

# 360-degree wheel rotating vehicle

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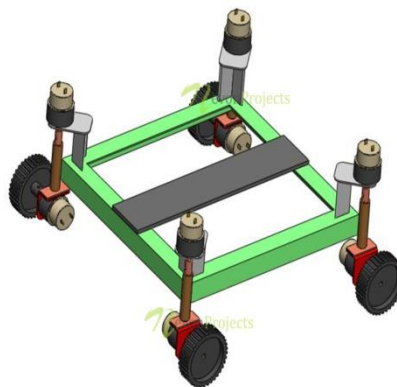
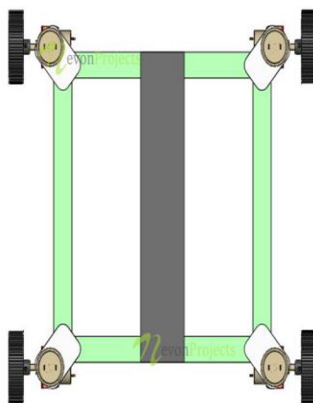
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**Abstract** - This project is about 360-degree rotating vehicle. This vehicle moves in all directions and this design provides better comfort and also saves the time, most of the people uses this vehicle to carry goods, emergency patients etc. The normal wheel vehicles face lot of problems like parking, U turn and much more which consumes more time. So, we have designed a 360-degree wheel rotating vehicle to reduce and eliminate problems in the industry as well as common life of people.

## I. INTRODUCTION

This project is about plan of 360 degree wheel turning vehicle. This vehicle moves every which way and this plan gives better solace and furthermore spares the season of clients, the vast majority of the general population utilizing this vehicle to convey products, understanding and so on. In any case, more often than not, they need to confront the issue like taking U turn and so forth. So need to structure a 360 degree wheel turning vehicle to lessen and dispose of issues in the business and at the railroad stage. This structure will give better solace and furthermore spares the season of clients, that is the reason it is additionally the dependable for the client. As it is likewise battery worked vehicle consequently no fuel is required. Consequently it is affordable to the earth. This will likewise diminish the expense of the vehicle. Zero degree turning span of a vehicle suggests the vehicle pivoting around a hub going through the focal point of gravity of vehicle for example the vehicle turning at a similar spot, where it is standing. No additional room is required to turn the vehicle. So vehicle is to be turned in the space equivalent to the length of the vehicle itself. In this framework, controlling is associated with sprocket and this sprocket is associated with sprocket of front wheel by chain drive. Guiding is utilized to give the course of front wheel. The DC engine is associated with sprocket jolt at above of casing. At the point when control supply from battery to DC engine then revolving movement exchange from DC engine to the wheel. The headings are give beneath sprocket which permit to wheel turn 360 degree about vertical pivot. At that point this equivalent rotating movement is exchange to the back wheels by sprockets and chain drive course of action.



## II. LITERATURE SURVEY

- I. Arunkumar S M, Chandan Kumar Sahu, Yubaraj G M, Jahangeer A B [18] Proposed a system of consist of steering, chain sprocket, DC motor, wheel, bearing, iron pipe, battery and chain drive. In this system first the vehicle is stopped and wheels are then turned within the required direction with help of steering mechanism and DC motor. [2] SudipKachhia Proposed the idea of all electric concept of vehicle is that if it becomes a reality would prove to be a lot of fun to drive in the city. The vehicle works on 8 electric motors, four motors attached uniquely to each wheels and it can rotate 360 degrees. The wheels of the car are magnetically coupled and it is controlled by magnetic fields. Hence the car is rotate fastly and effectively
- III. [3]. Jaishnu Moudgil 360 degree rotating car to beat the matter of parking zone. This car has zero degree turning radius of a vehicle implies the vehicle rotating about an axis passing through the axis of gravity of vehicle i.e. the vehicle turning at the similar place, where it's standing. No extra space is required to revolve the vehicle.
- IV. [4] K. Lohith Presented a four wheel steering mechanism for a car. In four wheels steering the rear wheels revolve with the front wheels thus raising the effectiveness of the vehicle. The direction of steering the rear wheels comparative to the front wheels depends on the working circumstances.

