

## Design and Fabrication of Four Wheel Off Road Electric Scooter

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### Abstract

Electric vehicles are becoming more important, as not only to reduce carbon emission but also to reduce the dependency on normal combustion engine vehicles. The harmless and power-controlled vehicle with safety technologies is introduced. Besides, it also reduces time consumption. In This project, we have design and development the weightless electric scooter. Hence, we use 20HP hub motor to run the scooter. It will run with of 20 to 40kmph. We use four wheels instead of 3wheels. If helps to increase the friction on ground and reduce the drag. Here we use 40kW lead acid battery. it gives enough power to run scooter.

**Keywords:** Wheel, drag, motor, carbon, wheels, scooter, engine, emission, combustion.

### 1. Introduction

Electric scooter is a type of a scooter that contains an electric battery which provides power to it. The electricity is provided by these electric batteries. Importance of treating e-scooter as a distinct transport mode and contributes to matching policy and practice to integrate e-scooters into transport planning. Future studies should analyze the interaction of e-scooters with other road users

### 2. Literature Review

**Terrance yee et.al**, road runner will accomplish these impressive schedules fielding a suite of centered around a new optical payload. Road runner combination of high performance, powerful on-board processing it is a smallest and trends will greatly enhance.

**Mahesh S. Khande et.al**, the vehicles of new energy, which is green, environmentally friendly and economical, is an important goal for economic and social development of many countries. Being an e-scooter, the electric system plays a promising role in its designing and creation. The electric system consists of battery, motor, motor controller and other electronic equipment. A proper electric system is important to ensure driver and vehicle safety in case of collision.

**Uzair Khaleeq Uz Zaman et.al**, national efforts to improve air quality in the country have revitalized the interest in the development of electric vehicle technology that can be sustained for years to come. Battery-powered vehicles not only offer a diminished carbon impact on our environment but also provide an economical alternative. Considering the high prices of commercially available electric vehicles, our project is aimed at converting an already available combustion engine model into a BEV (Battery Electric Vehicle).

**T. Lokitha et.al**, electric vehicles are becoming more important, as not only to reduce carbon emission but also to reduce the dependency on normal combustion engine vehicles. Most of the universities have really big campuses. To make the mobility in campus easier, the harmless and power-controlled vehicle with safety technologies is introduced. Besides, it also reduces time consumption. Further, it aids differently abled persons and aged professors. This

paper presents the design and development of a compact, portable and weightless electric scooter.

**Jay Todd et.al**, the United States is experiencing a rapid growth in the presence of e-scooters by “scooter-share” companies in cities across the country. For many people, e-scooter are a fun and convenient way to travel short distances. The most common behavior that may be considered unsafe or risky is for scooter rider to not wear helmets. The challenge for drivers to be aware of a relatively small e-scooter is not just perceptual, there is also a cognitive component.

**S Arun Kumar et/al**, this is greatly helpful in reducing pollution and has zero exhaust emissions. In future, the price of electric-vehicle will fall. Electric vehicles play an important role to maintain a pollution free environment. This paper presents the design and development of a compact portable and weightless electric vehicle

**Kaushik rajashekara et.al**, General Motors in its continuous search for better vehicle propulsion systems and to reduce vehicle emission, has conducted extensive research and development in the area of electric and hybrid vehicle. Motor developers will need to focus their development into two major areas, efficiency improvement to increase the vehicle range and cost reduction to help lower vehicle cost.

**Sylvaine Tuncer et.al**, the findings offer insights into the integration of e-scooters as one of what may be many new forms of electric powered micro-mobility in urban space. E-scooters allow weaving through dense urban environments, and they provide a solution to the ‘last mile’ problem

**Y. Kailash Nath Reddy et.al**, this Electric Bike uses Lithium-ion rechargeable batteries whose rate of self-discharge is quite low. They have a greater energy density and will last longer than other batteries. The BLDC motor is having 1000watts capacity with a maximum of 3000rpm. The Frame is made up of M.S. along with some additional lightweight components.

