*International Journal of Scientific Research and Engineering Development-– Volume X Issue X, Year*

*Available at www.ijsred.com*

RESEARCH ARTICLE OPEN ACCESS

# DESIGN AND FABRICATION OF AQUATIC DEBRIS REMOVING MACHINE

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## Abstract:

Public health and aquatic ecosystems are seriously threatened by the growing pollution of rivers brought on by sewage, trash, and industrial waste. This project showcases the creation and design of a cutting-edge river cleaning device intended to efficiently remove surface trash from bodies of water. The suggested device blends a sturdy mechanical design with cutting-edge technologies to automate the cleaning procedure, meeting the pressing need for efficient control of pollution in our country's rivers. The device has a unique waste management system. collecting system that lifts rubbish using a number of movable arms and nets, including organic trash and plastics from the water's surface. The system uses a motor and chain drive configuration and is powered by a rechargeable battery, enabling effective operation without the need for external power sources. In addition to improving operational efficiency while reducing its negative effects on the environment. One of the project's main goals is to decrease the amount of time and labour needed to clean rivers. By automating the process of removing trash. The device makes it possible to respond to pollutants more quickly, which eventually improves the quality of the water and more wholesome marine life. Energy-efficient component integration provides additional support for sustainable methods for managing the environment.

*Keywords* — Water pollution, Aquatic debris, conveyor mechanism, Environment, floating waste.

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## I. INTRODUCTION

Debris build up in rivers, lakes, and oceans has resulted in water pollution, which is now a serious environmental problem. Aquatic ecosystems, biodiversity, and human health are all seriously threatened by this debris, which comprises organic materials, plastic waste, and industrial garbage. Given the enormous volume of waste produced every day, traditional techniques of debris removal are sometimes labour-intensive, time-consuming, and ineffective. The creation of an automated aquatic debris removal equipment presents a viable way to deal with this issue. By effectively collecting both floating and submerged waste, such a machine can increase the pace and scope of clean up efforts while lessening the burden on manual labour. The machine seeks to minimize the environmental impact of managing water pollution by streamlining the

  

cleaning process and combining mechanical collecting systems with environmentally friendly energy sources and computerized control mechanisms. Designing and creating an economical, environmentally friendly, and effective method of water body cleansing is the main goal of this project. By encouraging sustainable waste management techniques, this device will support long-term environmental conservation initiatives in addition to preserving cleaner and better water habitats.

## II. LITERATURE REVIEW

**[1] Hart, R., & Pollyn, T. Design and Construction of an Automated Boat that Removes Debris from the Ocean. International Journal of Advanced Research in Science, Communication and Technology.** There is a vast aquatic environment in water bodies. There must be a way to get rid of this waste from the water bodies because any excessive concentration of suspended particles can harm aquatic life in many ways by preventing light from reaching submerged vegetation. The goal of this project, which involves designing and building an automated boat to remove garbage from the water, is to provide a reliable and effective prototype solution for managing and collecting marine debris on its own, helping to preserve the environment. The boat will be able to follow predetermined routes, locate and gather rubbish using specialized mechanisms, and return to a designated collective point thanks to the two-channel remote control with receiver. Control over the boat's operation and precise movement are made possible by the two-channel remote control system. using the use of shafts, tread mill configuration, conveyor belts, propellers, and engineering concepts. While demonstrating the possibilities of remote-controlled boats in marine environmental management, this research seeks to solve the pressing problems of ocean pollution.

**[2]Chikhalkar, S., Kamble, M., Ubale, A., Loli, V., Kapre, P., & Tale, V. Design and Fabrication of River Water Cleaning System. International Journal of Advanced Research in Science, Communication and Technology.** In order to lessen water pollution and, eventually, aquatic animal death from these issues, this project will use a machine to extract trash from the surface of water bodies. The project's primary goal is to cut down on the amount of time and labor needed to clean the river. This project stores energy for cleaning rivers using a battery and a motor and chain drive setup. As part of our project, we are creating a river cleaning machine. All of the components are made, put together, and tested after the 3D model is created.

**[17]Sharma, T., Sharma, S., Sharma, P., Jain, S., & Joshi, A. Design of River Cleaning Machine. Waste e Journal.** The design of a sewage waste collection machine is the main focus of this project. This machine was created in an attempt to prevent floating trash from entering water bodies, taking into consideration the current state of our country's rivers, which are clogged with pollutants, toxic materials, debris, and crores of liters of sewage. Although there are a number of ways to accomplish the aforementioned goal, we will talk about a mechanically straightforward yet effective approach in this review paper. Additionally, by automating the process, an attempt is made to reduce the amount of human involvement throughout. Automation is becoming a key component of mass manufacturing. Our project involves designing a river cleaning equipment that is powered by water. The project's primary purpose was to develop a mechanically and electrically straightforward system that would accomplish the objective of floating garbage

  

removal from sewage streams while also saving time and manpower in cleaning water bodies.

## III. PROBLEM IDENTIFICATON

A serious environmental problem, water pollution is brought on by a variety of human and natural processes that taint water sources, rendering them unfit for human consumption and damaging ecosystems. The main causes of water pollution are plastic waste, untreated sewage, industrial discharge, and agricultural runoff. These pollutants cause major health concerns, including waterborne infections, and disturb aquatic life by introducing dangerous chemicals, bacteria, and physical debris into rivers, lakes, and oceans. The issue is further made worse by inadequate wastewater treatment facilities and lax enforcement of environmental laws. Effective management is further hampered by a lack of public knowledge and a lack of collaboration among regulatory agencies. To protect water resources and ecosystem health, combating water pollution necessitates a multifaceted strategy that includes stronger laws, better wastewater treatment facilities.

