

# Design and fabrication of remote controlled sewage cleaning machine

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**Abstract** - 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. The system has a wiper motor that starts running as soon as the set-up is switched on. Two power window motors are connected to the wheel and it is driven with the help of the remote control set-up. The process starts collecting the sewage wastes by using the arm and it throws back the waste into the bin fixed in the machine at the bottom. An arm is used to lift the sewage and in turn a bucket is used to collect them. The set-up runs even in sewage area with water (limited to a particular amount) so that the wastages which floats on the water surface also gets collected. The garbage which affects the drainage is also picked up and removed. This system has limited human intervention in the process of cleaning and in turn reduces spreading of diseases to mankind.

## I. INTRODUCTION

Water is a basic necessity of human and all living beings. There is a plenty of water on earth that is not suitable for human use. The impurities present in water can cause hazardous diseases. Waste water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. The biggest impact of cleaning the chemical wastes can cause respiratory diseases and it plays a challenging issue for the municipality officers. Water damage is classified as three types of contaminated water. They are clean water, gray water and black water. Clean water is from a broken water supply line or leaking faucet. If not treated quickly, this water can turn into black water or gray water, depending on length of time, temperature, and contact with surrounding contaminants. Gray water is

contaminated water that causes discomfort or illness. It includes washing machine overflow; toilet overflow with some urine, and dishwasher overflow. Black water is grossly contaminated and could cause severe illness or death if ingested and avoided such as flooding from rivers or streams, water from beyond the toilet trap, water from the toilet bowl, or standing water that has begun to support microbial growth.

A drainage ditch is a narrow channel that is dug at the side of a road or field to carry away the water. Nowadays, even though automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and sewage cleaning is still a challenging task. Drainage pipes are used for the disposal of sewage and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. 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.

With the continued expansion of industries, the problem of sewage water must be urgently resolved due to the increasing sewage problems from industries to the surrounding environment. To overcome this problem and to save the human life this design of sewage cleaning machine is proposed. In the proposal concept, the manual work in drainage cleaning is replaced by an automated system. The existing system is designed in order to reduce the load of workers and to make clean India. This machine can be placed inside the drainage pipe to remove all the wastes like plastic and thermocol. Changes have been made in the proposed project which can move with the function of a remote control. This enables the workers to clean the sewage by operating the machine with a simple remote control. The machine operator doesn't need much skill and it is looks very simple and economical.

## II. PROBLEM IDENTIFICATION

### A. Motivation and objective

The problem of water logging due to plastic, thermocole and metal leads to pest growth and it favors diseases like malaria, typhoid etc. This is unsafe for human life and hence the idea of this project emerged. The objective of the proposed project is to design and fabricate an automated machine for drainage cleaning in order to prevent humans from getting affected by various diseases from the infectious microbes present in the sewage while cleaning manually. This proposed system is to minimize or overcome the problem faced while using man operated machine and to minimize the increased dumping rate of waste.

### B. Existing method

The existing system is completely a mechanical based project. It is a stationary system, simply kept in the sewage area to collect the wastes passing over it. The chain and sprocket is used for conveyor movement, which has fitted fork plates to collect the wastes from the sewage. The rotation of the chain along with the plates will collect the floating wastes and put off the wastes in the bin that is placed at the backside of the system.

## III MATERIALS AND METHODS

### A. Methodology

Floating waste like bottles, plastic cans, covers etc., are lifted by lifters which are connected to the chain. The chain revolves with the sprocket wheel which is driven by a motor. When the motor runs, the chain starts to circulate and it makes the lifter to move upwards. The wastage material are lifted by lifter teeth and stored in a collector bin. Once the collecting bin is full, the waste materials are removed from the bin manually. This proposed system is similar to a remote operated car using RF transmitter and receiver.

The output is connected with the 4 channel relay board in order to transfer the signal by triggering a relay. The system consists of remote switch, RF Transmitter, Encoder, 9V battery, Voltage regulator, RF receiver, Decoder and 4 channel relay board. The RF transmitter transmits the signal as the switches are operated by human. The antenna helps in transmitting the signals over a long distance and the RF receiver receives the signal transmitted by the transmitter.

### B. Working

As soon as the setup is on, the sprocket and chain starts to rotate. This sprocket and chain collects the waste materials from the sewage. The rotation of the wheel is controllable, while the rotation of the sprocket and the chain is uncontrollable. The rotation of the wheel is controlled by RF Module and the wiper motor rotates the sprocket and chain is directly connected to the battery. The RF Transmitter acts as a

remote and sends the signal to the receiver. In turn the RF receiver receives the signals and rotates the wheel as and when required.

The RF module consists of an encoder and a decoder. The functions of encoder are to convert  $2^n$  inputs into n outputs. The receiver consists of decoder and it converts n inputs into  $2^n$  outputs. RF receiver module is connected to the 4 channel relay which rotates the motor clockwise or counters clockwise as per the given signal. The RF transmitter consists of a remote switch. The signal transmitting is directly proportional to the button switch as it pressed. The corresponding pin energizes the relay and it in turn energizes the magnetic coil. The collected waste is transmitted to the bin attached to the back of the setup and is removed periodically.

