

Design & Construction of River Cleaning Mechanism

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Abstract:- The project emphasizes on design & construction of river cleaning mechanism. The system is successfully able to clean the floating solid waste over the river surface more efficiently. This system works towards its social aim of cleaning the rivers & other water bodies. It simulates the conventionally used mechanisms of using conveyors in its working principles but have an intimidating modification of Air Tube Piping Guider mechanism for improving its efficiency. The conventional & generally used method of cleaning or more precisely collecting the floating waste are manual or by means of boat etc. and are deposited near the shore of river. But these methods are risky, costly, time consuming and required major workforce. By considering all the parameters of river surface cleaning systems and eliminating the drawback of all the methods mention earlier, the remote operated river cleaning machine has been design and constructed which helps in river surface cleaning effectively, efficiently and ecofriendly. The main aim of the project is to reduce the manpower, time consumption and thereby increasing the efficiency of the machine for cleaning the river. In this project, we have remotely controlled the operation of river cleaning with the help of motor, coupling & R/C arrangement.

Keywords:- Air Tube Guider Mechanism, Conveyors, Efficiently, Eco-friendly.

I. INTRODUCTION

One of the major objectives of the project is to return at least few favors to our mother nature. As it is coated “Water is Life, Life is Water”, so there is huge need to preserve the few water resources we have. We all know that 71% of our earth is covered with water but to our disadvantage or bad luck or lack of technological advancement we cannot use it all. The only percentage we can use from overall water resources is 3, which involves rivers, lakes, ponds, wells, underground water sources and glaciers. This 3% is the only water which is life as far as human are concerned, as this is the only quantity that human can consume to break his thirst and live his life. Other 97% which resides in oceans and seas, for now is of no use due to lack of technological advancement. It is not like our technology is so down that it can't convert the ocean and sea water, so that to avail it to drink but, the capital and investment involving are of the charts & also the efficiency is of the charts but in the converse manner viz. very poor. Thus this technology of converting ocean and sea water into consumable will require further research & development. It can be developed and improved but, it will take at least a few decades to become a reality.

But unfortunately on the other hand, during the past two to three decades water quality has deteriorated at a rapid pace. One of the major reasons for this is dumping of solid waste into the rivers, turning them to be a dirt drain. The Ganga and the Yamuna, the most sacred river of our county are no exception to it & also our reference the “Ulhas River” is a great example of the same. Thus nowadays we can see river sewage surface pollution is the biggest problem for our planet as only 3% of overall water sources are fit for human consumption further 97% is stored in oceans. So we want to share our innovative idea of an advance river surface cleaning system enabled with air tube guider mechanism, which we call ‘The DAAG Design’ with the society. We make this project looking forward to the achievable dream of clean rivers. So our aim is to preserve the little quantity of water sources we have, thus we have designed & fabricated an advance Water body viz. River cleaning mechanism by taking “Ulhas River” as reference.

II. LITERATURE SURVEY & REVIEWS

There was plenty of related work & research done in the form of literature survey to acquire the knowledge & skills needed to complete this project. This led us to come across various project work, thesis & technical papers accompanied by various reviews given on them. We will be discussing some of the papers & the work done in them & then reviewing by comparing them to our project work.

In [1]: Design & Fabrication of River Cleaning System -Mr. Abhijeet & Team.

This paper states that India is a holy country with many festivals like Ganesh Visarjan, Navratri Durga Pooja & mainly Siahnsth Kumbhmela where there is lots of water pollution & then giving an idea of using River Clean Up machine to reduce water pollution.

In [2]: Design and Fabrication of River Waste Cleaning Machine –Mr. P.M.Sirsat & Team.

This paper emphasizes on design and fabrication details of the river waste cleaning machine. The work has done looking at the current situation of our national rivers which are dump with crore liters of sewage and loaded with pollutants, toxic materials, debris etc. It gives the idea of using conveyors as a means of waste collection.

In [3]: Design & Fabrication of Remotely Controlled Sewage Cleaning Machine –Mr. M. Mohamed Idhris & Team.

The motive of the project is to remotely control the sewage cleaning process in drainage, to reduce the spreading of diseases to human. It states that system has limited human intervention in the process of cleaning and in turn reduces spreading of diseases to mankind.

There were many other related work & research, which were done besides the mentioned. While reviewing them all & comparing them with our system we came across many notable things which are mentioned as follows:

All the system has their own unique way to fight the problems. But they all seems to lac one of the 3-E's viz. Eco-friendly, Effective & Efficient. Out of which Efficiency is most overlooked factor, which we with our System are trying to overcome.

