© APR 2026 | IRE Journals | Volume 9 Issue 10 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I10-1716162

River Cleaning Machine

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Abstract- ***Water pollution is one of the most serious environmental challenges affecting aquatic life and human health. Rivers, being a major source of freshwater, are continuously polluted by domestic waste, plastics, and industrial effluents. To overcome this problem, an automated River Cleaning Machine with Depth Measuring System is proposed. The developed model consists of a floating structure equipped with a conveyor belt mechanism that collects floating waste materials from the water surface. The system is operated through an Arduino microcontroller, which controls the movement of DC motors and processes depth information from an ultrasonic sensor. The depth measurement feature helps monitor the riverbed level and analyze water conditions for future environmental studies. This dual-function design reduces human effort, improves cleaning efficiency, and provides useful data for river maintenance. The machine is low-cost, energy-efficient, and suitable for small and medium water bodies.***

Keywords: River Cleaning Machine, Depth Measuring System, Arduino, Ultrasonic Sensor.

I. INTRODUCTION

Water is the most essential natural resource and a fundamental need for all living organ isms. Among various water sources, rivers play a key role in providing freshwater for domestic, agricultural, and industrial applications. However, rapid urbanization, industrial discharge, and human negligence have led to severe river pollution. Plastics, bottle s, and waste materials floating on the river surface not only harm aquatic life but also disturb the ecological balance. In recent years, river pollution has become a major concern in both developing and developed countries. Manual river cleaning requires significant manpower, is time-consuming, and of ten exposes workers to unsafe and unhygienic conditions. These challenges highlight the need for an automated system that can clean river surfaces efficiently, safely, and at a lower cost. The River Cleaning Machin e with Depth Measuring System aims to overcome these limitations by introducing an automated mechanism.

These machines typically use a motor-driven conveyor system on a floating vessel, operated remotely, to cut and lift waste int o a collection bin, significantly reducing the manpower and time needed for cleanup.

II. PROBLEM STATEMENT

Rivers are a vital natural resource, serving as a primary source of water for drinking, agriculture, industry, and ecosystem sustainability. However, rapid urbanization, industrialization, and population growth have led to the severe pollution of rivers. Large quantities of solid waste such as plastic bottles, bags, organic debris, and industrial refuse are continuously being discharged into river bodies. This accumulation of waste not only degrades water quality but also threatens aquatic life, disrupts ecosystems, and poses serious health risks to humans.

Traditional methods of river cleaning, such as manual collection and periodic cleaning drives, are inefficient, labor- intensive, time-consuming, and often hazardous to workers. These methods fail to address the continuous inflow of waste and are not scalable for large rivers or heavily polluted areas. Additionally, the lack of automation and real-time monitoring leads to inconsistent cleaning performance and high operational costs.

III. OBJECTIVES

1) To ensure the machine operates without harming aquatic life or disturbing the natural ecosystem.
2) To run the motor continuously aft er successful ignition.

IV. LITERATURE SURVEY

River pollution has become a major environ mental issue due to rapid urbanization, industrial discharge, and improper waste disposa Various researchers have proposed river cleaning machines to remove floating

and suspended waste effectively. Traditional cleaning methods rely heavily on manual labor, which is time-consuming, unsafe, and inefficient for large-scale operations.

Recent studies focus on automated and semi-automated river cleaning systems. For instance, automatic river cleaning robots use conveyor mechanisms, sensors, and motorized systems to collect floating waste such as plastics and debris. These machines improve efficiency and reduce human effort in hazardous conditions.

Another approach involves floating barrier systems that trap waste along riverbanks. Advanced models integrate computer vision and optimization algorithms to detect, classify, and plan waste collection efficiently, improving operational cost and performance.

Innovative designs such as rotating drum screens and trash rack systems have also been studied. These systems capture both floating and suspended particles across the river width and transport waste toward collection points. They are designed to operate under varying water levels and flow conditions, ensuring continuous cleaning performance

River water pollution is a critical global concern caused by increasing population, industrialization, and improper waste management practices. Researchers have explored various technologies to address this issue, particularly focusing on river cleaning machines that can efficiently remove floating and submerged waste.

Advanced river cleaning concepts include drum screen mechanisms and inclined trash racks installed across river cleaning machine. organization of gauges, and correct material selection are essential for improving inspection accuracy and productivity.

III. METHODOLOGY

River water pollution is a critical global concern caused by increasing population, industrialization, and improper waste management practices. Researchers have explored various technologies to address this issue, particularly focusing on river cleaning machines that can efficiently remove floating and submerged waste. Recent studies focus on automated and semi-automated river cleaning systems. For instance, automatic river cleaning robots use conveyor mechanisms, sensors, and motorized systems to collect floating waste such as plastics and debris. These machines improve efficiency and reduce human effort in hazardous conditions.

