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Fabrication of Automated Drainage Cleaner

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Abstract: *This Project is about planned conception to exchange the manual add gutter cleaning by automatic gutter cleaning system.Now a days although mechanical evacuation plays a significant role all together domestic and industrial applications within the correct disposal of sewages from domestic, industries applications within the correct disposal of sewage. Yet, the proper disposal of sewage from industries is still a challenging task. Drainage pipes are been used for disposal and unfortunately sometimes there may be loss of human life while cleaning the blockage in the drainage pipes. In order to overcome the problems in manual drain cleaning, we are implementing "AUTOMATIC DRAINAGE CLEANING SYSTEM", to clean and control the drainage level.*

Keywords: *Evacuation, Sewage, Drainage, Disposal.*

I. INTRODUCTION

Automated Drainage Cleaner is an innovative Solution to the age-old problem of maintaining a clean drainage system. The device will be capable of detecting blockages, removing debris, and flushing the pipes with water. Automated Drainage Cleaner is a system designed to automate the process of cleaning and maintaining drainage systems in residential and commercial areas. Water running through a water drainage system mostly carries along waste materials most which are non-biodegradable which cause flooding as well as climate change. Overflow of water drainage system occurs when there is a blockage of drainage system. This blockage forces the water to find its way apart from the mapped out drainage system.

The impurities present in water can cause hazardous and harmful diseases which can be very harmful to all living beings. As long as the draining system is considered the function of the main drainage system is to collect, transport and dispose of the water through an outlet. Impurities in drainage water can be only like empty bottles, polythene bags, papers, domestic waste, etc.

With the continued expansion of industries, the problems of sewage water must be urgently resolved due to the increasing sewage problems from industries of the surrounding environment. Our proposed system is to cleaning and control the drainage level using auto mechanism technique. Auto mechanism is the major controlling unit and the drainage level a monitor by municipal. In this system we used hand wheel, chain driver, bucket, frame, solar panel.

The device is designed to automate the cleaning process and reduce the work load for maintenance personnel. The project involves the design and development of a machine that can be used to clean drainage systems in both residential and commercial settings.

II. LITERATURE SURVEY

Proposed with the automatic cleaning of waste water in order to prevent global warming and melting of glaciers [1]. The results emphasize the need of waste water treatment plants, through which the water is treated before suspending in rivers. Firstly power is generated and that power is used for waste water cleaning process. The drainage cleaning to replace manual work to automated system because manually cleaning system it is harmful for human life and cleaning time, is more so to overcome this problem they implemented a design [2] "Automatic drainage water pump monitoring and control system using PLC and SCADA". PLC and SCADA were designed. In this project to use efficient way to control the disposal of wastage regularly, treatment of disposal in different way toxic and non-toxic gases. [3] Showed the usage of mechanical drainage cleaner to replace the manual work required for drainage cleaning system. Drainage pipes are very dirty. Sometimes it is harmful for human life while it is need for cleaning drainage system. To overcome

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this problem, they implemented a mechanical semi-automatic drainage water cleaner and so the water flow is efficient because of regular filtration of wastages with the help of that project.

Drainage pipe using for disposal and it may be loss for human life while cleaning the blockage in the drainage pipes [4]. To overcome this problem they implemented "Automatic Sewage Cleaning System". They designed their project different way by clearance of gaseous substance are treated separately so the flow of water efficiently. They made their project economical and efficient with the available resources. E bucket (electronic bucket) [5] use for drainage cleaning system because E-bucket lifted a sewage and used evaporation treatment for this sewage wet sewage was converted into dry matters, with the of ARM board (ARDUINO) this process was performed. The flow of used water from homes, business industries, and commercial activities is called waste water. [6] 200 and 500 litres wastage water are generated each person every day. So using waste water technology that removes, rather than destroys, a pollutant in a drainage system. Describing the concept and software design of an innovative general purpose platform for network based model development and look at some of crucial computational design issues [7].

III. OBJECTIVE

- To replace the manual work in drainage cleaning by an automated system.
- Drainage cleaning to prevent humans from getting affected by various diseases from the infectious microbes present in the sewage while cleaning manually.
- Improve the efficiency and effectiveness of drain cleaning.
- This proposed system is to minimize or overcome the problem faced while using man-operated machine and to minimize the increased dumping rate of the waste.

