Design and Development Aquatic Weed Harvester

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***Abstract*: Water hyacinth (Eichhornia crassipes) or may be a free-floating water trash material that float in still or slows moving water bodies and has become one among the world's worst aquatic waste because of its ability to make dense floating mats on the water's surface. These mats have significant impacts on rivers, wetlands, dams, lake, and irrigation systems. However, floating water trash, which evades waterways and reduces recreation and aesthetics value of water bodies, must be controlled. The purpose of this project is to design a harvester for control of aquatic plant and floating trash on various water bodies. The anatomy and physiology of the aquatic trash harvester where to design and development of dispatch mechanism using basic mechatronics and automation engineering procedures. The most feature of the aquatic trash harvester included an electrical motor, mower disc, shaft with number of blades made from stainless-steel. The machine also includes a dedicated dispatch mechanism with a conveyor and motor attachment which provides churning and breaking the aquatic plants and waste material into small pieces. The machine operates with capacity of 1-2tons /hr at the speed of 10-20 km/hr approximately. Fabrication of the designed aquatic plant harvester, using local resources will help to promote and improve indigenous technology, allowing for better waste's physical management.**

Index Terms*: *Floating trash, Water hygienic, Mechatronics, Mechanism

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I. INTRODUCTION

Aquatic weeds are plants that grow in or on water and are undesirable in large quantities. Harvesting, shredding, mowing, rototilling, rotovating, and chaining are examples of mechanical control methods that involve the entire or partial removal of plants. With the use of motor-driven machinery, mechanical control methods can also be employed to expedite manual harvesting tasks like as hand harvesting, raking, and cut stump control. The "River cleaning machine" is used in locations where waste particles from a water body needs to be removed. A waterwheel-driven conveyer system collects and removes waste, trash, and plastic waste from bodies of water in this machine. This also reduces the difficulties faced when collecting rubbish. A machine will remove trash from water bodies, resulting in reduced water pollution and, as a result, fewer aquatic species dying as a result of these issues. It consists of a belt drive mechanism that extracts garbage from the water. The goal of this initiative is to remove surface water debris from rivers, ponds, lakes, and other bodies of water.

II. LITERATURE SURVEY

The Kadamb Prasad [3] has demonstrated the Remote-Controlled Sewage Cleaning Machine Design and Fabrication. The goal of the project is to automate the sewage cleaning process in drainage systems in order to decrease disease transmission to humans. By eliminating leftovers that might attract and nourish bugs, the black water cleaning procedure helps to avoid insect infestations. It also extends the shelf life and improves the sensory quality of food. The suggested method uses a remote control to run the equipment that cleans the sewage. As a result, this system mitigates the negative effects of sewage waste and its toxic gases. This aids in the prevention of mosquito development due to waste.

The Dave Gerr [7] has Review on Advance River Cleaner. The water from the river is utilised for agriculture, which provides food for the inhabitants. They also contribute to the region's environment and wealth. This initiative was created to help clean up the river. We will be able to manage river pollution after completing this project, which will be extremely useful to our society. The turbine in this project spins due to the flow of river water, and two conveyor belts are arranged via a mechanical gear arrangement. For solid waste management, the first conveyor belt is used to pick solid trash from the river, and the second conveyor belt is used to pull solid waste out of the river.

The Devendra Kumar [3] has Demonstrated on Efficient Lake Garbage Collector by Using Pedal Operated Boat. The Ganga River is the world's most sacred river and India's national river. The Ganga is India's spirit and the Holly River in the country. Our major goal is to clean the lake water; therefore, we're building an efficient lake rubbish collector with a pedal-powered boat. We are collecting rubbish from the lake using a pedal-operated boat with a conveyor attached to it. Several firms provide waste removal equipment for river lakes and ports. The water surface trash collection boat may work in a river or a lake, collecting floating trash and other weed cutting equipment, and harvesting aquatic weed from the lake.

