Design And Fabrication of Autonomous Waterbin

Suraj Kumar Mandal
Dept of Mechanical Engineering
New Horizon College Of Engineering, Bangalore, Karnataka, India

Abstract- *Autonomous Automated Waterbin is a machine which is design and fabricated in the way of removing the waste materials from water surface and safely dispose from the water bodies. It is a floating – Self Balancing Waterbin made from 80% - 100% recycled polyethylene plastic materials. It is attached and temporary install to a dock, swimming pool, river bank, yacht club, ports and uses a centrifugal water pump to suck water and trash into its interior, where it is detected by proximity sensor – garbage and waste nasty fluids can be filtered out of water i.e., via a natural fiber bag and the water is pumped out.*

The concept behind making an automated autonomous garbage collecting system that can collect the floating debris, litter from the rivers, ponds, oceans of the world is to help educating, analyzing, solving, preventing the oceanic and other water body problems. The ports, yacht clubs, river, pond and dock are the perfect place to start intellectual cleaning process. The automated autonomous waterbin is a revolutionary and intensive method of collecting the garbage from the surface of the ocean and respective water body cleaning field.

Keywords- Plastic bin, Mini Submersible DC Centrifugal water pump, Solar Panel, Proximity Sensor, Arduino Uno R3, Buzzer.

I. INTRODUCTION

Environment management has become one of the main issues in both urban and rural areas all over the world due to both [Solid + Liquid] disposal waste. Initiating the progressive nature with the civilization, waste handling becomes more complicated towards the environmental area. It is undeniable fact that the environment condition on heated extent. Most of the litters and waste generated from workplace, industrial setup area and mostly found in gutters, sewage water, yacht clubs, ports, docks, rivers, ponds, and oceans all over the world. Consideration of these issue – The automated autonomous waterbin is designed and used in that places where there is debris and litters in the water body which are to be removed. This fabricated machine equipped with plastic bin, centrifugal water pump and proximity sensor, and due to the follow of water into the trash bin – water follows through pipe and filtered out (Cohesion action), and debris collected in the filter bag and dumped out of the bag.

Similarly there are lots of problems of water pollution is trending at current standup level under **River Kamala**, **River Koshi** which affect the acoustic, human life and beauty of other rivers. Surface debris, litters and solid disposal causes the many others problem towards the human diseases and climatic change. Recently the government updated the program on the control management of cleaning the waste disposal and collecting unwanted debris and litter from the waterside area. This fabricated design is adopted to reduce the manpower, time consumption in order to clean the waste from the surface of the water. As we talk automation plays vital role now-a-days in the mass production as the designed setup with the proximity sensor detect full debris collecting compartment and allows buzzer to turn on as per satisfaction condition of algorithm Arduino program.

II. LITERATURE REVIEW

Mr. Abhijeet, M. Ballade, Mr. Vishal. S. Garde, Mr. Akash. S. Lahane and Mr. Pranav. V

Design & Fabrication Of River Cleaning System [1]

Due to increases in water pollution in the form of water waste debris, it is hampering the life aquatic bodies and make life to exhaust. Similarly sometimes aquatics animal tends to eat surface waste water debris considering it as a food; which ultimately causes death to aquatic and amphibian animals. Due to polluted water many human skin born diseases is observed so that as per trying to reduce the waste from the surface of water “River Clean-up Machine” designed.

M. Mohamed Idhris, M. Elamparthi, C. Manoj Kumar, Dr.M. Nithyavathy, Mr. K. Suganeswaran, Mr. S. Arun Kumar,

Design And Fabrication Of Remote Controlled Sewage Cleaning Machine [2]

The motive of this particular project is to automate the sewage cleaning process in drainage to reduce the overall spreading causing diseases to human and aquatic bodies. The black pesticide infected water, cleaning process helps to filter

out the pest infestations. This system has high torque wiper motor are connected to the wheel and it is drive with the help of motor set-up. This process is start to collect the sewage wastes by using the arm and it throws back the waste to the bin fixed in the device at the bottom. The arm is used to the lifting of sewage and turned back in a bucket is used to collect them. The waste which relevant spreading the diseases to the mankind is also collected.

