



International Journal of Intellectual Advancements and Research in Engineering Computations

Design and fabrication of automated drain /gutter cleaner

**Mr.R.Bharathkumaar^{1*}, S.Syed Sameer², D.Tamilventhan², P.Thamarai Selvan^{2*},
J.Vasudevan²**

¹Assistant Professor of Mechanical Engineering, K.S.R. College of Engineering,

²Students of Mechanical Engineering, K.S.R College of Engineering.

ABSTRACT

In this project we proposed the concept of "AUTOMATIC DRAINAGE CLEANING SYSTEM", which replace the manual work of cleaning drainage by humans. AUTOMATIC DRAIN GUTTER / CLEANER SYSTEM (ADG/CS) proposed to overcome the real time problems. This system is used for automatic cleaning of drainage. This proposed system uses an automatic drain cleaning system that lets fluid flow through it but catches large solid waste like bottles, plastic and accumulates it. Labour cleaning drainage leads to a high risk of them catching infections or poisoning due to large amount of waste/chemical in them.so for reducing work of humans and analysing several problems, we proposed our project ADG/CS.

Keywords: Battery, Chain, Drainage, Gear, GSM, IR sensor, Wiper motor.

INTRODUCTION

The Automatic drainage cleaning system is used to clean the drainage system automatically by the ADCS Machine, which is operated mechanically with the help of several arrangement of various components of machine and various linkages. The water flowing in drainage have various impurities which having plastic bottles, polythene, dirt and other solid waste. Due to blocking of drainage system we may face several problems in rainy seasons as well as normal days. Due to blocking of drainage we see that the wastes get overflow on the roads which is a big problem mostly in rainy season.

So by introducing the Automatic drainage cleaning system we can eliminate the several problems as well as we can replace the human labour who clean these drainage and they having high risk of catching infections. As we know that the drainage is narrow width of 910mm approx. So we have to introduce the ADCS in between the width of drainage.

Working principle

The device is placed across drain so that only water flow through screen, the waste like bottles, plastic etc. Floating in drain are lifted by lifter which is attached with screen. Screen is connected to the shaft which is driven by chain with the help of DC motor. When motor runs the chain start the circulation making screen with lifter to lift up waste, further it is connected to a horizontal screening and waste stored in a container.

LITERATURE SURVEY

Ganesh UL1 et al, Got result as follow-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. a. Alarm will turn on when the collecting bin is filled. b. Lifter speed is constant and it regularly lifts the waste. c. Cost of the machine is economic and it requires only 12-24 volts of current. [1]

Author for correspondence:

Mr.R.Bharathkumaar

Assistant Professor of Mechanical Engineering,
K.S.R. College of Engineering,

Vikisahebrao bagul et al, They worked on deplete squander water cleaner machine planned and made by utilizing gear changing and shaft coupling it comprises fundamentally dc equipped engine shaft squander expulsion plate receptacle course sprocket and chain construction material are effortlessly available create work development and maintenance siple to build [2]

Dr .K.KUMARESAN M.E, Ph.D, et all, During the study of automation technology they realized that Automation is a technology concerned with his application of mechanical, electronic and computer based systems to operate and control production. This system is used TO OPERATE AUTOMATIC SEWAGE CLEANING [3].

Mragank Sharma, They worked on automatic gutter cleaner but constant type of gutter cleaner and can clean only polythene bottle which have ability to flow in water not the salt and soil present on gutter lowest level. [4]

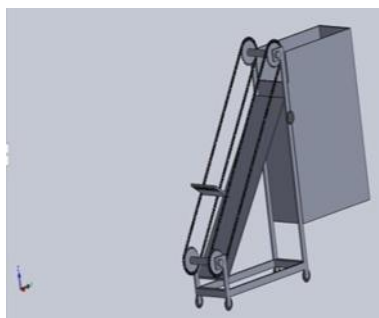
PROBLEM IDENTIFICATION

In today's era automation plays a very important role in all industrial applications for the proper disposal of sewage from industries and household is still a challenging task. Drain pipes are used for the adequate disposal of waste and unfortunately sometimes there may be a threat to human life during the cleaning of blockage in the

drain pipes or it can cause serious health issues because of the pertaining problems like malaria, dengue, etc. In order to overcome this problem as well as to save human life we implement a design “**Automatic Drain gutter/cleaner System**”. We designed our project in order to use it in an efficient way to control the disposal of waste along with regular filtration of drains, removal of solid waste in order to avoid blockage in drains to promote continuous flow of drainage water which ultimately reduces the threat to human life.

