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Fabrication of Manual Plastic Boat for Garbage Collection from Water Surface

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Abstract - This paper focuses on fabrication of manual plastic boat for garbage collection from water . We are aware that water pollution is a significant issue that impacts both the environment and human health. According to numerous studies, plastic is commonly found in water such as river, pond, ocean and many other places. Ganga, Yamuna, Godavri, Panchganga are most spiritual rivers polluted day by day. The density of plastic allows it to float on water multiple times, which prevents oxygen from dissolving in water. Therefore plastic and other garbage are also harmful to marine life. During the festivals, people throw plastic and other garbage directly into almost water bodies due to absence of proper garbage disposal facilities. It is fact that government or other authorities do not support water cleaning projects due to high cost of resources required for fabrication of water surface cleaning mechanism. Our main focus is on making a boat that is both cost effective and their parts readily available in the market. Also we design and manufactured a boat in such a way that it can safely operate against different water layer conditions.Small scale areas, rural areas, and suburban areas can benefit from this project due to its cost-effectiveness, less operation needed, and manual operation.

Key Words – Manual plastic boat, Marine life, Proper garbage disposal facilities, water surface cleaning mechanism

1. INTRODUCTION –

In today's society, water pollution is a perilous situation. To focus on health, it is necessary to remove garbage such as plastics, papers, rubbers and other waste. The density of plastic makes it float on water. Our objective of project is :To develop a device that can easily float on water surface and collect trash in the water.

i. The project overall weight is less than 1000 kg/m³, which makes it capable of flying on water.
ii. The boat should have a less effort-intensive driving mechanism and the operator's seating arrangement should be comfortable.
iii. Manual operation of a boat is necessary without the use of electrical devices like driving motor, battery etc.
iv. The cost of fabrication should be reasonable and its components should be readily available in the market.
v. Make an effort to minimize boat manufacturing, operations and design a boat that can float in different water layers like ocean waves.

While fabricating the project, we consider the following principle .

1. Buoyancy (Archimedes' Principle)
2. Density of project
3. Hydrostatic Pressure

Our objectives require us to study research papers on different garbage cleaners and their design first. Water is necessary for life, and there are many places where humans can drink it. Not only humans but also animals aquatic life can affect this polluted water. The water is adversely affected by plastic and other garbage. Therefore we can develop a model for removing trash from water that takes into account considered all above seven objectives. In the fabrication of boat involve net that are assembled on boat. Once the net assembly is attached, we can determine its overall capacity

because the heavy weight of collected garbage cause problems during changing direction. The rate of collection of garbage is improved by the addition of a net on one side. In order to maintain a constant speed ratio, we attached chain drive and create a mechanical linkage to change direction.

2. METHODOLOGY

2.1 DESIGN

When designing a four-wheeler, the chassis is the primary factor to take into account likewise The plastic tank serves as the foundation of this project. Therefore, plastic tanks should be available in a wide dimensional range and have a high height so that they are capable of floating on different water layers. After we acquire the tank, we must construct a chain drive assembly to propel the ship in the water. To prevent torque loss, ensure that the torque generated by the pedal is proportional to the rim – rod assembly when making a chain drive assembly. The chain drive assembly is attached to plywood and mounted on the plastic container, which eliminates the need to create a hole in the plastic tank. After constructing the chain drive assembly, construct a direction linkage for a boat. This direction linkage adjustment is inspired by an old handicapped tricycle and the gyroscopic principle. The work has reached 70% completion .now, Ensure that net assemblies are made on both sides in accordance with our calculations for the boat's weight.

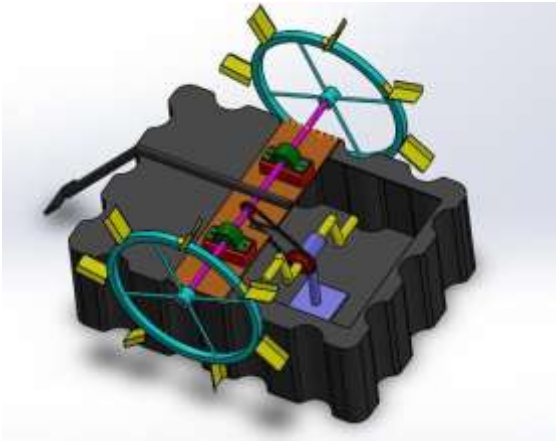

Fig 1: Solidworks model on solidworks

2.2 MAIN COMPONENTS

Fig. 2: Plastic Tank (Base)

It is nothing but the framework of the project. The inside of this tank houses a chain drive assembly with a pedal and

sitting arrangement. The tank has nets attached on both side and at front.

Fig. 3: Chain drive assembly

It is a most typical mechanical drive for transferring torque from one end to another with a constant velocity ratio. To generate torque, the pedal is rotated using one end and other end attached to the rod.