V. [5] Er. Amitesh Kumar presented zero turn four wheel steering mechanism, the a variety of functions of the steering wheel are to manage the angular motion the wheels, direction of motion of the vehicle, to supply directional stability of the vehicle while going straight ahead, to facilitate straight ahead condition of the vehicle after completing a turn, the road irregularities must be damped to the utmost possible extent. This project the utilization of steering is to rotate front wheels.

VI. [6] Mr. Sharad P. Mali Presented zero turn four wheel mechanisms, in this project people have used DC motor and wheel to vehicle rotate 360 degree at a same position. So in this task, the initiative is to organize of DC motor and wheel.

### III. Problem identification

Continuous improvement and progressive development of modern technology has brought about the increment of vehicles on streets in a large scale. Besides, due to rapid increase of financial stability, a large number of people use their personal vehicles in their daily life. Most often they need to deal with the issues like short parking places, taking more time to park the vehicle or to take risky U-turns and so on. In that case, 360-degree rotating vehicle is probably the sole solution to park as many cars as possible in small, tight parking spaces with a short amount of time as this vehicle is capable of moving through all directions with respect to the vertical axis.



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### IV. COMPONENTS DESIGN

Components Effectiveness and flexibility of the mechanical system is the first thing to consider while selecting a component. This low-cost mechanism needs small time for the design and manufacture and fabrication. We are making the garbage collection equipment that is working on solar. The main aim is to introduce the use of nonconventional energy source to run the mechanical machines rake is well known to all for its application. It is a material handling equipment basically used to the wheel, moves, rotates & places the wastes, which was extracted by the motion of the conveyor. The constructional parts used for this machine are very simple and readily available. Components of the vehicle are as follows

DC motor: We use two DC motors in this machine one is the gear motor and the other one is the high-speed motor. The gear motor is used is run the conveyor chain. The special feature of gear motor is to induce high torque. As per the calculations made from the design we use 50 Watts gear motor and the other motor has a capacity of 10 Watts to run the wheels of the machine to move forward. Cranes use gear motors that which works based on Flemmings rule. Here speed is compensated to increase torque since they are inversely proportional. The speed required by the conveyor can be calculated and based on that speed, a gearbox has to be placed.

DC MOTOR When the DC motor starts, at starting it will draw alot more current, and also if you stall them, they alsodraw a very high current.

They can operate in bothforward and reverse direction, by switching voltage polarity. So by using different voltage polarities wecontrol the direction of dc motor. Usually rotate atvery high speed. Usually greater than 3000 RPM. forgetting slower running need gearing.

- a) Base plate
- b) Main frame
- c) Rack & pinion mechanism
- d) Supporting rod.
- e) Chain & sprocket drive
- f) Helical tension spring.
- g) Shaft.
- h) Wheels.
- i) Bearing

#### Chasis

It is the back bone of the system. All the systems and parts are attached to it. The main part for the waste collector is the structural base. It is made up of mild steel L angler. The major purpose for using this mild steel bar is because it is widely available at low cost and provides much strength to carry the weight of the whole system. The L angler is used for avoiding buckling of the bar at heavy weight. The L angler is much stronger than usual mild steel bars. Carbon fiber is much suitable for the construction of this structure but it is very costly because molding is needed. It is less weight than mild steel.

Specifications:

Total length of chassis : 1250 mm  
 Total width of chassis : 500 mm  
 Total height of chassis : 640 mm  
 Material used : Mild Steel or Carbon Fibre

### Wheels

A wheel is a circular block of a hard and durable material at whose centre has been bored a circular hole through which is placed an axle bearing about which the wheel rotates when a moment is applied by gravity or torque to the wheel about its axis, thereby making together one of the six simple machines. For the prototype on the waste collecting machine there are 4 wheels which support and transfer the load to the ground. For the future production, using of rocker bogie needs 6 wheels, these 6 wheels need separate motors and speed controllers which is expensive.

