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ARRANGEMENT AND DESIGN OF RIVER TRASH CLEANING MECHANISM

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ABSTRACT: 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. In this project turbine rotates by flow of river water and through the mechanical gear arrangement we arrange two conveyor belts. The first conveyor belt is used to pick solid waste from river and the second conveyor belt is used to draw solid waste out of river for solid waste management.

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. Automation plays an important role in mass production. In this project we have fabricated the remote operated river cleaning machine. The main aim of the project is to reduce the man power, time consumption for cleaning the river. With increase in population, the scenario of cleanliness with respect to waste management is degrading tremendously. The overflow of garbage in river side creates unhygienic condition in the nearby surroundings. The floating bodies on the river water will cause a severe problem to the environment and is a big risk to the future. These floating wastes will not be dissolved easily in water. So these unwanted suspended objects will cut off the oxygen, hence creates oxygen deficiency which directly affects the marine life.

I. INTRODUCTION

This invention relates to skimmer boats, i.e., work boats for collecting and disposing of floating solid waste materials in harbours and waterways. The invention is more specifically directed to highly manoeuvrable vessel equipped with means for picking up floating debris, means for storing the debris on the vessel, and means for discharging the debris from the vessel to a storage area, which may be ashore or which may be another vessel such as a barge. With increase in population, the scenario of cleanliness with respect to waste management is degrading tremendously. The overflow of garbage in river side creates the unhygienic condition in the nearby surroundings. We have all witnessed in recent times that the pollution of water bodies is one of the major problems. The quality of water in major rivers has deteriorated to a greater extent. Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat and humans. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste, or through exposure to chemicals within plastics that cause interruptions in biological functions. Humans are also affected by plastic pollution, such as through the disruption of the thyroid hormone axis or hormone levels. We know that pollution is a human problem because it is a relatively recent development in the planets history before the 19th century. As industrialization has spread around the globe, so the problem of pollution has spread with. Water running through a water drainage system mostly carries along waste materials most which are non-biodegradable which not only cause flooding but also climate change. Overflow of water drainage system occurs when there is a blockage of an end of the drainage system forcing the water to find its way elsewhere apart from the mapped out drainage system, therefore the running water spills over the horizontal height of the drainage systems spreading to regions alongside the drainage system, thereby causing problems such as pushing down of structures such as fences, water logging of farm lands and residential building, etc. The impurities present in water can cause hazardous and disease. As long as the draining system is considered the function of the main drainage system is to collect, transport and dispose of the water through an outfall or outlet. Impurities in drainage water can be only like empty bottles, polythene bags, papers, etc. It's an industrial working prototype of entirely solar powered water cleaning mechanism which can auto collect floating garbage and solid waste from the water surface and collect it into its floating bin. It can be programmed, scaled up to any size and can operate remotely. The system is indigenous and efficient to tack river cleaning cause.

a. It's reduces the human efforts.
b. Its works fast than Man Power.

II. PROBLEM DEFINITION

To design a remote operated machine to collect trash effectively, efficiently and eco-friendly.

- India is a country which is surrounded by water in three directions. But the drinkable water is very less.
- As it is a developing country, the drainage system is also developing but currently it is very bad system.
- Today, we people are facing pollution everywhere. Due to rise in pollution our environment is getting adversely affected.
- One of the most recent problems we are facing is pollution of the water in rivers and lakes.
- All the trash like industrial, house hold is disposed in river.

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Which causes the contamination of water, affects aquatic life badly and also creates blockage in river flow.

III. OBJECTIVE AND SUMMARY OF INVENTION

To overcome the difficulty of removing waste particulate floating on water surface.

In this project the main aim of this machine is to lift the waste debris from water surface and disposed them in the tray. Hence this will result in cleaning of water surface and safe collection of waste debris from water.

