International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

Design of Automatic Garbage Collecting Vehicle

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Abstract – *As the garbage collection is one of the most hazardous jobs in our country and to avoid direct contact between the worker and harmful trash. So this paper concentrates on designing of automated garbage collecting vehicle. It also discuss in detail about the every component of this garbage collecting vehicle. Automation is nothing but a work without manual effort so this paper; contain the design and analysis of each and every parameter of automatic garbage collecting vehicle. As this automatic garbage collecting vehicle is battery operated so the pollution by this vehicle is negligible.*

Key Words: *Lifting mechanism (arm), three-wheeler, Actuator, Battery, Creo3.0.*

1. INTRODUCTION

In today's era of huge Modernization, in different sector of engineering so many of new advanced techniques are released. So we have to add some modern techniques in it. As we know that everyone trying to reduces three things in today's era which is- 1] Manpower 2] Cost 3] pollution.

As the accuracy of any machines work is very preferable and the time consumption is also a three wheeler vehicle consist of garbage container while is the tail of the vehicle. This vehicle is electronic vehicle operated by battery in which pollution by fuel is reduced. In this three wheeler vehicle has two breaks i.e. disc and drum at its back and front wheel respectively. This mechanical arm (lifting mechanism) is placed at center and right hand side of the trolley. This mechanical arm has three joints and actuators for the ruse of arm. This arm has gripper at its one end which grips the dustbin and pull down into the garbage container (trolley). This arm (Mechanism) has three degree of freedom.

During the garbage collection process, the worker who always in contact with the hazardous garbage which may cause diseases.

As the safety of worker is also important this could be achieved in this project. This automated garbage collecting vehicle expected only one man for its working operation as he just want to drive the vehicle and operate the mechanical arm by the lever provided near him.`

1.1 Literature Review:-

For designing the automated garbage collecting vehicle we required a clear idea of basic parameters, requirement and design of any three- wheeled vehicle. So we made a detail study on automobile and refer different books for arm.

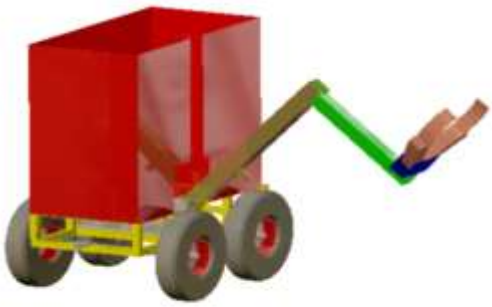
1.2 Main Parts of vehicle.

- **Actuator**
- **Mechanical Linkage Arm**
- **Trolley**
- **Battery**

Actuator:- Actuator is a device which convert electrical energy into linear motion. It is a component that is responsible for moving and controlling a mechanism or system, in simple term it is a "mover". An actuator requires a control a signal and a source of energy.

Mechanical linkage arm: - The arm is a type of mechanical arm, usually programmable with similar functions to a human arm. The links of such a manipulator are connected by joints allowing either rotational or translational motion.

Trolley: - It is use for the storage of garbage which is place behind the driver cabin and generally made out of metal or plastic.



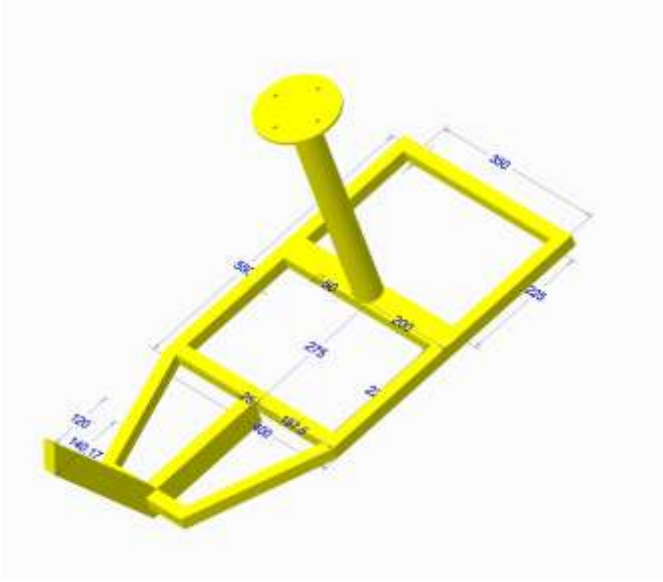
Battery: - 12v battery is use for power supply to vehicle. It is use for driving the vehicle and movement of arm.