IV. WORKING PRINCIPLE

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 the machine then the motor starts functioning. Which provides rotation to the shaft, and through the help of the shaft, the sprockets which are fixed to the shaft rotates.

Due to the rotation of the sprocket rotates. As the chain turns, the two lifters, which are connected to the chain at half-length of the chain, start turning 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 trash from the water. The devices are placed across drain so that only water flows through lower grids; waste like a bottle, etc.

So gutter cleaners need to just clean these gutter cleaning systems installed at a point instead of cleaning entire gutter floors. Our system consists of metal teeth based jaws that wait at the bottom of the mechanism. The vertical frame bed is used to let liquid flow but catch all solid waste. The system consists of a filter basket on the top of it. After particular time of interval the jaw lifts up using a motorized shaft which is connected using a chain to the jaws. It then reaches the top and turns upside down to dump the solid waste. Now after dumping the waste, the motor rotates again to bring the jaws again to the bottom position to collect more waste. The system is a very efficient way to cleaning gutters & drains.

V. FRAME DESIGN

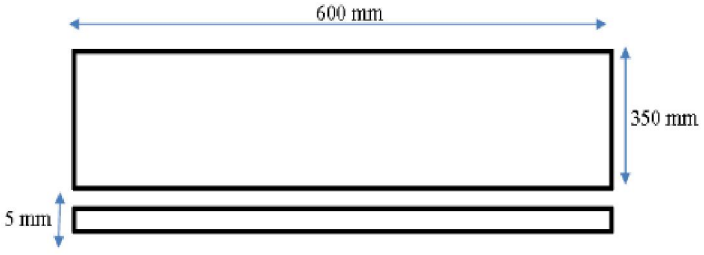

Fig. 1 Frame Dimensions

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5.1 Final Model in Catia V5:

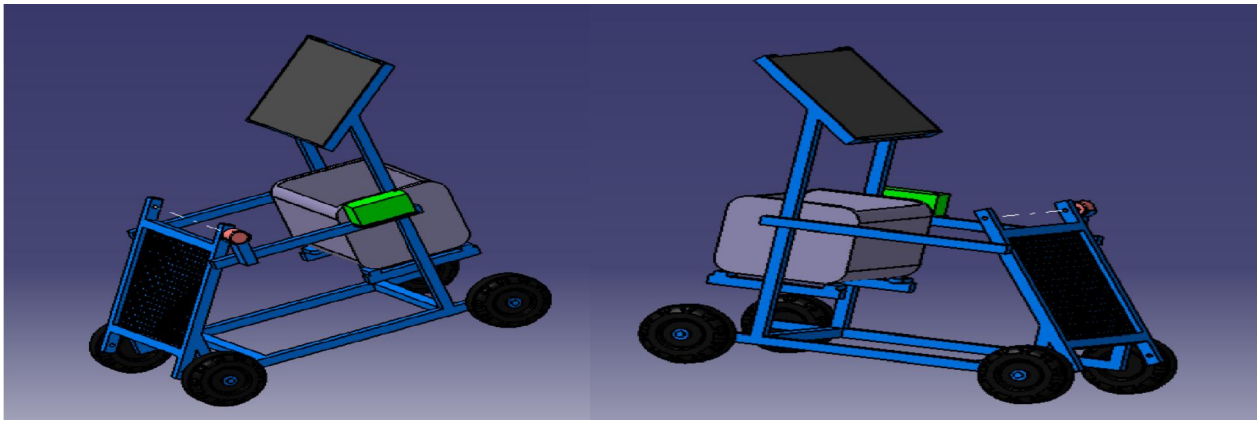

Fig. 2 Catia Model of the setup

5.2 Pressure Calculations

Assumptions:

1. Assuming water pressure on frame is 2000 kg/m^3

P = 2000 Kg/m^3

$m = PV$

= 2000 x 0.35 x 0.6 x 0.005

= 2.1 kg

W = mg

= 2.1 x 9.81

= 20.601 N

Pressure = Force/Area

= 20601/(210 x 10^{-3})

= 98.1 Pa

As its pressure limit is 5 Kgf/cm^2 which is greater than calculated pressure 0.0010034 Kgf/cm^2. Therefore, calculated pressure is within the safe limit.

