International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 01 | Jan 2021 www.irjet.net p-ISSN: 2395-0072

Comparative Study on Water Floating Garbage Cleaning Machine

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Abstract - *This study is focused on development of water floating garbage cleaning machine or river waste cleaning machine; a machine which is capable of removing waste debris from water efficiently and effectively. For the existence of life on earth water is the basic need and only about 3% of Earth's water is fresh for drinking. Of that, only about 1.2 percent is often used as drinking water; remaining is in the form of glaciers, ice caps, or deep inside the ground. The drinkable water which we drink comes from rivers and waterfalls. If we move our eyes towards existing situation of our rivers and water bodies which supply drinking water, they are serving as dumping yards for waste debris, solid and liquid wastes, which includes plastic bags, bottles, plastic wrappings of food, beverage cans, so many toxic materials, pollutants, etc. Due to this pollution in water is increasing rapidly, which is dangerous for humans as well as aquatic animals. The motive of this project is to clean this type of garbage from the water bodies like rivers and lake by, "water floating garbage cleaning machine." This machine will work on the chain drive mechanism which is operated by RF module remote control arrangement having components like conveyor belt attached with fins, motor, battery or solar panels, propellers, floating pipes, collecting tray, etc. assembled together. As motor runs conveyor belt will also run, which will collect the garbage floating on water and further transfer it to the collecting tray. With less human intervention reducing time and man power for cleaning water bodies is our alternating aim.*

***Key Words*: RF module, conveyer belt, propeller, solar panel, collecting tray**

1. INTRODUCTION

Over 71% of Earth's surface is covered with water; water is the most precious resource for the humans as well for the animals. The population of earth continues to grow; the pressure over the planet's water resources is rapidly increasing. In current scenario, our oceans, rivers, and other inland waters are being "squeezed" by human activities so their quality is reduced. The proof: tons of trash in our rivers and creeks, making it look and smell like a dumpsite by which quality of water is going too poor; by the effect of which animals as well as humans are getting affected with the new types of fevers and diseases. Waste water garbage is defined as the flow of used water come from homes, business industries, commercial activities and institution, etc.

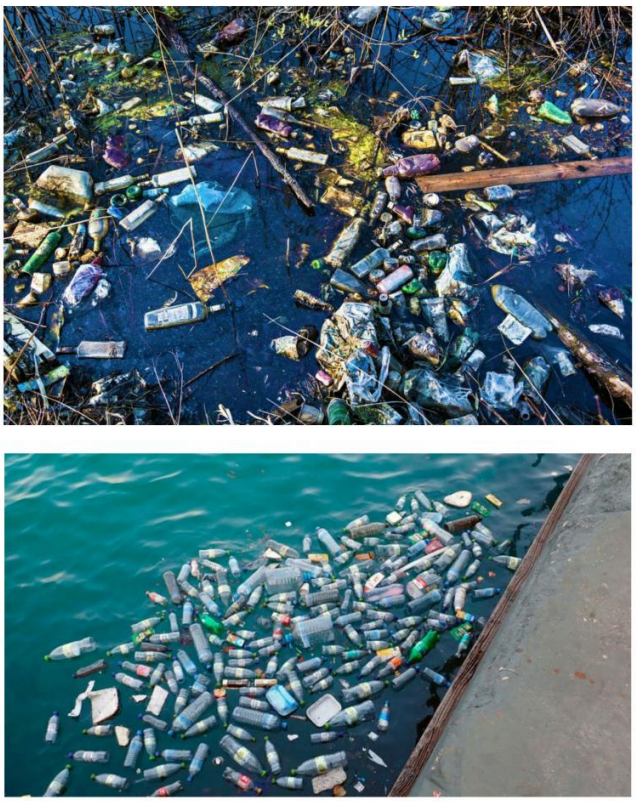

Fig -1: Water floating garbage (Source: Google)

Our project can be used in that places where there is waste debris in the water body which are need to be removed. Our project is consisting of motor driven conveyer mechanism; which is efficient for collecting and removing the floating solid wastages from water bodies. This will reduce the water pollution and also the uncertain death of aquatic animals. It consists of Belt drive mechanism which lifts the floating solid, plastics food wrappings and other solid wastages objects from the water surface. The use of this project will be made in rivers, ponds, lakes and other water bodies for to clean the surface water debris from bodies. Some machines have been developed to clear and remove the waste on the surface of the water bodies but in our project/model we will use the different and more efficient garbage cleaning machine as compare to other developed garbage cleaning machine. Impurities in drainage water can be like empty bottles, polythene bags, food wrapping papers, etc. It's an Industrial, commercial and residential working wastes battery used Water Cleaning Mechanism Which Can auto collect floating garbage and solid waste from the water surface and collect it

into its floating plastic made collecting tray or dustbin. In which we can use here Solar panel for continuously charging of our battery and which will improve our machine performance and efficiency with reduced human efforts.

