

## Solar Powered River Cleaning Machine

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**ABSTRACT-** This project deals with design and fabrication of the solar powered river waste cleaning machine. The work has done looking at the current situation of our national rivers, lakes, ponds etc which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc in our locality. The government of India has taken initiative 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. By taking this into consideration, this machine has designed to clean river water surface. The motive of the project is to automate the sewage cleaning process in drainage, to reduce the spreading of diseases to human. The black water cleaning process helps to prevent pest infestations by reducing the residues that can attract and support pests. It also improves the shelf life and sensory quality of food products. In the proposed system, the machine is operated with remote control to clean the sewage. Hence, this system avoids the impacts from the sewage waste

### I. INTRODUCTION

The “River cleanup machine” used in that places where there is waste debris in the water body which are to be removed. This machine is consists of waterwheel driven conveyer mechanism which collect & remove the wastage, garbage & plastic wastages from water bodies. This also reduce the difficulties which we face when collection of debris take place. A machine will lift the waste surface debris from the water bodies, this will ultimately result in reduction of water pollution and lastly the aquatic animal's death to these problems will be reduced. It consists of Belt drive mechanism which lifts the debris from the water. The garbage which affects the drainage is also picked up and removed. This system has limited human intervention in the process of cleaning and in turn reduces spreading of diseases to mankind. Modern services are becoming polarized.

Conventional methods used for collection of floating waste are manual basis or by means of boat, thrash skimmers etc. and deposited near the shore of rivers. These methods are risky, costly and time consuming. By considering all the parameters of river surface cleaning systems and eliminating the drawback of the methods used earlier, the remote operated river

cleaning machine has designed which helps in river surface cleaning effectively, efficiently and eco-friendly. The “River waste cleaning machine” is used where there is waste debris in the water body which are to be removed Due to polluted water many skin diseases to human kind are observed. So that to reduce the water

pollution we are trying to make river clean-up machine. “River clean up machine” a machine which involves the removing the waste debris from water surface and safely dispose from the water body.

### OBJECTIVE

1. The aim of the project is cleaning process in drainage, to reduce the spreading of diseases to human.
2. Maintain clean & healthy Environment
3. whole machine should powered by using non conventional energy i.e. Solar energy
4. Maintain the design cost of machine less as compare to machine which available in market
5. Conventional methods used for collection of floating waste are manual basis or by means of boat, thrash skimmers etc.
6. To overcome the difficulty of removing waste particulate floating on water energy

### LITERATURE REVIEW AND PROBLEM DEFINITION

As Earth's pollution continues to grow, peoples are putting ever increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are beings “squeezed” by human activities. According to the estimate almost 70% of the surface water in the country is not fit for human consumption. We know that pollution is a human problem because it is a relatively recent development in the planet's history. Water pollution can be defined in many ways. “The introduction by man, directly or indirectly, of substances or energy into marine environment resulting in such deleterious effects as harm to living resources, hazards to human health, to hindrance to

marine activities, including fishing, impairment of quality for use of sea water and reduction of amenities.”

Water hyacinth is a freshwater weeds species. It is free floating plant and draws all its nutrient directly from water. The weeds is mainly found in inshore and shallow area to which it is swept by currents and sometimes in patchy off shore area. It spreads fast in shallow bays and inlets with mud bed surfaces. Lake Rankala's, River Panchaganga's & Krishna location's shallow depth and nutrient enrichment provide favorable condition for its proliferation.

## PROBLEM DEFINITION

The current situation of our national river which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc. Waste water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. The biggest impact of cleaning the chemical wastes can cause respiratory diseases and it plays a challenging issue for Municipal Corporation. The municipality workers need to get down into the sewage sludge to clean the wide sewage. It affects their health badly and also causes skin allergies, by taking into consideration this is need to design such type machine. Municipal corporation uses heavy vehicles like Cranes JCBs ,Pocklands for removal of waste which involves heavy cost, noise pollution. So we are designing machine which can overcome this problems.

