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Bluetooth Operated River Cleaning Mechanism for Efficient Waterway Maintenance

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Abstract:

Water pollution remains a significant environmental concern, particularly in rivers and waterways. This paper presents the design and development of a Bluetooth-operated River cleaning mechanism aimed at efficiently removing debris and pollutants from water bodies. The system utilizes innovative technology to enhance water quality and ecosystem health while minimizing human intervention.

Keywords: Bluetooth, River cleaning, Water pollution, Mechanism, Environmental sustainability.

Introduction:

Rivers and waterways serve as vital ecosystems, supporting diverse flora and fauna while providing essential resources for human populations. However, these water bodies face increasing pollution levels due to various anthropogenic activities. To address this challenge, innovative technologies such as Bluetooth-operated River cleaning mechanisms are being developed to enhance water quality and ecosystem health.

The technology of converting ocean and sea water into consumable can be developed and improved but, it will take at least a few decades to become a reality. On the other hand, from the past 2 to 3 decades the quality of consumable water has deteriorated in rapid pace so now is the time to conserve and preserve it, we cannot wait for more few decades for development of ocean water convergence technology. The time is now. So, our aim is to preserve the little quantity of water sources we have, thus we have designed & fabricated an advance Water body viz. River cleaning mechanism by taking “Chandrabhaga River” as reference.

Literature Review

Research by [1] By Mr.Abhijeet. M.Ballade, Mr. Vishal.S.Garde, Mr.Akash.S.Lahane and India is holy country & during lots of festival like ganesh visarjan, navratri durga puja & mainly Siahnsth kumbhmela there is lots of water pollution of Godavari River at Nashik. The water pollution is very important problem in rivers, ponds, and water bodies near Godavari River at Nashik. [2] Mr. P. M. Sirsat, Dr. I. A. Khan, Mr. P. V. Jadhav, Mr. P.T. Date This paper emphasis on design and fabrication details of the river waste cleaning machine. The work has done looking at the current situation of our

national rivers which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc. The government of India has taken charge 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 like Ahmadabad, Varanasi etc [3] Pankaj Singh Sirohi, Rahul Dev, Shubham Gautam, Vinay Kumar Singh, Saroj Kumar River water is used for irrigation which in return gives food to the people. They also maintain the ecology of region and bring prosperity. We made this project to clean the river. After implementing this project we can control the pollution of river it is very beneficial for our society

Objectives:

Design Development: To conceptualize and develop a robust and efficient river cleaning mechanism integrated with Bluetooth technology for remote operation and monitoring.
Efficiency Enhancement: To optimize the cleaning mechanism's design to efficiently remove debris, floating waste, and pollutants from the water surface and riverbed, thereby improving overall water quality.
Bluetooth Integration: To seamlessly integrate Bluetooth connectivity into the cleaning mechanism, enabling remote control, real-time data transmission, and communication with mobile devices or computer interfaces.
Environmental Impact Mitigation: To prioritize environmental sustainability by implementing gentle yet effective cleaning methods that minimize disruption to aquatic life and sensitive ecosystems.

Design Calculation:

Motor calculation: Type: - DC Motor

Power= $V \times I$
 Where, Volt= 12V
 Amp=7.6 amp
 Power= 12×7.6
 Power= 85 watt

Water Wheel Calculation

Power of Motor is(P): 85 watts
 Velocity: $\pi \times d \times N/60$

1. FOR RPM 30 Motor of Pipe

mechanism
 $V=3.14 \times 62.5 \times 30/60$
 $V= 98.125 \text{ MM}$
 $V=0.098 \text{ M/Sec D}=62.5\text{mm}$

FOR RPM 60 Motor Of Conveyors

$V=3.14 \times 40 \times 60/60$
 $V= 125.6 \text{ MM}$
 $V=0.125 \text{ M/Sec D}=40\text{mm}$

3. FOR RPM 600 Motor Of Water

Wheel
 $V=3.14 \times 406.4 \times 600$
 $V=12760.96 \text{ MM}$
 $V=12.760 \text{ M/Sec D}=406.4 \text{ mm}$

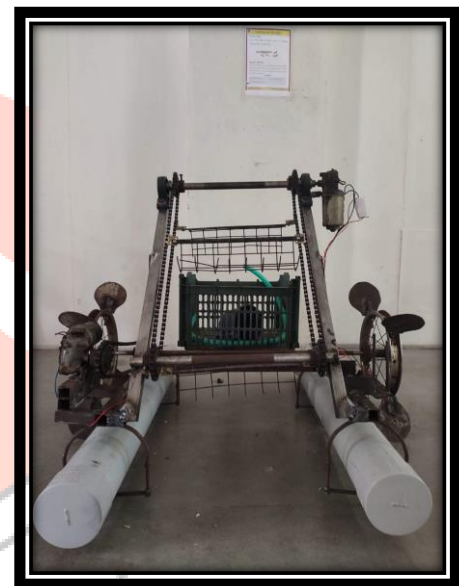


Fig. Actual Bluetooth River Cleaning Mechanism

Torque:
 Power= $2\pi NT/60$
 1. For N=30 RPM
 $T=85 \times 60 / 2\pi \times 30$
 $T=27.05 \text{ Nm}$ Used 30 Nm
 2. For N=60RPM $T=85 \times 60 / 2\pi \times 60$
 $T=13.52 \text{ Nm}$ Used 10 Nm
 3. For N=500 RPM
 $T=85 \times 60 / 2\pi \times 500$
 $T=1.62$ + Allowances Nm
Used 20Nm

