

Design and Analysis of Drain Scrap System for Recycling

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Abstract: Water is a critical resource in the lives of people who both benefit from its use and who are harmed by its misuse and unpredictability. There are many ways in which water intended for human consumption can get polluted. It is reported that one of the largest sources for this is untreated sewage, discharge into rivers that ultimately affects environment and thus, finally human beings. Nowadays, water is purified in many ways but here we are developing drain scrap recycler so that dumped waste in water sources can be removed without polluting rivers and sea. So to remove a certain amount of solid waste from the waste water we will use the Drain scrap recycling machine.

KEYWORDS: Chain Drives, pulley, Drain Water, Filtration



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INTRODUCTION:

Cleaning of drainage has always been a major problem in the society. It got contaminated by various toxic, inorganic industrial pollutants that results in several problems such as unsafe for consumption for humans and irrigation activities. There are also various micro-biological agents that include bacteria, viruses which can also cause water pollution and may cause various water-borne diseases.

Researcher's shows that heavy metals are a major constituent of the toxicants released from the scrap metals that resulted from smelting, refining and disposal of the tailings into the environment. These metallic particles could be washed off by erosion into rivers and they could degrade the water quality. Man, plants, and animals need water for their survival, thus these inorganic pollutants present in the water pose a great threat to the environment and consequently to human existence.

A huge number of municipal solid waste (MSW) landfills and the many hazardous materials which they contain pose a serious threat to both surrounding environment and human society. Once waste is deposited at the landfill, pollution can arise from the percolation of leachate to the porous ground surface.

The Device is to be placed across drain so that only water flow through lower grid, waste bottles etc. Floating in drain is lifted by tooth connected to chain. When motor runs the chain starts to circulate making teeth to lift up.

STRUCTURE OF PAPER

The paper is organized as follows: In Section 1, the introduction of the paper is provided along with the structure, important terms, objectives and overall description. In Section 2 we discuss about literature review. In Section 3 We have given the methodology and cad analysis of the machine. In Section 4 we have given the Results. The Section 5 it includes Conclusion, Future Scope and References.

OBJECTIVES

Providing clean water is an essential requirement for setting up and maintaining various human activities. The problem such as Environmental pollution and spreading of viral diseases are avoidable. Drain scrap

recycling system would reduce the risk of various diseases spread due to accumulation of waste.

LITERATURE REVIEW

1. A Journal of pollution effects and control; 2017:202 "Clean India through Reuse and Recycling of wastes

- To improve solid waste management, waste generation and disposal, Organic wastes converted to manures.

2. Journal of Water Resources Development, Journal of Great Lakes Research.

- To reuse waste water, role of ground water in loading of nutrients to a restricted bay in shield lake, irrigation and drainage: management, maintenance and operation, water use, river conservation.

METHODOLOGY AND MODELLING

3.1 GEOMETRY: -

For the Geometry of 2D machine we have taken it from the the journal on

- "Design and Fabrication of automated drain cleaner machine."

According to the Journal, Our dimensions and specifications of the drain scrap system are as follows:

Part	Material	Specification (all lengths in mm)
Sprocket	Cast iron	No of teeth 45 Diameter 60mm
Total chain length	hardened steel	7770
Tube dimensions	steel	60 x 24 x 2
Conveyor (Mesh)	GI sheets	1584 x 1219 x 20
Collecting tank	MS	1158.24 x 411.48 x 457.2
Shaft length	EN8	1342
Total height		2200
Total width		1220
Drainage collector	Hardened steel	1048.5 length x 104.75 radius
No of caster wheels		4 Quantity

Motor Specifications:

Holding torque (kg-cm) -87

Operating Voltage (VDC) -4.2

Supply Current (A) -5A/Phase

No of leads	-4
Weight(gm)	-3620
Dimensions(mm) LxWxH	-114x85x85
Frame size(mm)	-85x85
Shaft diameter(mm)	-14
Shaft Length(mm)	-37
Step angle accuracy	- +/-5%
Cable length(cm)	-42
Shipment weight(Kg)	-4.1
Shipment dimensions(cm)	-16X10X10

Assuming this life as average life= 21000x60x25 =31.5million revolution

Taking bearing No.: 6200

This bearing is having the dynamic load capacity (C) = 626080

Static Load carrying capacity (Co) = 3070

Now $F_r/C_o = 0.0012$

Now the value of 'e' = 0.19

Density = 7208 Kg/M3.