Specifications:

Wheel diameter : 305mm

Wheel width : 40mm



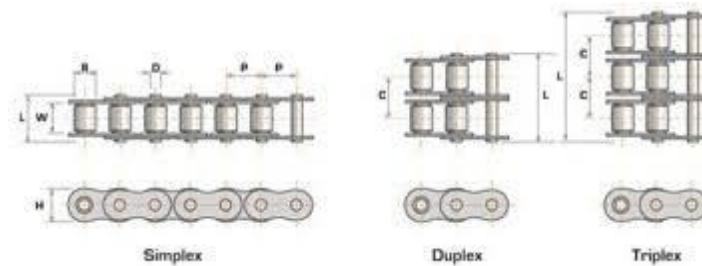
### Sprockets

A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. No. of teeth on sprocket (freewheel) = 18 No. of teeth on driving sprocket = 44



### Chain drive

A chain drive consists of an endless chain wrapped around two sprockets. It is a series of links connected by pin joints. It has some features of belt drives and some of gear drives. Chain drive can be used for long as well as short centre distances and they have good flexibility in all directions. Chain drives compared with belt drives



**Simplex chain**

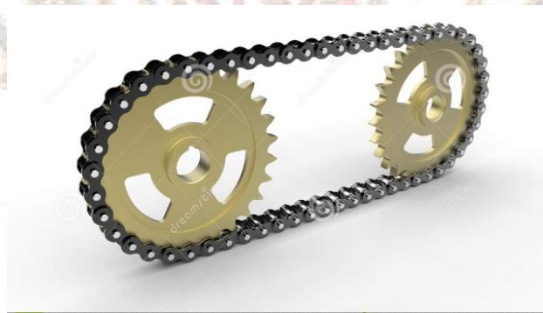
Pitch = 0.5 inch

Length = 6 mtr

4) Chain sprocket

Pitch = 0.5 inch

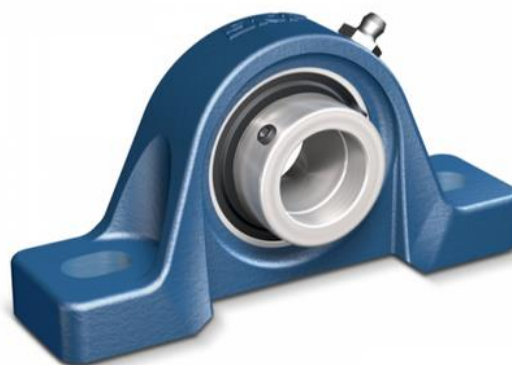
No of teeth = 24



- i. Chain drives can be used for long as well as short center distances. They are particularly suitable for medium center distance, where gear drives will require additional idler gears. Thus, chain drives can be used over a wide range of center distances.
- ii. a number of shafts can be driven in the same or opposite direction by means of the chain from a single driving sprocket.
- iii. chain drives have small overall dimensions than belt drives, resulting in compact unit.
- iv. a chain does not slip and to that extent, chain drive is a positive drive.
- v. the efficiency of chain drives is high. For properly lubricated chain, the efficiency of chain drive is from 96% to 98%.
- vi. chain does not require initial tension. Therefore, the forces acting on shafts are reduced.
- vii. atmospheric conditions and temperatures do not affect the performance of chain drives. They do not present any fire hazard.

Hence chain drives were selected for this project The velocity ratio  $i$  of the chain drives is given by,  $i = \frac{n_1 n_2}{z_1 z_2}$  where  $n_1, n_2 =$  speeds of rotation of driven and driving shafts (rpm)  $z_1, z_2 =$  number of teeth on driven and driving sprockets.

The average velocity of the chain is given by,  $v = \frac{\pi D N}{60} \times 10^3$  Where  $V$  is the average velocity of in m/s,



The length of the chain is always expressed in terms of the number of links;  $L = L_n \times p$ ,  
Where;  $L =$  length of the chain,  $L_n =$  length of the links in the chain;

**Bearings**

Bearing is a mechanical element that permits relative motion between two parts, such as the shaft and the housing, with minimum friction. The functions of the bearing are as follows:

- The bearing ensures free rotation of the shaft or the axle with minimum friction.
- The bearing supports the shaft or the axle and holds it in the correct position.
- The bearing takes up the forces that act on the shaft or the axle and transmits them to the frame or the foundation.