## IV. PROBLEM RECTIFICATION

Using aquatic debris removal devices to efficiently remove floating rubbish from rivers, lakes, and coastal areas is a creative way to address water pollution. In order to stop plastics, organic materials, and other solid pollutants from further contaminating water bodies and endangering aquatic ecosystems, these devices are made to gather a variety of trash. They aid in restoring water quality, safeguarding marine life, and slowing the decomposition of plastics into dangerous microplastics by lowering physical pollution. Furthermore, a lot of these devices are environmentally friendly, frequently using electric motors or solar power to reduce their negative effects on the environment. However, routine upkeep and appropriate waste disposal are necessary for optimal efficacy. A workable and sustainable way to fight water pollution and promote cleaner, healthier aquatic habitats is to integrate these devices into larger water management plans.

## V. LIST OF COMPONENTS

**TABLE 1**

| S. NO | NAME OF THE COMPONENTS | QUANTITY NO | MATERIALS |
|---|---|---|---|
| 1 | Frame & Shaft | 1 | Mild Steel |
| 2 | DC Motor | 3 | Powdered metal |
| 3 | DC Battery | 2 | Non toxic |
| 4 | Sprocket | 4 | Steel |
| 5 | Paddle wheel | 2 | Plastic |
| 6 | PVC Pipe | 4 | Poly vinyl chloride |
| 7 | Roller chain | 2 | Alloy steel |
| 8 | Bearings | 4 | Stainless steel |
| 9 | Pcb board | 4 | Composite material |

## VI. DESIGN

### A. DESIGN CALCULATION

This chapter will include the mechanical design calculations required for the Selection of Motor used in the project

Voltage = 12V

Current = 2 Amp
RPM = 500 RPM
Motor Weight = 150 gm
Torque = 2 Kg cm
Efficiency = 80%
No-Load current = 60mA (max)
Stall current = 360mA (max)

  

**B. MODEL**

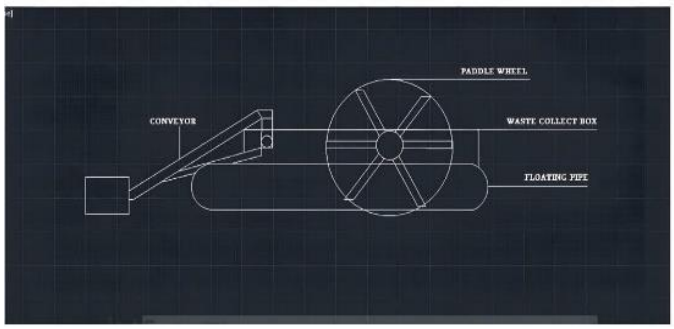


Fig. 1 Model

**C. WEIGHT CALCULATION**

Weight ( approx. ) = (3 x DC motor weight) +(1xchassisweight) + (4x pipe weight)+(4 x bearing)+(1x battery)+(2 x chain drive)+(4 x sprocket)+(1 x box)+(2 x paddle wheel) = (3 x 150) + (1 x 5440) + (4 x 350) +(4 x 100)+(1 x 2000)+(2 x 350)+(4 x 150)+(1x1000)+(2 x 250)=
12490 grams.

## VII. WORKING PRINICIPLE

The collection, separation, and removal of floating garbage from water bodies using a mix of mechanical and filtration systems is the basic idea behind how an aquatic debris removal machine operates. The device collects waste from the water's surface using a conveyor belt, scoop system, or rotating arms; for maximum efficiency, booms or nets are frequently used. Filters or screens are used to separate solid trash from water after it has been collected, capturing both bigger debris and tiny particles such as microplastics. After that, the garbage is moved to a storage area where it can be recycled or disposed of later. These eco-friendly and energy-efficient equipment are powered by diesel engines, electric motors, or solar panels. With the use of sensors, GPS, and automated navigation, some sophisticated models can function independently and gather water quality data in real time. This effective procedure lowers pollution, preserves aquatic habitats, and keeps rivers cleaner.

## VIII. APPLICATIONS

- Used to clear trash and floating garbage from canals and rivers in order to enhance water flow, avoid obstructions, and lessen pollution downstream.
- Reduces dangers for marine vessels, improves visual appeal, and keeps ports, harbors, and marinas clean by clearing away garbage that builds up from boats.
- Placed close to shorelines to gather marine garbage, preserving coastal habitats and reducing trash from washing up on beaches.
- Reduces pollution and the risk of flooding by assisting in the management of waste in urban water systems including stormwater retention ponds and drainage canals.

## IX. FUTURE SCOPE

Due to increased environmental concerns and technology breakthroughs, the future of an aquatic debris-removing equipment is extremely bright. Efficiency and sustainability will be improved by innovations like AI-driven automation, IoT-enabled real-time monitoring, and machines fuel by renewable energy. These devices can be used to combat pollution in rivers, lakes, and seas; their uses range from regular upkeep of urban waterways to extensive ocean clean ups. Adoption will be accelerated by stricter government laws and corporate sustainability programs, with public-private partnerships being crucial to financing and execution. The need for such solutions will only increase as people become more conscious of water pollution, so removing aquatic debris will be an

  

essential component of any future environmental conservation initiatives.

## X. FINAL ASSEMBLY

Fig. 2 SIDE VIEW

Fig. 3 FRONT VIEW

## XI. CONCLUSION

Our project is based on research and literature from various journals and papers that are pertinently available. It is constructed in a way that allows for operational flexibility. This invention is simple, inexpensive, and offers a lot of potential for further cost-effectiveness. The "Remote Operated River Cleaning Machine" project is intended to be very cost-effective and beneficial for cleaning rivers and ponds. Based on its design, cost estimation, and availability, it is incredibly affordable and beneficial to society. a creative way to reduce manual strain and thereby stabilize the pond with high reliability.

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