## METHODOLOGY

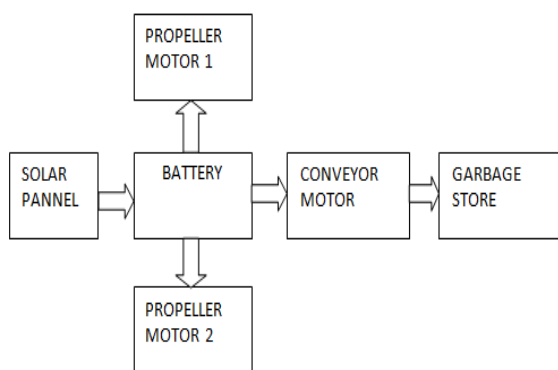


Fig 1 Block Diagram

## BATTERY

The An electric battery is a device consisting of one or more electrochemical cells with external connections

provided to power electrical devices such as flashlights ,smartphones,& electric cars

EV Batteries are quite different from those used in consumer electronic devices such as laptops and cell phones .They are required to handle high power and high energy capacity within limited space and weight at an affordable price.

## ELECTRIC MOTOR:

Brushless DC Electric Motor also known as electronically commutated motor or synchronous DC motor. The Synchronous motors powered by DC electricity via an inverter or switching power supply which produces an AC electric current to drive each phase of motor via close loop controller. Controller provides pulses of current to the motor winding that control speed and torque of the of the motor

## TYPES OF MOTOR:

- Brushless Motor
- Brushed Motor

## Brushless DC Motor

Brushless Dc Motor also known as electronically commuted motor or Synchronous DC Motor, are motors powered by DC electricity via an inverter or switching power supply which produces an AC electric current to drive each phase of the motor via a closed loop controller. The controller provides pulses of current to the motor windings that control the speed and torque of the motor.The construction of a brushless motor system is typically similar to a permanent magnet synchronous motor (PMSM). The advantages of a brushless motor over brushed motors are high power to weight ratio, high speed, and electronic control. Brushless motors find applications in such places as computer peripherals (disk drives, printers), hand-held power tools, and vehicles ranging from model aircraft to automobiles.

## Brushed Motor

A brushed DC motor is an internally commutated electric motor designed to be run from a direct current power source. Brushed motors were the first commercially important application of electric power to driving mechanical energy, and DC distribution systems were used for more than 100 years to operate motors in commercial and industrial buildings. Brushed DC motors can be varied in speed by changing the operating voltage or the strength of the magnetic field. Depending on the connections of the field to the power supply, the speed and torque characteristics of a brushed motor can be altered to provide steady speed or speed inversely proportional to the mechanical load. Brushed motors continue to be used for electrical propulsion, cranes, paper machines and steel rolling mills. Since the brushes wear down and require replacement, brushless DC motors using power electronic devices have displaced brushed motors from many applications

### DESIGN OF FLOAT

Float is special type of construction on which whole unit (conveyer, batteries, garbage's water hyacinth, motor and motor shaft is to be mounted the function of float is to support the whole unit, bear the load of entire mechanism on the water surface the float is going to be the back bone of the entire machinery

### DESIGN OF PROPELLOR

For any float or boat propeller design is very important for the moment of particular boat. The basic idea behind the propeller design is that propeller should overcome the resistance offered by the both for the moment of both. Hence for propeller design first of all we have to find out the resistance offered by boat.