In this project roller bearings, of pillow block bearings and cone hub type block bearing were used.

**Wheels**

In its primitive form, a wheel is a circular block of a hard and durable material at whose centre has been bored a circular hole through which is placed an axle bearing about which the wheel rotates when a moment is applied by gravity or torque to the wheel about its axis. Metal welded wheels as they easily move forward in agri field due to their own weight were used in the project.

**Wires**

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term wire is also used more loosely to refer to a bundle of such strands, as in "multistranded wire", which is more correctly termed a wire rope in mechanics, or a cable in electricity. Wire comes in solid core, stranded, or braided forms. Although usually circular incross-section, wire can be made in square, hexagonal, flattened rectangular or other cross-sections, either for decorative purposes, or for technical purposes such as highefficiency voice coils in loudspeakers. Edge-wound [1] coil springs, such as the Slinky toy, are made of special flattened wire.

Steering, Sprocket, Chain drive, Wheel, Iron pipe, DC motor, Bearing, Fixed frame, Battery Steering:- Steering is a element of 360 degree wheel revolving vehicle. This element is used to supply the way to the front wheels by help out sprocket and chain drive, which provides path to the front wheels clockwise or anticlockwise direction. Sprocket:- A sprocket is a profiled wheel with teeth, gear-teeth, or even sprockets that work with a chain. The sprockets are utilized for the power transmission among controlling and wheel through the roller chain drive Chain sprocket is a section this vehicle. Chain sprockets are utilized to gracefully the clockwise or anticlockwise heading to front hagle wheel through the chain drive. Sprockets are use in bikes, bikes, vehicles, followed vehicles, and other apparatus either to transmit rotating movement between two shafts where riggings are unacceptable or to grant straight movement to a track, tape and so on. Wheel:- In this vehicle wheels are made of plastic material. Wheels are interface with DC engine and front wheel turn 360 degree by help of controlling, chain sprocket, chain drive and bearing game plan. The back wheels turn 90 degree left and 90 degree directly from unique situation by help of DC engine, sprocket and chain driver course of action, DC engine has given to each wheel to flexibly advance and in reverse development of wheel. Iron pipe:- It is a one of significant pieces of 360 degree wheel pivot vehicle. It is made of mellow steel. Which is utilized to join bearing and DC engine of each wheel DC motor: - During this vehicle one DC engine are give in each wheel to go ahead and reverse way. The detail of engine utilized is 12 V, with 60 rpm. / When power gracefully from battery to DC engine then DC engine turn clockwise way and when switch current flexibly from battery to DC engine then DC engine will anticlockwise course. Which will advance and in reverse development of car. Bearing:- In this vehicle bearing is utilize simple to move wheel from one heading to other course, each bearing is associated with each wheel with the assistance of sprocket and iron pipe. Pipe .A bearing is a machine segment that obliges relative development to simply the perfect development, and lessens scouring between moving parts., and diminishes rubbing between moving parts. The plan of the bearing may, for instance, accommodate free straight development of the moving part or with the expectation of complimentary revolution around a fixed pivot; or, it might forestall a movement by controlling the vectors of typical powers that bear on the moving parts. Most heading encourage the ideal movement by limiting contact. 5.8 Fixed casing The fixed casing structures the base of the 360 degree wheel turn vehicle. This casing is made of Mellow Steel (MS). It has four wheels appended to its different sides by sprocket jolt and iron funnel. Battery: - Battery is one of the significant pieces of 360 degree wheel pivot vehicle. Which is associated with DC engine by electric wire. It is store electrical vitality and gracefully to DC engine so vehicle will push ahead and reverse way. Batteries work by changing over compound vitality into electrical vitality through electrochemical release responses. Batteries are made out of at least one cells, each containing a positive anode, negative cathode, separator, and electrolyte. Cells is to be separated into two significant classes essential

**V.Design calculations**

Motor calculation Specification and calculation 60 rpm→ 12V→ 18W→  
Torque of motor:  $\tau = P \div 2 \times 3.14 = 18 \div 2 \times 3.14 \times N = 2.866Nm$

If load apply on the vehicle is 4 kg and length 385mm width of vehicle 270 mm.  
Find the reaction developed by each wheel and find the torque of each Wheel.

