



REVIEW PAPER ON DESIGN AND DEVELOPMENT OF RIVER FLOATING CLEANER

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ABSTRACT

This Project emphasis on Design and Analysis of the River Floating Cleaner. The work has done looking at the current situations of the rivers which are dump with crore litters of sewage and loaded with pollutants and toxic materials, debris etc. The government of India has charged to clean rivers and invest huge capital in many river cleaning projects .

By taking this into considerations this machine has been designed to clean river water surface . Nowadays almost all manufacturing atomized in order to deliver products at faster rate. Automation place as an important role in mass production. Those garbage materials can clog water flow and induce the water become remote operated river cleaning machine .

The main aim of this project is to reduce the manpower and time consumption for cleaning the river . In this project we have automated operation of river cleaning with the help of a motor and chain drive arrangement . Here using RF transmitter and receiver are to control the river machine.

Automation can be achieved through computer , pneumatics, hydraulic ,robotics etc., of the sources , pneumatics form an attractive for low cost automation.

Keywords: River floating Cleaner

1. Introduction

The Over two thirds of Earth's surface is covered by water; less than a third is taken up by land. As Earth's population continues to grow, people are putting ever-increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities so their quality is reduced. Poorer water quality means water pollution. This invention relates to skimmer boats, i.e., work boats for collecting and disposing of floating solid waste materials in harbors and waterways. The invention is more specifically directed to highly maneuverable vessels 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 barge. Many work boats and vessels have been proposed for collection of floating solid waste and other debris. These may typically be formed as a catamaran-type hull, i.e., a pair of pontoons or sponsors, or as a monohull, with paddle wheel or screw driver propulsion, and an operator station. In one typical trash skimmer design, one or more hydraulically powered open mesh conveyors are positioned between the pontoons of a catamaran-type twin-hull vessel. The problem of flooding and climate change has become outrageous because of its recent trends in our environment today. This has become a cause of major concern to the world, especially the developing countries. 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.It's works fast than Man Power

2. LITERATURE REVIEW

PAPER NAME	RESEARCH PAPER DEATIL	FINDINGS
AGATOR (Automatic Garbage Collector) as Automatic Garbage Collector Robot Model	International Journal of Future Computer and Communication, Vol. 3, No. 5, October 2014, Osiany Nurlansa, Dewi Anisa Istiqomah, and Mahendra Astu Sanggha Pawitra, Member, IACSIT	This research aims to design and make AGATOR (Automatic Garbage Collector), a rotor robot model as automatic garbage collector to counter accumulation of garbage in the river which has no flow effectively and efficiently Support devices of the robot are mechanical robot, robot control system, sensor system, and actuator robot. The maximum load drives the garbage receptacle until 5 kg. The average speed of robot when take out the garbage is 0,26 m/s.
SEMI-AUTOMATIC DRAIN FOR SEWAGE WATER TREATMENT OF FLOATING MATERIALS	IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 pISSN: 2321-7308, Vinod V Rampur2 1Assistant Professor, Mechanical Department, PESITM, Zhimoga, Karnataka, India	In this research paper the proposed concept is to replace the manual work in drainage cleaning by mechanical drain cleaner. To overcome this problem and to save human life we implement a design "mechanical semi-automatic drainage water cleaner" and we designed our project to use this in efficient way to control the disposal of wastages and with regular filtration of wastages.

3. Equations

Considerations made:

Material Selected: C45 (Yield Strength = 380N/mm²)

Battery Weight = 0.7 kg Motor Weight = 0.2kg

Flappers are welded with a metal strip which is welded with the chain drive.

N = 20 rpm

Power Calculation:

PMDC Motor = 15 Watt Battery Specification = 12 V

Designing the machine to carry a load of 1 kg maximum So, F = 10 N

The length of flapper which will lift up the trash be 60mm Power of Shaft = P = 15 watt

Power transmitted by shaft,

Where, N[^] Rpm of motor shaft = 20 T

->Torque transmitted

$$15 = \frac{2\pi \times 20 \times T}{60} 10^3$$

Standard available motor in market is Permanent magnet direct current (PMDC)

Motor power is 15-Watt, 20 rpm with inbuilt gearbox.

