Design, Analysis & Fabrication of Garbage Removal Machine from Water Surfaces

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Abstract **- Water is the basic need for the existence of life on earth. In spite of 70% water on earth majority of water is not suitable for drinking purpose. There is a huge demand of clean water as it is used for a variety of purpose such as drinking, bathing, cleaning, cooking etc. Impurities present in water can cause serious health issues that can damage the life of human beings. The main objective of doing this project is to clean the garbage present in small and big lake. To reduce the cost of river cleaning by use of river surface cleaning machine. To tackle the problems about wastage, food material, plastics present in the lake. To clean the polluted water reservoirs to save the life of aquatic animals. To reduce the human efforts by automation in machine. To make eco-friendly and cost-efficient machine without use of liquors like petrol or diesel. 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. 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 water surface cleaning systems and eliminating the drawback of all the methods mentioned earlier, the water surface cleaning machine has been designed and constructed which helps in river surface cleaning effectively, efficiently. 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 the operation of water cleaning with the help of motor, conveyor belt arrangement.**

Index Terms **- Bearing, Conveyor Belt, D.C. Motor, Garbage Bin, Garbage Removal Machine.**

I.INTRODUCTION

Waste management (or waste disposal) are the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment, and disposal of waste, together with monitoring and regulation of the waste management process. Waste can be solid, liquid, or gaseous and each type has different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological, and household. In some cases, waste can pose a threat to human health. Waste is produced by human activity, for example the extraction and processing of raw materials. Waste management is intended to reduce adverse effects of waste on human health, the environment or aesthetics. Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural areas), and residential and industrial sectors can all take different approaches. The various government-owned garbage treatment plants remain closed most of the time thanks to improper style or poor maintenance or lack of reliable electricity offer to control the plants, together with absentee employees and poor management. The wastewater generated in these areas commonly mixes into the soil or evaporates. The uncollected waste accumulates within the urban areas causes unsanitary conditions and cathartic pollutants that leach into surface and groundwater.

More than 500 million people live along the Ganges River. An estimated 2,000,000 persons ritually bathe daily in the river, which is considered holy by Hindus. Ganges river pollution is a major health risk. Minister of Environment, B. Kambuaya, and discovered waste production of thirty-three cities across state by the Central Bureau of Statistics records in 2007 reached 132,192 cubic meters per day. Not all the waste

disposed and transported in landfill, such as a lot of garbage that have not been handled properly such as burned and thronged in the river. This phenomenon that causes environment problems. Rivers turn into domestic landfill. Kambuaya states 80 percent of river polluted by local waste. River scheme that gets besieged of high pollution load than different rivers in Java is Ciliwung watercourse.

II. LITERATURE SURVEY

1. S A Karande, in this project review the proposal concept is to reduce the human effort in garbage cleaning in sea ways by automated system. The machine is placed in the drain, so that the solid waste like bottle, clothes which floats on water gets lifted by teeth connected to the chain. The waste materials are stored in the collector.
2. According to Prof. Ketan V. Dhande invented a River Cleanup Machine which is used in those places where there is waste debris in the water body. In this machine waterwheel driven conveyer mechanism and belt drive mechanism which lifts the debris from the water. According to the article from "The Times of India" newspaper entitled with "Nagpur Municipal Corporation begins Nag- Pilli rivers campaign", The Nagpur Municipal Corporation has set the project for cleaning the Nag and Pilli River in West Nagpur. The aim of the project is to rejuvenate and beautify the river. The machineries are used for the collection of floating weeds and debris. As the world moving towards creation of smart cities due to enormous growth in the population and advancement the technology it becomes most important to control water cleaning through efficient method. As the world is moving towards smart cities still the way celebrating festivals remains the same. Automation is required is ordered to manage the things.
3. M. Mohamed Idhris Design and Fabrication of Remote-Controlled Sewage Cleaning Machine the motive of the project is to automate the sewage cleaning process in drainage, to reduce the spreading of diseases to human. The black water cleaning process helps to prevent pest infestations by reducing the residues that can attract and support pests. It also improves the shelf life and sensory quality of food products. In the proposed system, the machine is operated with remote control to clean the sewage. Hence, this system avoids the impacts from the sewage waste and its harmful gases. This helps to prevent the mosquito generation from the wastage.
4. Mr. Abhijeet Design & Fabrication of river cleaning system India is holy country & during lots of festival like Ganesh visarjan, navratri durga puja & mainly Siahnsth kumbhmela there is lots of water pollution of Godavari River at 6 Nashik. The water pollution is very important problem in rivers, ponds and water bodies near Godavari River at Nashik.
5. S D Rahul Bharadwaj, proposed with the automatic cleaning of wastewater in order to reduce global warming& wastage of power to treat wastewater management.
6. Nitin Sall, here using wastewater technology that removes, rather than destroys, a pollutant in a drainage system. flow of used water from homes, business industries, commercial activities is called wastewater.

