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Automated Sewage Cleaning System

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Abstract – *Water is basic need for every creature in this world, we must use it wisely before it's impossible to pure. So, keeping in mind the environment we have come up with the idea of removing foreign elements from water at a very low cost. The system consists of two rotating shaft, one shaft pivoted with a 12-volt DC motor. Using chains shafts are connected. Waste products are collected on sieve which drives and throws in a porous bin, which will be later on collected by "safai karmachari" a.k.a Sewer Cleaners. Thus, reducing manual scavenging.*

Key Words: *Main Frame, Waste Products, Collecting bin,*

1. INTRODUCTION

It is seen that in the rise of COVID-19 pandemic, people have got extra careful in terms of cleaning, sanitation etc. Since most of people are working remotely i.e., from their home, household waste has been increased drastically (reports says). This choaking of drains in remote location is the main concern, manual scavenging is required in this case.

The chief goal in our project is to remove manual scavenging from this country, using installing this machine in every remote and urban areas so manually these karmacharis don't have to risk their life. At least one karmachari dies every two weeks in this manual scavenging practice. This our main motivation is to eliminate this practice so none people have to risk their life.

2. PROBLEM IDENTIFICATION

2.1. Existing Method

There are two kinds of existing machines in the market and both have some or the other disadvantages.

1-) The first machine "Sewer cleaning machine" is the machine which is approved by Bangalore Municipal is costly ranging in lakhs, which indeed focusses on sewer instead of sewage is a portable mini truck. This machine can easily be used in urban areas but in remote areas where electricity and gas is in lesser amount gets a drawback.

Our machine totally works on low power AC motor which can be installed near a street light and that amount of electricity is enough for our motor to run smoothly

2 -) The "Sewage Cleaning System" machine is really not an automated machine as manually operator has to switch it on off when required.

Our machine is fitted with Arduino chip which intelligently turns motor on off after certain period of time this reducing electricity consumption and increasing motor life.

2.2. Motivation and Objective

This proposed system overcomes all the above-mentioned challenges. The uniqueness, the robustness in design, the intelligence in motor, low maintenance and the most important factor, the cost makes it unique to work in any desired location.

The factors keeping in mind, we ae here to join hands and completely remove manual scavenging from the country as most developed nation did. India is practicing, elimination of manual scavenging this we have proposed this idea in a vast scale.

3. OBJECTIVES

The major objective of this work is to remove manual scavenging, keeping in mind about the cost and other essential factors like construction of machine, we have designed the machine under CAD software.

The basic work of this machine is when the flowing sewage containing waste floating products, the waste gets collected on the sieve of the system. At certain amount of time the motor starts rotating and the waste product which were collected is lifted by jaws and collected in the porous bin. The Sewer Cleaners will now empty the bins at regular intervals and thus preventing choaking of drains,

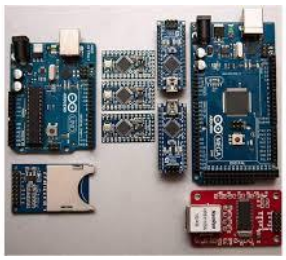
4. CONSTRUCTION OF THE COMPONANTS

4.1. Arduino: Since we are going to rotate our motor simultaneously at a small interval, we will use Arduino system. The amplifier will convert AC to DC. The code I is written in simple C programming language. We will be using the following components:

- 1x Arduino UNO board
- 1x PN2222 Transistor
- 1x 1N4001 diode

- 1x 270 Ω Resistor

Arduino is a programmable circuit with input and output port and hence is an essential element of our project.



4.2. Motor: - We have used a 12-Volt DC motor. This motor is capable of rotating the entire shaft in one go. Since the waste products like plastic, diaper etc. light in weight so not much force/torque is required

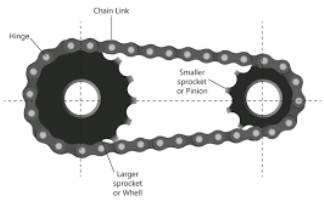
Description of motor -

- Number of motors: - 1
- Supply: - 12-Volt DC supply
- Power: - 17W
- RPM: - 30 RPM
- Weight: - 145-150 gms

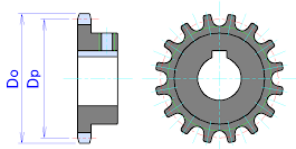
4.3. Chain Conveyor: We have been using three driving chain conveyors, two on the end one in the middle. We are using three conveyors because we will be using jaws at regular intervals so much amount of waste product gets collected in jaws and more efficient the machine works.

The conveyors will be attached with the sprockets (explained later) which makes the driven and driving shaft rotate in the same axis. These chains will be of stainless steel keeping in mind, water and less in maintenance cost

Description of chain drive: -



4.4. Sprocket-Sprockets are the main part in the machine which helps giving rotating motion to shafts, both driven and driving. The sprockets are Stainless steel grade and is capable of corrosion resistant. The sprockets used in bicycle is will be the sprocket we'll use here.