2. LITERATURE REVIEW

1] "They worked looking at the current situation of national sacred rivers which are dump with thousands liters of waste and loaded with pollutants, toxic chemicals, debris etc. which are multiplying water pollution in the form of waste debris and putting the life of aquatic animal in danger. They worked on a machine which will lift the waste surface debris from the lakes and water reservoirs, whose final result will be in fall of water pollution and fall of aquatic animal's death. Their other aim was to reduce the man power and time consumption for cleaning the river. In their project (Design and Fabrication of River Cleaning Machine) they have stored the energy in the battery and used the energy for river cleaning with the help of a motor and chain drive arrangement."[1]

2] "The motive of their project "Design and fabrication of sewage cleaning machine" was to automate the sewage cleaning process in drainage, to reduce the spreading of diseases to human. They proposed the system where they made machine which was operated by the remote control to clean the sewage from the water bodies. Hence their system reduces the impacts from the sewage waste and its harmful chemicals and gases. They had used wiper motor that starts working as soon as the setup is switched on. They attached two power window motors to the wheel and driven them with the help of remote control system. They used arm to lift the sewage and made a dustbin bucket arrangement for collecting the sewage. They proposed that their machine is also capable of lifting the wastage which floats on the water surface. Their system has limited human contacts and interference in the process of cleaning and this in turn reduces spreading of diseases to humans."[2]

3] "These research emphases the lake garbage collector by using Pedal powered boat that uses a flexible shaft to drive a propeller. For seating arrangement they placed a seat lower in the vessel which is doing function of increasing stability. It eliminates the pedal with their sweeping circular motion and replaces them with a pair of foot pegs and a ratcheted straight driver. This straight drive not only increases the efficiency of the power, it also converts the rotary action of the pedals to a liner motion that reduces the amount of space required to operate the unit. Thus, the driver unit can be placed under a seat so that it does not excessively intrude into the space of the boat."[3]

4] "They explained Cleaning the wastes by utilizing manual procedures would be insufficient as it regularly covers large territory of activities and attached with plausibility to getting affected by different sicknesses from the different type of microorganisms present in the sewage while cleaning with human contact. Their project (Design and Development of River Cleaning Robot Using IOT Technology) features a proposed plan of garbage gathering system important and effective for tidying up waste from rivers, channels and lakes. Their trash gathering system is nicely coordinated to application for getting up a wide differentiation of debris, including gliding water litter, trash logs, disposed tires, plastics and others. For this integrated system they used IOT technology (Internet of Things) that has the ability to monitor and control the total process."[4]

5] "In this project they have explained about the present scenario of the national rivers; and the major resources which are responsible for these situation or water pollution. With this they have also explained the need of automation for reducing manual work as it may cause so many diseases. And taking this as inspiration they worked on project called "Design of Automatic Aquatic Weed Cleaning System" and given efficient solution for cleaning of water bodies which are loaded with so many different type of water floating garbage, sewages, plants weeds, etc. For making project fully efficient and effective they have specifically used Radio Frequency model i.e. (RF model) for controlling and operating the operation of weed cleaning machine. Also they tried their best for providing best design. With this they also full filled their main objective of reducing man power and human intervention with better automation."[5]

6] "They specified there main aim as reducing the consumption of time and the man power required for the manual work of cleaning process. In this project they have used the motor, battery and chain drive arrangement for automation; with this they also used special purpose harvesting cutter for cutting the aquatic weed. They have given proper design and calculations for every component of the machine with the material specification and selection procedure. The main components they have used in the project are as follows: cutter, cutter shaft, chain, chain drive, conveyer, conveyor shaft and base frame. With all this they have suggested proper economical approach for implementation of project in urban areas."[6]