III. OBJECTIVES

- To collect many types of wastes from water bodies and also reduces the human interference. The collected waste from the equipment is disposed at easy way. Solar based water trash collector is eco-friendly in nature, and it is safe for the user.
- To minimize or overcome the problem which can face in the manual machine.
- To identify any potential environmental impacts from the generation of waste at the site.
- To keep the living beings safe and healthy.

IV. METHODOLOGY

A. Data Analysis - While conducting study the issues arise i.e. cost of machinery is too high. There are so many methods used for the collection of waste floating on river or lacks manually, by using boat, thrash skimmers etc. and that deposited to the shore of rivers. These methods are risky, costly and time consuming. By considering all the parameters of river surface cleaning and eliminating the drawback of the methods used earlier, the design of the remote operated river

cleaning machine which will help in river surface cleaning effectively, efficiently, and eco-friendly is proposed. Several companies offer equipment to clean river, lakes and harbors.

The remote operated river surface cleaning machine can work in river or lake. It can collect the floating garbage by conveyor belt system and stores in a storage tank provided on the machine. This is really a good solution for the aquatic solid waste management. This machine is remotely operated and clean the waste present in the water bodies. In this machine, the conveyor collects the waste present in lake and then collect it in box like structure called storage tank present in back side of the machine. It collects the waste like polythene, food material, and the waste occurs due to religious festivals.

B. Proposed Solution - Hence the designing and fabrication of the remote operated river cleaning machine is proposed. The machine is consisting of the collecting plate which is coupled with conveyor belt and chain drives are rotating continuously by the motor. The collecting plate is coupled between the two chain drives to collect the waste materials from river. Then the collected waste is thrown on the collecting tray. The propeller is used to give motion to the machine hence drive the machine on the river. The propeller runs with help of PMDC motor. The total electrical devices are controlled by RF transmitter and receiver which use to control the machine remotely.

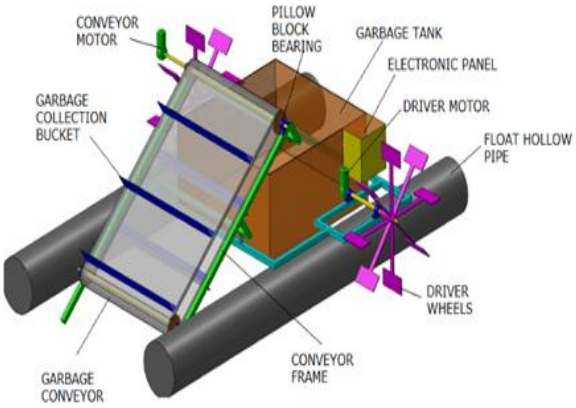

Fig. 1 CATIA Design of Garbage Removal Machine from Water Surfaces in 3-D

C. Design and Working Principle:

The project Garbage cleaning machine which we fabricate is easy to construct and simple in operation. The 12-volt battery is used to drive the permanent magnet D.C motor. The two-conveyor roller is fixed to the two ends of the frame stand with the help of an end bearing with bearing cap.