1. To reduce the pollution in water bodies.
2. To overcome the difficulty of removing waste particulate floating on water surface.
3. To maintain the automation during working towards cleaning river.
4. To perform the fast and reliable operation during cleaning river.
5. To work for society for clean up a section of a stream or river.

IV. DESIGN AND CONSTRUCTIONAL FEATURES

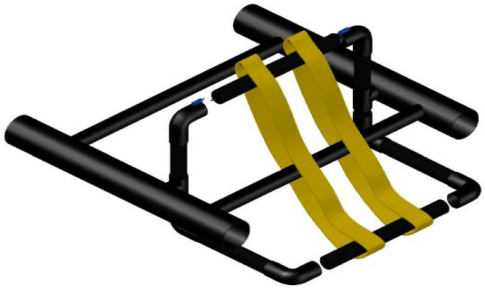
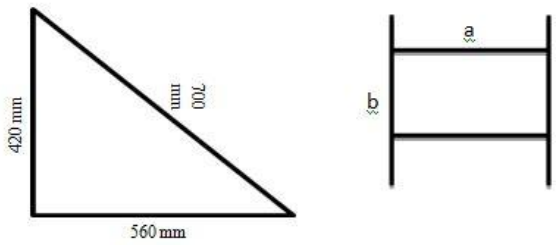


Fig: Design of conveyor belt and mechanism



a: Dia = 44 mm
Len= 500 mm
b: Dia = 150 mm
Len= 1000 mm
Width of belt = 60 mm

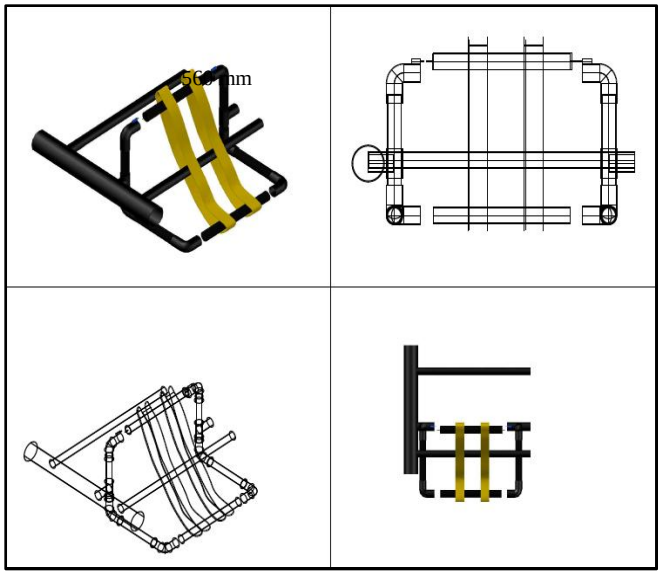


Fig: CAD model

Fig: Fabrication of conveyer mechanism

CALCULATION:

- Weight of body (mechanism) = Density of material × Acceleration due to gravity× Volume of mechanism body (N)
- For Equilibrium, (from fluid mechanics book by R. K. Bansal)
  Weight of body = Weight of water displaced
  Volume of water displaced = volume of body
  Therefore
  Volume of water displaced =
  Wt. of water displaced/wt. density of water
- Crouch's Formula
  Speed of mechanism = C × √(Power/ Weight)
  Assuming Speed = 0.25m/s, C = 0.176 (from 0.163 to 0.176), Weight of body = 20 Kg
  Therefore, Power = 44 W
  Standard Power = 48 W = 0.0643 HP
- Power = Force x Velocity (W)……. From this velocity is being calculated
- Meta centric height:
  = (Iy/volume of body submerged) – BG
- Thrust developed by propeller:
  $T = 326 \times S_{hp} \times E/V_a$

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Where,
S_{hp} = Shaft horse power
E = efficiency of propeller
V_a = speed of water at propeller

- Propeller pitch:
  Pitch ratio =0.46 x speed of mechanism in knots
  = 0.46 x 0.486
  Pitch ratio = 0.38