Mr. P. M. Sirsat, Dr. I. A. Khan, Mr. P. V. Jadhav, Mr. P. T. Date

Design And Fabrication Of River Waste Cleaning Machine [3]

By the consideration of the current situation of our national rivers are dumped with millions of liters of sewage and weighed with pollutants, toxic materials etc. The machine is fabricated and well designed to river water surface. The parameters of rivers cleaning systems and eliminating the limitations of the condition used before, the remote operated river cleaning machine is designed which helps to clean river surface water effectively, efficiently, and eco – friendly. The river waste cleaning machine is used to remove the debris and system equipped with DC motors, RF transmitters and receiver, propeller, and chain drive with conveyor mechanism.

Ndubuisi c. Daniels

Drainage System Cleaner A Solution To Environmental Hazards [4]

The drainage machine cleaner is a device which helps to protect the environment from different kinds of environmental hazards through the promotion waste managements by the removal of the waste from the drainage system. The system equipped with three efficient parts which are propellers, the cleaner, and the pan for use of efficient functioning. Best after finding the test results under the maximum load the government, individuals, waster recycling companies for the prevention of the waste hazards and encouraging waste management. Throughout the overflow of water drainage system occurred when there is a blockage of an end of the drainage system forcing the water to find its own way elsewhere apart the mapped out the drainage system, therefore the running water spills over the horizontal heights of the drainage system spreading to regions alongside the drainage system, thereby causing problems such as pushing down structures such as fences, water logging of farm lands and residential buildings.

Huang Cheng, Zhang Zhi

Identification Of The Most Efficient Methods For Improving Water Quality In Rapid Urbanized Area Using The Mike 11 Modelling System [5]

The Liangtan River Basin was shared by Jiulongpo, Shapingba and Beiberi district in Chongquing, China. The Liangtan River Pilot project comprised identification of key pollution sources leading the Liangtan River basin pollution and the most efficient projects and technology for improving water quality in rapid urbanized area using the relevant MIKE 11 modelling dynamic system. Ammonia-N and chemical oxygen demand were found to be most illustration represent nutrient load from municipal and diffused rural sources and industrial sources, respectively. The modelling period for 2015 shows that in terms of improving the water quality, the different sectors to be addressed in the following order: Urban wastewater, Industrial Pollution load, Rural wastewater, livestock Pollution load, domestic solid waste and fertilizer pollution load.

III. COMPONENTS USED FOR FABRICATION

For the fabrication components which are used is listed below:

1. Plastic Dustbin
2. PVC (Poly vinyl Chloride) Plastic Pipe
3. Electric Centrifugal Water Pump
4. Stainless Steel Wire Mesh
5. Li-Po Battery
6. Solar Panel
7. Filter Cloth
8. Proximity Sensor
9. Arduino Uno R3
10. Buzzer

- Electric Centrifugal Water Pump

Fig.1: Electric Centrifugal Water Pump

- Electric Centrifugal Water Pump Details:

Table 1: Electric Water Pump Details

Voltage	12 V Normal (9-14)
Ampere	2.8 A
Flow	50 LPM
Pressure	100 PSI(6.8 bar)
Capacity	280 L/H

IV. DESIGN AND CALCULATION

The respective fabricated model is designed in solid edge software. As per following view presented in the software are shown below.

The following solid edge V18 version is used for the fabricated design as per its dimension.