FABRICATION OF AUTOMATED DRAIN GUTTER

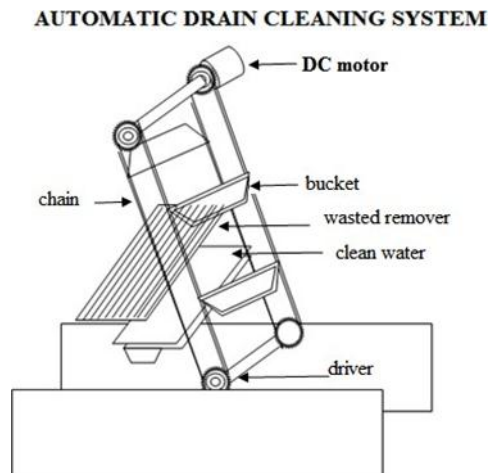
The devices is place across drain so that only water flow through lower grids, waste like bottle, Etc. Floating in drain are lifted by teeth which is connected to chain. This chain is attached by gear driven by motor. When motor runs the chain starts to circulate making teeth to lift up. The waste materials are lifted by teeth and are stored in waste storage tank. The lower shaft and wheel arrangement is placed for transporting the machine from one place to another place as well as one gutter to another gutter. 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 of gutter.



METHODOLOGY

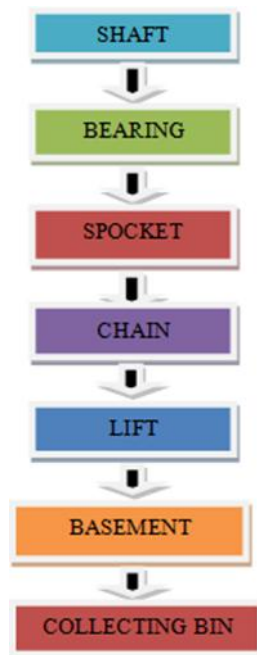
The device is place across a drain so that only water flows through the lower basement. Floating waste like bottles, plastic cans, covers.....etc. is lifted by lifters which are connected to the chain. The chain revolves with the sprocket wheel which is driven by the motor. The energy provided to the

motor is electrical energy. When motor runs the chain starts to circulate making the lifter to lift up. The wastage material are lifted by lifter teeth and stored in storage or collecting bin. Once the collecting bin is full, the waste materials are removed from the bin.



The device is placed across the drain so that only water flows through lower grids. Waste like bottles, etc. floating in the drain are lifted by teeth which are connected to the chain. This chain is attached by gear

driven by the motor. When the motor runs, the chain starts to circulate, making the teeth lift up. The waste materials are lifted by the teeth and are stored in the waste storage tank.



Bill of materials

This material is required for an automated drain cleaner.

Table: Bill of materials list

PARTS	MATERIALS	QUANTITY
Sprockets	Stainless steel	4
Motor	Cast iron	1

Shaft	Mild steel	2
Sheet metal	G.I Sheet	3
Chain	Stainless steel	4
Iron bars	Cast iron	9
Fabrication of lifter and box	Mild steel and G.I Sheet	3
Paint work	Paint(silver)	1

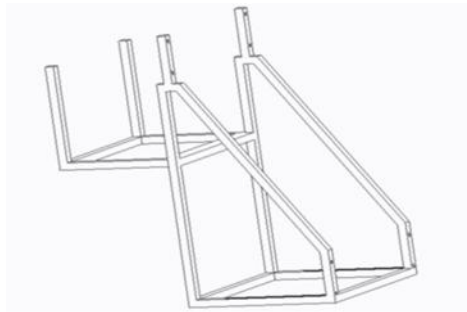
DESIGN

Configuration comprises of use of logical guideline, specialized data, and creative energy for advancement of new component to perform particular capacity with most extreme economy and effectiveness. Thus cautious outline approach

must be embraced. The aggregate plan work has been part into two sections.

1. System design
2. Mechanical design

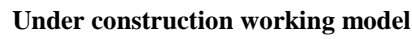
We can use the CAD software to create the model of frame for automated drain cleaner.



This is CAD model frame for automated drain cleaner.

