



4th National Conference on Advances in Engineering and Applied Science
Organized by : Anjuman College of Engineering and Technology (ACET) Nagpur,
Maharashtra, India, In association with
International Journal of Scientific Research in Science and Technology



Design and Fabrication of Semi-Automatic Drainage Cleaner

Krishna Khapekar¹, Prof. Syed Mohiuddin²

¹Mechanical Engineering, A.C.E.T., RTMNU, Nagpur, Maharashtra, India

²Professor in Mechanical Engineering, A.C.E.T., RTMNU, Nagpur, Maharashtra, India

ABSTRACT

Controlling of wastes of water and water pollution must our primary purpose. A short description about the primary treatment which includes screening whereas secondary treatment involves activated sludge, trickling filters etc. and also to measure removal of the carbon in the waste water treatment processes can be done by TOC(Total organic carbon), BOD(Biochemical oxygen demand), and COD(Chemical oxygen demand) is also explained here. The method starts aggregation the sewerage wastes by victimization the arm and it throws back the waste into the box mounted behind the machine. This method has restricted human intervention within the method of clean up and successively reduces spreading of diseases to humans. Drainage systems and its role in sanitation related outbreaks are evident but still occluded once it has been installed. This current review evaluates if drainage system can cause infection and thus be of clinical concern. Improper management of drain line led to chronic diseases. To ensure adequate safe hygiene, this will help to clean drain line in superior manner that will help to maintain public hygiene.

Keywords : Mechanical Drainage System, Hygiene, Sewage, Chain Drive, Induction Motor

I. INTRODUCTION

Impurities gift in removal water will cause blockage of the system. The system are often cleansed time to time manually or such a system are often designed which will mechanically throw out wastage and can keep the water clean. This project is intended to stay clean the system and helps the sleek operating of the system. Drainage cleaning system would reduce the risk of various diseases spread due to accumulation of waste. Thus modified drainage cleaning system will clean up waste from surface to bottom of drain by grab floating as well as waste accumulate at bottom.

Decaying wastes attract household pests and result in urban areas becoming unhealthy, dirty and unsightly places to reside in. Moreover, it also causes damage to terrestrial organisms while also reducing the uses of the land for other more useful purposes. The drainage system can be cleaned time to time manually or such a system can be designed that will automatically throw out wastages and will keep the water clean.

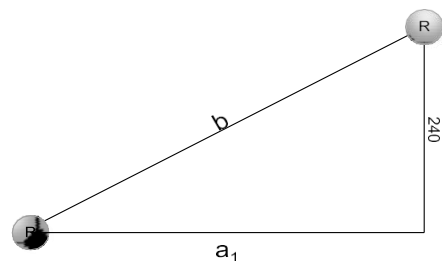


Fig. 1 Concept of Design

II. METHODS AND MATERIAL

A. Working principle

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 lower shaft and wheel arrangement is placed for transporting the machine from one place to another. The upper shaft and wheel arrangement helped for moving the machine during cleaning process. Means this gutter and drain cleaner clean and move together for better cleaning.

Once one lifter completes one cycle from down upward direction, it takes all garbage material like waste bottles, plastics, tins, etc. and therefore the grid drops it on the collecting box fixed up at the rear. The gathering rate of garbage is continued. This device is placed across drainage in order that solely water flows through lower grid waste like bottles, plastics that are floating in drain are upraised by teeth of lifter that is connected to conveyor. This conveyor is connected to shafts driven by motor. Once motor runs the conveyor starts to flow into creating teeth to elevate. The waste materials are upraised by teeth and are stored in waste.

B. Objective

The major objectives of the proposed work are, Design of mechanical drainer, taking into account the various factors that might affect the functionality of the equipment. Fabrication of the model and Assembling of the model carried out, then process are studied and optimized for effective semi-automatic drainer for sewage water treatment for floating materials.

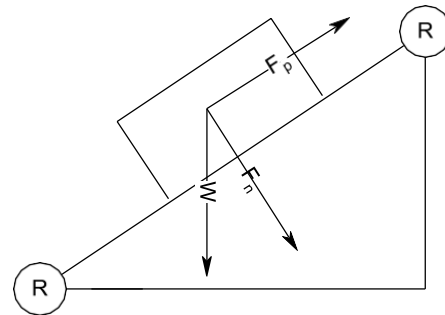


Fig. 2 Force diagram

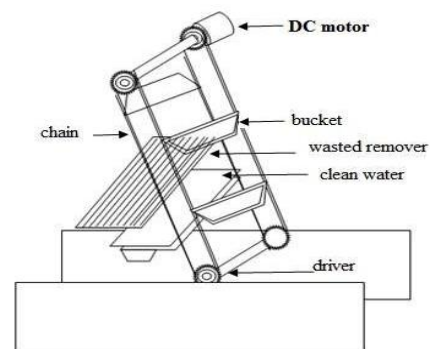


Fig. 3 Roller distance

C. Calculations

Assuming, (a) mass to be lifted
= 5 kg and

(b) Self weight of bucket = 2
kg

Thus,

Total mass = 7 kg,

$\theta = 45^\circ$

If height of bar is selected as 200 cm and according to survey it was found that depth of drainage is 40 to 60 cm. Thus total height is 240 cm and 10 cm clearance provided so that bucket will not stuck to bottom of drainage.