Design of shaft :

$$T = \frac{\pi}{16} \times T \times d^3$$

Consider FOS 4 times 380/4 = 95 N/mm² T = 95 N/mm²

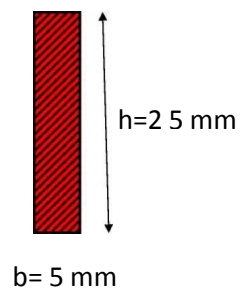
Therefore, 6760 = $\frac{\pi}{16} \times d^3 \times 95$ D= 5.5 mm.

But we are using 20mm shaft, so our design is safe

Design of transverse fillet welded joint.

Hence, selecting weld rod size = 3.2mm

Area of Weld = 0.707 x Weld Size x L



$$= 0.707 \times 3.2 \times 25 = 56.56 \text{ mm}^2$$

Force exerted = ---N

Stress induced = Force Exerted / Area of Weld

$$21 = F / 56.56 \quad F = 1187.76 \text{ N} = 121.07 \text{ kg}$$

Maximum Allowable Stress for Welded Joints = 21 N/mm²

$$F_b = M / Z$$

$$F_b = 1000 / 336 = 2.97 \text{ N/mm}^2$$

Induced stress is less than allowable 270 N/mm² so design is safe

DESIGN OF CHAIN & SPROCKET :

We know ,

$$\text{TRANSMISSION RATIO} = Z_2 / Z_1 = 18/18 = 1 \quad P = 9.52 \text{ mm}$$

SELECTION OF PITCH OF SPROCKET

Dia. Of sprocket,

Periphery = n x dia. Of sprocket

$$18(\text{teeth}) \times 9.52 (\text{pitch}) = n \times D$$

$$D = 18 \times 9.52$$

$$D = 54.54 \text{ mm}$$

CALCULATION OF MAXIMUM TENSION ON CHAIN

As we know maximum torque on shaft = T_{max} = 9555 N-mm Where ,

T₁ = Tension in tight side

T₂ = Tension in slack side

O_1, O_2 = center distance between two shaft From fig.

$$\sin a = \frac{R_1 - R_2}{O_1 O_2}$$

$$\sin a = \frac{27.27 - 27.27}{260}$$

$$\sin a = 0 \quad a = 0 \quad \text{TO FIND } \theta$$

$$\theta = (180 - 2a) \times \frac{3.14}{180} = (180) \times \frac{3.14}{180} = 3.142 \text{ rad we know that,}$$

$$\frac{T_1}{T_2} = e^{\mu \theta} \quad \frac{T_1}{T_2} = e^{0.35 \times 3.142}$$

$$T_1 = 3 T_2$$

We have

$$= (T_1 - T_2) \times R$$

$$9555 = (3T_2 - T_2) \times 27.27$$

$$T_2 = 175.2 \text{ N} \quad T_1 = 3 \times 175.2 \quad T_1 = 525.6 \text{ N}$$

So,

tension in tight side = 525.6 N We know ,

$$\text{Stress} = \frac{\text{force}}{\text{area}}$$

$$\text{Stress induced} = \frac{525.6}{\left(\frac{3.14 \times 3.582^2}{4}\right) \times 2}$$

$$\text{Stress induced} = 26 \text{ N/mm}^2$$

As we have used 2 sets of chain so on single chain 13 N /mm² stress will be induced

As induced stress is less than allowable stress = 640 N /mm² design of sprocket is safe.

