

SOLAR OPERATED BASED RIVER CLEANING

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Abstract - River is the important source of water for the city it flows through. Maintaining its purity is very important. May times we see accumulation of vines and leaf on its surface. Also on the other hand gutter acts as a channel to divert the waste water from the city to the outer part of the city, where it again meets the river at the other end.

Hence, maintaining the purity of both the river and gutter is very important. However this task is related with the hygienic condition of the workers and its allied objects. So a negligence tendency is mostly seen among the workers doing this task.

Hence with this project we propose a human less automatic machine used for the cleaning of this sources. The machine would be powered with the help of solar panels, so reducing the strain on electricity demand, thus making it fully freely operated cleanliness machine.

1. INTRODUCTION

Drain cleaner machine is the system installed in an open canal, river or drainage passage so that manual extraction of waste to be replaced through it. This helps us to prevent the spreading of diseases in between humans by manual working in garbage waste. Plastic & other waste dump & block the flow of water in Canal & Rivers near the bridges support pillars, so it can extract out from river & canal & allow the water to flow without any obstacle. Then, may pass through conveyors to recycling plant. A drain cleaner is a chemical based consumer product that unblocks sewer pipes or helps to prevent the occurrence of clogged drains. The term may also refer to the individual who uses performs the activity with chemical drain cleaners or devices known as plumber's snake. Drain cleaners can be classified in two categories: chemical, or device. If a single sink, toilet, or tub or shower drain is clogged the first choice is normally a drain cleaner that can remove soft obstructions such as hair and grease clogs that can accumulate close to interior drain openings. Chemical drain cleaners, plungers, handheld drain augers, air burst drain cleaners, and home remedy drain cleaners are intended for this purpose. If more than one plumbing fixture is clogged the first choice is normally a drain cleaner that can remove soft or hard obstructions along the entire length of the drain, from the drain opening through the main sewer drain to the lateral piping outside the building. Electric drain cleaners and sewer jetters are intended for this purpose. It is generally used for removing from sewage water mechanical impurities. Water is a basic necessity of humans and all living beings. This project is

designed to keep clean the drainage system and helps the smooth working of the system. This project automatically cleans the water in the drainage system each time any wastage appears and this form an efficient and easy way of cleaning the drainage system and preventing the blockage. It also reduces labour and improves the quality of water that is cleaned. If the garbage are allowed to flow that will end up flowing down to recreational beaches used for tourism purposes making a scene not pleasurable to the eyes else these garbage flow to residential sites where they are burnt in a way of getting rid of them, thereby causing climate change. The drainage systems are cleaned when there is no water in them i.e. when it is not raining, but when it is raining the drainage systems cannot be cleaned because of the harsh conditions of the rain which no one would volunteer to endure to ensure garbage does not enter into the drainage systems.

Problem Statement

- Pure sources of water getting polluted at large.
- Pure water available in very limited quantity on earth.
- Due to pollution of water, hygienic conditions of the people will be in danger due to the cause of disease and contamination problems.
- India being a river worshipping country, there is always a need to clean the garlands of flowers, statues and other garbage.
- Manpower feels incomplete to fulfill this cleanliness demand.
- Also, there arise a new requirement to maintain hygiene of the manpower doing this cleanliness job.
- Clogging of gutters causes accumulation of garbage and leads to disease like cholera, malaria, etc.
- It also leads to stop the flow of rain water in rainy seasons, thereby causing floods. Also the current machines are operated by petrol and diesel engines, thereby causing air pollution on the other hand.

Objective of project

- Provide a human less solution, which can perform the cleanliness task.
- Cleaning the river and gutter, by segregation of water and garbage. Thus saving water wastage.
- Power this machine through solar power, thus saving in electricity usage and pollution of air also.
- Provide this machine as a compact and standalone solution with speed and efficiency.

CONSTRUCTION

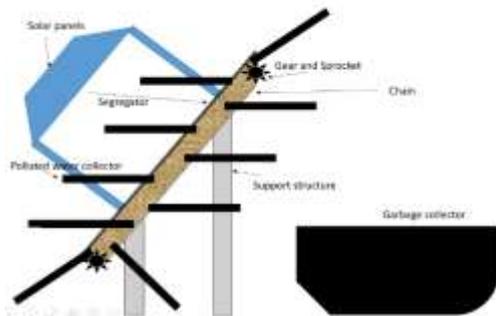


Fig. Construction Diagram of River Cleaning Machine

It consist of a chin drive mechanism driven with the help of motor.