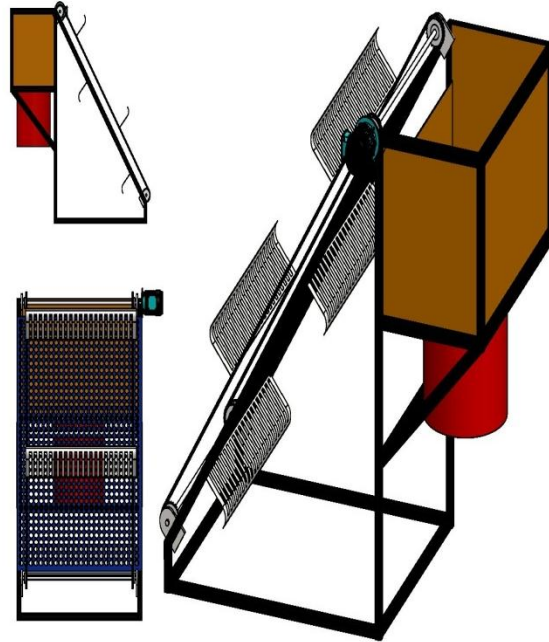


This is Actual model for automated drain cleaner.



Framework configuration is for the most part concerns the different physical limitations and ergonomics, space prerequisites, game plan of different segments on casing at framework, man-

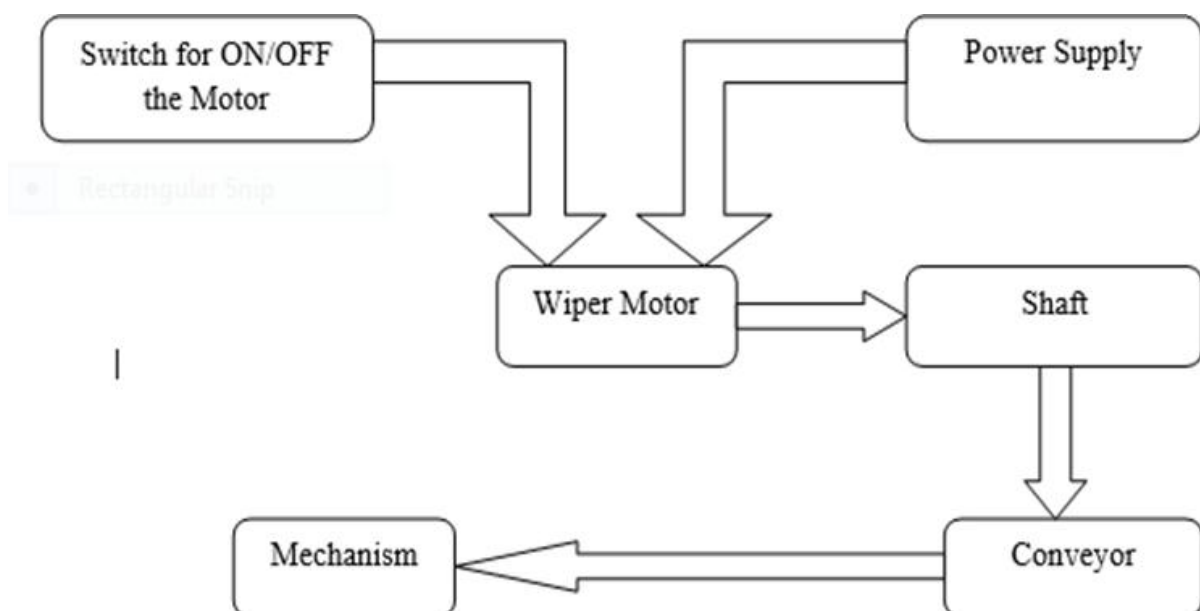
ITEM NO.	PART NUMBER	QTY.
1	frame drain cleaner	1
2	chain sprocket and shaft assembly	1
3	safety holder	4
4	mesh sheet	1
5	hatch - drain cleaner	1
6	hook - drain cleaner	4
7	GDTL-B1 ASSEMBLY w/ MOTOR	1
8	drum	1

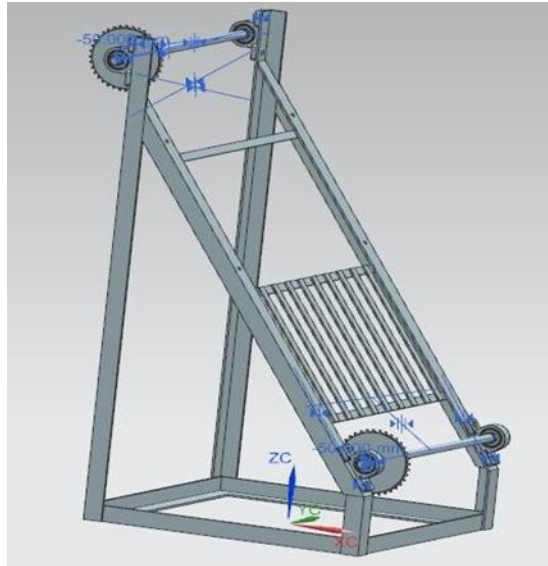


Working

The device is placed across a drain so that only water flows through the lower basement. The system consists of four sprockets (set of two). Floating wastes like plastic bags, bottles, cans, etc. is lifted by the lifters which are connected to the chains. The chain revolves with the sprockets which are driven with help of worm gear motor. The purpose to select worm gear motor is that it has high torque and low rpm. When we supply electric power to the motor the motor starts to