1. System Isometric View:

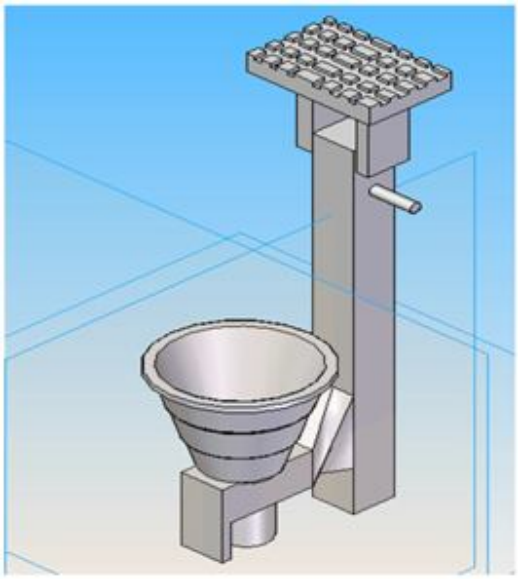

Fig. 2: System Isometric View

2. System Top View

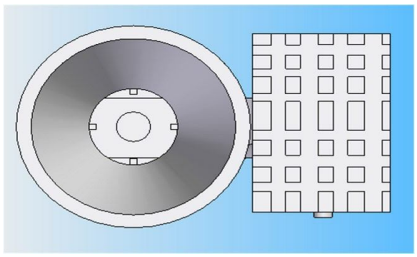

Fig. 3: System Top View

3. System Trimetric View:

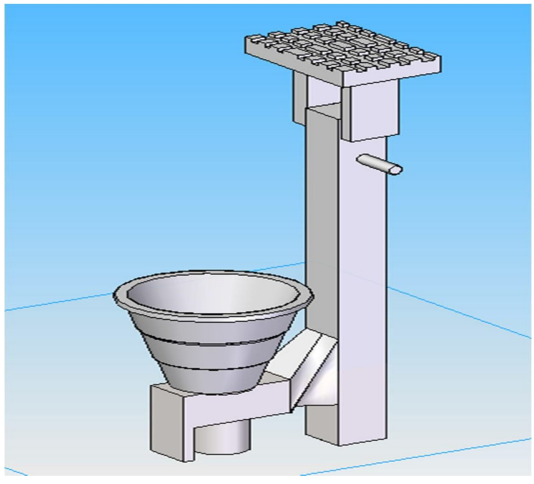

Fig. 3. System Trimetric View

4. System Right View:

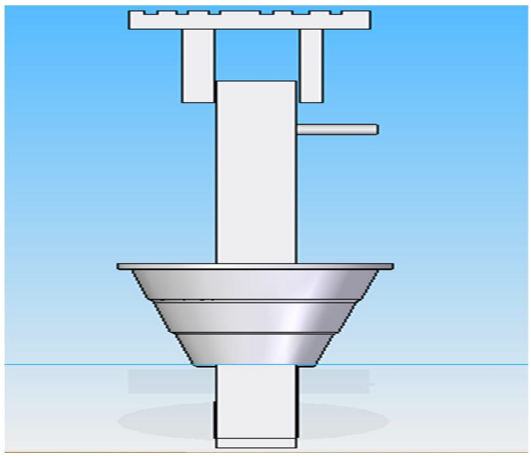

Fig. 4. System Right View

5. Fabricated System With Label:

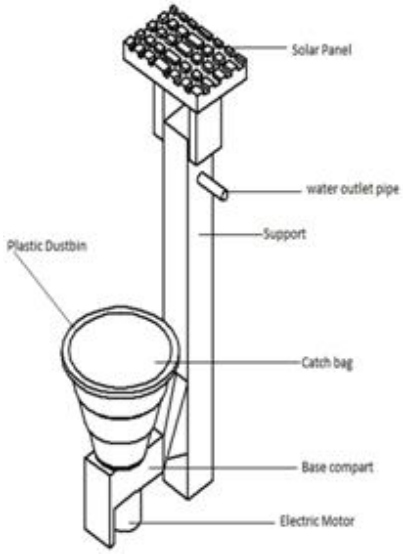

Fig. 5: Fabricated System With Label

6. Plastic Dustbin:

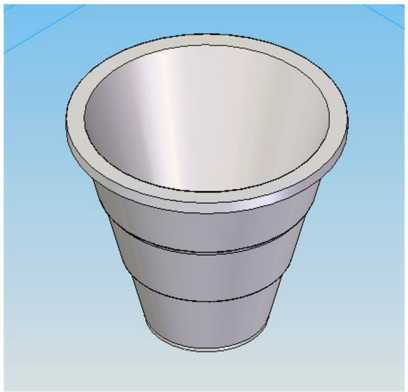

Fig. 6: Plastic Dustbin

7. Solar Panel:

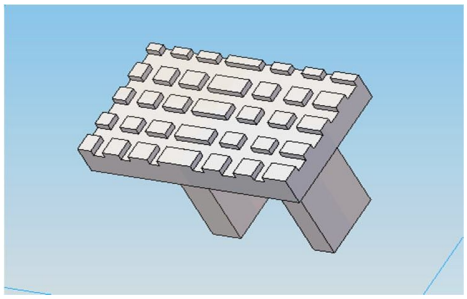

Fig. 7: Solar Panel

8. Support Frame:

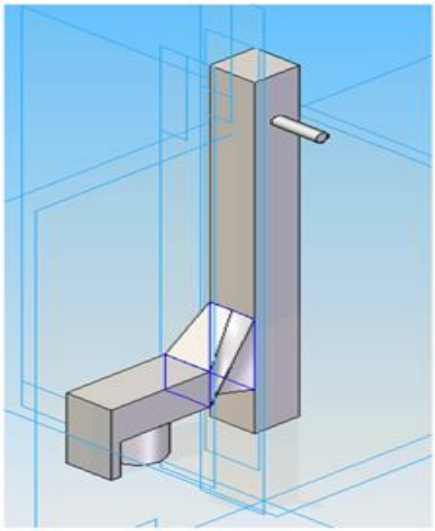

Fig. 8: Support Frame

- **CALCULATION OF CATCH BAG DESIGN**

As per calculation and analysis basis the numerical value is listed below with its description.

Table 2: Catch Bag Design

Radius of the design	15 cm
Diameter of the design	30 cm
Volume of the design	0.02 m cubic
Capacity of carrying	20 kgs of debris in terms of volume