1. System Overview

A river cleaning machine is an automate d or semi-automated system designed to remove floating waste and debris from rivers, canals, and other water bodies. The system works continuously to improve water quality, reduce pollution, and maintain ecological balance. The machine mainly consists of a floating platform or frame that supports all components and allows it to operate on the water surface. At the front of the system, a conveyor belt mechanism or collection arm is installed to capture floating waste such as plastic, leaves, and other debris.

The conveyor belt lifts the collected waste from the water surface and transfers it into a storage container or collection bin. The conveyor is powered by an electric motor, which may be supplied by batteries, solar panels, or an external power source. In some advanced systems, sensors are used to detect waste levels and automate the operation.

The machine may also include guiding mechanisms such as barriers or side wings to channel waste toward the collection area, increasing efficiency. For mobility, the system can be manually operated or equipped with a propulsion mechanism like motors or paddles.

IV. DESIGN AND FABRICATION

Design of the River cleaning machine.

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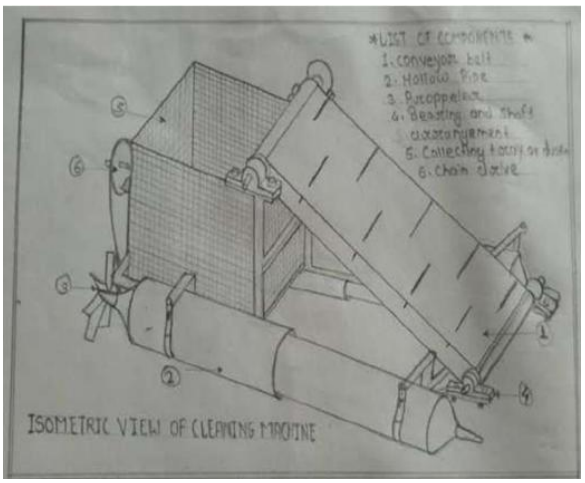

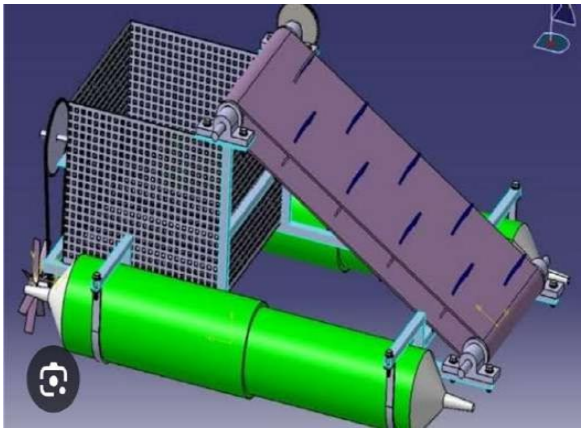

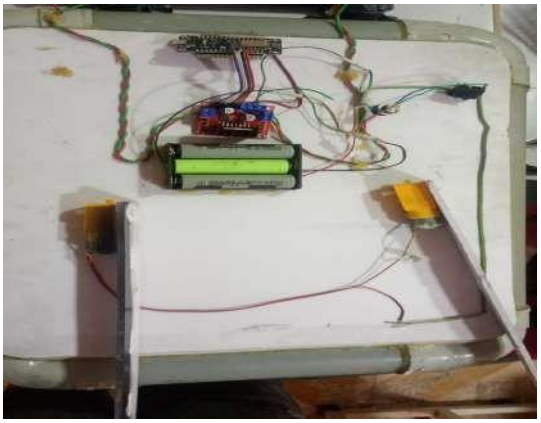

The river cleaning machine is designed as a compact floating system capable of collecting floating waste efficiently. The base structure is fabricated using a lightweight thermocol (foam) platform supported by PVC pipes, which provide buoyancy and stability on water. This floating base ensures that the machine remains balanced while operating in rivers or small water bodies.

Overall, the design is simple, cost-effective, and suitable for small-scale applications, demonstrating an efficient method for collecting floating waste and contributing to wat er pollution control.

The main cleaning mechanism consists of an inclined conveyor belt system mounted between two side supports. The belt is mad e from flexible material and rotates over cylindrical rollers. Two DC geared motors are used—one for driving the conveyor belt and others for propulsion if required. The con veyor is positioned at an angle so that it collects floating waste and lifts it upward into a collection container placed at the top.