Our project itself is 'Eco-friendly' as its primary aim is to reduce water pollution by cleaning of water resources, thereby helping the environment. In addition to that one of its secondary aims which include remotely controlling the system reduces the human interaction with the polluted water thereby reducing the diseases which can affect them.

The working principle of our system viz. using conveyors, chain drive, coupling & motors for cleaning & collecting the river waste is by far the most 'Effective' method. Also the use of remote controller to control the entire system further increases the effectiveness.

As we stated earlier, the most overlooked factor in any of the designed system was efficiency. We can elaborate it by asking a simple question, 'Wouldn't be the system more convenient & efficient, if rather than moving the entire bulky system towards the river waste, the waste can be moved towards the system?' Thus thinking over it we came up with the idea of 'Air Tube Guider' mechanism which can be remotely controlled & forms the loop which helps the waste to come to the system for a certain limited area thereby increasing the 'Efficiency'. Thus this efficient system can stay at one place & clean the in range loop area & then move to other places & cleans the other in range loop areas. Hence it enables the system with 'Area-Wise Cleaning' rather than Point Cleaning.

III. SYSTEM MODEL & DESIGN



Fig: 1. System Design

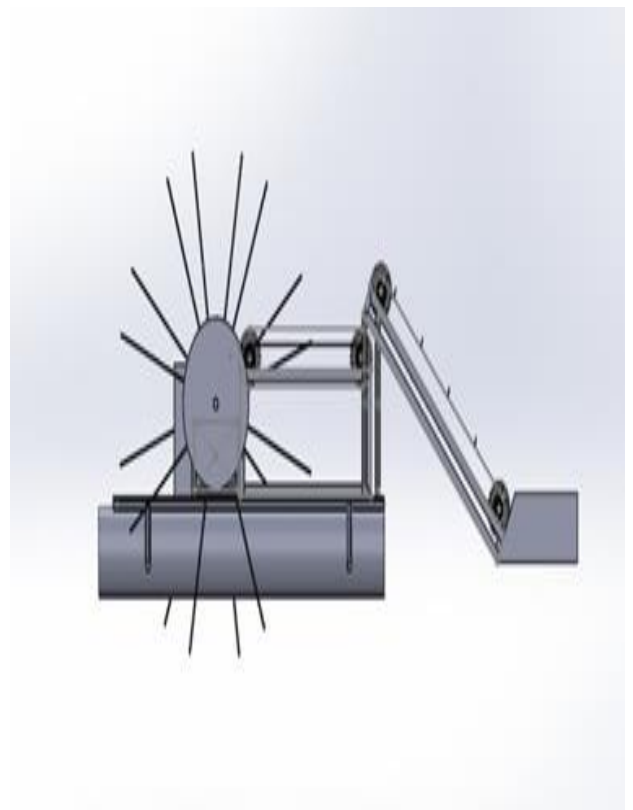


Fig: 2. Side View

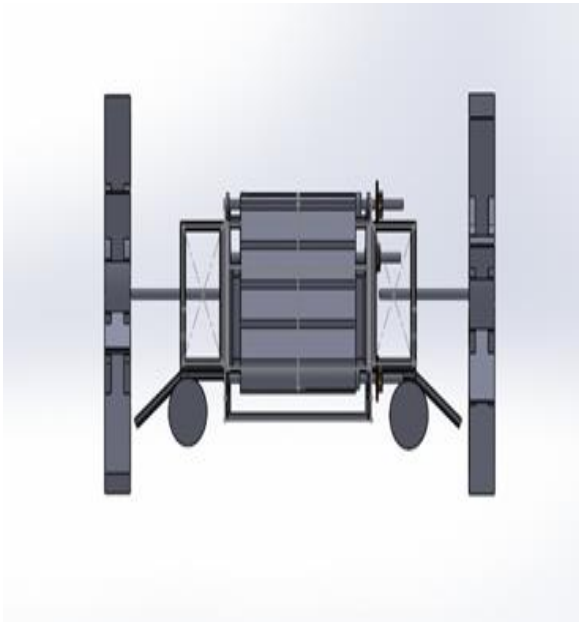


Fig. 3. Front View

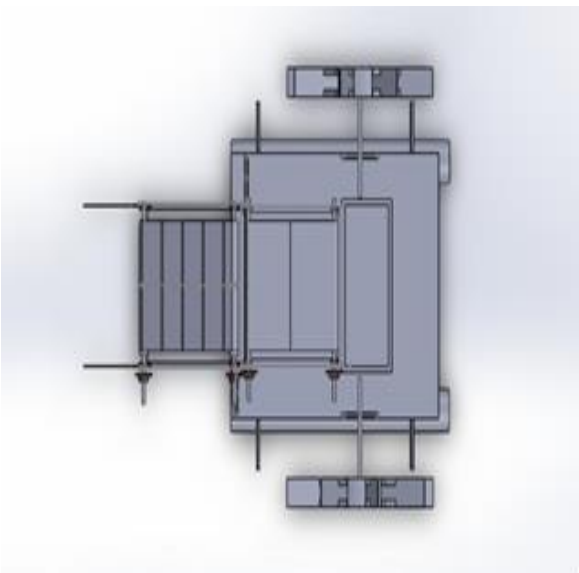


Fig. 4. Top View

IV. WORKING PRINCIPLE

The main objective of this project is to clean the floating solid waste dumped by various sources in the fresh water resources. The system consists of various components, some of the major ones are:

- Power supply/Battery
- Water wheel
- Inclined and flat conveyers
- Trash rack
- Pipping/Air-Tube mechanism with RC Controlled Guider
- Wired Control Box
- DC Gear Motors and respective electronics elements.
- Air tubes/PVC pipes

The assembly of this system is shown in the design section. The whole system accomplished the floating nature due to the buoyancy force incorporated with the help of air

tubes or PVC pipes situated at the bottom base of the whole system. The balancing of the system was taken care by two water wheels provided on both sides situated at the mid-back side of the system. But to provide balancing is not the only function of the water wheel. The other major function the water wheel performs is providing movement to the system in any direction, let be front, back, left and right. The front and back motion is provided by rotating the water wheel in respective directions with the help of DC Gear motors and the couplings situated in the main system and toggles switches situated in the main controller box.

The turning motion is provided by starting and stopping the respective water wheel, for example if the system is needed to turn right, the right water wheel stops and the left ones rotates and vice versa for the left turn. These water wheels are also provided with speed control mechanism situated in the main controller box.

Firstly, the system is made to travel to the position of the damped waste floating on the surface of the river. Once it gets to that point, the water wheel stops. Now the piping mechanism initiates with the help of guider, which in our case is a RC boat. The one end of the floating pipe is attached to the roller mechanism of the piping system and other end is attached to the guider. The roller mechanism is operated with DC motor. The main controller consists of RF transmitter and the guider and RF receiver for transmitting and receiving the signal with the help of RC controller in the main controller box. The piping system and the guider start simultaneously to make a loop containing floating waste. This is done to increase the efficiency of the system, which can be explained as follows, for example if the floating solid waste in the river is dispersed then it would be beneficial to collect the disperse waste at one position and then cleaning it up rather than moving the huge system at various places of small disperse wastes on the expense of more power.

Once the loop is completed, the guider is locked at its locking position, so that now the loop is fixed. Now, the piping mechanism's roller is rotated in the reverse direction again with help of DC Gear motor and toggle switch so that, the loop starts contracting to smaller and smaller loop and all the disperse waste are collected in front of the system. Once all the above mentioned is accomplished, both the inclined conveyer and flat conveyer initiates. From one side $\frac{1}{4}$ th of the inclined conveyer is inside the water and on the other side another $\frac{1}{4}$ th part is inclined above the flat conveyer. Also the inclined conveyer consists of curved shaped sheet metal flaps to support the collection of the waste. The solid waste travels through the inclined and flat conveyer into the trash rack where it's collected.

Lastly when the waste is collected and trash rack is full, the system is stopped by stopping the inclined and flat conveyer and then the whole system is reverted to its original positions. The collected waste in the trash rack is brought to the side basin of the river where this waste can be dumped into the trucks for further processing. And again the cycle repeats and continues.

V. OBSERVATION & RESULTS

During the course of the project, we learned many things and made various observations. A brief summary of the observation made is as follows. The efficiency of the traditional water cleaning mechanism is too low thus, we observed that by replacing the traditional method with this water cleaning mechanism could increase the efficiency drastically with minimum expenses.

This system has an air tube piping guider mechanism, which covers the area of about 30 sq.-ft. which facilitates bringing the waste to the machine rather than moving the machine towards the waste, which reduces the power consumption & increases the efficiency. During the analysis we made 2 notable observations. They are as follows:

Firstly without the Air tube piping mechanism for the collection of the certain amount of the waste, the system needed 20 min. But with the inclusion of air tube piping guider mechanism the system took 11min. for the same amount of waste collection. Thus the effectiveness increased by 81.81 percent as shown in Fig: 6.

