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An Efficient River Cleaning Machine Using Bluetooth Module

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ABSTRACT: The paper is based on design and fabrication of the river cleaning machine. The motive is taking a glance at the current situation of rivers which are dump with litres of sewage and stacked with poisons, harmful materials, garbage and so on. This River cleaning machine removes waste harmful material from water surface and dispose it from the water body. The life of aquatic animal is in danger due to increase in water pollution. The death of aquatic animals can be reduced by this machine. This machine reduces time consumption for cleaning the river and the man power. This machine stores the energy in battery and uses this energy for cleaning the river with the help of chain drive arrangement and motor.

KEYWORDS: River garbage, conveyor, drive motor, bearings, chain.

I. INTRODUCTION

Rivers are an important feature of the Earth's landscape. They are extremely valuable ecosystems and provide a range of goods and services to humankind. The cleanliness and hygiene of water is important since it is a basic need for all living beings. Various traditional methods are used to clean the water which is polluted due to waste from industry, sewage waste, garbage waste etc. This problem should be considered as serious and technology should be implemented to reduce this severe problem. In this paper a technology is implemented which collects the waste from the surface of water bodies such as plastic wastes, garlands, bottles and other wastes and disposes it safely.

This River Cleaning Machine works on waterwheel driven conveyer mechanism that collects & dispose the waste debris from water bodies. The various components used for River cleanup machine are water wheel, shaft, pedestal bearing, belt drive, conveyor, bevel gear and ms angle frame. The Belt drive mechanism is used to lift the debris from the water. This mechanism reduces the problems that are faced by people while collecting the debris and even the water pollution is reduced.

II. LITERATURE REVIEW

The paper of M. Mohamed Idhris et al. is used to operate the sewage cleaning process in drainage and reduce the spread of diseases. In this proposed system, the sewage cleaning machine operates on remote which avoids the adverse effects of sewage waste. When system is switched on the wiper motor turns on and power window motors are driven automatically with the help of remote. The arm collects the waste from the surface and disposes it in the bin fixed to the system. The proposed system has less human power in cleaning process [1]. P. Sirsat et al. designed a river cleaning machine used DC motors, propeller, RF transmitter and receiver, PVC pipes and chain drive with the conveyor connected to it for collecting garbage, wastage & plastic waste from water bodies[2].The author N. Daniels designed the machine which had Propeller, the Cleaner and the Pan which generates the motion for its functions by itself through the action of running water thereby cutting out the dangers of the powering the machine by other sources of power because of the harshness of the rain on these other sources[3]. O. Nurlansa et al. designed a machine named AGATOR(Automatic Garbage Collector), which is rotor model that work as an automatic garbage collector. The proposed system used IC ATmega16, limit switch as the controller, mechanical robot, robot control system, sensor system, and actuator robot. The maximum load carried by the system is upto 5 kg [4]. The author E. Zahugi et al. designed a robot to operate on the surface of water. It consists of a half oval shape skimmer with radius of 2 meter

or boom 2 to push a floating oil spill to some position for cleaning. They also used transceiver module, GPS module and a digital compass, motor driver IC, LCD etc. This system is expensive compared to others [5]. The author Mark Knapp in his patent used a pedal powered boat with flexible shaft to drive a propeller. The flexible shaft increases users stability. The boat used a ratcheted straight driver and a foot pegs pair that has sweeping circular motion. Although these boats are not much practical and are used for amusement. But it is only controllable at low speeds specially used during fishing [6]. The author N. Jogi et al. designed an efficient lake garbage collector by using pedal operated boat with a shaft to drive a propeller. It consists of two pedals, two propellers, that are connected to shaft. The proposed system is attached with conveyor system operated by the same pedal to clean the debris [7]. Dr. K. Kumaresan designed a system that converted manual work to automated system. The system overcome the problem blockage of drainage pipe. The gaseous substance were allowed to flow from pipe efficiently. The system was operated and controlled by the application of mechanical, electronics and computer based systems [8]. P.Sironi has explained As there is big problem of water pollution and mainly this is found in lakes, rivers. To solve this problem they introduce the river cleaning machine. We pumped out thousand crores to save the rivers through various plans. River cleaner which makes the turbine driven alternator to produce electricity. When water flowing in river falls on turbine the turbine begins to rotate the alternator generate electricity. This drives the vertical conveyor belt and horizontal conveyor belt through timing chains and sprockets. The first belt is used to pick the solid waste from river and the second belt is used to draw the solid waste out of river for solid waste management. With help of spur gears both the conveyor belt are connected with each other [9]. The author Ganesh U.L designed that usage of mechanical drainage cleaner to replace the manual work required for drainage cleaning system. Drainage pipes are very dirty. Sometimes it is very harmful for human life while it is need for cleaning drainage system. To overcome this problem they invented the semi-automatic drainage water cleaning machine to overcome this issue, the mechanical semi automatically operated drainage waste cleaner is made which allows water to move in laminar way[10].