rotate so as the sprockets and the chain. As the chain starts to rotate the lifter starts to lift up. The lifters collect the floating waste from the waste water and store it into the storage bin or collecting bin. The collecting bin is of detachable type which can be replaced by another bin when it gets filled up by waste. A wire mesh is placed between the arrangements so that no solid waste flows through the arrangement. A regulator is also provided so as to control the speed of the motor according to the amount of the solid waste flow.





Proposed system

Machine Specification

The machine specification of automated drain gutter/cleaner.

Dimension of Base- 635mm x 635mm

Height of Frame- 1219.2 mm

Rpm of Motor- 30 rpm

Voltage of worm gear motor- 12v

Current Capacity of worm gear motor-15 amp

Torque of Motor-171800.00 N-mm

Inner Diameter of Bearing- 20mm

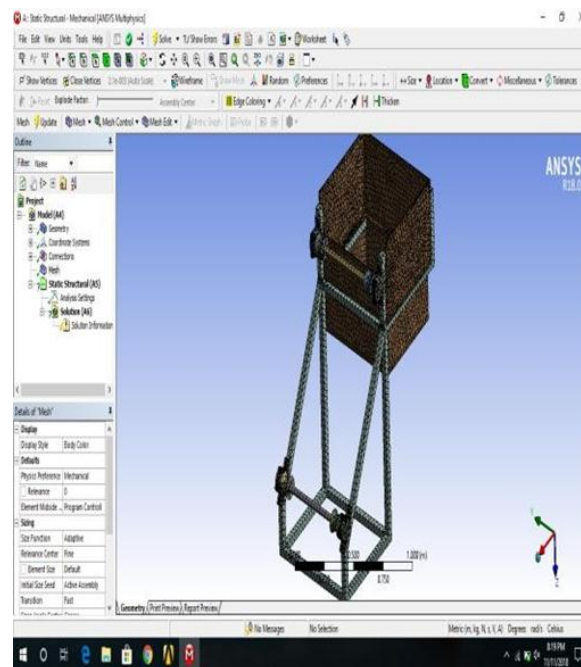
Diameter of Shaft- 22mm

Inner Diameter of Sprocket-22 mm

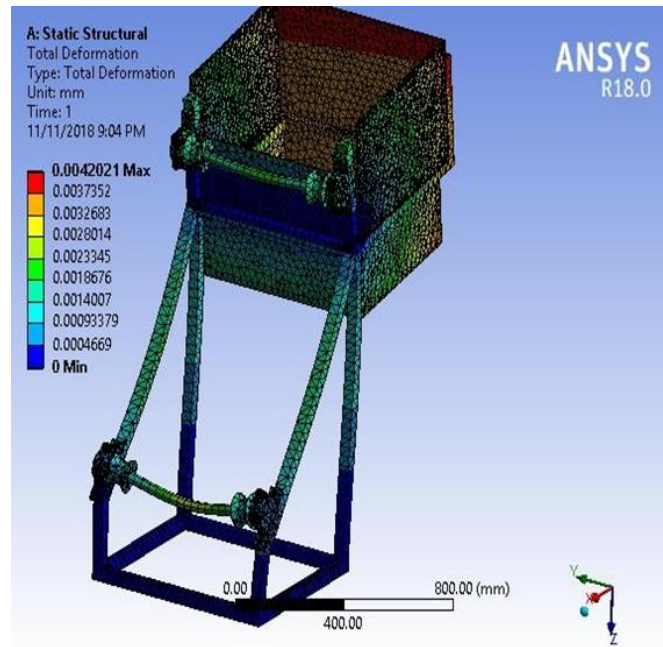
Length of Chain- 2540mm

Analysis

The automated drain gutter can be analysis by FEA-finite element analysis.