4.5. Ball Bearing: We are using Stainless steel grade ball bearing which is a low maintenance bearing. Since S.S it will be self-rolling and corrosive resistant.

Since ball bearing will be fitted inside of bush (explained later), it will make our shaft rotation smoother. We will be using 4 bushes for both the shafts at both ends.

4.6. Bush: We will be using four bushes at four ends of the main frame. These bushes are fitted with ball bearing inside which will help in smooth rotation of shafts.

4.7. Hollow Shaft: In concern for high strength, we are using, an alloy steel hollow rods such as nickel chromium or chromium-vanadium steel. These will allow shaft to work on any condition because of in-corrosive in nature. We will be using two hollow shafts in our machine.

4.8. Jaws: As shown in main frame, the forks act as rake in collecting the floating and sub floating particles in the drain and carry them to the collecting basket. Continuous flow of waste water will contain foreign products, 3 sets of jaws at both ends total 6 are attached to the conveyor chain drive will collect all the floating products. For picking up large waste products like polythene bags, diapers, plastic bottles, etc. we make use of a fork with large finger like teeth's which is capable of lifting larger particles. For the collection and disposal of small particles such as paper or plastic bits, small leaves, silts, etc. we use a fork with small holes which are capable of colleting tiny floating bodies.

4.9. Collection Bin: Collecting bin is the rectangular hollow box which is situated behind the model. When the waste product is lifted with jaws, waste is thrown in collection bin Water filters out remaining only waste. The collecting bin we used is porous S.S.

Dimension of the collecting bin

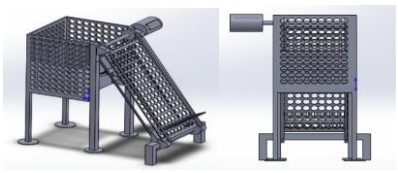
- Width of collecting bin-30cm
- Depth of collecting bin- 38cm
- Length of collecting bin-75cm

4.10. Sieve: Sieve, is an equipment which can lift products. The lifting depends on how much is strength. We are been using a S.S lifter or any metal object lifter. They are used to lifts floating waste. This includes waste floating products like diapers, disposables, polyethene etc. which if not filter can choke drains. In our project we used two lifters for better performance, and it also help for balancing the model.

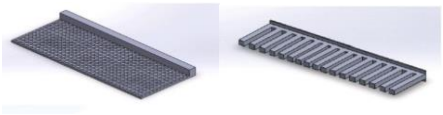
The specifications are:

- Lifter of width – 12.7cm,
- Total length of lifter – 60 – 80cm,
- Weight of lifter – 150gram
- Thickness of lifter – 2cm

4.11. The Main Frame: With the help of CAD software, we were able to do a sketch of our prototype and finally developed a 3D model of the primary design considering all the aspects of the mechanism. The Fig.1.1. (a), (b), (c) & (d) shows the isometric view and the rear view of the developed design of the prototype. The jaws, which are used in chain mechanism were also designed keeping in mind about the floating waste materials in the sewers are flowing.



(a) **(b)**



(c) **(d)**

4.12. Costing of the equipment:

SR. No	EQUIPMENT NAME	NOS. * COST OF EACH	COSTING (₹)
1.	Main frame of the Machine	1 * 5000	5000
2.	Motor	2 * 600	1200
3.	Chain Conveyer	3 * 90	270
4	Sprocket	6 * 60	360
5.	Arduino	1 * 1200	1200
6.	Ball Bearings	6 * 40	240
7.	Shaft	2 * 200	400
8.	Lifter (Sieve)	1 * 100	100
9.	Bin	1 * 200	200
10.	Bush	6 * 80	480
12.	Fork (Jaws)	8 * 50	400
13.	Miscellaneous	-	± 1000

THEREFORE: On calculating the total costing it comes out around **₹ 13,050 /-**

5. CONCLUSION

The device is place across a sewer so that water flows through the lower part of the machine. Floating products like plastic bottles, cans, diapers etc. are collected in the jaws of the machine. This will now allow us to lift when Arduino starts the motor rotating. When motor runs at a lower speed the chain starts to circulate making the jaws to lift up. The waste products are lifted by jaws and is thrown in collection bin. Once the collection bin is full, the "safai karmacharis" (sewer cleaners) will come and empty it this manual scavenging is eliminated.

6. ACKNOWLEDGEMENT

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He guided us right from equipment selection to functionality and worked as a best Co- Ordinator in multiple ways. He even handed us 1st position in IIC council for idea creation.

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Last but not the least, we thankfully acknowledge our Project coordinator Mr. M.J. Patil sir for giving us with an opportunity to carry out this project.

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