

Automated Gutter Cleaner Machine

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Abstract

The automated gutter cleaning device is suggested with the intention of clearing the trash and debris from the drainage gutter, and directing them toward a tidy and sanitary atmosphere. The primary goal is to streamline and lower the cost of rubbish management. India is a developing country that relies heavily on labour for most jobs since labour is used to manage waste in India, there is always a potential that someone would die while working. A report claims that a death occurs every three days among the labourers cleaning gutters and drainage systems, who either contract dangerous infections or, in the worst situations, lose their lives from working in filth. To resolve this issue and save many lives, we offered the idea of a “Automated Gutter Cleaning Machine”. The project contributes to environmental protection and helps prevent human fatalities.

Keywords: Waste management, grey water, loss of human life, automated system, black water

INTRODUCTION

The rate of garbage production is relatively high. Waste accumulates in gutters and drainage lines, causing water to clog. Diseases and viruses spread as a result of the garbage in the water. Water is the necessity for human life. Humans rely on water for drinking, cooking, personal hygiene, and other uses. In industries and factories, the water is used for cleaning, processing, and manufacturing. The automated cleaner system is used to remove wastes from water, including bottles, polythene, and other materials. This can be utilised to get around the issue of wastes getting filtered out of water and it saves time and money on cleaning the drains [1]. Plastic bags and polythene bottles are abundant in the industrial waste, which is full of trash and debris. The machine will efficiently and quickly clean up all of the waste that is currently present. In this project, we typically use a DC or AC motor to power the system once electricity is available, and for the instrumentation, we typically use a motor, chain, driver, bucket, frame, wheel, sprocket gear, solid shaft, etc. This type of water filtration is

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known as primary filtration. A basic requirement for humans and all other living things may be water. There is a lot of water on the planet that should not be used by humans. Risky diseases will be caused by the impurities water gives us. Waste water is defined as the flow of used water from residences, businesses, industries, and other facilities that are exposed to treatment plants through a meticulously planned and constructed network of pipes. The most significant result of cleaning up chemical wastes will be metabolic ailments, which poses a challenge for municipal officials. Three types of contaminated water are used to assess water damage, grey water, black water, and pure water [2–4].

PROBLEM STATEMENT

Since cleansing the water is our main objective, it has been done manually up until now. Gutter cleaning by hand causes additional health problems that are harmful to people's health. Therefore, we developed a device that automatically cleans gutters and protects various living things from various diseases while also saving human life. Gutter and drain cleaning has never been easy. Given the amount of debris and chemicals present, cleaning gutters and drains appears unethical and puts workers at a greater risk of illness or poisoning. Additionally, dumping bottles, plastics, and other similar items in the gutters causes them to get smaller and finally become blocked. In many circumstances, this results in an overflow. In order to address these contemporary gutter jamming concerns, we have provided a fully automated drain gutter cleaning method. Our solution employs an automated gutter/drain cleaning system that allows liquids to pass through it while catching and storing large solid waste items like bottles and plastic. Therefore, rather than cleaning the entire gutter floors, gutter cleaners only need to clean these gutter cleaning systems that have been installed at specific locations. At the base of the mechanism, our system's jaws are made of metal teeth. For the system to remain upright in the gutter, it is installed in a frame. The vertical frame bed is used to capture all solid waste while allowing liquid to flow. There is a filter basket on top of the mechanism [5]. A motorised shaft that is linked to the jaws by a chain raises the mouth at predetermined intervals. When it reaches the top, it flips over to dump the solid waste. Now that the waste has been dumped, the motor turns once again to move the jaw back to the bottom position for additional waste collection. Since the system only rotates once or twice a day to dump the solid debris, it uses very little electricity and is a very effective way to clear gutters and drains [6].

SCOPE OF THE MODEL

Since the Model is founded on the idea, it incorporates the advantages for human health, societal issues, and the government's policy on cleanliness. Since it benefits every aspect of modern life, it covers a wide range of topics [7–10].

Through the use of automatic sensors and the application of control algorithms, this model can eventually be transformed into a completely automated system. This system can be entirely automated by getting rid of the starting and stopping mechanisms' idle time by using the right sensors. One must use the proper handling equipment to efficiently control and manage the wastes. The simple-to-design automatic drainage cleaning machine is a semiautomatic equipment for removing trash and solid waste from drainage. It is crucial to the cleaning of water because we need it and because it will benefit the employees who risk their lives to clean the drainage system. The automatic drainage device operates with excellent efficiency and minimal expense. Water is a requirement for everyone, and our project is assisting in the process of cleaning the water and eliminating the water obstructions. It will simply consist of shafts, bearings, sprockets, chain, and lifters and cleans the drainage so that after some processes we can use the water again.