7] "The use of mechanical drainage cleaner system is the replacement of manual drainage cleaning system. To overcome this problem, they implemental mechanical semi-automatic drainage water cleaner and so the water flow is efficient because of regular filtration of wastage with the help of that project. The method followed these days is proving to be the very much hazardous for the health of workers undergoing the process of cleaning the blockage in the drainage pipes; along with the drainage water some solid water travels through the drainage line and chock at the junction points of drainage system. This solid waste remains over time and thus causes blockage to the system. This creates the needs of cleaning drainage lines time to time. So this system will help to resolve the problem and will thus help in ensuring the cleaning of the system time to time by separating the solid waste."[7]

8] "They explained efficient and practical disposal of garbage is very necessary with respect to the health of the surrounding nature. The current methods of garbage collection have been proven inefficient for the use. For that they proposed the system, which is the great way of reducing the garbage collection and disposal problem. Their paper (Design and Implementation of Solar Powered Automated Garbage Monitoring System) presents the Garbage Collector robot using ARM7 (ARM processer for microcontroller use) technology. They constructed a robot on a base of size 50 x 40 cm, which is powered by a rechargeable battery of 12 V, 7.5 Ah from the solar panel. The robot movement is operated by a program in an Android Phone or tablet. The robot is constructed to collect wet and dry Garbage from every lakes and water bodies, by making use of solar energy as a source."[8]

9] In this paper they described India as one of largest population country in the world. And India is also known for its cultural and traditional festivals. During this festival people discharge large amount of garbage into the rivers which remain there for long time and get contaminated. And if this contaminated water is get used for residential activities, then it causes the different type of diseases like epidermal, gastrointestinal, neurological disorder, etc. and affects the life of humans as well as other living beings. Mostly this water pollution affects the aquatic animal. The conventional machines which are available in market are of high price having costly maintenance. So they come up with the project which is totally economical and efficient for the cleaning of rivers. In their project they specifically used remote control devices for controlling the functions of conveyer and motor.

10] "They explained the present situation/scenario of our environment and the effects of the increased pollution over mankind. After that they highlighted the recent problem of water pollution in rivers and lakes and also explained the major resources which are responsible for the water pollution: like biological, commercial, industrial, institutional, residential, etc. Further they added cleaning this polluted rivers and water bodies with traditional or manual methods effectively are impossible and takes so much time and man power with risk of getting diseases. And for overcoming this problem they proposed the trash collecting system design which is effective for cleaning of trash from the river."[10]

11] " They explained the fresh and clean water is the important basic need for all mankind and living beings, without water the survival of living being is impossible. Industry waste, garbage waste, sewage waste are the main resources of water pollution in the rivers and lakes. With increased water pollution the various diseases are also increasing so it is important to increase the level of hygiene and cleanliness. They considered this issue of water pollution very seriously and acted in the direction of it. For that they incorporated the technology for the efficient and effective cleaning of rivers and lakes. The main specification of their project is that, it is semi-automatic whose operating is controlled by Radio Frequency (RF) model. The RF model is the model having transmitter and receiver placed at two different ends, which are capable of transmitting and receiving signals. Further they added monitoring the pH of water body is very important as it indicates the level of pollution, for fulfilling this purpose they added pH sensors in their project."[11]

12] There model consists of a cage arrangement which they partially submerge it into the water while collecting the water floating garbage. They move their model around this floating debris and trap them into it. They have attached level sensors to their model for identifying the level of garbage filled into the cage. They have also added turbidity and pH sensors to determine the level of pollution in water bodies and used odor sensors for sensing odor and harmful smell of water. They have used RF transmitters and receivers for controlling all the functions of a model. This way they have worked on achieving eco-friendly and less human intervention efficient technology.

13] "They explained rising water pollution is destroying the life of aquatic animal and causing danger to their life. And sometimes the aquatic animals eat surface waste considering it as a readymade food; which lastly takes the life of aquatic animals. Due to the polluted water so many skin problems has been seen in population. So to reduce the solid waste pollution from the river they proposed the system "River cleanup machine'. A machine which involves the removing and disposing of waste debris from the water body. Their river cleanup machine works on hydropower to clean waste water debris, plastics & garbage from Godavari River. They used hydropower energy for rotating the waterwheels, which converts the kinetic energy (K.E.) into the mechanical energy from the drive shaft to the conveyer."[13]