Weight=4 kg Length=385 mm Width=270 mm

To find the reaction force on each wheel (r)

$$R = \sqrt{\left(\frac{l}{2}\right)^2 + \left(\frac{b}{2}\right)^2}$$

$$R = \sqrt{\left(\frac{385}{2}\right)^2 + \left(\frac{270}{2}\right)^2}$$

R=235.11  
R=236 mm

Reaction per wheel = W/4 =4/4=1

Weight = Mg= 1\*9.81  
= 9.81 N

Torque on each wheel (T)

T=R × r  
T=9.81×.236

T=2.315 N.m

Calculation of Motor Specification and calculation

$$N=10\text{rpm}$$

$$\text{Voltage}=12\text{ volt}$$

$$I=2\text{ Amp}$$

$$\text{Power} = V \times I \text{ Power}= 12 \times 2 \text{ VA}$$

$$\text{Speed ratio } N1=10\text{ rpm,}$$

$$T1=15$$

$$N2=? ,$$

$$T2=38$$

$$N1/N2=T2/T1$$

$$10/N2=38/15$$

$$N2=3.94\text{ rpm}$$

$$P=2\pi NT/60$$

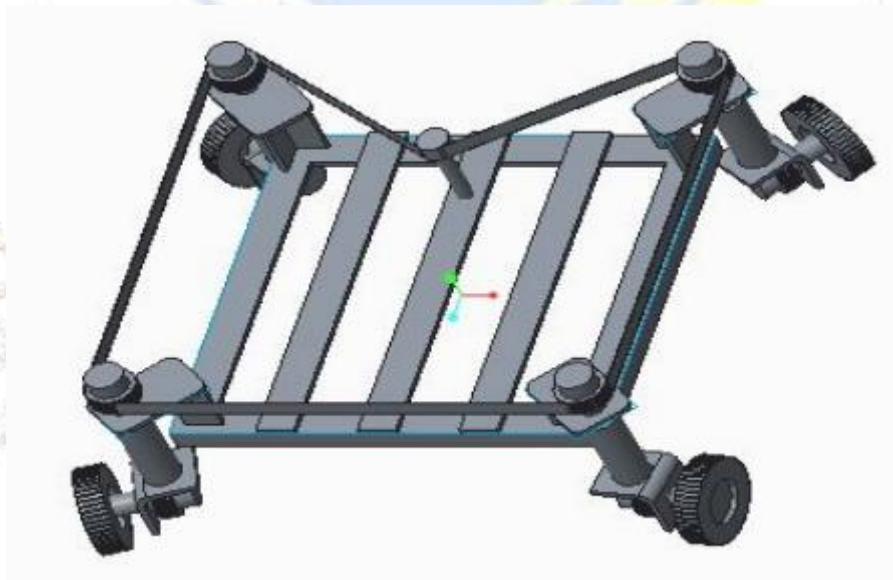
$$24=2\pi 4T/60$$

$$T=57.29\text{Nm}$$

$$T=57.29 \times 103 \text{ N.mm}$$

**Working**

The base frame is manufactured as per the dimensions. At the corners of the frame the clamps are fixed with shafts mounted on them. Above the shaft the sprocket wheel setup is mounted. Totally four wheel sprocket are used in the setup. The wheel sprockets are connected using a cycle chain. Using the clamp the dc motor are mounted in the frame. The wheels are connected to the motor via the shaft. A 12v 7amp/hr battery is placed in the back of the frame. The interfaced electronic setup is then connected to the motor for controlling the motor setup. All the connections are made to connect to the battery. With this the setup is assembled. Now the power supply is given to all the circuits and motors.. The load is loaded in the loading area. Using battery power supply the motor starts to operate. The motor operation is controlled by the remote board. There are two types of key sets for controlling the motor. The first key set controls the forward and reverse operation of the device. This is achieved by varying the power supply to the motors using the relay board. Forward movement is achieved by giving positive supply and reverse motion by reversing the polarity. The second set of keys control the directions of the setup. 360\* rotation of the setup is achieved by this concept. The same principle applied above is done here also. By these processes the load is carried from one location to another without much disturbance. Due to 360\* rotation of wheels the movement of the setup is far more easy than the conventional systems used. Usage of remote control for controlling the movement of the device ensures that human intervention for controlling it is reduced. Because of this human error that occur carelessly or out of consciousness is greatly reduced. Other than that the cost for movement of resources is greatly reduced and unnecessary usage of manpower is reduced. This system increases the working time of the unit. Since humans get tired after some time of hard lifting works





### Advantages and disadvantages

#### . ADVANTAGES:

Eco Friendly Less Noise Operation Battery Operated thus No Fuel Required Non Toxic And No Hazardous Less Costly Less Maintenance except battery requirement More Efficient Car Can Easily Parked It consumes very less time to turn from one direction to other direction

- It is more efficient compare to other type of load carry vehicle
- This type of load carry vehicle is easily parked in any direction.
- It is less costly load carry vehicle.
- Eco friendly.
- Less noise operation
- Battery operated thus no fuel required
- More efficient.
- Battery is using in this 360 degree wheel rotation vehicle to move forward and backward, so it is a kind
- pollution free vehicle

