the machine has been supported by pedestal bearing mounted on the S.S angle frame. When the paddles (P1) are rotated manually the power generates through chain drive and transfers to rear wheel of the cycle after gear reduction (P2).The rear wheel gear sprocket is attached to the waterwheel shaft gear (P3).

So the power generated by the paddling of cycle is transferred to the waterwheel rotor shaft which helps in the lake cleaning machine navigations.

Hence this will result in cleaning of water surface and safe collection of waste debris from water. After collection of all wastage debris it can be deposited from the collection bucket for waste management.

VI. MACHINE DIMENSIONS AND MATERIAL

- 1) Length: 10 FEET
- 2) Width: 6 FEET
- 3) Height: 3FEET 6 INCHES
- 4) PONTOON material and dimension:
 - PVC PIPES (02 no.)
 - OUTERDIAMETER-8FEET, THICKNESS-10mm
 - LENGTH - 7FEET 6INCHES
 - PLASTIC FORM SHEET OF THICKNESS-4INCHES
- 5) GARBAGE CAPACITY = 0.1134 cubic meter

VIII.BUOYANCY FORCE CALCULATION

- ❖ Area of submerged segment for each PONTOON (assuming $\theta=60^\circ$)

GIVEN RADIUS OF PONTOON = 0.152m & LENGTH= 2.286m

$$R^2 (\pi - \theta + \text{SIN}\theta.\text{COS}\theta) = 0.0583688 \text{ SQ. METER}$$

- ❖ $F_B =$ WEIGHT OF VOLUME OF WATER DISPLACED

$$= (\text{VOLUME OF PONTOON}) * \text{WATER WEIGHT}$$

$$= (0.0583688 * 2.286) * 10$$

$$= 1.33431 \text{ KN OR } 1334.31 \text{ N}$$

SO, $F_B = 136.154 \text{ KG}$ WEIGHT IS BEARABLE BY EACH PONTOON

- ❖ THEREFORE WEIGHT BEARABLE BY 2PONTOONS = $136.154 \times 2 = 272.3 \text{ KG}$

IX.POWER AND TORQUE CALCULATION

The power of a cyclist depends on:

- How much force the pedals are being pushed with
- The speed at which the pedals are being turned around.

The maximum power occurs when the force pushing on the pedals multiplied by the speed of the pedals is greatest.

Torque: It can be defined as the *twisting force*, acting on an object that results in a *rotation*.

$$\text{Torque} = \text{Force} * \text{perpendicular distance (from the centre axis to the point of action of force)}$$

$$\text{Power} = \frac{(2 * \pi * N * T)}{60}$$

Where N is the number of rotations per minute and T is torque. The unit of torque is Nm .

Power calculations:

Where Power in HP

Weight in pounds

Speed in knots {C =constant=0.1767}

$$\text{speed} = c * (\sqrt{\text{power}/\text{weight}})$$

Power = 0.0022637 HP or 1.46641 kilowatts

Now Power= $(2\pi \times N \times T)/60$

Therefore, Torque = 0.13 Nm

And Torque = Force x d

Hence Force = 3.2N or 0.33 kg

So 330grams of weight force is required on the paddle to obtain one revolution of the rotor shaft.

X.LAKE CLEANING MACHINE IN PROCESS



Fig.4- Floating Garbage on the lake surface

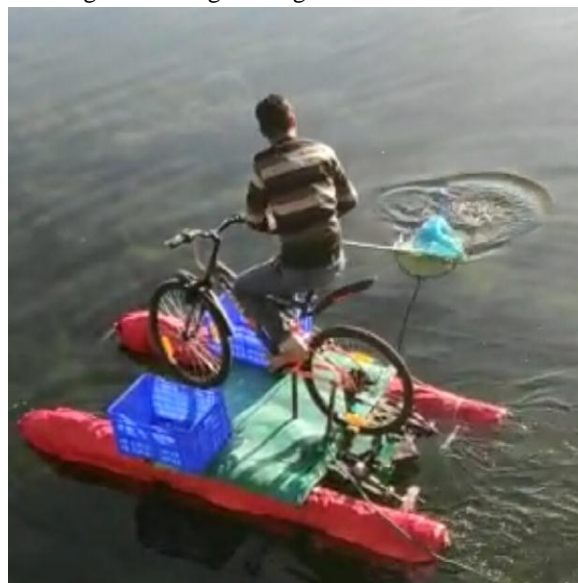


Fig.5- Trapping of garbage by Portable lever



Fig.6- Garbage collection in Bucket

XI. ADVANTAGES

1. Initial & maintenance cost is less.
2. It is very useful for small as well as big lake, rivers where garbage is present in large amount.
3. Easy replacement and installation of various parts
4. Skill worker not required to drive the system self propel.
5. Environment friendly system.

XII. LIMITATIONS

1. The waste collecting capacity of machine is limited at a time.
2. This machine is able to collect the waste which is only floating on water level or at certain depth approx 1 feet.

XIII. FUTURE SCOPE

1. The machine can be designed for deep cleaning.
2. Solar panel can be used for providing power to the machine and engine can be used.
3. Capacity of the machine can be increased for cleaning big rivers and lakes.
4. Machine can be remote controlled.

CONCLUSIONS

Lake Cleaning Machine is designed with an intention of cleaning the water debris floating on the lake, by using portable lever we can collect many floating

wastes like plastic bottles, bags, flowers, debris without any difficulties and then dispose off the waste easily. Also, machine helps in reducing the water pollutants to a certain extent. The major advantage is the safety provided by the proposed machine. Worker has no need to risk his life while cleaning of lakes and it just need one person to control the machine. It is socially helpful for the labourers who clean the lake and economically viable. If the product is used in large numbers, it would be a perfect example for Technological application in environmental protection.

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