The Kathalyn S. Tung [6] has Designed and Fabrication of River Waste Collector. The "River Waste Collector" is utilised in areas where waste debris has to be collected from a water body. This machine is made up of various sized fins that gather rubbish in the spaces between them. This also lessens the challenges we experience when collecting waste. In this machine, one end of the fins is fixed and the other is movable; we raise the fins from the moveable side using servo motors. All of the waste material is collected in a tank in the boat's stern.

III. Gap Identification

According to the water level of the Indian River, current trash collection machines are too large to be employed in shallow water. Because no company in India manufactures an aquatic waste collection machine, the machine's cost is excessively high because it is imported from China. There are very few automation techniques employed in today's garbage collection machines. There is no provision for a dispatching conveyor mechanism in the current aquatic trash collection machine.

IV. Problem Statement

To design and development of IC engine based manually operated floating trash handling machine for the capacity of 1 tone. The proposed machine is assisted with mechatronics devices to improvise its performance. The proposed machine targeted to maintain the water eco system.

V. Objectives

To create a frame that is light in weight and properly balanced. To choose a water-resistant and cost-effective material. The conveyor requires more surface area than the frame for other mechanisms. Calculating approximate weight of each equipment's used in the assembly for weight balancing. To study, understand and analysis different existing methods and exiting machines that used for floating trash handling. To design and analysis of proposed floating trash handling machine with suitable software. To develop the proposed floating trash handling machine. To test and investigate the performance of proposed floating trash handling machine.

VI. Proposed Methodology

Best Model Selection Taking into Account Various Parameters Material selection is depending on the river's pollution. When linking the conveyor assembly to the main boat haul, it must be weight balanced. Making a 3D model based on the parameters listed above. Using AutoCAD Maya to run the float test. Adding some sensors for detecting the water level and for upcoming hurdles on the water bodies.