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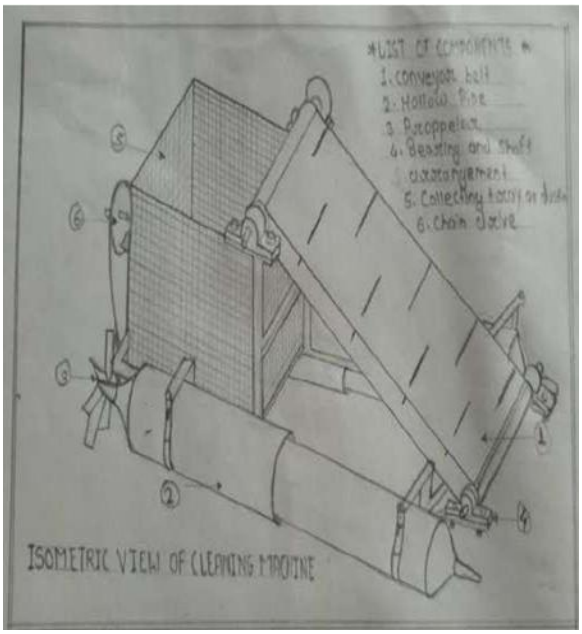
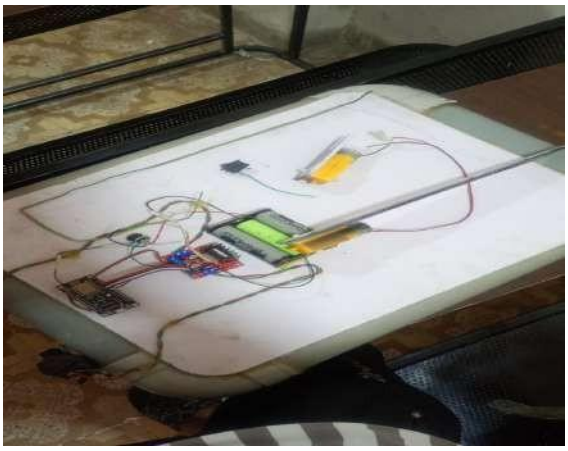
The electronic control system includes a motor driver module, rechargeable battery pack, and connecting circuitry. The battery supplies power to the motors through the driver, allowing controlled movement and operation

V. FABRICATION OF THE RIVER CLEANING MACHINE

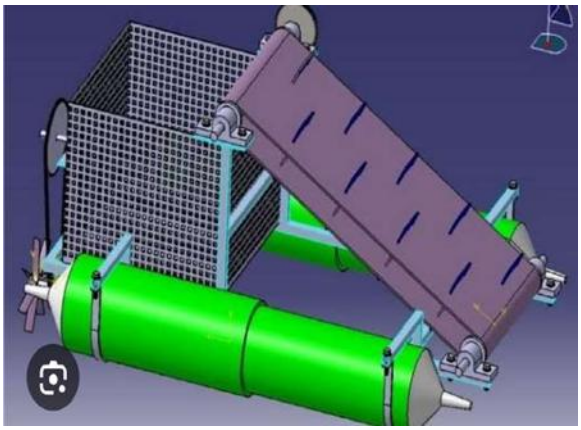




A river cleaning machine is used to remove floating waste such as plastics, leaves, and other debris from water bodies. Its working principle is based on a mechanical system that collects, lifts, and stores waste efficiently.

The machine is positioned in the river or along the riverbank. It consists of a conveyor belt or chain mechanism that is partially sub merged in water. When the machine is switched on, an electric motor drives the convey or belt continuously. The lower end of the belt dips into the water and collects floating waste as it moves.

As the conveyor rotates upward, it lifts the waste out of the water. The belt is designed with perforations or gaps, allowing water to drain back into the river while retaining solid waste. This helps in separating waste from water effectively.



The collected waste is then transferred into a storage container or bin placed on the ma chine. Once the bin

is full, it can be removed and emptied manually.

VI. WORKING PRINCIPLE

The river cleaning machine works on the basic principle of mechanical collection, separation, and storage of floating waste from water bodies such as rivers, lakes, and cana. The machine is usually installed on a floating platform or near the riverbank It consists of a conveyor belt or chain drive system that is inclined and partially submerged in water. When the machine is turned on, an electric motor drives the conveyor mechanism continuously. Once the waste reaches the top of the conveyor, it is discharged into a collection bin or storage container. This waste can later be removed manually or automatically for proper disposal or recycling.

River cleaning machines operate by using a conveyor belt, chain drive, or aquatic drone mechanism to lift floating trash (plastics, debris) from water surfaces. Powered by electric motors, solar energy, or water wheels, they transport waste upward to a storage container, often featuring autonomous navigation, remote controls, or floating barriers for continuous operation.

VII. RESULTS AND DISCUSSION

The developed river cleaning machine was tested under different operating conditions to evaluate its performance, efficiency, and reliability. The machine successfully collected floating waste materials such as plastic bottles, polythene bags, leaves, and other debris from the water surface. The conveyor mechanism effectively lifted the waste and deposited it into the storage container without significant spillage.

The power consumption of the system remained within acceptable limits, making it energy-efficient and cost-effective for long-ter m use. Additionally.

CONCLUSION

The River Cleaning Machine offers a practical, sustainable solution to river pollution. By integrating a floating platform, conveyor belt, solar-compatible power system, and Arduino-based automation, the machine continuously removes floating waste with minimal human intervention.

It can operate across rivers, canals, lakes, and reservoirs, improving water quality, protecting aquatic ecosystems, and reducing.

limitations such as inability to remove submerged pollutants and dependence on sunlight for solar operation the system represents a significant step toward smart. eco-friendly environmental management and cleaner waterways for future generations.

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