14] "They analyzed and explained, from the last two decades, most of the urban water bodies in India are suffering because of increased pollution of local sewages and solid waste debris. Further they added that those water bodies get turned into landfills and get wasted. By taking this things into consideration, they proposed the project "Solar Operated Water Trash Collector" for removing garbage, solid waste debris from water bodies for making it clean. The main aim of their concept is to reduce time consumption and man power for cleaning the river and to use of non-conventional energy source (solar) for running the garbage collection equipment. The Solar based water trash collector is eco-friendly in nature and it is safe for the user. In this system Photovoltaic (PV) cells generate electricity by absorbing sunlight and using that light energy to create electricity current." [14]

15] "They explained the concept of aquatic plants harvesting in the "Study of River Harvesting and Trash Cleaning Machine". Harvesting the plant biomass reduces the risk of

oxygen depletion rate of rivers and water bodies in winter season. This Mechanical control method involves the total or partial removal of plants and waste by mechanical means, along with: harvesting, shredding and other things. Mechanical aquatic harvester (harvester) is a type of multi taker used for a variety of tasks, including aquatic plants management and waste remover in lakes, bays, rivers, and harbors. Harvesters are designed and constructed to collect and unload vegetation and debris using a conveyor system on a boat arrangement, adjustable for the different cutting height, up to 6 feet below the water surface. The main specification in their explanation is that they used a complete Hydraulic System for all the functions and operations with suitable speed control. And made a remote controlled system for the operating the functions."[15]

16] "In this paper they discussed the design of a multi-robot system of autonomous aquatic vehicles which can be used for cleaning of garbage from lakes and for maintenance of fisheries. The present method of removing the weeds manually and collecting them with other surface wastes debris is inefficient and all this come up with labor intensive. They aimed at modifying automating the total process, in robots they make use of tactile sensors and wireless communication to work automatically and collectively perform cleaning work such as removing the water floating surface debris, increasing the level of oxygen in water, spraying useful chemicals and supplying food at specific distances along with calculating the quality of water. "A novel algorithm for navigation and waste removal strategy of the multi-robot aquatic system, inspired by insects such as ants and bees, referred to as 'recruitment algorithm', has been proposed."[16] By the the help of virtual replication, amplified by present environment testing, they have demonstrated and stated that multi-robot system is an effective for rapid cleaning of rivers and water bodies."[16]

17] "They explained that all the sectors are accepting atomization and mostly the manufacturing process industries for delivering the products rapidly. For large quantity of production automation plays a vital role. In this project they have constructed the river cleaning machine which is completely operated by the remote control. With that they specified there main aim as to reduce the man power and time consumption for cleaning and disposing the garbage and debris from the water bodies. Here they have automated the working of river cleaning by using the motor and chain drive arrangement by DC battery. They specified the use of RF transmitter and receiver for the remote controlling of river cleaning machine and also for the direction sensing. Automation can be accomplished through the help of computers, hydraulics, pneumatics, robotic technologies and through many more other things but they stated that pneumatic and RF module technology is less costly and economical."[17]

18] "They explained that if we look at the current situation of the world then we will know that due to fast economic growth, population growth, industrialization, ineffective urban planning the world is facing crisis of garbage. For overcoming that garbage crisis in the world they have presented concept of river cleaning robot operated by 'ARDUINO'. ARDUINO is an electronics system having arrangement of hardware and software which can perform different functions. Their machine is semi-automatic and robotic which float on the water and uses energy from a DC battery. Reduction in time and man power for cleaning water bodies is their main purpose. By looking at this they designed automated river cleaning robot which can perform activities like cleaning and disposing solid water floating garbage like glass bottles, plastic materials, plastic bags, etc." [18]

3. CONCLUSIONS

After studying and understanding above all research journal papers and the projects on river cleaning machine or water floating garbage cleaning machine, we can conclude that from the manual to semi-automatic operated machines, so much efficient and effective work and research has been done by different authors from different regions of different country. Many researchers have accomplished their project objectives like minimizing manual stress, less human intervention, environmental friendly, reliable stability, cost efficient and economical. But still there are certain future scopes in the field which are as follows-

- Deep cleaning of rivers and water bodies can be possible and also garbage carrying capacity can be increased.
- The assortment system for different category of waste is also possible.
- By increasing the fineness of conveyor and the material used in conveyor the efficiency of water floating garbage collector can be increased.
- And there is still gap for automation techniques like sensor technology, AI (Artificial Intelligence) technology, IOT (Internet of Things) technology, etc. which having potential of total automation.

This way we can conclude that the objective of our project is successfully accomplished.

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