

DESIGN OF AFFORDABLE ELECTRIC VEHICLE FOR HANDICAPPED

Jayaprabakar J*¹, Saikiran K², Paranthaman P³, Nirmal Raj R⁴, Arunkumar T⁵

¹²³⁴⁵Department of Mechanical Engineering, Sathyabama University, Chennai, India

*Email: Jp21tn@gmail.com

Abstract

It is always a great challenge for the patients, disabled and aged people to move in to the places like bus stops, hospitals, colleges, schools, Railway stations and Airports. For the benefit of such people an affordable electrical bike was designed and fabricated in this study. The electrical bike designed here is four wheeler with three rear wheels and one front wheel. And also the vehicle has one carrier basket and two pillions for accommodating two persons and a driver. Electric vehicles (EVs) use an electric motor powered by electricity stored in batteries. The electric vehicle is aimed to have many advantages like little noise and zero emissions. And also electric vehicles are designed to operate with more energy efficient than an Internal Combustion Engine vehicle. In addition to the efficient propulsion system, the energy losses through the transmission and idling are fully absent. The objective of this study is to design and develop a vehicle of highly compact to enter the building and structures like industries, Hospitals, indoor and outdoor place. The proposed design was fabricated and tested for its compatibility. The vehicle was made with light weight in order to increase its range and also to carry a better weight. The vehicle was built with a height as low as possible but the other factor, ground clearance is also considered for the suitability of Indian roads

Key words: electric vehicle, design, fabrication, testing, handicapped vehicle

I. INTRODUCTION

Internal combustion engines are run by the combustion of hydrocarbon fuels thus getting power which is required for their propulsion. Combustion, a rapid reaction between fuel and oxygen in the air releases heat and combustion products. Combustion fossil fuels emit carbon monoxides, unburnt hydro carbons and nitrogen oxides. Exhaust smoke indicates visibly the nature of combustion takes place inside the engine. The Globe gets warmed by the result of the greenhouse gases like carbon dioxide and methane present in the atmosphere. To avoid these environmental issues and to satisfy the ease of travelling in to the public places like hospital, theaters, malls, bus stops, railway stations etc, the electrical vehicle became possible as well as sensible. These vehicles provide a pollution free way to travel up to medium level distances. Thus the usage of fossil fuel driven vehicles can be reduced. Electric bikes and cycle users are the people identified by many transport authorities as most vulnerable road. Motorized and electric vehicles are alternate form of transport used by the disable persons today. Older peoples still using motorized cycle instead of a motor vehicle as an alternative form of transport since they feel they are not safe enough. This work aims to bring an attractive

modern electric car also called electro handy has been designed for handicapped people.

There are already several types of vehicles available in the market for the physically challenged people. And those vehicles pose few problems associated with the existing design. The electric bikes have very low ground clearance which is difficult for them to move in the uneven landscapes. With longer length it has more turning radius and also the existing electric bikes are comparatively comfort. The aim of the present study is to design and fabricate a comfortable and affordable electric vehicle for the aged and physically challenged people. This makes those special peoples to travel by their vehicles comfortably and safely with negligible cost. The advantages expected from the designed vehicles are i) to enhance the approach towards the use of handicapped electric vehicle, ii) to provide a low maintenance and powered vehicle, iii) to provide a comfort and affordable vehicle for disabled people and to maximize safety.

II. EXPERIMENTAL SETUP

This work involved preparation of detail drawings and an affordable system was finalized. The detailed specifications of this vehicle is shown in Table 1. This has one front wheel and three rear wheels with the centre

wheel having motor hub (wheel alloy). The steering handle connected with the front wheel. There are two types of control panels for the two category people. The persons affected by disabled hands can control the vehicle by the base control unit, whereas the person affected by disabled legs can handle the driving using hand control panel provided at the top. The driver can occupy the comfortable front seat and this vehicle is provided with a basket carrier too. Two support wheels are located in the backside to ease the vehicle to be parked anywhere without using a bike stand. the side view of the designed vehicle during fabrication is shown in fig. 1.



Fig. 1. Side view of the vehicle

A. Methodology

The fabrication of this kind of vehicle includes material selection for the chassis and the chassis was fabricated by bending the channels/box sections and welded to achieve the proposed design. The back axle, wheels and bearings are also selected based on design procedures. After fixing the front fork; a perforated sheet was fixed to cover entire body of the vehicle and also the seats. Finally wheels and hub motor were mounted and the electrical connection is given with a battery.

B. Power supply unit

The power supply unit is the primary importance for this kind of electric vehicles. A battery with charger, cables and plug in - plug out constitutes the power supply system. A picture on power control unit is shown in fig. 2. The battery is the main component in the power supply unit. It was first ensured that the battery storage capacity is to be double the power that required in day time. The

source for power of the system is a DC battery with 48V output capacity. The battery is of the type of lithium ion cell. Each cell is of 12V capacity.

C. Wheels

The wheels of these vehicles are totally 4 with 3 rears and one front. The centre wheel in the rear has electric motor to operate the vehicle. The support wheels are also added to ensure greater support for the aid people. The detailed specifications of the vehicle are shown in the Table 1.



Fig. 2. Power control

Table 1. Specifications of the Vehicle

Motor	Brush less Dc motor
Battery capacity	48 volt
Charging time	50 min
Maximum speed	20 kmph
Frame	Mild steel round rod, MS flat plate
Wheels & Tires	4 (Front -1 and back-3)
Size	350 mm
Weight	120 kg
Load capacity	150 kg
Watts	24 volt
Power rating	250 w
Speed	20 kmph
Seat	Galvanized iron sheet 0.5 mm thickness



Fig. 3. Power Exchanging Wheel

D. Controller

The vehicle control is handled by electrical units. It includes basically pedal assist and cruise modes, hall timing, voltage cutoffs, interlock switches etc.

III. CONCLUSION

The objective of this study was to design and develop a vehicle of highly compact to enter the building and structures like industries, Hospitals, indoor and outdoor place. The vehicle was made with light weight in order to increase its range and also to carry a better weight. The vehicle was built with a height as low as possible but the other factor, ground clearance is also considered for the suitability of Indian roads. A platform was made in the vehicle so as the disabled persons survive with wheelchairs can also keep their wheelchairs comfortably. By wheel up or down they can accommodate in the vehicle easily without without

dismount them. A prototype of this vehicle was designed fabricated and tested manually on the road.

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