The motor is powered with the help of solar panel. This make the model standalone to use in countryside parts of river.

The motor shaft is coupled to the gear drive which rotates the chain with support of sprocket at other ends.

The similar design resides on both sides of support structure.

Between the two chain gear mechanisms the buckets is attached, which moves up and down around the sprockets at both ends and sides.

When the motor is switched ON, the bucket moves in form of water collector, collecting the garbage mixed water.

The bucket is made up of net like structures in order to drain out the water leaving behind the garbage residue.

This residue is then thrown automatically in a garbage collector present behind the mechanism.

The bucket thus acts as a segregator of water and garbage from the mixture.

In this way, the river water will continue to flow ahead without any garbage and will be clean.

The main motor is powered here with the help of solar panel.

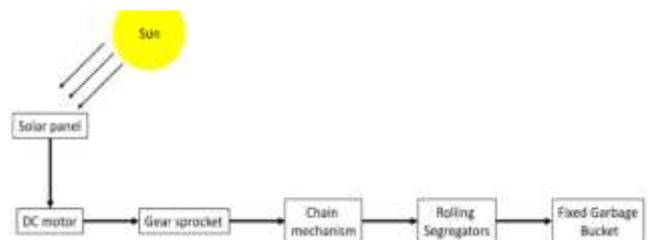
The solar panel first of all charges the battery during the daytime.

A switch is provided in order to turn on off the machine as and when required.



Fig. Construction of river cleaning machine

BLOCK DIAGRAM



COMPONENTS USED

Check if required?

WORKING

In automatic drain cleaner the lifting pans are lifted by the chains which are in-line with the sprockets. This mechanism is known as chain drive mechanism.

The drain cleaner machine helps us to clean small or big sewage through its mechanical design and functioning.

This machine consists of parts such as motor, shaft, chain, sprocket, lifter, collecting bin etc.

When we give power to this machine then motor starts functioning which gives rotation to the shaft and through the help of shaft, the sprockets which are fixed to the shaft rotates.

Due to the rotation of the sprocket, the chain connected to the sprocket rotates.

As the chain rotates the two lifters which are connected to the chain at half length of the chain starts rotating as well.

When one lifter completes one round from down to upward direction, it takes all the garbage material like waste bottles, plastic, tins, etc, on the grid and drops it in the collecting bin attached at the back. Since there are two lifters, the collection rate of garbage will be more. This is how this machine helps us clean sewage or any garbage from water.

The devices is place across drain so that only water flow through lower grids, waste like bottle, Etc.

Floating in drain are lifted by teeth of lifters which are connected to chain. This chain is attached by gear driven by motor. When motor runs the chain starts to circulate making teeth to lift up.

The waste materials are lifted by teeth and are stored in waste storage tank.

The device is a prototype can be used for fine purification of wastewater from mechanical impurities, however, maintenance and operation process manifests a number of disadvantages.

For example, a complex is the installation process of the rake with teeth due to the increasing inaccuracy of the location of the teeth; the filter screen grid has a high hydrodynamic resistance; the accumulation of long fibers that are in the water on the transverse ribs and at the bottom of the lattice is the settling of sand and stones that leads to the formation of bottom sediments and the occurrence of stagnant zones.

The basis of the invention is to create a mechanical grate rake type, allowing to simplify its installation, repair and maintenance.

SPECIFICATIONS

1) Base Frame:

Length= 1220mm

Width= 480mm

Square pipe of 20mm

Thickness= 2m

2) L-section*04:

Height= 8inch (203mm)

Width= 7.5inch (190.5mm)

Plates of 1 inch (25.4mm) Mounted at 230mm from ends

3) Stand:

Height= 520mm

Fixed at 500mm from 1 side

4) L - support

at a height of 40 inch to main end

5) Motor support:

Fixed at the height of 340mm

Length= 10cm

Width= 1cm

6) Dc motor

Rpm= 30

Shaft= 20mm

7) Main shaft:

Diameter= 25.4mm

8) Table: Small chain drive Sprocket (2 Nos.):

Sprocket	Radius
Teeth	27
Addendum circle	2.88
Base circle	2.74 cm
Pitch circle	2.8 cm
Center distance	30 cm
Pitch Revolution	8 mm , 30/min

