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Design and Fabrication of "Extraction Wheel"

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Abstract - *In this project the concept is to reduce the human effort in garbage cleaning from flowing water (drainage systems) 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 blades connected to the wheel.*

Nowadays, there are number of devices and machines are used to clean rivers, drainage systems and other water bodies but these are mainly used for collection or extraction of garbage and waste from water. On the other hand our project is based on extraction as well as management of solid waste from flowing water.

This system is powered by electric motors. It consists a conveyor belt mechanism which transfers the debris that is collected from the water to the storage tank. After successfully collection of garbage in storage cylinder there is a piston cylinder arrangement for reducing the volume of the garbage in order to store more of it in the storage cylinder and also ease the handling of the garbage. The system is semi-automated and with the help of sensors the piston will start after the level of garbage reaches to the specific height.

This project is especially designed for drainage systems of industries as well as for disposal pipes of sewage treatment plants.

Proposal of this project is management of collected waste from flowing water by reducing its volume with the help of compression system and also to ease the handling of the debris.

Key Words: Garbage collection, garbage management, conveyor belt, water wheel, infrared sensors.

1. INTRODUCTION

Conventional methods used for collection of floating waste from the drainage pipes which are incorporated near the sewage treatment plants of either industries or domestic sewages are manual basis or by using skimmers etc. and this process is tedious. If unfortunately some of these indecomposable debris move into the sewage treatment plant the only way of cleaning this is manually and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes of such sewage treatment plant[4]. The municipality workers are only responsible to ensure that the sewage is clean or not. Though they clean the ditches at the side of buildings, they can't clean in very wide sewages. The municipality workers need to get down into the sewage sludge to clean the wide sewage. It affects their health badly and also causes skin allergies. These methods are risky and tedious as well.

Our project idea is inspired from the various types of automated river cleaning machines and semi-automated garbage collectors. These machines effectively collect the waste or garbage from the flowing water but after collection there is a problem of management of waste. So our main focus is on the management of the collected waste. The waste materials that are collected with the help of wheel are stored in the storage cylinder. This system is powered by electric motors. After successfully collection of garbage in storage cylinder there is a piston cylinder arrangement for reducing the volume of the garbage in order to store more of it in the storage cylinder and also ease the handling of the garbage. The whole system is automated and with the help of sensors the piston will start after the level of garbage reaches to the specific height. By compressing the waste we can easily handle it also. 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 after made some modifications in the dimensions of wheel and belt drive and increasing the power of compression (compression ratio).

2. LITERATURE SURVEY

This paper emphasis 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 litres of sewage and loaded with pollutants, toxic materials, debris etc. The government of India has taken charge to clean rivers and invest huge capital in many river cleaning projects like "Namami Gange", ''Narmada Bachao'' and many major and medium projects in various cities like Ahmadabad, Varanasi etc.[2]

This project mainly concentrates on offering an easy, safety, reliable solution to the common problem of inefficient garbage disposal. This paper presents the Semi-automatic waste collector machine for foot paths. The machine is built on a metallic base which is powered by battery. The machine movement is controlled by remote or by mechanically (push or pull). The machine is designed to collect Garbage at foot path, public places (parks, schools and colleges), mostly cemented paths and beaches. Basically, our idea of collection of waste from flowing water with the help of rotating wheel is taken from this project.[1]

Wastewater is characterized as the stream of utilized water from homes, organizations, ventures, business exercises and foundations which are subjected to the treatment plants by a precisely planned and built system of funnels. There are no occasions for wastewater treatment, and most plants work 24 hours each day of the week. Wastewater treatment plants take a shot at basic purpose of the water cycle, helping nature shields water from the intemperate contamination. But the abundant amount of undesirables in the waste water such as solid wastes and other form of materials that do not form the waste water treatment can overwhelm the system at times due to rainfall and natural forces. In order to remove a certain amount of solid waste and undesirables from the waste water we use the automatic gutter cleaning machine which is intended to as a check point at various focus points where the waste get accumulated. Thus it reduces the work done by the treatment plan and facilitates smooth flow of waste water system.[4]

The objectives of writing this paper is to study the current practices related to the various waste management initiatives taken in India for human wellbeing. The other purpose is to provide some suggestions and recommendations to improve the waste management practices in Indian towns. This paper is based on secondary research. Existing reports related to waste management and recommendations of planners/NGOs/consultants/government accountability agencies/key industry experts/ for improving the system are studied. It offers deep knowledge about the various waste management initiatives in India and find out the scope for improvement in the management of waste for the welfare of the society. The paper attempts to understand the important role played by the formal sector engaged in waste management in our country. This work is original and could be further extended. The study of types of waste is done with the help of this paper.[11]