The resistance is depend on following factor

1. Speed of the boat
2. Density of fluid
3. Area of the boat

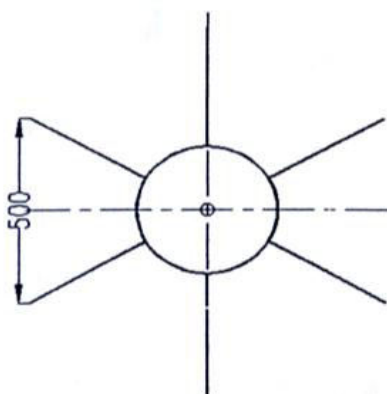


Fig 2 Design of Propeller

### WORKING PRINCIPLE

In this project the main aim of this machine is to lift the waste debris from the water surface and dispose them in the tray. Here we are fabricating the remote operated river cleaning machine. The collecting plate and chain drives are rotating continuously by the motor. The collecting plate is coupled between the two chain drives for collect the waste materials from river. The collected wastages are thrown on the collecting tray with the help of conveyer. Our project is having propeller which is used to drive the machine on the river. The propeller is run with the help of two PMDC motor.

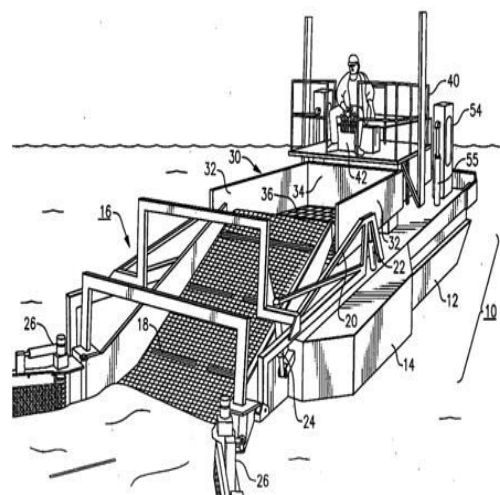


Fig 3 Model Diagram

### CALCULATIONS

- Propeller Design

Total Resistance=  $F_f + F_r$

where ,

$F_f$ = Frictional Resistance

$F_r$ =Residual Resistance

$F_f = c_f \cdot k_1$

Where,

$k_1 = \text{refrance force} = \frac{1}{2} \cdot \rho \cdot v^2 \cdot A_s$

Where,

$\rho$ =density of fluid= 1000kg/m<sup>2</sup>

$v$ =velocity of boat=1m/Sec

$A_s$ =hulls weighted area=1.92 m<sup>2</sup>

$F_r = C_r \cdot k_2$

Where,

$C_r$ =residual resistance coefi.=0.8

Power required to move boat=  $F \cdot v$

Where,

$F$ =total resistance+weight of assembly

From calculation,

$K_1 = 962.5$

$F_f = 96.25N$

$k_2 = 269.45$

$F_r = 215.56N$

Total resistance=371.81N

$F$ =total resistance weight of assembly

$F = 371.81 + (600 \cdot 9.81)$

$F = 6257.81N$

Power=6257\*1=6257watt

Diameter of propeller=1 m

$N = \text{velocity} \cdot 60 / \pi \cdot D = 20\text{rpm}$

Length of propeller blade= $0.325m^2$

Width of blade= $0.28m^2$

### Motor for Propeller (BLDC Motor)

Rated Power -1000W

Rated voltage -48Volts

Speed -3000rpm

Rated Current -24am

### Solar panel specification

Power= 320watt,4 Panel

Optimum Operating voltage=24v

Optimum Operating current=13.33A

Weight=25kg

### Battery Calculation

Battery Backup=Load\*Utilization time/Vtg

Battery Backup= $1500*3/24=187.5$

Required batteries=100Ah four batteries

Battery Voltage =12volt

Battery Weight=60kg

Capacity=100Ah

### Overall Dimensions

Length= 9.3 ft.

Width= 7.1ft.

Height=5ft.

Barrel

1)Diameter=69inch.

2)Length=3ft.

### 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.

### FUTURE SCOPE

- The machine can be designed for deep cleaning
- Solar panel can be used for providing power to the Machine.

- Capacity of the machine can be increased for cleaning big rivers and lakes.

### APPLICATIONS

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

### CONCLUSIONS

The project "River Waste Cleaning Machine" has Designed which is very much economical, easy to operate And helpful for water cleaning and it can be modified with More cleaning capacity and efficiency

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