Length of the PVC Pipe	1.5 m
Diameter of the PVC Pipe	2.54 cm
Length of the Support Frame	1.2 m
Electric Pump Capacity	280 L/H

- Mathematical Calculation:

I. Lateral Area of the Catch Bag:

Area= π x r x h= 3.14 x 0.15 x 0.3= 0.1413 m2

II. Volume of the Catch Bag:

V= π x r2 x h= 3.14 x 0.152 x 0.3= 0.02 m3

- Motor Calculation:

  - Motor Specifications

1) Speed of the impeller = 1500 RPM
2) Voltage of the motor = 12V
3) Power of the motor = 33.6 Watts
4) Current supply to the motor = 2.8 Amps Electrical (Electric) Power Equation: Power, P= I x V

Where,

Voltage, V = 12 Volts Power, P = 33.6 Watts
Current, I = 33.6/12 = 2.8 Amps Power of the motor = 0.045040 HP

Torque of the motor,

$$T = \frac{60 \times P}{2 \times 3.14 \times 1500} = \frac{60 \times 33.6}{2 \times 3.14 \times 1500} = 0.214 \text{ N-m.}$$

Conclusion: The project "Automated Autonomous Water "has been designed which is very much economical, easy to operate and helpful for water cleaning as well as waste management and it can be modified with more economical, more with capacity and efficiency.