Working Principle:

The project works on 12volt 7.5 Ah battery. As the switch is ON from the main controller, the current flows through motor and the motor runs the shaft of the water wheel, which in turn rotates the water wheel. The water wheel can rotate in forward as well as reverse direction, which provides turning effect to the whole system, which is controlled by variable resistor potentiometer fitted in main controller. The water wheel runs and follows the directed path to collect the floating garbage, plants etc . As the system is located to a particular space, the guider that is connected to the pipe mechanism move towards the floating garbage. The guider is radio controlled by the main controller system. It can move in forward as well as in left and right direction. The guider covers the entire lumps of floating garbage, surrounding them and then with help of floating pipe its pulls the garbage near main system.

Fabrication:

The various matters involved while fabricating this project includes market analysis, product survey and use of various techniques used in industries. All of them are mentioned & elaborated as follows.

Base Frame:

For making base frame we have used stainless steel square pipe and plywood. The base frame has length of 950 mm and 700 mm width. At first sight 20 ft., steel pipe had been cut into 11 pieces with corresponding dimensions. To ensure proper fittings and rigid structure stainless steel pipe were cut at an angle of 50° and were gas welded using stainless steel filament.

Flat Conveyor System

Conveyor system is a fast and efficient mechanical handling apparatus for automatically transporting loads and materials within an area. This system minimizes human error, lowers workplace risks, and reduces lab or costs among other benefits. They are useful in helping to move bulky or heavy items from one point to another. A conveyor system may use a belt, wheels, rollers, or a chain to transport objects. Conveyor systems save

time when transporting items from one location to another. As they can be inclined to span multiple levels, they make it simpler to move items up and down floors, a task that, when performed manually by humans, causes physical strain

Trash rack

Trash rack provides collection of floating trash. The trash rack used in this project is used to Plastic hole crate. The dimension of the trash rack are 250×100 mm. Trash rack is mounted on back portion of the base frame and behind of flat frame at lowered height than that of the flat conveyor frame.

Design Methodology

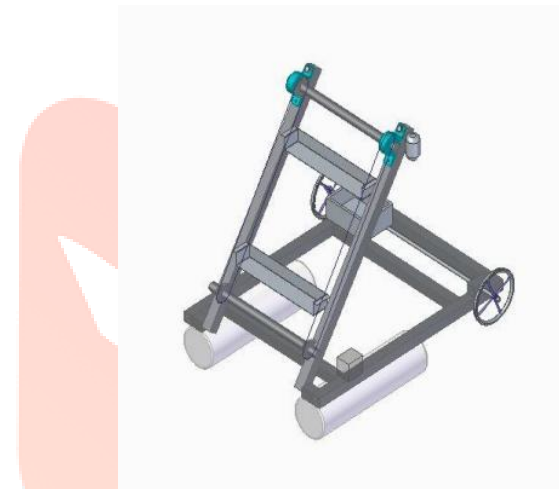


Fig. AutoCAD 3D View

Dimensions:

Base Frame:

Length = 950 mm

Width = 700 mm

PVC pipe of Length = 600 Diameter = 48.3 mm
thickness = 1.5 mm

Water Wheel

Diameter = 406.4 mm

Floating Pipe

Length = 600mm

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Diameter = 48.3mm

DC motors

1. 600 RPM

30-kgcm² torque

2. 60 RPM

10-kgcm² torque

3. 30 RPM

10-kgcm² torque

Water wheel

Water wheel provides forward as well as turning motion to the entire assembly. Water wheels are made up of mild steel bicycle rims having diameter of 16 inch to which flat acrylic sheets of 350×100 mm dimension was drilled and connected using hollow mild steel square pipe. As these rims are light in weight and unable to be arc welded the technique use for connection of

mild steel square rods with rims is brazing. Brazing is the technique in which brass rod along with its flux is gas welded to form a rigid joint.

Conclusion:

In conclusion, the design and development of a Bluetooth-operated river cleaning mechanism represent a significant advancement in waterway maintenance and environmental sustainability. By integrating innovative technology with efficient cleaning capabilities, this mechanism offers a promising solution for addressing the persistent challenge of water pollution in rivers and waterways.

Through meticulous design considerations, including efficiency enhancement, Bluetooth integration, environmental impact mitigation, and user interface enhancement, the cleaning mechanism has been tailored to meet the needs of both users and the environment. Its remote operation capabilities via Bluetooth connectivity allow for convenient monitoring and control, reducing the need for manual intervention and enhancing operational efficiency.

Furthermore, the emphasis on environmental sustainability ensures that the cleaning mechanism operates gently and effectively, minimizing disruption to aquatic life and ecosystems while efficiently removing debris and pollutants. Safety features and structural integrity calculations guarantee the safe and reliable operation of the device, promoting confidence among users and stakeholders.

Acknowledgement:

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