**P. Andrada et.al**, in this paper, an analytical and experimental comparison of two different drives for electric scooters is carried out. From this analysis can be conclude that the efficiency and mass is clearly favorable to the mid-term drive but this drive requires a mechanical transmission with a gear ratio of 4:1 in order to obtain the same torque capability than the in-wheel motor, although in addition provides the same advantages of maneuverability of a conventional scooter equipped with internal combustion engine.

**Khashayar Kazemzadeh et.al**, this study highlights the importance of treating e-scooter as a distinct transport mode and contributes to matching policy and practice to integrate e-scooters into transport planning. This work is part of the eSPARK research project on the e-scooter usage pattern analysis funded by the Swedish Energy Agency for assessing e-scooters’ role in the fossil-free transport system.

**Julio A. Sanguesa et.al**, there is a greater number of vehicles on the roads, which allows for us to move quickly and comfortably. However, this has led to a dramatic increase in air pollution levels in urban environments. We analyzed the types of EVs, the technology used, the advantages with respect to the internal combustion engine vehicles, the evolution of sales within the last years, as well as the different charging modes and future technologies.

**Xiaoli Sun et.al**, the technical challenges and emerging technologies for the improvement of efficiency, reliability, and safety of EVs in the coming stages as another contribution. The development of battery technology is very important for EV penetration. In addition to the traditional lead–acid batteries, a wider range of battery types are being used in EVs. Nickel-metal hydride batteries, Zebra batteries, and lithium-ion batteries are employed as the power source of EVs because they have higher specific energy, higher power density, and are more environment-friendly.

**Mahmoud Masoud et.al**, the charging problem as a game between two sets of disjoint players, namely e-scooters and chargers. Then we adapted the college admission algorithm (ACA) to solve the ESCA problem. The application of this approach can help the e-scooter companies to meet the customer's demand with considering the renting cost, and at the same time, increase the hourly rate of the charger.

**Chergui Hicham et.al**, the main purpose of this paper is to design a three-wheeled electric scooter with protracted autonomy. This model is driven by double BLDCM positioned on the back wheels and controlled by a fuzzy logic controller. Electronic Differential system has a rapid response on the bend as well as ramp road. The findings of the simulation demonstrate that the suggested electronic differential system functions pleasingly

**Bernard L. Theisen et.al**, Development and Engineering Center (TARDEC) since its beginning and supported by the Society of Automotive Engineers (SAE) for the past 11 years. The employment and professional networking opportunities created for students and industrial sponsors through a series of technical events over the three-day competition are highlighted.

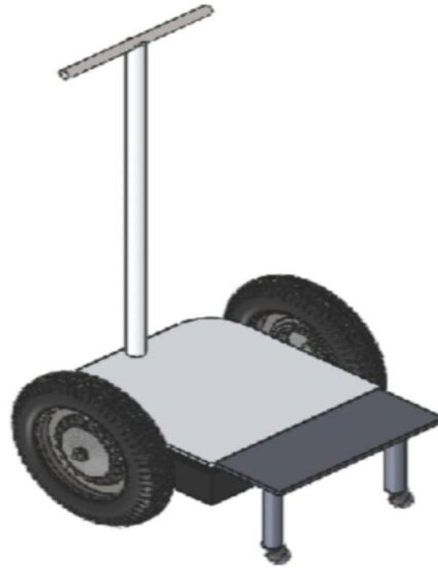
**Mandeep Sindhu et.al**, in this paper an approach for designing, examining and assembling of air admission and fumes framework is talked about for model of a Formula style car with the locally accessible assets close by according to the tenets indicated by the two noteworthy understudy level occasions sorted out in India. Application compose, maybe accessible space, cost and appearance likewise ought to be considered. To choose a silencer, utilize silencer provider information, amended for outlet temperature and speed

**Abrar Ahmed Choudhry et.al**, the concept is very simple, and all types of light weight components are used in the manufacturing of this process. During the last few decades, environmental impact of the petroleum-based transportation infrastructure, along with the peak oil, has led to renewed interest in an electric transportation infrastructure. Three main types of electric vehicles exist, those that are directly powered from an external power station, those that are powered by stored electricity originally from an external power source, and those that are powered by an on-board electrical generator. Due to efficiency of electric engines as compared to combustion engines, even when the electricity used to charge electric vehicles comes from a CO<sub>2</sub>-emitting source.