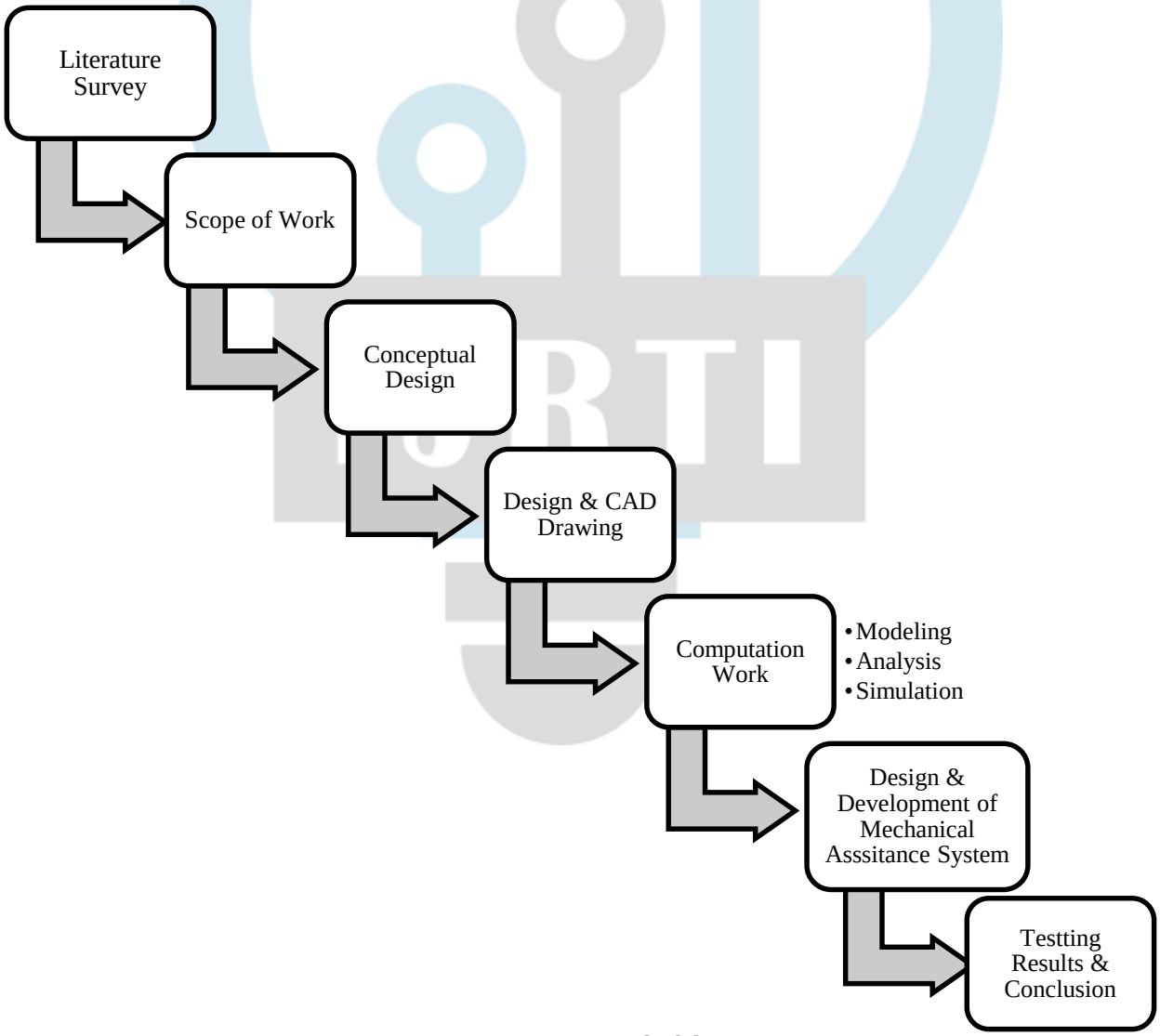


Fig No.1 Methodology

VII. CATIA DRAWING

As per the weight carrying capacity of the actual model, we have designed the actual frame for harvester on CATIA. In this we have consider the 'L' section bars for the frame. The 'L' section bar was used because they have high strength as compared to circular bars. The dimensions of the frame where 11ft x 12ft.