Battery Power Calculation and Regeneration

Battery specification: 12V, 7.5 Ah Power generated 90 W-h

Solar panel specification:

Capacity= 6 W

Charging duration= 15.hrs if battery is fully dead

Motor power calculation:

1. Shaft Motor : 15 W
2. Propeller pump : 10 W each [Total 10 W]

Total Power consumed = 15 + 10 + 10 = 25 W

Computing Power Input for 2 hours:

Battery 12v 7.5 amp = 90 watt

Total Power consumed = 15 + 10 + 10 = 25 W

$90/25 = 3.6 \times 60 = 216$ min

4.6 Buoyancy

Calculation for Buoyancy:

Force exerted by weight,

$F_g = \text{mass} \times g = 20 \times 9.81$

= 200 N

Density of PVC pipe 1467 kg/m³ Buoyancy Formula

Liquid exerts a force on objects immersed or floating in it. This force is equal to the weight of the liquid that is displaced by an object. This is also known as Archimedes' principle. The unit for the buoyant force (like other forces) is the Newton (N).

buoyant force = (density of liquid)(gravitational acceleration)(volume of liquid)

= (density)(gravitational acceleration)(height of liquid)(surface area of object)

$$F_b = \rho g V = \rho g h A$$

F_b = buoyant force of a liquid acting on an object (N) ρ = density of the liquid (kg/m³)

g = gravitational acceleration (9.80 m/s²)

V = volume of liquid displaced (m³ or liters, where 1 m³ = 1000 L)

h = height of water displaced by a floating object (m)

A = surface area of a floating object (m²)

Buoyancy Formula Questions:

If the object involved sinks, it displaces a volume, V , of the fluid equal to the object's volume, V , when on dry land.

If the object floats, it displaces a volume, V , of the fluid equal only to as much as is under the surface. That volume can be hard to determine depending on the shape of the object.

In either case, the buoyant force, F_b , equals the volume, V ; times the density, ρ (in kg/m³) of the fluid; times the value of g .

$$F_b = V \rho g$$

Here,

Volume of body for lake cleaner: The body is made up of cylindrical PVC pipe whose density is 1467 kg/m³

The total height of tube be: 0.1 m And size of tube = $R = 0.5$ $r = 0.35$

$$V = \pi R^2 L$$

$$V = 3.14 \times 0.1 \times 3.2 \text{ m} = 1.00 \text{ m}^3$$

The buoyant force can be found using the formula. First, we ensure that the units used for volume are the same. If 1 m³ = 1000 L, then $L = 0.0274 \text{ m}^3$.

The buoyant force is:

$$F_b = \rho g V$$

$$F_b = (1000 \text{ kg/m}^3)(9.80 \text{ m/s}^2)(1 \text{ m}^3)$$

$$F_b = 9800 \text{ N}$$

The buoyant force acting on the vessel is 9800 N. = 980 kg Total weight kept on is not more than 20 kg = 200 N

We see that, $F_b > F_g$ $980 > 200 \text{ N}$

Hence, the model would float.

Design of V- belt:

CALCULATION OF LENGTH OF BELT:-

We know that radius of pulley on shaft $r_1 = d_1/2 = 100/2 = 50\text{mm}$ Radius of pulley on motor shaft

$r_2 = d_2/2 = 100/2 = 50\text{ mm}$ Center distance between two pulley = 305mm We know length of belt

$$L = n (r_2+r_1) + 2 \times X + (r_2-r_1)^2/x = n (50 + 50) + (2 \times 290) + (50 - 50)^2/305$$

$$L = 889\text{ mm} = 35\text{ inch}$$

4. Conclusion

River floating cleaning machine is easy, effective, economical and environment friendly system to tackle the global crisis of the drainage cleaning. It has many advantages over present day technologies to clean spilled water. It can effectively clean the drain and save it from choking. The system can be automated and run on solar system making it greatly capable to survive on its own. Hence lots of human efforts are eliminated and hence collecting trash can get faster and efficient response. The hazardous effects of plastic inorganic are thus effectively reduced. Hence, Solar based, trash cleaning machine promises to be an important tool against global crisis of pollution.

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