Now from fig,

$\text{Cos}\theta = 240/b$

$b = 340 \text{ cm}$

$$\tan\theta = 340/a$$

$$a = 240 \text{ cm}$$

Pulling forces,

$$(F_p) = \text{mass} \times 9.81 \times = 48.55 \text{ N} \{ \text{assume mass of bucket } 7 \text{ kg} \}$$

Velocity,

$$v = 0.227 \text{ m/s} \{ \text{assume time } t=15\text{sec} \}$$

Acceleration,

$$a = v/t = 0.0151 \text{ m/s}^2$$

Resisting force,

$$F_r = \text{mass} \times \text{acceleration} = 1.05 \text{ N}$$

Torque required,

$$T = F_p \times r = 165.104 \text{ Nm}$$

Power required to drive,

$$P = 2NT\pi/60 = 2.08 \text{ KW} \{ N = 1200 \text{ RPM} \}$$

SR.No.	Description	Size/Qty
1	Mile steel	24 feet
2	Conveyor Belt	1 belt
3	12v DC Motor	One
4	Wheels	Four
5	12v 7.2Ah Battery	One

Table. 1 Materials Required

D. Fabrication of model

Basically during fabrication of the model the basement part is prepared by welding. Then the supporting rods are welded from the basement, the pillow block bearings are fixed to the supporting rod and the front part of the basement. Hollow cylindrical shafts are moving to the bearings and also chain drive are also moving to the shaft in order to fix the shafts the factor of safety of the chain is calculated. The lifters are fixed to the chain by gas welding at an equal distance from each. Wheel shaft arrangement at the basement port of the drain machine another wheel arrangement are also added at near about middle point of the wheel which make the

machine able to move during the cleaning processes

III. RESULTS AND DISCUSSION

While conducting the experiment the parameters considered are uniform flow rate of water, depth of the channel is 1feet and height of the channel is 3feet, rate of disposal of waste is uniform, lifter speed and motor speed is constant. It regularly lifts the waste.

A. Advantages

- 1) These cleaners are easy cheapest way to fix drainage problems.
- 2) Reduction of labour oriented method of cleaning, thus upgrading dignity of labour.
- 3) Low-cost drain-off solution .
- 4) Efficient in handling.
- 5) Time saving, highly efficient.

B. Applications

- 1) Project to use this in efficient way to control the disposal of wastages and with regular filtration of wastages.
- 2) Cleaning and maintenance of sewer lines drains.
- 3) It is used in small and medium type of drainage.

C. Future scope

- 1) Possible to make it a fully automated system by the implementation of control algorithms.
- 2) It can be used with higher accuracy.
- 3) During the real time application, the size of the machine will be big so that more lifter pans can be fixed to the chain and a bigger motor can be used to increase performance and rate of collecting waste.
- 4) A sensor can be placed in the collecting box. As the collecting box becomes full, it gives an alert.

IV. CONCLUSION

The proposed system is providing solution over the total cleaning of drain line not only floating material but also waste accumulates at the bottom of drain. The drain waste water cleaner machine is designed and manufactured by using gear changing and shaft coupling principle. Drainage from industries is treated through this project to meet the national emission standards, with stable operation, low cost and good effect. Also irrigate plants, clean toilets, etc. The cleaner functioned move effectively during the heavier rains which had more volume of running water with garbage and high velocity. By this proposed system, the men power will be reduced. It will also helpful in future for growing economy of Municipal Corporation.

V. REFERENCES

- [1]. Monika S Tambe, et.al. Review paper on fabrication of manually controlled drainage cleaning system. (IGSRD)Volume: 8, issue: 3, March 2017
- [2]. www.howstuffworks.com
- [3]. Department of Water Affairs and Forestry (DWAF). 1998. Quality of domestic water supplies - assessment guide, Department of Water Affairs and Forestry, Pretoria.
- [4]. Sabin Khatri, et.al. Design and Fabrication of Drainage Cleaning System, International Journal of Latest Engineering Research and Applications (IJLERA) Volume – 03, Issue – 05, May 2018
- [5]. Ganesh U L, et.al.Semi-automatic drain for sewage water treatment of floating materials. (IGSRT) Volume: 05 Issue: 07 Jul-2016