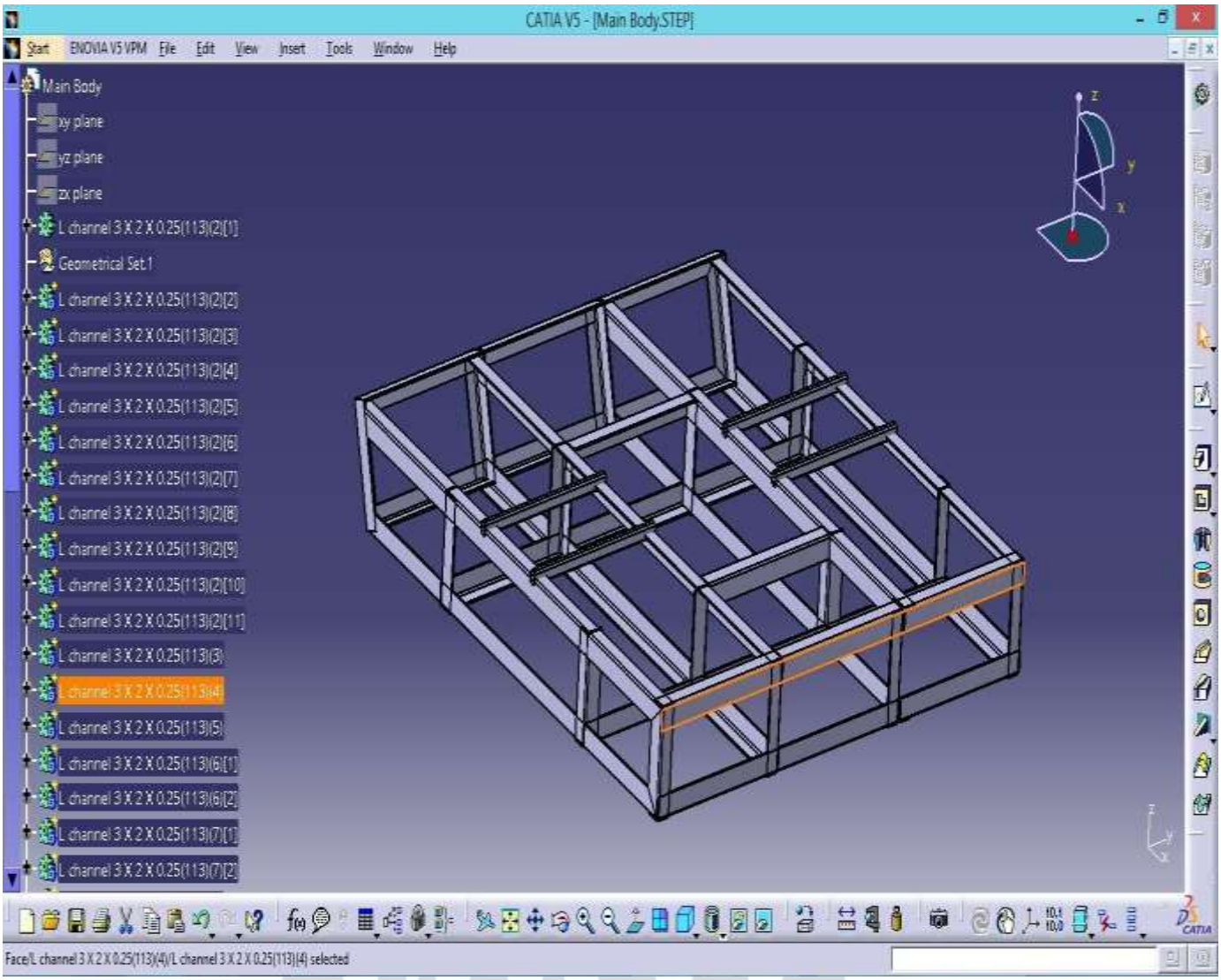


Fig No.2 Actual design of frame on CATIA.

Attachment of Plastic Tanks for Floating Purpose

As per the weight calculations the for floating purpose we had used the tanks of capacity of 1000 liters we had required two tanks of 1000 liter's each for floating and balancing purpose. So, we needed to do the frame designing on CATIA with the tanks for balancing of the harvester and to know the actual arrangements before manufacturing the actual frame.

Plastic Tanks Specialty are

- Low weight as compared to other designs
- Anti-corrosion and no effect of water
- No joints and welding's are required
- Low cost and reduced the overall cost of the Harvester