2. Design & Analysis report

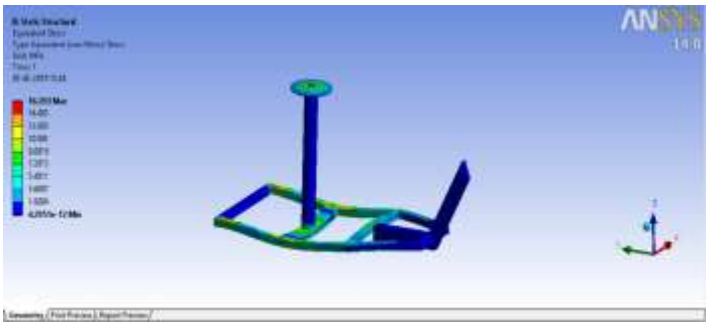
- **Chassis**
- **Wheel Hub**
- **Mechanical Arm**
- **Axle**
- **Creo Assembly**
- **Draft Model**

1. **Chasssis:-**

The chassis is the mail supporting structure of motor vehicle. The chassis we have used is of the rectangular tubular section, so as to make it light weight and shock absorbent. The function is to deal with static and dynamic load without under deflection or distortion. The material used for making the chassis is mild steel (SAE 1018) which is having young modulus 210 GPA. It is analysis by applying various constrained and loads was performed on the basis of ANSYS software.



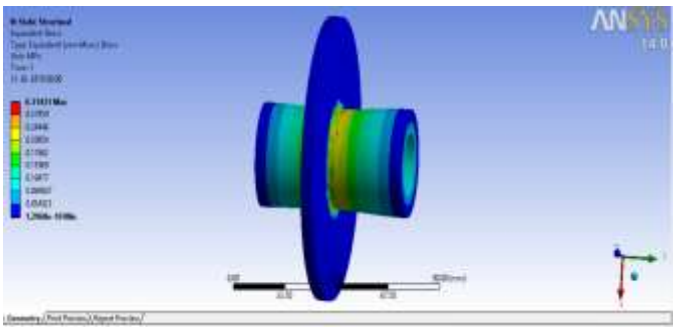
CHASSIS DESIGN -CREO MODEL



Load applied: 2000 N
Maximum stress induced: 16.203 mpa
Factor of safety: 2

2. Wheel Hub:-

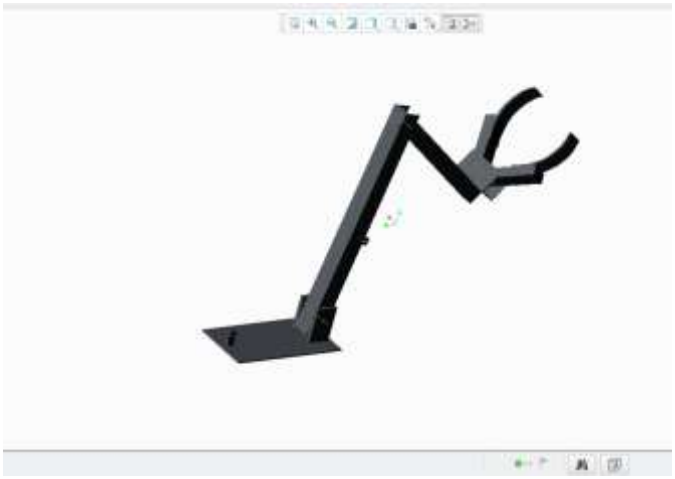
A wheel hub is the mounting assembly for the wheel of vehicle, it houses the wheel bearing as support the lugs. It is automotive part used in most cars, passenger vehicle ,light &heavy trucks. The wheel hub transfer the vertical load from the wheel to the axle. The axle hub spins along the wheels bolted to it and provide the power to the wheels in order to rotate.