III. METHODOLOGY

The proposed system is a vehicle that floats on water which run on dc power and controlled by android phone. This vehicle consist of metal base frame on which collecting mechanism is made which collect the waste from river and dump it in the tray. This collecting mechanism is run on dc wiper motor which is powered from solar plate. For floating mechanism

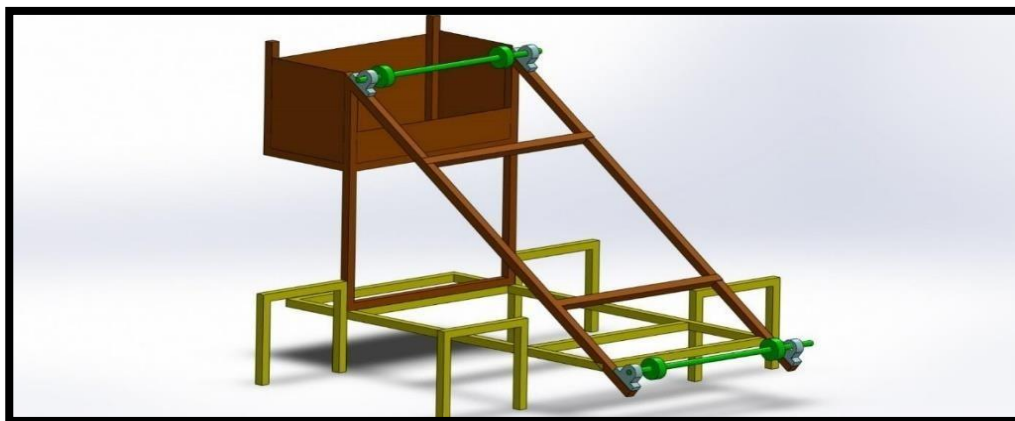


Fig 1. Mechanism of River Cleaning Machine

put tubes having pressurized air in it. The collecting mechanism consist of chain sprocket arrangement in which two chains are connected with the help of rod and for which links are attached.

Fig.1 shows the mechanism of River Cleaning Machine. The components used in the proposed system are base frame, drive motor, ball bearings, dc battery, Bluetooth model-HC 05, tubes. The Base Frame is used to give a supports to other physical components connected to structural components. The Drive motor is an electric motor which sustain the motion for automatic platform. It drives the whole system with high efficiency. The Ball bearings are used to reduce the rotational friction and supports the loads acting on the system. The battery is of 12V and 7Ah and dimensions are 16.1*10.4*7.5 cm and weighs around 9kg. The Bluetooth model HC 05 has Data Rate of 3Mbps Modulation and 2.4GHz radio transceiver. Tubes are used to avoid the system from sinking.