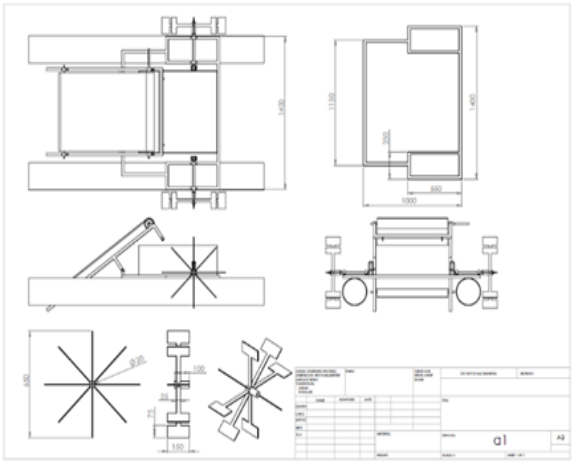

Fig. 2.1 CATIA Design of Garbage Removal Machine from Water Surfaces in 2-D

The conveyor roller shaft is coupled to the D.C. permanent magnet motor with the help of spur gear mechanism. This total arrangement is used to waste trash from water bodies transfer the material from one place to another place with the help of conveyor. There is only one conveyor used in this project that is used for garbage removal from water bodies.

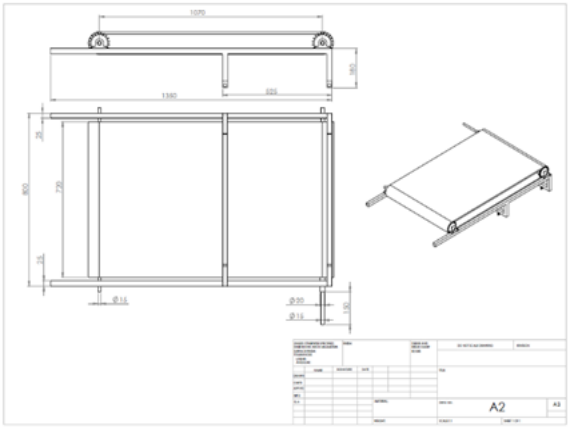

Fig. 2.2 CATIA Design of Garbage Removal Machine (Conveyor Belt) from Water Surfaces in 2-D

D. Selection of Components -

1. D. C. Motor: The operation of electric motor is based on simple electromagnetism. In this a magnetic field is generated by current-carrying conductor; it will experience a force proportional to the current in the conductor and to the strength

of the external magnetic field when it is placed in an external magnetic field.

2. Chain Drive: The work of chain drive is used to transmit mechanical power from one place to another. It is generally used to convey power to the wheels of a vehicle like bicycles, motorcycles etc. In this the power is conveyed by a roller chain called the drive chain by passing it over a sprocket gear. The sprocket gear teeth are meshed with the holes in the links of the chain. The chain is pulled by putting mechanical force as the gear is turned.
3. Propeller: In propeller the power is transmitted by converting rotational motion into thrust. The blades are of air foil shaped. A fluid may be air or water is accelerated behind the blade by producing a pressure difference between the forward and rear surfaces of the blade.
4. Conveyor belt: According to Mechanical Engineering conveyor belts are flexible endless strip of fabric or linked plates driven by rollers and used to transport objects. Belt conveyor is one of the basic tools in material handling industry. It is most commonly used in transportation of bulk materials such as grain, salt, coal, ore, sand, etc.
5. Spur Gear: Spur gear is the most common type of gear used. For transmitting power between two parallel shafts spur gears are used. Here the teeth cut on the cylindrical face are parallel to the axis of the gear. Cutting teeth can be done though several types of profiles on a spur gear, we commonly use involute teeth profile. For transmitting rotational motion between parallel shafts, a spur gear drive is used. A combination of two spur gears properly meshed with each other is nothing but a spur gear drive.
6. RF Transmitter and Receiver: The RF receiver is used to receive the encoded data which is transmitted by the RF transmitter. A transistor is used which acts as amplifier. From RF receiver the received data is given to transistor. Then the amplified signal is given to carrier demodulator section in which transistor is turn on and turn off and it is depending on the signal. Because of this the capacitor is get charge and discharge so the carrier signal is removed and saw tooth signal is appeared across the capacitor. Then this saw tooth signal is given to comparator, its circuit is constructed by LM558. Now the comparator is used to convert the saw tooth signal to exact square pulse, then for getting the decoded original signal the encoded signal is given to decoder.
7. Control Unit: Since its emergence in the early 1980's the microcontroller has been recognized as a general-purpose building block for intelligent digital systems. As it has generated a great deal of interest and enthusiasm among students, teachers and practicing engineers, it is needed to create an acute education for imparting the knowledge of microcontroller-based system design and development.
8. Microcontroller: is a general-purpose device. In microcontroller, a number of the components of a microprocessor system are integrated on to a single chip. For making microcontroller as a minicomputer it has inbuilt CPU, memory and peripherals. A microcontroller combines on to the same microchip: The CPU core Memory (both ROM and RAM). As compared to microprocessor microcontroller is better. It has extra peripherals devices connected to enhance the connectivity. It can hold the instruction. It has input and output devices connectivity. Instruction handling capacity of microcontroller is much better. Instructions written in microcontroller is long lasting i.e. never corrupts.