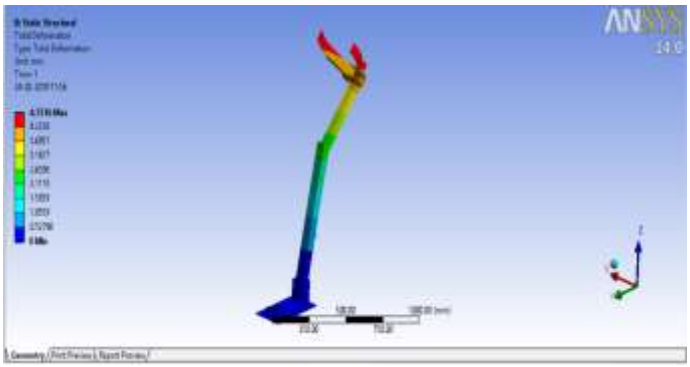
Load applied: 1500 N
Maximum stress: 0.35431 mpa
Factor of safety: 2

3. Mechanical Arm:-

A mechanical arm is machine the mimics the action of human arm. They are composed of various linkages. The mechanical arm (lifting mechanism) is placed at center and right hand side of the trolley. This mechanical arm has 3 joints and actuator for the rise of the arm. The 2 actuator used for the moment of the 2 actuator & 1 actuator is used for the gripping mechanism. This arm has gripper at its end which catch the dustbin and pull down in the garbage container (trolley). This mechanical arm has 3 degree of freedom.



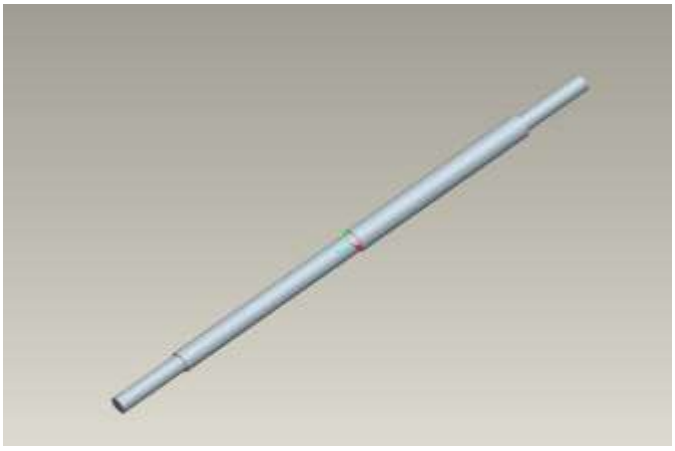
ARM DESIGN- CREO MODEL



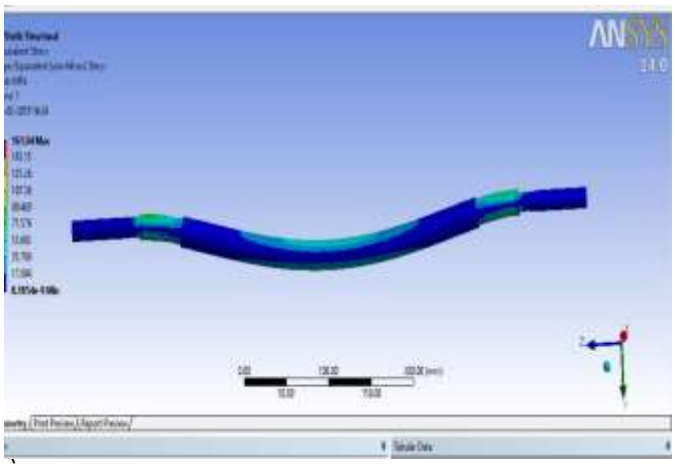
Load applied: 500 N
Total deformation: 475.96mm