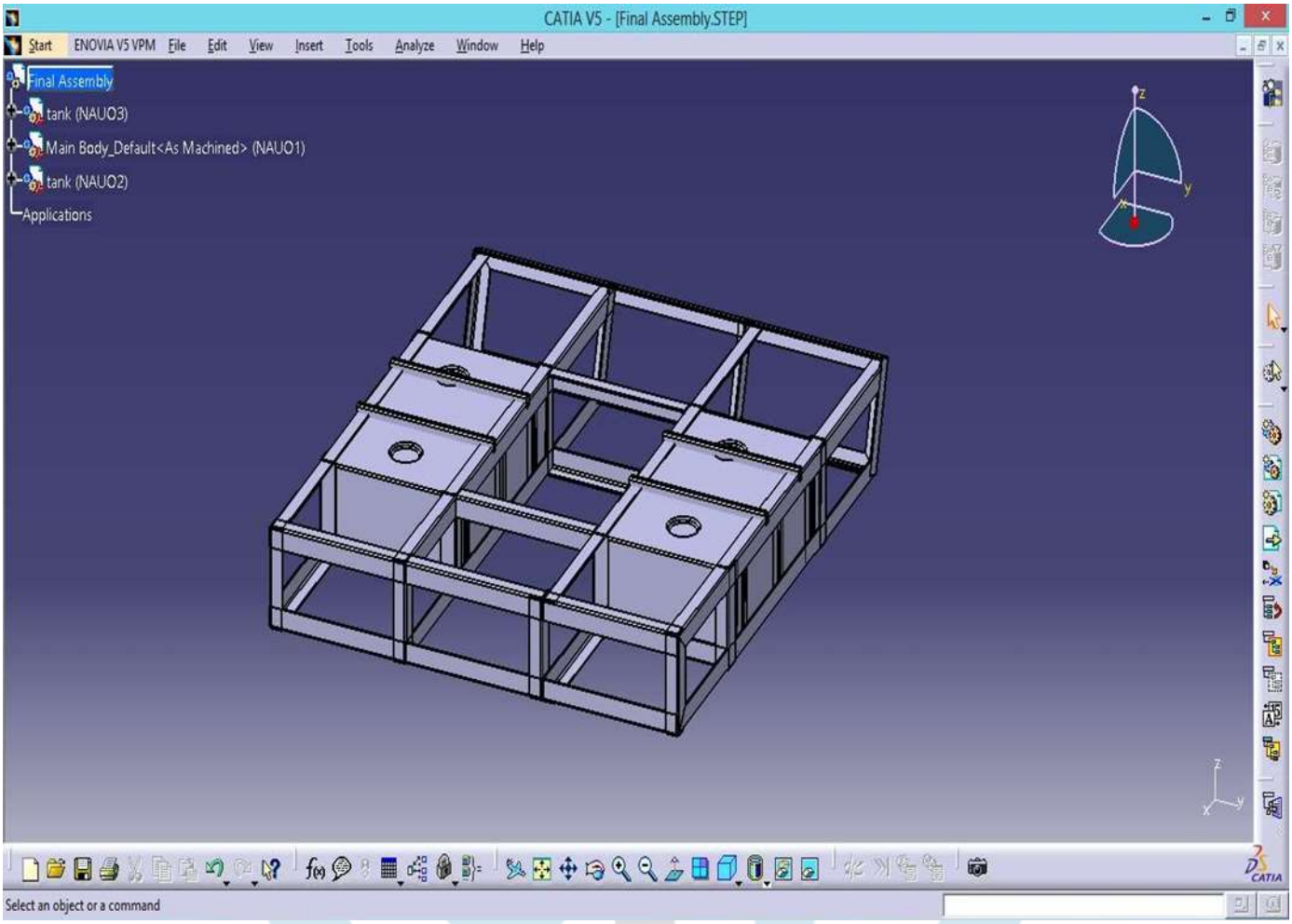


Fig No.3 Actual design of frame with Tanks on CATIA.