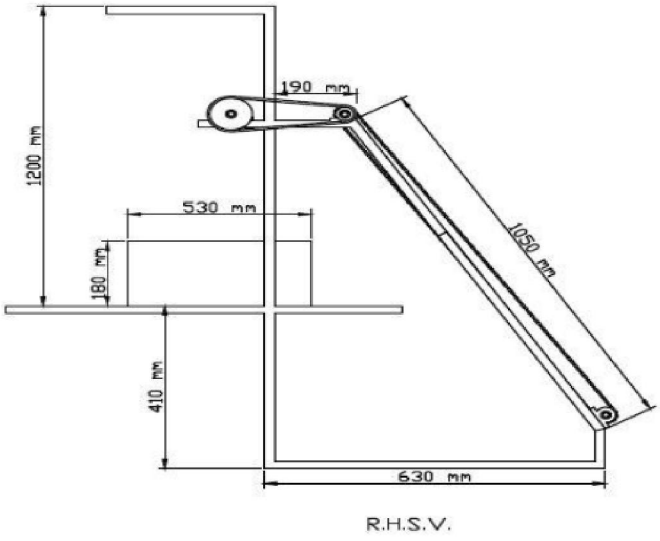

Fig3: Side View Dimensions

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5.3 Calculation for Base Frame

Assumptions

Total load on frame is about 10 Kg

F = m x g

= 10 x 9.81

= 98.1 N

This load is applied at the centre as shown in fig i.e. at 305 m

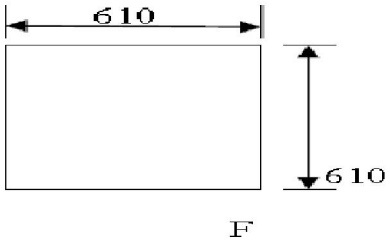

Fig.4 Base Frame Dimensions in mm

From Fig.

R1 + R2 = F

And

ΣMR1 = 0

F x 305 – R2 x 610 = 0

98.1 x 305 – R2 x 610 = 0

Therefore,

R2 = 49.05

R1 + 49.05 = 98.1

R1 = 49.05

Mb = 49.05 × 305

Mb = 14960.75

Y = b/2 (b = width of square pipe of frame)

Y = 25/2

Y = 12.5 mm

$I = bd^3 / 12$

$I = d^4 / 12$ (b=d

$I= (25)^4 / 12$

I= 32552.333

Stress on frame,

σ = Mb y / I

σ = (32552 × 10) / 14960.75

$\sigma = 21.75 \text{ N / mm}^2$

σ = Syt / FOS

Therefore,

Syt = σ × FOS

Syt= 21.75 × 3 (Assuming FOS = 3)

$Syt = 65.75 \text{ N / mm}^2$

Selecting material GCI 15 having Tensile strength (min) = 150N / mm^2

For, safer design considerations as 65.75 N / mm^2

Therefore all assumptions are in safer state.

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5.4 Selection of Motor

Fig. 5. Motor

Motor selection,
Suppose 2 Kg of waste to be lifted.
Force required = 2 x 9.81
= 19.62 N
Torque required = Force x Radius
= 19.62 x 0.075
T = 1.5 Nm
Power = 2 Pie NT/60 (Consider Motor of 30 RPM)
P = 2 x Pie x 30 x 1.5/60
P = 4.71 Watt
Hence, we used motor of 30 RPM and 10 Watt.
We used motor of 12 V and 850 mA.
So we are using battery of 80 Watt, efficiency 75 %
Hence, if battery is full charged, our system will run for approx. 8 hr.

VI. FINAL MODEL OF THE PROJECT

Fig. 6 Final fabricated model of the project

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VII. 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 "AUTOMATED DRAINAGE CLEANER" system is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. Thus we have developed a "DRAINAGE CLEANING MACHINE".

VIII. FUTURE SCOPE OF THE PROJECT

- The project Drainage Cleaning System definitely serves the many dimension the human needs and definitely presents a bright future aspect in this domain.
- With technological advancement this core-mechanical project can be revolutionized to include the technology like GSM, to make the working of the Municipal Boards of the cities more viable.
- The project can be incorporate the automatic dustbin lifting system and hence the project can be tech-abled.

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