4. Axle:-

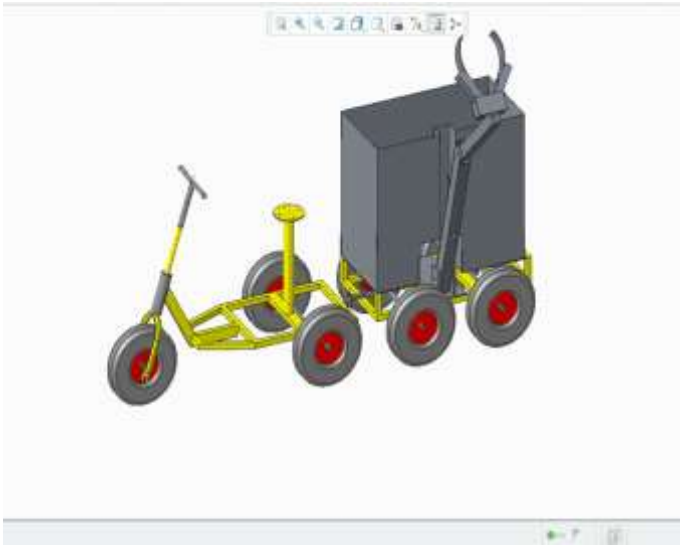
Axle is the main shaft of the vehicle which carry maximum load, the diameter of main shaft is 22mm. The material use for axle is Bright Mild steel bar.



AXLE DESIGN- CREO MODEL

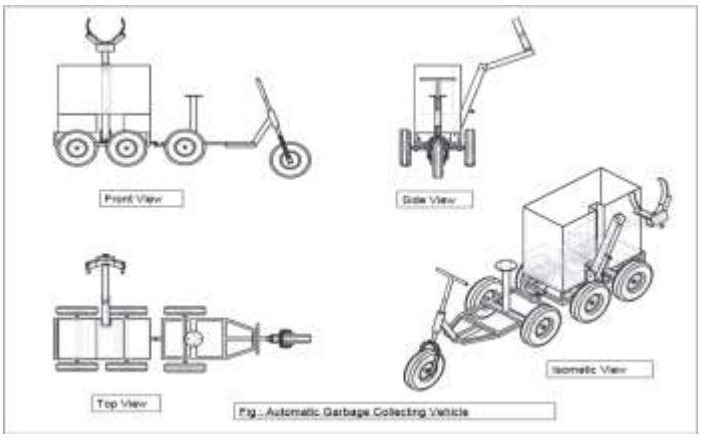


Load Applied- 2000N
Maximum Stess-161.04mpa
Factor of safety- 2



AUTOMATIC GARBAGE COLLECTING VEHICLE:-CREO ASSEMBLY.

DRAFT MODEL:-



SPECIFICATION:-

1. Motor:- e-bike motor

- **250w**
- **450rpm**

2. Battery:- Lead acid battery

- **12(4)**
- **24 Ah**

3. Controller:-

Controller is the heart of an electric vehicle, and it is the key for the realization of the high performance vehicle with an optimal balance of maximum speed, acceleration performance and driving range per charge. Generally controls the ratio between torque and speed. In this vehicle we are using **BLDC** hub controller.

4. Material:-

- **Mild steel (SAE1018)**
- **YS = 250 mpa**
- **Young's modulus = 210 Gpa**
- **Poisson's Ratio = 0.29**

5. Wheel:-

- **Wheel diameter =350 mm**
- **Wheel base =950 mm**

6. Brakes:-

- **Disc Brakes**
- **Disc Diameter :-**
- **Outer diameter: 140mm**
- **Inner diameter: 35mm**

7. Track Width:- 650mm

8 .Top Speed :-25 kmph

9. Ground Clearance:-

170 mm

10. Trolley Dimension:-

820mm*410mm

BENEFITS:-

Economical:-

Now a days cost of fuel is increasing day by day ,by implementing the vehicle which is(fuel free)is very beneficial and economical to use.

No Pollution:-

As there is no emission of hazardous gaseous like CO2, HC,N,CO carbon particle, hence there is no air pollution.

Less Maintenance:-

As the vehicle is compact in size, hence consist of less parts therefore the maintenance required is less.

Less power:-

Less power is required for performing various operation to three –wheeler vehicle and arm.

Working Skills:-

Automated garbage collecting vehicle only require a single person for their operation and semi-skilled worker can operate easily.

CONCLUSION:-

This project is designed to fulfill the task of collecting garbage from various places. The innovation is easy and less expensive and has many advantages. From above paper we conclude that this vehicle is directly applicable for society. It is our one step forward " Swatch Bharat Abhyan " by referring above advantage , the vehicle is not only use for society but also economical for environment. The design and construction of Automatic garbage collecting vehicle was challenging task this report provide a clean insight in design and analysis of our vehicle.

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