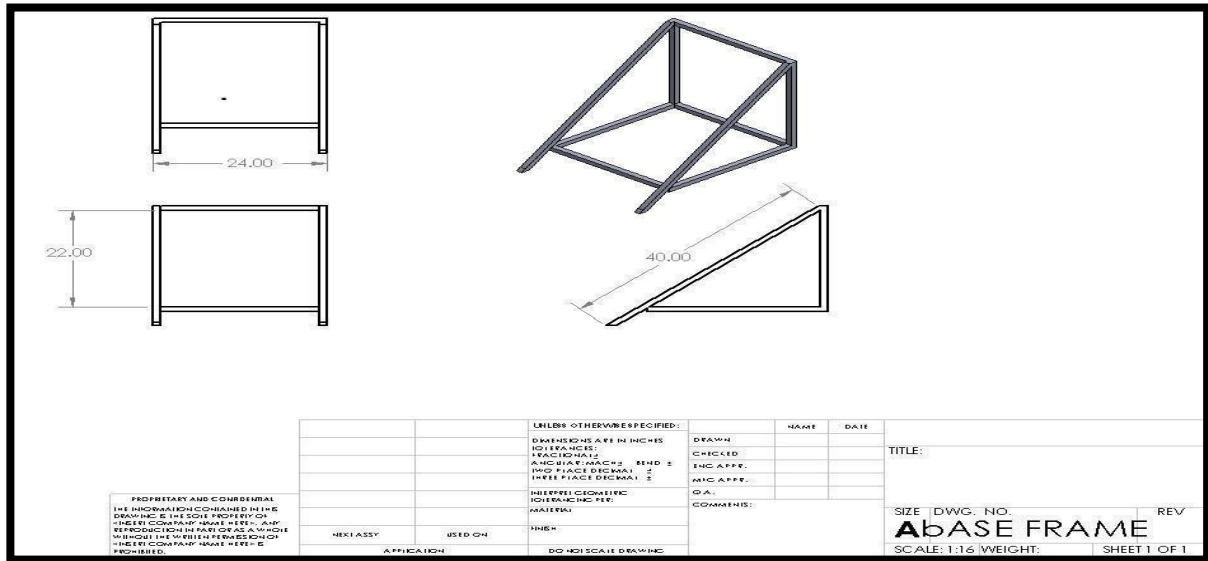


Fig 2. 3D model of River Cleaning Machine

Fig 2 shows the 3D model of the proposed system. The figure shows an overlook of the designed river cleaning machine with dimensions.



Fig. 3. Base Frame



Fig. 4. River Cleaning Machine

Fig 3 shows the base frame with chain on both sides and Fig 4 shows the proposed River Cleaning Machine

IV. CALCULATIONS

Design procedure of chain drive and sprocket-

- 1) Determine the velocity ratio of the chain drive Velocity ratio = N_1/N_2 So, $N_1/N_2 = T_2/T_1$, velocity ratio = 1
- 2) Select the minimum number of teeth on the smallest sprocket or pinion Minimum Number Of Teeth On The Sprocket = 18
- 3) Calculate the design power with the help of Service factor (K_s)- Design power = Service factor (K_s) x Rated power
 = 106.25 x Service factor (K_s)
 = 106.25 x (Load factor (K_1) x (Lubrication factor (K_2) x Rating factor (K_3)))



$$= 106.25 \times (1.5 \times 1 \times 1.25)$$

Design power = 0.20kW

- 4) Choose the type of chain,
number of strands for the design power and RPM of the sprocket Types of chain = simple roller chain (06B)
Power rating (in kW) = 0.25

Speed of sprocket or pinion (RPM) = 30

- 5) Note down the parameters of the chain, such as pitch, roller diameter, minimum width of roller. ISO chain number = 06B (35)BdShivalkar
Pitch (mm) = 9.525 Roller dia (mm) = 6.5

Min width (mm) = 5.7

Braking load (simple type roller chain) in k N = 8.9 6)

Determine the load (W) on the chain by using the following relation, Pitch line velocity

$$= \frac{dN}{60}$$

Pitch line velocity = $(3.14 \times 0.06 \times 30) / 60$ Pitch line velocity = 0.0942 m/s

W = Rated power/pitch line velocity

W = 0.25 / pitch line velocity W = 0.25 / 0.0942 W = 2.65KN Load on the chain

W = 2650N

- 6) Calculate the factor of safety by dividing the breaking load (WB) to the load on the chain (W). This value of factor should be greater than the value.

Factor of safety = (WB/W) = 8.9/2.65 Factor of safety = 3.358

V. CONCLUSION

The proposed River Cleaning Machine is simple and easy to use. The system reduces manual stress and is much reliable. The system collects the garbage from rivers and ponds and reduces the water pollution with less human intervention. The design and costing of this River Cleaning Machine is very cheap and very useful for the society.

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