3.2 DESIGN MECHANISM: -

A sprocket is a toothed wheel that is used to transmit motion and torque from one shaft to another. Chains that are used to transmit motion and force from one sprocket to another are called power transmission chains. Unlike gears that have to mesh to transmit motion and torque from one gear to another, sprockets may be positioned far apart. Sprockets are connected by a chain.

Design of shaft:

Material: Mild Steel (Water Quenched)

Modulus of Rigidity (G) = 72 gpa.

Modulus of Elasticity (E) = 205gpa.

Yield Stress (τ) = 241 mpa (In Shear)

Yield Stress (σ) = 414 mpa.(In Tension)

Permissible Shear Stress: 462 mpa.

Permissible Tension: 655 mpa.

Shaft Dia = 20 mm

Length of Shaft (l) = 40 mm

Volume = $(\pi/4) d^2 l = 2.09 \times 10^{-5}$

Mass = Volume * Density = $2.09 \times 10^{-5} \times 7808 = 0.1257\text{kg}$

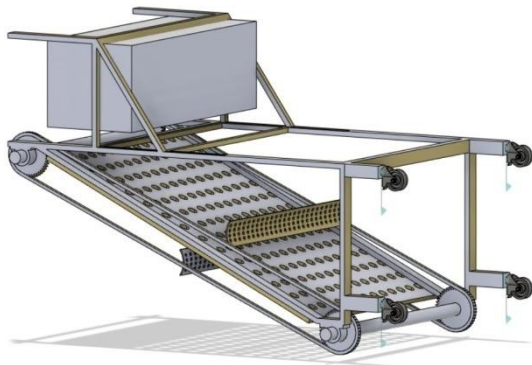


Fig 1.0

3.3 CALCULATIONS:-

3.4 Design calculation-

Design of shaft bearing of mechanism:

Radial load (ft) :7.2N

Diameter of shaft : 60mm

Let the life of bearing be : 21000Hrs

M=22rpm

Weight = $0.1257 \times 9.81 = 0.7136\text{N}$

Now calculating bending stress on shaft

$M = 0.26209 \text{ N-m.}$

$y = d/2$

$\sigma = 1.89 \text{ MPa}$

$\sigma = 2.099 \text{ MPa}$

3.5 ANALYSIS

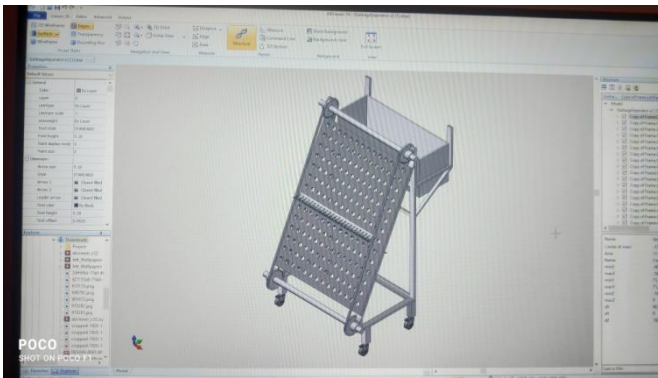


Fig 2.0_design

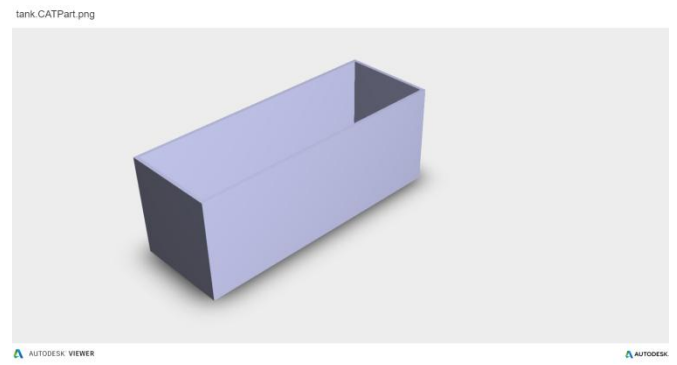


Fig2.4_tank

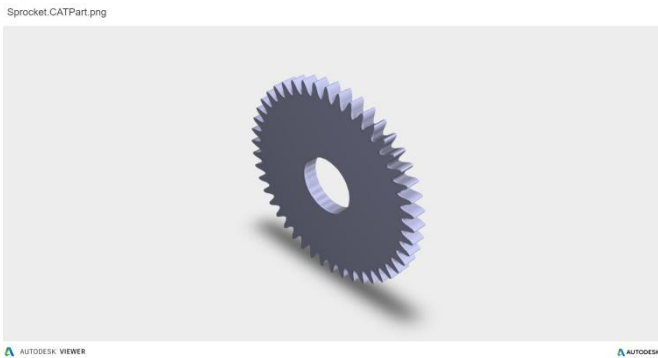


Fig 2.1 _Sprocket

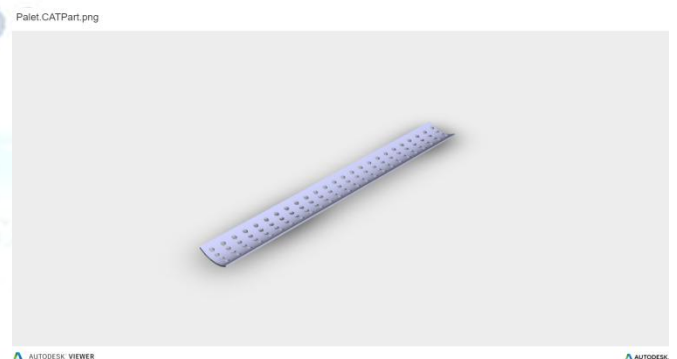


Fig 2.5_Palet



Fig 2.2_Frame



Fig 2.6_shaft

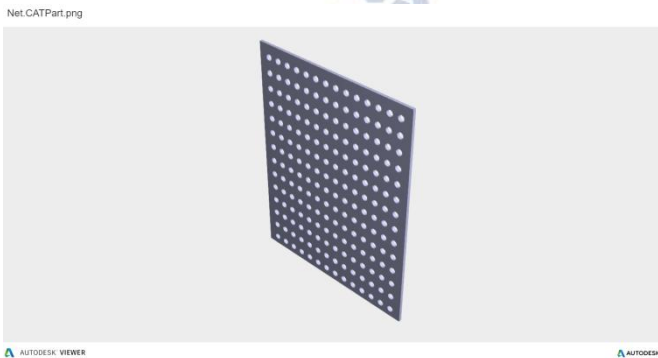


Fig 2.3_Net

The format of the file is “.step and .CATPart” which is mostly used in CAD softwares for viewing 3D objects. The above model is done by using CAD software and by using AB viewer v14 to show. So this device is set across the drain such that floating waste running through the drain is easily picked by teeth and throws it away in the bucket attached at backside of the system model. This tank can be changed frequently according to wastage.

RESULTS

Drainage scrap system is our initiative project for providing a clean drainage and keeping our surroundings safe. The collecting tank can be changed or can be used after cleaning.

Maximum weight lifted by the collector is found to be 1-15Kg.

Based on real view drainage condition, we provided drain with Minimum speed of 20-40Rpm.

CONCLUSION AND FUTURE SCOPE

As the project has been based on the concept, in benefit for human health and providing society benefits. All these solid waste can be converted into bio fuels and manures.

All the basic components used majorly consists of chain drives, Welding, Bearings etc components are finely designed to build a simple structural project.

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4. Yassi AL, Kjellstrom T, DeKok T, Guidotti T 2001. Basic Environmental Health. New York: Oxford University press.