VIII. ACTUAL FRAME FABRICATION

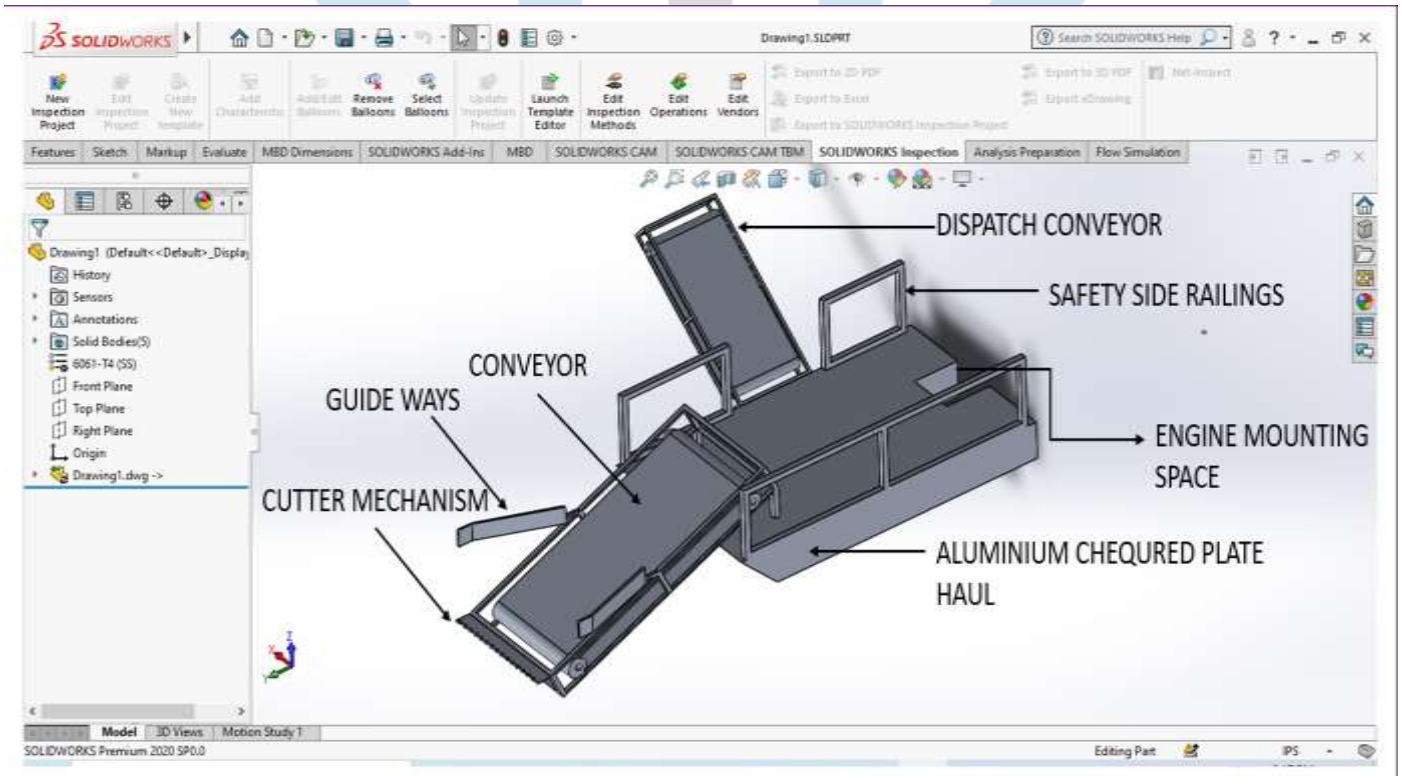
Welding of the frame was carried out at local welding shop. The welding method used was shielded metal arc welding process for high strength at joints. The stick welding is most widely used welding processes. Shielded metal arc welding in which the flux covering on the electrode melts during welding. this forms the gas and slag to shield the arc and molten weld pool. The slag must be chipped of the weld bed after welding. The flux also provides a method of scavengers, deoxidizers and alloying elements to weld metals. When the arc is stuck between the metal rod (electrode) and the workpiece both the rod and workpiece surface melt to form a weld pool. Simultaneous melting of flux coating on rod will a form a gas and slag which protects weld pool from the surrounding atmosphere. The slag will solidify and cool and must be chipped off the weld bead once the weld run is complete.

Fig No.4 Actual Frame Welding

Fig No.5 Engine Attachment to the Frame.

IX. FUTURE MODIFICATION IN FRAME

The overall actual frame was built of steel "L" section bars which used to get rusted after use in River water, so there was a need of new frame development which is more sustainable in river water and has better balancing opportunities and advanced technologies equipped. So new Aluminum frame tried on Solid Works software.



X. CONCLUSION

On the basis of Prototype, calculations, design were made for actual river water trash collector. According to calculation and design the river water trash collector body frame constituting plastic tank was manufactured. After manufacturing it was observed that frame was big in size, which resulted in increase of project frame wait. As weight of project frame was increase, the weight caring capacity of the project frame was reduced. So, taking observation in account, the modifications were made in project frame. Secondly, the engine constituting boat long tail shaft was selected on the grounds of calculated weight and design. The engine was mounted on frame as per design requirement. Aluminum alloy plates was selected for flooring purpose on frame. Therefore, it was observed that using of such material became uneconomical for project. Hence from economical point of view bamboo flooring was selected, which had capability to withstand the loads coming on the operating floor as per requirements.