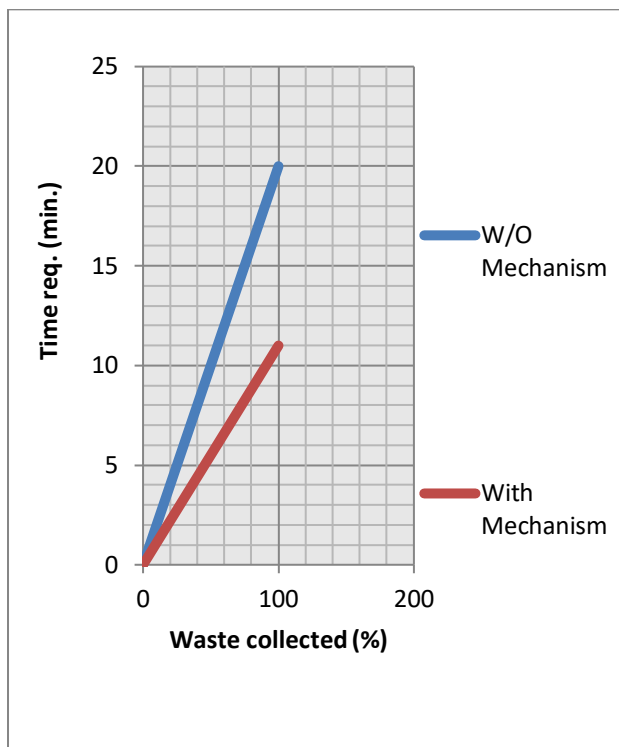


Fig: 6. Effectiveness Graph

[Waste collected v/s Time Req. Graph]

Secondly the system without Air tube guider mechanism worked for about 24 min. But with the inclusion of the Air Tube piping guider mechanism this system worked for about 39 min. Thus it was noted that the efficiency of the system is increased by 62.5 percent with the help of Air Tube Piping Guider Mechanism.

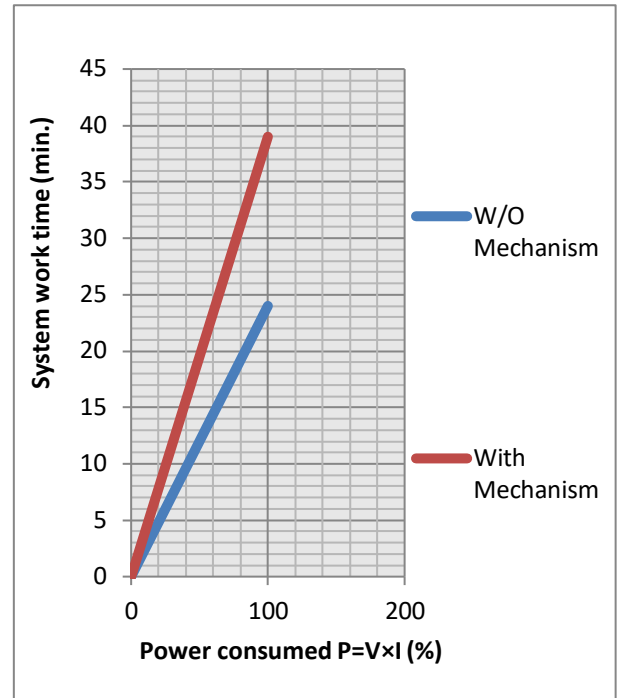


Fig: 7. Efficiency Graph

[Power Consumed v/s System Work Time Graph]

VI. CONCLUSION

During the course of the project study, we tackled many challenges and studied many things. At first, we only started with defining the problem, which affect the society and community, with a driving motivation to do something about it, which made us to across the growing problem of waste disposal in fresh water sources. Therefore, with keen determination we designed the project, which would overcome this problem.

While doing so we performed various task, which included extensive research on present status of rivers in India, more precisely we selected a river named ‘Ulhas River’. So on the basis of present status of the fresh water resources & comparing with it with the past; we can conclude the resources were not always scare or depleted. What caused it was growing population & their lack of awareness in reference to environment & society.

The first thing is to care about the environment that provides us human with so many things. The precise meaning of this is that we should stop polluting the water resources & create awareness about the same in more political & social ways. Then the next step is cleaning the fresh water resources in a technological way, for which we have designed our project.

So the answer to the problem is quite simple, firstly putting a stop to an unsightly mentality of polluting the environment, secondly stopping the pollution itself on the physical grounds by taking suitable measures & lastly cleaning the already polluted fresh water resources in a more technological advance way.

VII. FUTURE SCOPE

Technological advancement is one of the major factors, which will lead the future of humanity to prosperity and stability. This Water Cleaning mechanism is no different from this fact as this system can further advance technologically.

The major development, which can be done in this system, is using non-conventional energy resources as a power source in this system. Options are, use of solar energy when the system is working in rivers and use of solar as well as wave energy when the system is working in ocean and sea.

The second major development, which can be made, is the automation of the whole system that is without use of the operator, thereby reducing the chances of human errors.

Lastly the area which we included in our project with the help piping mechanism can be increased further with help of better RC control technology.

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