#### DISADVANTAGES

2 Disadvantages This type of load carry vehicle is not applicable to carry more weight. → Battery power is required to move of the vehicle. →

### Application

In Industries for automation of raw material like automated guided vehicle. In automobile sector there are so many types of vehicle are using to carry goods from one position to → another position, there is space problem in the industry so this vehicle is used in automobile applications because this vehicle consumes very less space compare to other type of vehicle. This vehicle is used in small Industries for transportation of raw material from one position to another → position. Modern development and economical progression of Indian society resulted in increase of vehicle in park → so there are also problem. In park other vehicle are taking more space to move from one direction to other direction and 360 degree wheel rotation vehicle have capability to move parallel direction so this vehicle is easily move from one direction to other direction in park. Take easily U-turn because front wheel of this vehicle are rotating freely by steering, chain drive and → sprocket arrangement. It is used in hospitals to carry the patient from one room to another room. Because there are lots of patients → those are staying in one room.

It is used in Automated Guided Vehicle In Automobiles Application In industries For Transportation of Raw Material

### Result and conclusion

#### RESULT

Performance analysis The performance analysis of the 360 degree wheel rotation vehicle has clearly shown that it is more efficient, economical and effective. In this project forward and backward movement of vehicle and turning of rear wheel of the vehicle are getting power from the battery in the form of an electrical energy. This energy is has stored into a 12V battery and then supplied to the components. As the electrical power is used and transmitted to components by the use of electrical wires in place of any mechanical arrangement, this results in less noise, less wear of components and less vibration. Use of battery provides a smooth flow of current toward the components. Most of time people are facing problem in parking and railway platform because other vehicle are taking more space to move from one direction to other direction. But developed 360 degree wheel rotation vehicle this problem easily solved. Because this vehicle has capability to move from one direction to other direction in very less space. In this project a DC motor and battery are used according to load carry capacity which is of 5 kg, but vehicle able to carry more load if use more than 12V of battery.

**CONCLUSION**

A model for the proposed approach was created by acquainting controlling and DC engine with wheel turn 360 degree. This model was seen as ready to be moved effectively in tight spaces, and after production of 360 degree wheel pivot vehicle devoured less space to turn from one direction to another direction and it consumes less time to turn and this vehicle used in various area such as small industries, railway platforms and in a parking area

This project is made with pre planning, that it provides flexibility in operation. This innovation has made the more desirable and Economical. This project "fabrication of 360 degree rotating wheel in vehicle" is designed with the hope that it is very much economical and help full to vehicles for parking and other purpose. This project helped us to know the periodic steps in completing a project work. Thus we have completed the project successfully.

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