Fig.4: Rod

It is 25 mm diameter shaft and is attached to the second end of the chain drive assembly. Both sides of this shaft have the rim attached to them. By using the shaft, the torque generated by the pedals can be transferred directly to this rim..

Fig.4: Rim

The rim is attached to both ends of the shaft. The rim's inner diameter is 25 mm and its outer diameter is 630 mm. Mounting aluminum vanes on the perimeter of this rim is done through bolting. At once, six vases are attached to one rim.

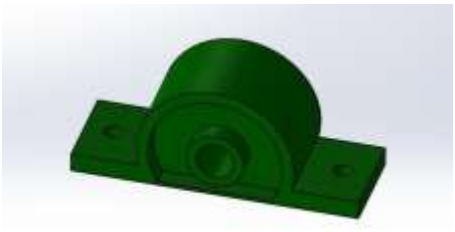

Fig.5: Bearing block

The purpose of a bearing block is to support the shaft on both sides and transmit torque to the rim. The block's inner diameter is 25 mm, which makes it easy for the shaft to be inserted.assembly to be carried on the other. To avoid drilling on the plastic container, this plywood sheet is helpful in drilling and bolting nuts of assemblies.

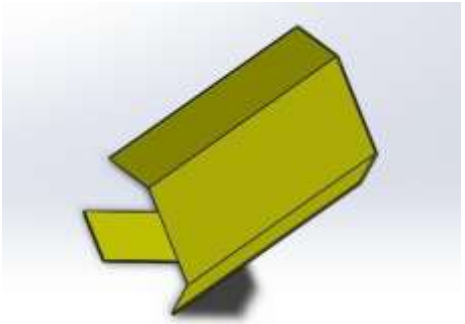

Fig.7: Vanes

The function of vanes is to propel water, which assists the boat in floating on the surface. it has a width of 100 mm and a length of 140 mm.

Fig 8: Chain sprocket stand

The stand itself provides the necessary structural support to keep the sprockets and chain aligned and tensioned. It allows the chain to operate without sagging, skipping, or causing friction, ensuring smooth power transmission or mechanical action.

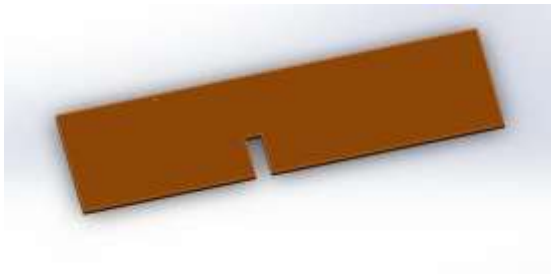

Fig.6: Plywood sheet

Two plastic sheets are necessary for the rim-rod assembly to be carried on one, and the chain drive

2.3 COMPONENTS LIST

Sr. No.	Component Name	Material Used	Quantity
1	Plastic container	HDPE	1
2	Bearing block pillow unit	Cast iron	2
3	Rim	Mild steel	2
4	Rod	Mild steel	1
5	Blades	Aluminium	14
6	Plywood sheet	plywood	1
7	Wooden blocks	wood	1
8	Chain drive with pedals	steel	1
9	Hollow rod piece	Mild steel	1
10	Square plywood sheet	plywood	1
11	Square metal sheet	Mild steel	1
12	8 mm bolt/nut/washer	Mild steel	2
13	12.7mmbolt/nut/washer	Mild steel	4
14	10mmbolt/nut/washer	Mild steel	8
15	Pipe and L-bow	PVC Plastic	1
16	C- Clamp	Mild steel	1

3. CALCULATIONS

1. Driving gear diameter (D) = 0.105 m
2. Driven gear diameter (D) = 0.060 m
3. Center distance between gears (C) = 430 mm
4. Inclination angle (θ) = 30°
5. Teeth on driving gear (T) = 41 6.

Teeth on driven gear (T) = 18

a. Cadence or Speed of Paddling For 1 minute, we count 43 rpm

b. Speed Ratio (Gear Ratio)

Speed ratio = Teeth on driven gear /Teeth on driving gear

= 41 /18

= 2.28

Speed of Driven Gear Torque N2 = T1 /T2 × N1
= 41 /18 × 43

= 97.94 rpm

c. Torque = F × r

F =150N, crank radius = 0.175m (standard crank value)

T (input) = 150 × 0.175

= 26.25 Nm

T(output) = T2/T1 ×T(input) T(output)= 18 41 ×26.25 = 11.52 Nm

Fig 9: Fabricated Project photos

CONCLUSION

Water is a necessity for life , and when it becomes polluted, it is directly harmful to people and many forms of life. Hence, water purification is a vital responsibility for us. We attempted to design a plastic boat that would be cost-effective and require minimal operations. Due to the double assembly on the side net, it can collect garbage to the maximum extent. Our models are made to be manually operated and don't need any electrical equipment during operation. Therefore, we can assert that our project is simply a waste that should be utilized. Cleaning rivers, ponds, and the ocean(depending on the height of the plastic container) can be made easier by using this tool .

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