DETAILS OF MODEL

The Automatic Gutter Cleaning device is made up of a chain conveyor assembly with buckets attached to it to collect gutter debris. The model is capable of performing tasks faster than human labour. The device is capable of carrying out heavy tasks for an extended amount of time. This model's output is high and input is little because only battery charging is needed. The list of project-related components is shown in Table 1.

WORKING

To ensure that only water flows through lower grids, garbage such as bottles, etc., the devices are placed across drains. Teeth that are attached to a chain hoist floating objects out of the drain. A gear that is powered by a motor connects this chain. As soon as the motor starts running, the chain begins

Table 1. Components list.

S.N.	Component
1.	Shaft
2	Bearing
3.	Sprocket
4.	Battery
5.	Chain
6.	Lifter mount
7.	Collecting bin
8.	Gears
9.	DC motor

Table 2. BOD specification.

S.N.	Parameters	Specifications
1	Material used	Mild steel
2	Body Inclination angle	60 degree
3	Axel distance (vertical)	500 mm
4	Distance between shaft (horizontal)	300 mm
5	Sprocket diameter	60 mm
6	Shaft diameter	15 mm

Table 3. Total weight of the machine.

S.N.	Components	Weights
1	Battery	1.5 kg
2	Iron Frame	6 kg
3	Shafts	1 kg
4	Sprocket	500 gm
5	Motor	800 gm
6	Miscellaneous	400 gm
7	Total weight of the machine	10.2 kg

to flow and form teeth that raise the bucket on the conveyor. The garbage is held in the waste tank after being raised by the teeth [11]. The bottom shaft and wheel system is set up to move the machine from one location to another, or from one gutter to another. The machine was easier to move during the cleaning process because of the taller shaft and wheel arrangement which mean that this gutter and drain cleaner cleans and moves along for more gutter cleaning. The project's mantra is “reduce, reuse, recycle”. Reduced garbage transportation and disposal should be a goal of all municipal solid waste management strategies. Waste should be recycled at the source, during transportation, or at the disposal location. The cloth will ultimately be cleaned and have a higher grade and pricing for consumers the earlier the separation occurs Incentives that encourage and promote the involvement of roving collectors, microbusinesses, and cooperatives in the informal sector can be essential for improved waste management. Table 2 shows the BOD specification. Table 3 shows the total weight of the machine [12].

CALCULATION VARIOUS PARAMETERS

Battery charging and discharging calculation:

Load applied to battery are two motors and two pumps.

Specifications of Motor:

Current = 1.2 A

Voltage = 12 v

Ampere hour rating = 7.2 Ah

Power = $V \times I = 12 \times 1.2 = 14.4$ watts**Specifications of Battery:**

Current = 3.5 A

Voltage = 12 v

Power = $V \times I = 12 \times 3.5 = 42$ watts**Battery charging rate:**

Battery ampere per hour time/ charging current
 $= 1.3 \text{ Ah} / 3.5 \text{ A} = 0.4285 \text{ hrs} = 25.71 \text{ mins}$

Motor power:
 $P = \text{Voltage} \times \text{Current} = 12 \times 1.2 = 14.4 \text{ W}$
Torque:
 $P = (2 \times 3.14 \times N \times T) / 60$
 $T = (60 \times 14.4) / (2 \times 3.14 \times 100)$
 $= 1.3757 \text{ Nm}$
 $= 1375.79 \text{ Nmm}$
METHODOLOGY

To ensure that only water travels through the lower basement, a device is placed over a drain. Bottles, plastic cans, covers, and other floating trash are lifted by lifters attached to the chain. The motor-driven sprocket wheel, which turns the chain, rotates. Electrical energy is used to power the motor. When the engine runs, the chain begins to move, lifting the lifter. By using lifter teeth, the waste material is raised and placed in a storage or collection bin. The waste products are taken from the collecting container once it is full [13–15]. Methodology for the entire drainage cleansing procedure is shown in Figure 1. How work is to be done in a methodical fashion is determined by methodology. It is usual practise to describe a procedure in the simplest possible terms. Figure 2 shows the layout of gutter cleaner. Figure 3 shows the physical model of a gutter cleaning device. Part (A) displays a close-up, while Part (B) displays a distance perspective.