**M.Selvakumar et.al**, designs are analysed using software and performance characteristics are parametrically and structurally optimized. The automotive chassis is one of the most important structures of any self-propelled construction because of its multifaceted role on vehicle dynamic behavior. The design is carried out based on specific standards and limitations set by the competition regulations. The specifications of chassis materials linked to mechanical and physical properties are defined and set. In order to improve the fuel efficiency and reduce emissions in air the use of conventional vehicles has to be reduced and the implementation of electric vehicles should be promoted.

**Varun V et.al**, the platform is designed in such a way that the vehicle will have easy, safe and stable manoeuvrability even at higher speeds. To ensure that the chassis is safe and stable in expanded as well as in contracted wheelbase conditions different mechanisms are used for the expansion of the wheelbase and for its locking. These mechanisms will also be electrically powered to ensure smooth functioning. The concept of the platform which can be used commonly for both, the commercial as well as passenger electric vehicles can be considered as a modern approach when the automobile industry is moving toward reducing the manufacturing cost, scraps and provide more features to the consumer.

### 3. Design and Fabrication of Electric Scooter



**Figure 1. Design and fabrication of electric scooter**

#### 3.1 Components

- Wheel
- Handle
- Foot Rest
- Vehicle frame

#### 3.2 Construction

Electric scooter is a type of scooter that contains an electric battery which provides power to it. The electricity is provided by these electric batteries. Importance of treating e-scooter as a distinct transport mode and contributes to matching policy and practice to integrate e-scooters into transport planning. Future studies should analyze the interaction of e-scooters with other road users. Electric vehicles are becoming more important, as not only to reduce carbon emission but also to reduce the dependency on normal combustion engine vehicles. The harmless and power-controlled vehicle with safety technologies is introduced. Besides, it also reduces time consumption. In This project, we have design and development the weightless electric scooter. Hence, we use 20HP hub motor to run the scooter. It will run with of 20-40kmph. We use four wheels instead of 3 wheels. It help to increase the friction on ground and reduce the drag. Here we use 40 kW lead acid battery. It gives enough power to run scooter.

#### 4. Working

Existing alternative system which can produce higher efficiency at minimum cost was though about an attempt has been made to design and fabricate such an alternative system So this project “Design and Fabrication of Four Wheel Off Road Electric Scooter. Is an aspect very much useful, since it is provided with good quality of power sources and simple operating mechanism. Hence “Each and Every Drop of Fuel Saves Our Economy and Meets the Needs” is the saturation point that is to be attained as soon as possible. In order to achieve this saturation point we have save and seek for some other source of power. This power, the alternate power must be much more convenient in availability and usage.

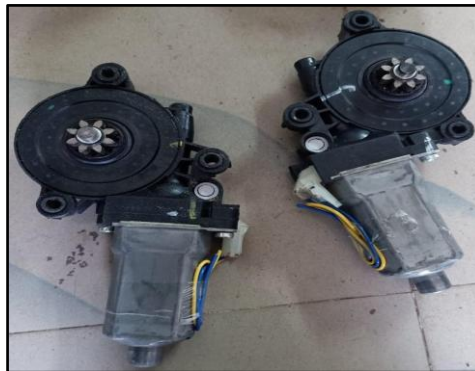
##### 4.1 Major Components

- Wheel
- Sheet Metal
- Lead Screw
- Metal Strips
- Battery
- Shaft
- Motor

##### 4.1 Motor

The electrical motor is an instrument, which converts electrical energy into mechanical energy. According to Faraday’s law of Electromagnetic induction, when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming’s left-hand rule.