KEY ELEMENTS AND MATERIALS:

- UPVC Pipes: Unplasticized Poly Vinyl Chloride pipes are used because this material is light weight as well as strong, also it floats on water.
  Mechanical strength: 550 Kg/cm2
  Density: 1.43 g/cm3
  Ultimate tensile strength: 50 MPa
  Compressive strength: 63 MPa
  Shear strength: 39 MPa
- Battery:
  Type: Lead Acid Battery Direct Current
  Rating: 12V-2.5A
  Output: 30W
- Solar Panel: Here we are using solar panel to charge the battery.
  Nos.: 5
  Area: 60mm x 100mm
  Total Area: 30,000 mm^2
- Power Generation: From 12V to 18VMotor:
  Type: Direct Current
  Input: 12V
  a) For Conveyor rpm: Approx 200 rpm
  b) For Propeller rpm: Approx 500 rpm
  Nos.: 2-2 each
- Belt:
  Type: Flat belt
  Length: 700mm
  Width: 40 mm
  No.: 3 Belts
- Aluminium: It is taken for manufacturing of frame because it is rust free, lightweight & having required strength for project.
  Density: 2700 Kg/m3
  Ultimate tensile strength: 327 MPa
  Compressive strength: 280 MPa

CONSTRUCTION:

- The project consist of H type frame, L type frame on which conveyor is placed, battery, motors, solar panel, 2 propellers, UPVC pipes of various diameters.
- L type frame is made by joining UPVC pipes of having diameter 44mm by flex quick glue by the joints.
- H type frame is made by same in which the horizontal part is made with 44mm diameter pipe of length 500mm & the vertical section is made with 150mm diameter pipe of having length 1000mm.
- The whole frame is joined only by means of quick flex glue.
- 2 small belts are joined together to make 700mm length of conveyor.
  2 motors are placed at the top of vertical side of L frame, these motors are connected to single pipe causing the rotation of pipe & indirectly rotation of the conveyor.

WORKING METHODOLOGY:

- The power from the solar panel is stored in the battery which firstly drives the 2propeller and when there is a need of trash removing the power is given to theconveyor motors.
- When the mechanism has to take a left turn, the left propeller is turned off and the whole supply is given to the right propeller and the turn is executed.
- The trash is collected to the collecting vessel of having dimension 500mm X 500mm X
  350mm.

The trash collecting vessel is removable so that the disposal of trash becomes easy.

- To drive this mechanism on the land the separate frame of aluminium along with the wheels which has ground clearance of 150mm is made & if the whole mechanism isplaced on this frame, the mechanism will run on the ground to collect the land waste.

BENEFITS OF MECHANISM:

1. Water pollution will be minimized.
2. Health related problems which are caused due to contaminated water can be minimized.
3. Aquatic life gets improved.
4. It is the cheapest way to clean the river trash.
5. Skill worker not required to driving the system.
6. Environment friendly system.

V. RESULT AND DISCUSSION

We performed the following test and results are being discussed as follows:

1. Weight Lifted : We tried to present the model where the model is successfully able to lift the 20 kg of the drainage APM i.e. solidwaste. With the constraint of the size and budget the project performs excellent in its parameters.
2. Speed of Drain : As the setup which performs excellently on the constraints condition that have been designed in view of the real life drain condition, we try to provide the drain with the minimum speed of 5km/hr and able to drive out the results that the battery is getting charged and able to run the mechanism.

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FUTURE SCOPE:

1. With advancment and modification inmechanism, it can be used for cleaning offloors or grounds and lawns.
2. In future this project can be improved to sort more categories of waste.
3. In this system we can use advance conveyor system and conveyor material forincreasing the efficiency of collection of garbage.
4. The modification of the boat is done to increase its waste collecting capacity.
5. This project is made only for small lakes and by doing some modification in itssize and capacity it can be used in big lakes and rivers like Ganga.

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