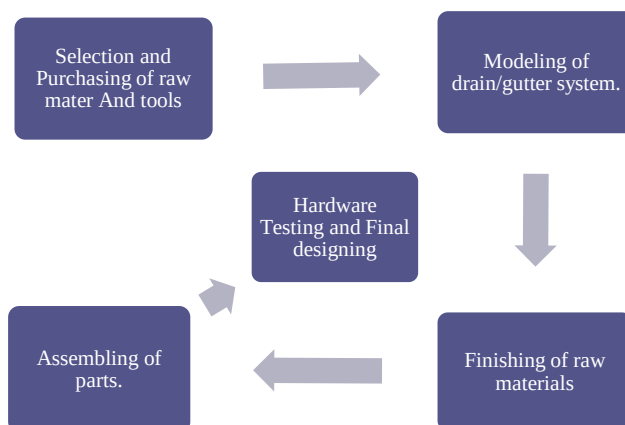


Figure 1. Methodology of gutter cleaning machine.

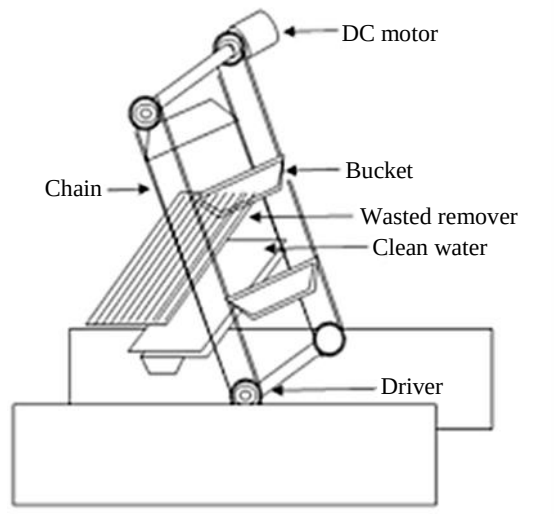


Figure 2. Layout of gutter cleaner.

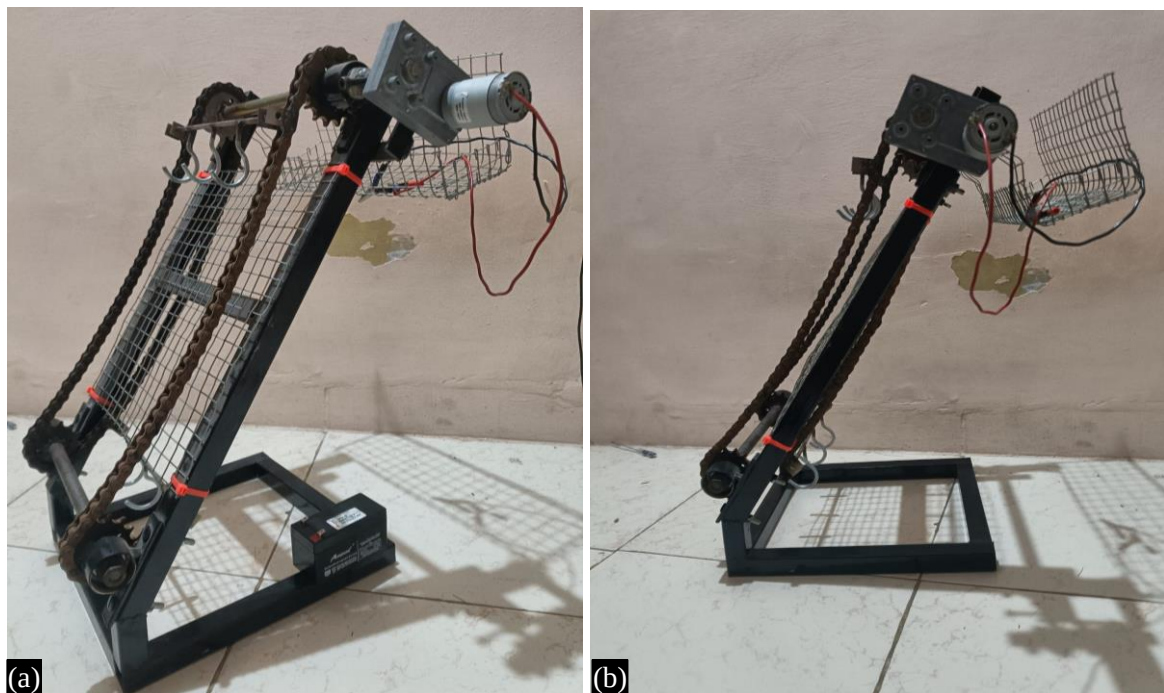


Figure 3. Physical model of gutter cleaning machine (a) close view, (b) distant view.

CONCLUSION

1. The cleanup of sewage and drain debris may be made easier by using gutter cleaner.
2. Commercially, it works well.
3. Labors do not always need to enter the gutter.
4. The ability of the gutter cleaner to run continuously will result in maximum
5. Cheap manufacturing costs.

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