V. TECHNICAL SPECIFICATION

1. Frame (Material Used: Mild Steel)
   Breath:760 mm, Length:1270 mm, Height:1400 mm, Slant Length: 1550 mm, Leg length: 210 mm, Adjustable leg length: 300 mm, Total Leg length: 510 mm, L-and frame: (25 x 25) mm
2. Roller (Material Used: Mild Steel)
   Length :600 mm, Radius :36 mm, Roller plate radius: 45 mm, Thickness:2 mm
3. Battery
   12 Volts, 7 Ampere, Lead Acid battery, Rechargeable type battery, Works for 2 Hrs.
4. D.C Motor
   12Volts, 90 Watts, 60 rpm, Permanent Magnet D.C Motor, Worm Gear Motor.
5. Spur Gear (Material Used: Cast Iron)
   Gear Ratio: 1:4Pitch :8 mm, Radius: 52.5 mm, Radius hole :10 mm
6. Conveyor Belt (Material Used: Rubber-Nylon)
   Breath: 600 mm, Length :890 mm,
   Thickness: 3 mm

7. Wheel (Material Used: Nylon)
   Radius: 37.5 mm, Thickness:25 mm
8. Shaft (Material Used: Mild Steel)
   a. Upper Shaft
      Length :915 mm, Radius: 7.5 mm
   b. Lower Shaft
      Length: 790 mm,
      Radius: 7.5 mm

VI. ADVANTAGES OF GARBAGE REMOVAL MACHINE

- Low-cost drain-off solution if drains already exist.
- Construction materials are often locally available.
- It is Portable.

VII. APPLICATIONS OF GARBAGE REMOVAL MACHINE

- It can be used domestic sewage treatment.
- It can be used to separate plastic, thermocol from sewage.
- It can be used in plastic industries.
- It can be used for the proper treatment of sewage as well as to avoid blockage of drains.
- Manual assistance is not required.

VIII. RESULTS AND DISCUSSION

While conducting study from newspaper articles, news reports, observations and literature review of existing projects, the problems faced during tackling the issues of cleaning surface of water from water reservoirs. The problems were identified and studied with the help of data collected during the study and applying the basic knowledge of mechanical engineering for overcoming the problem. Finally, it can come up with a machine with organized simple mechanism and the final product is shown in fig.3. It overcomes the water pollution. It is non-conventional river cleaning system. Less maintenance, there is no such system where regular maintenance is required. It is very beneficial for small as well as big lake, where garbage is present in large amount, it can collect this garbage as clean the lake. Its initial cost is less. No consumption of fuels, as fuels like petrol and diesel can be saved because of battery operated system. Skill worker not required to drive the system self-propel.

Fig. 3 Actual Working Model

IX. CONCLUSION

This project "Design, Analysis and Fabrication of Garbage Removal Machine from Water Surfaces" is designed on the basis of literature and research on different journal and paper relevantly available and designed in accordance so it can provide flexibility in operation. This innovation is easy and less costly and has lot of room to grow more economical. This project is designed with the hope that it is very much economical and helpful to river and Pond cleaning. On the basis of it design and estimating cost and availability it is very cheap and very useful for the society.

X. ACKNOWLEDGEMENT

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