www.ijarp.com ISSN 2456-9992 Page: 01-03

International Journal Advanced Research Publications

Review Article

Volume: 02
Issue: 01

RIVER CLEANING ROBOT

***Badal Rajendra Thakare, Rohit Karandhar Bansode, T. K. Hirey**

Department of Mechanical Engineering, Sandip Polytechnic, Nashik, India.

Article Received: 26 November 2025, Article Revised: 16 December 2025, Published on: 06 January 2026

***Corresponding Author: Badal Rajendra Thakare**

Department of Mechanical Engineering, Sandip Polytechnic, Nashik, India.

DOI: https://doi-doi.org/101555/ijarp.5201

ABSTRACT

River pollution has emerged as one of the most serious environmental problems worldwide due to rapid industrialization, urban expansion, and improper solid waste management practices. Large quantities of plastic waste, domestic garbage, and floating debris accumulate in rivers, leading to ecological imbalance and public health risks. Conventional river cleaning techniques such as manual scavenging and mechanical dredging are inefficient, hazardous, and costly. This paper presents a detailed study on the design, development, and operation of a River Cleaning Robot capable of autonomously removing floating waste from river surfaces. The system integrates mechanical components, electronic control systems, sensors, and renewable energy sources to provide an eco-friendly, efficient, and scalable solution for river pollution control.

KEYWORDS: River Cleaning Robot, Water Pollution, Automation, Conveyor System, Renewable Energy.

1. INTRODUCTION

Water bodies such as rivers and lakes are essential for sustaining life, supporting agriculture, and maintaining ecological balance. However, increasing population density, industrial discharge, and careless disposal of solid waste have significantly polluted river systems. Studies indicate that nearly 80 percent of marine plastic waste originates from rivers. Manual river cleaning operations expose workers to toxic substances, waterborne diseases, and physical hazards. Therefore, there is an urgent need for automated and intelligent river cleaning solutions. Robotic technologies offer continuous operation, reduced human intervention, and improved efficiency, making them a promising alternative to traditional

cleaning methods.

2. Literature Review

Extensive research has been conducted on automated water surface cleaning systems. The Ocean Cleanup project introduced the Interceptor, a solar-powered river cleaning system designed to capture floating waste before it reaches oceans. WasteShark, developed by RanMarine, is an autonomous surface vehicle capable of collecting plastics and biomass from water bodies. Jellyfishbot is a compact remotely operated robot used in ports and rivers for debris and oil spill collection. Researchers have also proposed Arduino-based river cleaning robots employing conveyor belt mechanisms for waste removal. Despite these advancements, limitations such as high cost, maintenance complexity, limited scalability, and inability to collect submerged waste persist, indicating the need for further improvements.

3. System Architecture

The River Cleaning Robot is designed as a floating autonomous platform consisting of mechanical, electrical, and software subsystems. The mechanical subsystem includes a buoyant base structure, conveyor belt assembly, waste storage container, and propulsion mechanism. The electrical subsystem consists of a microcontroller, motor drivers, sensors, batteries, and solar panels. The software subsystem handles navigation logic, sensor data processing, and motor control. The integration of these subsystems ensures reliable and efficient operation in varying water conditions.

3.1 Working Principle

The robot operates by navigating along the river surface using motor-driven propellers. Floating waste is directed toward the conveyor belt, which lifts debris from the water surface and deposits it into a waste collection bin. Ultrasonic sensors continuously monitor obstacles and assist in collision avoidance. The microcontroller processes sensor inputs and controls motor speed and direction. Power is supplied through rechargeable batteries supported by solar panels, enabling sustainable and long-duration operation.

3.2 Design Considerations

Key design considerations include stability, buoyancy, corrosion resistance, and energy efficiency. Lightweight materials such as aluminum and high-density polyethylene (HDPE) are used to ensure buoyancy and durability. The conveyor mechanism is designed to handle various types of floating waste without clogging. Energy efficiency is enhanced through

optimized motor selection and renewable power sources.

4. Advantages and Disadvantages

Advantages: The system enables continuous cleaning operations, reduces human exposure to polluted water, minimizes environmental disturbance, and supports real-time monitoring. It is scalable for use in rivers, lakes, and canals and promotes eco-friendly waste management.

Disadvantages: High initial investment, periodic maintenance requirements, vulnerability to extreme water currents, and limited capability to remove submerged or microplastic waste.

5. Applications

The River Cleaning Robot can be effectively deployed in urban rivers, lakes, canals, harbors, industrial water reservoirs, and tourist locations. It is suitable for smart city initiatives, environmental conservation programs, and academic research projects.

6. CONCLUSION AND FUTURE SCOPE

The River Cleaning Robot provides an automated, efficient, and sustainable solution to river pollution. By integrating mechanical design, electronics, and renewable energy, the system significantly reduces manual effort and enhances cleaning efficiency. Future developments may include artificial intelligence-based waste classification, swarm robotics for large-scale deployment, underwater waste collection modules, and IoT-enabled water quality monitoring systems.

REFERENCES

1. A. K. Sharma et al., “Design and Fabrication of River Cleaning Robot,” IJERT, 2020.
2. M. R. Kale et al., “Automatic River Cleaning System,” IJRASET, 2018.
3. T. Sivaramakrishnan et al., “Autonomous Water Surface Cleaning Robot,” IRJET, 2020.
4. R. V. Patil et al., “Automatic Water Surface Cleaning System,” IJIRSET, 2016.