9) Tube:

Length = 47.5 inch =1206mm

Diameter = 9cm = 90mm

10) Table -Large chain drive Sprocket *2:

Sprocket	Radius
Teeth	24
Addendum circle	5.5
Base circle	4.8 cm
Pitch circle	5.35 cm
Center distance	90 cm
Revolution	10/min

11) Table - Small chain drive Sprocket:

Sprocket	Radius
Teeth	28
Addendum circle	3
Base circle	2.5 cm
Pitch circle	2.75 cm
Center distance	30 cm
Revolution	23/min

12) Water wheel:

Diameter of water wheel= 16cm

CALCULATIONS

1) Motor calculation:

Type: - DC Motor

Power = $V \times I$

Where, Volt= 12V

Amp=7.6 amp

Power= 12×7.6

Power= 85 watt

2) DESIGN OF SPUR GEAR

Design power $P_d = P_R \times K_i$

Where $K_i = 1.25$ for light shocks (8 to 10 hrs a day)

$P_d = 85 \times 1.25$

$P_d = 106.25$ watt

3) Total Load:

Total load $F_t = P_d \div V_p$

Where, F_t = tooth load

V_p = pitch line velocity

4) $V_p = (\pi D_p N) / (60 \times 1000)$

$V_p = (\pi D_p N) / 60$

Where, $D_p = m \times t_p$

t_p = pinion teeth=24

$V_p = (\pi \times m \times 24 \times 30) / 60$

$V_p = 0.03769$ m

5) $F_t = P_d \div V_p$

$F_t = 106.75 \div 0.03769$ m

$F_t = 2832$ /m

DESIGN PROCEDURE OF CHAINDRIVE & SPROCKET

1) Determine the velocity ratio of the chain drive

Velocity ratio = N_1 / N_2

So, $N_1 / N_2 = T_2 / T_1$,

Velocity ratio = 1

2) Select the minimum number of teeth on the smallest sprocket or pinion

Minimum Number of Teeth on the Sprocket = **18**

3) Determine the design power by using the service factor, such that

Design power = Rated power x Service factor (K_s)

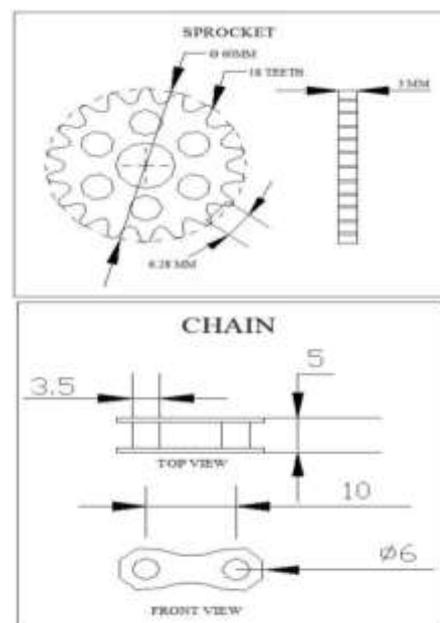
= $106.25 \times$ Service factor (K_s)

= $106.25 \times$ (Load factor (K_1) x

(Lubrication factor (K_2) x Rating factor (K_3))

= $106.25 \times (1.5 \times 1 \times 1.25)$

Design power = 0.20kW



ADVANTAGES

Advantages of electric drain cleaners include the ability to clean long sections of sewer drain, the ability to remove solid

objects such as tree roots and jewellery, and ready availability through hardware stores and tool rental counters. Machines using springs can easily negotiate multiple 90-degree bends while maintaining their effectiveness and without damaging the pipe. Low-cost drain-off solution if drains already exist. Construction materials are often locally available. Creates employment (construction and maintenance). It is Portable. These cleaners are easy cheapest way to fix river cleaning of Drainage and Irrigation Machinery" No.4, pp.220-223,2009.

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problems. Easy to operate as no special skill is required. Reduction of labour oriented method of cleaning, thus upgrading dignity of labour. Light weight and easily portable. Requires nearly 12-24 volts of power.

DISADVANTAGES

Disadvantages of electric drain cleaners include high relative cost and weight, and the considerable physical effort that may be required to control. Small vibration will occur. In order to avoid vibration the machine should be properly foundation with the floor.

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