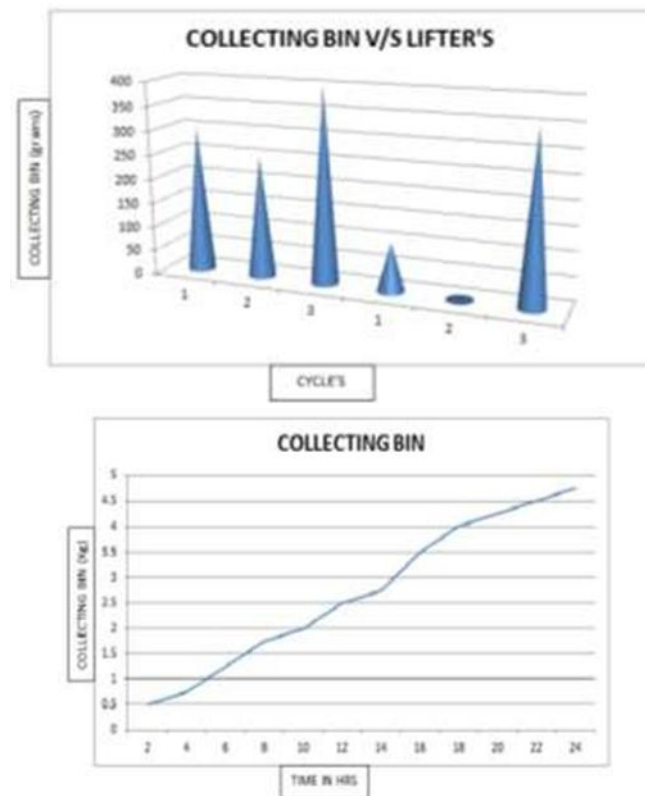
Meshing of model using ANSYS software.



Total deformation analysis of the model.

Graph

Time v/s collecting bin



Cycle v/s Collecting bin

RESULTS

Drainage Cleaning System is a social incentive project where we tried to present a much better procedure to keep our drain clean and thus providing the way to a cleaner and safer surrounding.

We performed the following test and results are being discussed as follows:-

- ✓ Weight Lifted We tried to present the model where the model is successfully able to lift the 15 Kg.
- ✓ Speed of the Drain As the setup which performs excellently on the constraints condition that have been designed in view of the real life drain condition, we try to provide the drain with the minimum speed of 30-50rpm.
- ✓ Time taken by each lifter to lift each object from bottom to top is 11.46 sec. Quantity of waste collecting in the collecting bin is nearly 8-9 kilogram.

CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries. We are proud that we have completed the work with the limited time successfully. The “Designing of automated drain/gutter cleaner “system is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities. Thus we have developed an “Drainage cleaning machine” successfully.

REFERENCES

- [1]. Refereed Journal of Engineering and Science (IRJES) ISSN (Online) 2319-183X, (Print) 2319-1821 3(3), 2014, 54-60.
- [2]. International journal of innovative research in technology IJIRT Balachandra.G, Karthikeyan.S, Elangovan.K, and Divya.N. 1,2,3 B.E/EEE Final year, Knowledge Institute of Technology, Salem, India 4 Assistant professor, Department of EEE, Knowledge Institute of Technology, Salem, India 3, 2014.
- [3]. Theory of machines –S S Rattan Department of Mechanical Engineering Regional Engineering College Kurukshetra. Publication: Tata McGraw-Hill Publishing company Limited 2004.
- [4]. Design of machine elements (DME-II) by K Raghavendra 1, 2015.
- [5]. Design and Data hand book for Mechanical Engineers by K Mahadevan and K Balaveera Reddy. 4, 2013.
- [6]. www.howstuffworks.com
- [7]. www.youtube.com.
- [8]. Theory of Machines – S. S. Ratan.
- [9]. R. Sathiyakala, S. Flora Grace, P.Maheswari., S. Majitha Bhanu, R.Muthu Lakshmi 4(2), 2016.
- [10]. Department of Civil Engineering Michael Okpara University of Agriculture Umudike Abia State 2014.
- [11]. Prof. Nitin Sall, Chougale Mohammed Zaid Sadique, Prathmesh Gawde, Shiraz Qureshi and Sunil Singh Bhadauriya 4(2), 2016.
- [12]. IJRET: International journal of research in engineering and technology eISSN 2319-1163 | pISSN: 2321-7308.
- [13]. International journal of science and technology management and research 2(2), 2017. International conference on exploration and innovation in engineering and technology (ICEIET 2016).
- [14]. International journal of engineering science and computing 7(5), 2017.