V. ANALYSIS OF FLOW OF WATER THROUGH CIRCULAR PIPE USING ANSYS SOFTWARE

A. Laminar Flow Through Pipe:

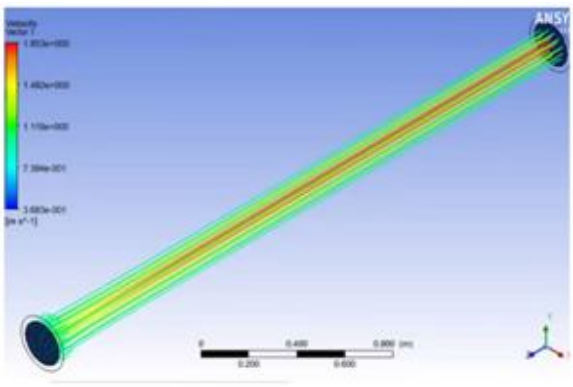

Fig. 9: Laminar Flow Through Pipe

B. Transition Flow Through Pipe:

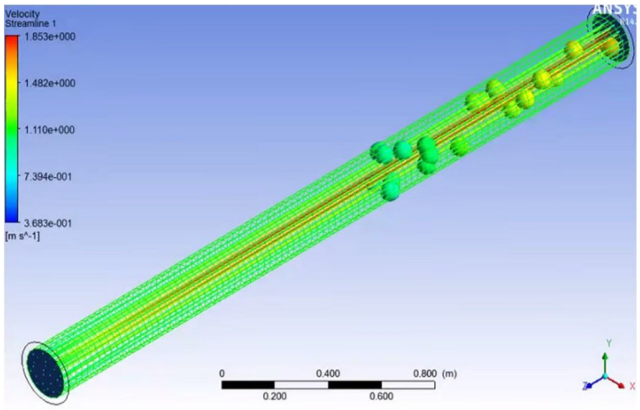

Fig. 10: Transition Flow Through Pipe

C. Turbulent Flow Through Pipe:

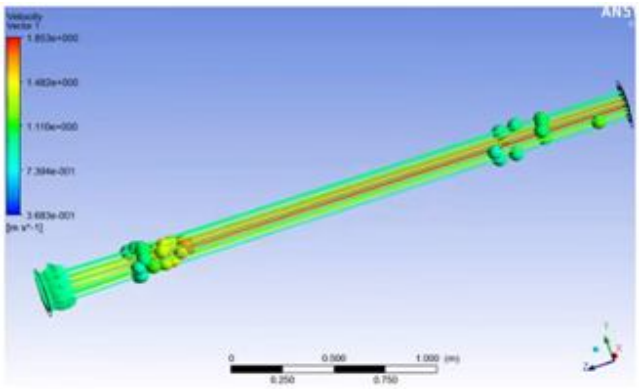

Fig. 11: Turbulent Flow Through Pipe

VI. EXPERIMENTAL METHODS

At this stage, we reached to a point where we need to focus and start planning to design the automated autonomous waterbin. Autonomous Waterbin install with centrifugal pump, Arduino Uno R3 board in which program is booted. Due to cohesion and vacuum action water allows to enter in the bin where catch bag collect the waste debris and consider the full follow of the debris, as the debris creates the obstacle at after filling the bin and proximity sensor fixed at the tip of bin, buzzer turn on.

VII. CONCLUSION

From our research we were able to come up with many important conclusions and suggestions which will profit the future advancement of the cleaning process. In past many researches carried in the process of cleaning and water treatment process. Our project stand with ideology and having the automation technique which will reduce the manpower and cleaning process keeps continue. The project is most relevant, efficient and effective to control environment nature and still the process on project to AI Level.

VIII. SCOPE OF FUTURE WORK

- This model can be used commercially to collect wastes in rivers, lakes and ponds.
- Scale down and scaled up models of present work, can taken up in the future work.
- CFD simulation can be carried out for it's real implementation.
- Numerical Modeling can be carried out.
- In future this project can be improved to sort more categories of waste.
- Less economic in design and availability.

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