The most sacred river in the world and the national river of India "Ganga River." Ganga is the soul of India and is Holly River in India. If we look at current status of our national river it is very shocking we dump about 29 crore litres of sewage in Ganga which is loaded with pollutants, toxins.[9] We also dump tones of municipal solid waste. The government Of India takes charge to clean rivers Ahmadabad, Varanasi, etc. All of us know about the Ganga Abhiyan. Similarly, The villages in all state of India which joint with small & big lake and maximum villages does not use the water of lake for farming as well as drinking and daily uses due to the maximum amount of garbage present in the lake water by taking this into consideration. Our main motive is to clean the lake water for that purpose we are making efficient lake garbage collector by using pedal operated boat. In this we are using pedal operated boat with the conveyor attached to it for collecting garbage from the lake.[10]

2.1 Conclusion drawn from literature review

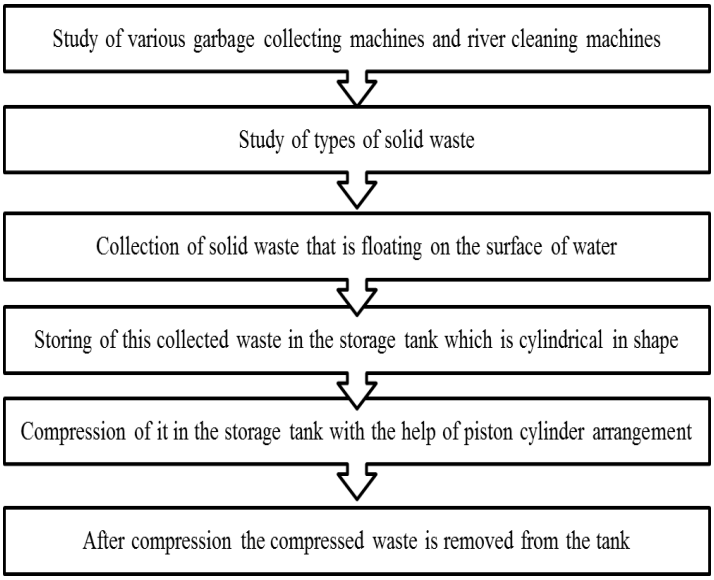
The papers we have studied during our literature survey, we have find that there are different types of machines available for the cleaning of rivers, sewages and different types of water bodies and also for collection of waste.

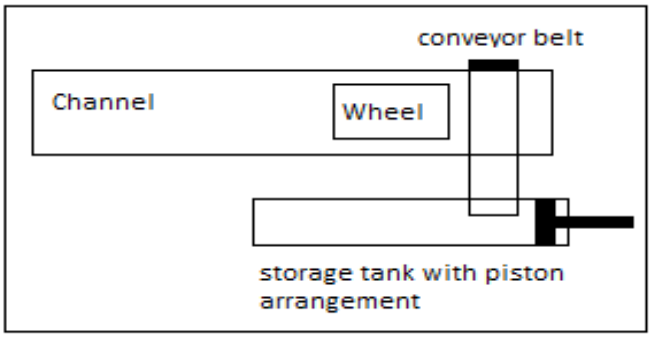
But, when we observe on the behalf of management of waste they just collect it from the water bodies, so we are mainly focusing on the management of this collected waste by storing and compressing.

3. GAP OBSERVED

The current projects which are working over river cleaning are limited to cleaning and garbage collection, but are not working over the management of the collected waste to reduce the current manual work.

4. PROPOSED METHODOLOGY





Proposed block diagram

5. DEVICES USED IN PROTOTYPE AND SPECIFICATIONS

5.1 DC motor

Johnson DC motors are used for powering the wheel and conveyor belt drive.

Specifications of motor:

- Rotations per minute: 10 rpm
- Output torque range: 5kg-cm to 7kg-cm.
- No-load current = 800 ma(max).

5.2 Infrared sensors

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

These are used to indicate the level of collected garbage in the storage tank when the level exceeding the fixed limit the piston start to push the garbage away from the opening of storage tank and after a certain time period it compresses the collected garbage.

5.3 Channel and Conveyor belt

The artificial channel flow is created for making the prototype of proposed model. It is a cubical channel like structure and a replica of drainage pipe with following specifications:

- Length: 1000mm
- Breadth: 200mm
- Height: 100mm

Conveyor belt drive is incorporated between channel and storage tank to transfer the waste that is collected by extraction wheel to the storage tank.

- Length: 250mm
- Breadth: 100mm

5.4 Wheel and storage tank

Wheel is the main part of the system, it is used to extract the floating waste from the channel flow that is the replica of drainage pipe. Wheel dimensions are taken by limiting the volume of flowing water. The blades are incorporated on the wheel at 20^0 with its center.

- Diameter: 200mm
- Width: 150mm

Storage tank is used for storing as well as for compressing collected waste. It is cylindrical in shape and having a piston arrangement for compression.

- Diameter: 100mm
- Length: 70mm

Piston arrangement is geared by rack and pinion gear system.

6. CONCLUSION

On the whole the project is mainly focused on the management of the solid waste which is to be collected form the drainage system so to reduce the daily manual work which was being done on the earlier garbage collection systems.

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