- DC Motor capacity: 12V
- Un loading: 130rpm
- Loading: 90rpm



**Figure 2. Motor**

##### 4.2 Lead Screw

A leadscrew (or lead screw), also known as a power screw or translation screw, is a screw designed to translate turning motion into linear motion. Common applications are Linear actuators, machine slides, vises, presses, and jacks. Leadscrews are manufactured in the same way as other thread forms. A lead screw can be used in conjunction with a split nut. A leadscrew nut and screw mate with rubbing surfaces, and consequently they have a relatively

high friction and stiction compared to mechanical parts which mate with rolling surfaces and bearings. Leadscrew efficiency is typically between 25 and 70%, with higher pitch screws tending to be more efficient. A higher performing but more expensive alternative is the ball screw.



**Figure 3. Lead Screw**

#### 4.3 Battery

In order to provide supply to the controller unit battery is used. Lead acid battery is used in this project. The lead-acid battery is a rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to volume ratio, their ability to supply high surge currents means that the cells maintain a relatively large power-to-weight ratio. These features, along with their low cost, make them attractive for use in motor vehicles to provide the high current required by automobile starter motor.



**Figure 4. Battery**

#### 4.4 Wheel

A Tire is a ring-shaped vehicle component that covers the wheel’s rim to protect it and enable better vehicle performance. Most tires, such as those for automobiles and bicycles, provide traction between the vehicle and the road while providing a flexible cushion that absorbs shock. The materials of modern pneumatic tires are synthetic rubber, natural rubber, fabric and wire, along with carbon black and other chemical compounds. They consist of a tread and a body. The tread provides traction while the body provides containment for a quantity of compressed air. Before rubber was developed, the first versions of tires were simply bands of metal that fitted around wooden wheels to prevent wear and tear. Early rubber tires were solid (not pneumatic). Today, the majority of tires are pneumatic inflatable structures, comprising a doughnut-shaped body of cords and wires encased in rubber and generally filled with compressed air to form an inflatable cushion. Pneumatic tires are used on many types of

vehicles, including cars, bicycles, motorcycles, buses, trucks, heavy equipment, and aircraft. Metal tires are still used on locomotive sand railcars, and solid rubber (or other polymer) tires are still used in various non-automotive applications, such as some casters, carts, lawnmowers, and wheelbarrows.

- Hub material: steel
- Tire: plastic



**Figure 5. Wheel**

#### *4.5 Shaft*

Shaft made up of mild steel of diameter 15mm is used to transmit rotary motion from motor to the four-bar linkage. Holes provided on the shaft. Reduce the occurrence of skeletal deformities, and enhance psychological wellbeing.

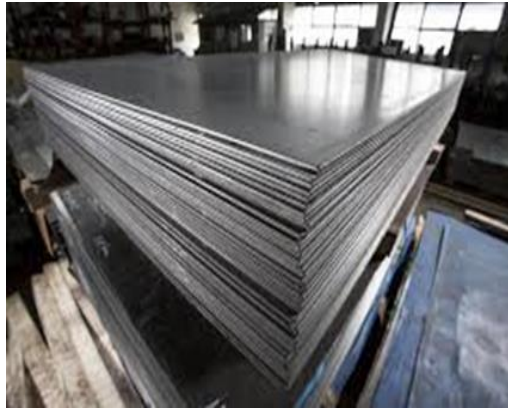


**Figure 6. Shaft**

#### *4.6 Metal Strip*

Sheet metal is used to make the collecting box.

- Material: Mild steel
- Size: 40×15cm
- Thickness: 3mm
- Quantity: 1



**Figure 7. Sheet metal**

## 5. Advantages

- Fuel savings and This vehicle consume no fuel than vehicles poweredby gasoline alone
- Emissions are greatly decreased
- It can reduce dependency on fossil fuels because they can run on alternative fuels and
- Special lightweight materials are used to reduce the overall vehicle weight.

## 6. Disadvantages

- High Initial cost
- Large size of panel for larger applications and
- source is a variable one.

## 7. Conclusions

Eliminate our dependency on foreign oil and reduce the tailpipe emission from automobiles and this was an attempt to design and implement this new technology that will drive us into the future. Use of production segway will smog-forming pollutants over the current national average. The first car on the market will cut emissions of global-warming pollutants by third to a half and later modes may cut emission by.

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