## IV. RESULT AND DISCUSSION

Sewage backlogs are the common cause of sewage water drainage damage to a particular area. When waste water pipes/drains are blocked, sewage water overflows from the pipes into our home through its plumbing system. Not only can this cause substantial property destruction, but also the growth of disease causing bacteria which is hazardous to our health. For these important reasons, it is necessary to have sewage removal performed quickly and properly by a proper mechanism.

### A. Mechanical setup

The mechanical setup is the final fabrication of the system using mechanical components that includes outer casing as shown in Fig. 1. Once the design meets the requirements, the real time setup is fabricated.

### B. Electrical setup

Battery is the main source of power for the entire electrical circuit design. Relays and switches are used for effective working of the circuit. A voltage regulator is used to regulate the voltage as per the requirement. RF transmitter and receiver are used for remote control operation. Thus, the complete electrical set up is shown in the Fig. 2.

### C. Proteus simulation

Software implementation of the electrical setup is carried out using proteus software for simulation.

### D. Application of Sewage cleaning machine

This machine is used in almost all types of drainage (Large, Small, and Medium) and is an efficient way to control the disposal of sewages with regular filtration of wastes. This is applied in cleaning and maintenance of sewer line drains in industries, hospitals, schools, colleges, roadsides and other public and private places.

### E. Advantage of Sewage cleaning machine

This cleaning system is easy to operate and cheap to fix the drainage problems. And, there is a reduction of labor oriented method of cleaning, thus upgrading dignity of labor. It is a light weighted

portable machine that requires less power. Large amount of garbage is collected and sent for recycling.

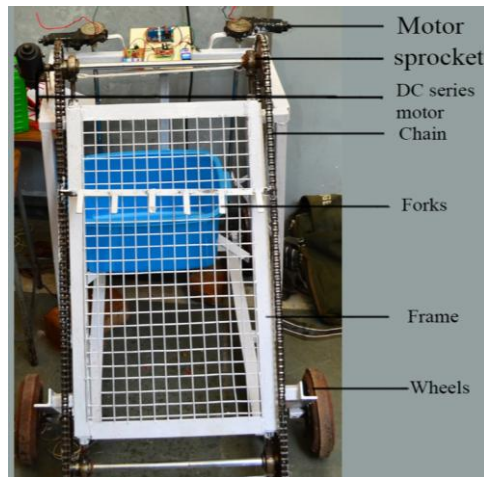


Fig. 1 Mechanical setup of sewage collector



Fig. 2.1 Electrical setup of sewage collector

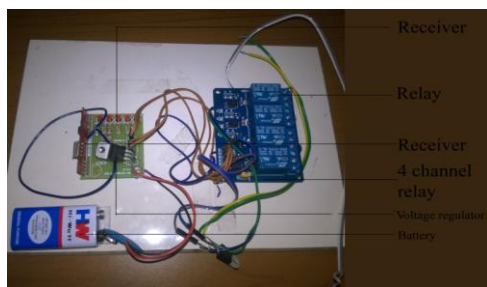


Fig. 2.2 Electrical setup of Sewage cleaning machine

## V. CONCLUSION

Modern services are becoming polarized. With the emergence of more and more automatic terminal services, modern services are also gradually becoming unmanned. Thus this semi automated sewage cleaning system helps in cleaning the sewage automatically and helps in decreasing the spread of diseases due to direct human intervention into the sewage. Since the system operation mainly depends

on high level programming, it can be extended as per requirements. This system is time saving, portable, affordable, consumes less power and can be made easily available so that can use this system whenever and wherever.

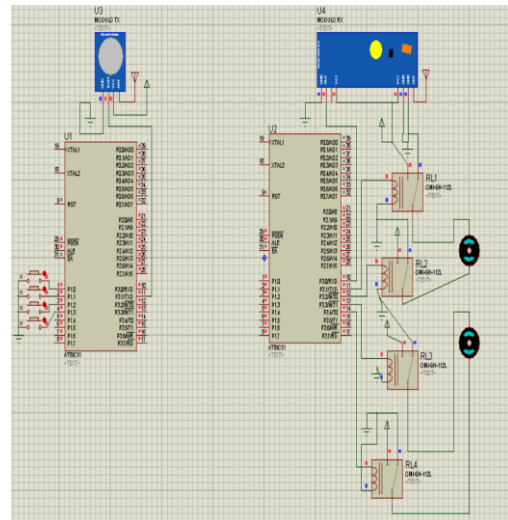


Fig. 3 Proteus Simulation of Sewage cleaning machine

Thus, these kinds of machines operate based on the application of electronics engineering, mechanical engineering and electrical engineering, which are collectively termed as ‘Mechatronics’. Drainage from industries is treated through this project to meet the national emission standards, with stable operation, low cost and good effect. Drainage wastewater control is treated by this method to irrigate plants, clean toilets, etc. This system functions move effectively during heavier rains, which have more volume of garbage running water.

## F. Future scope

In India, sewage drains are open. So people throw waste in sewage drains. Plastic bottles are used in most places and are thrown as such into the sewages. This project will be very useful in cleaning these areas. In future, it is possible to make it a fully automated system by the implementation of control algorithms. Thus, this project helps in making our nation clean and healthy.

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