International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Prototype Electric Self-Loading Cart

M.I.C.A. José Luis Hernández Corona.T.S.U. Omar Romano Vazquez.M.I.C.A. Ernesto Mendoza Vazquez

Technological University of Tlaxcala, Highway to El Carmen Xalpatlahuaya, Huamantla, Tlaxcala

Omar Romano Vazquez

Abstract: ***This project aims to make a prototype for an electric car, since electric cars have 0 emissions of carbon dioxide. Plus they are very economical as they do not need any kind of fuel to operate. Nowadays, the problem of contamination is huge and it is produced by many different factors. Contamination refers not only to littering on the streets, but also to air, noise and water pollution, among others. In this case we will focus on pollution caused by cars in Mexico City, since they produce carbon dioxide because they have internal combustion engines, and these use fuels derived from petroleum for their operation. Currently, in Mexico City and according to the Statistics of Motor Vehicles Registered in Circulation, the State of Mexico has a total of 5.1 million registered cars, which means that altogether circulate a total of 20.8 million vehicles in the country. This indicates that we have a high consumption of fuel and a high production of carbon dioxide. To reduce the carbon dioxide pollution, it was decided to create a prototype of an electric auto rechargeable car and for the creation of this prototype an avalanche, which is similar to a skateboard but it has a steering wheel, was taken as base.The prototype works with an electric motor that runs on direct current, two 15-plate auto batteries to power the engine and an auto alternator; this generates direct current to recharge the batteries. Pulleys and belts to transmit the mechanical power of the motor to the drive shaft and a speed regulator for the engine are also required.***

Keywords: pollution, electric motor, 0 emissions of carbon dioxide, pollution

1. Introduction

Car air pollution causes harmful effects on human health. Epidemiological studies, comparing urban areas (high level of pollution) and rural areas (low level of pollution) show that the increase in cases of respiratory diseases is related to emissions from cars. Emissions from leaks from these vehicles contain carbon dioxide, hydrocarbons and nitrogen oxides which are released into the atmosphere in significant quantities; are the components of the "photochemical oxidant smog". For this reason, the most populated urban areas are those that suffer the most pollution of this type. The number of cars recorded in Mexico practically doubled in eight years (2005-2013), from 5.1 million to 10.1 million. Before, this phenomenon had taken 25 years to occur (1980-2005). This has undoubtedly resulted in the increase of pollution.

This electric car prototype was made to prove that an electric car is more ecofriendly and cheaper than a car with a combustion engine. Since a gasoline car emits, on average, 2.7 tons of Carbon Dioxide (CO2) per year. In contrast, an electric car has practically zero CO2 emissions, because instead of burning fuel, it uses the electricity stored in the batteries.

At first the model we made was very basic as it only consists of an avalanche with 4 wheels and a steering axle. We added components such as motor batteries and an alternator to recharge the batteries with the same movement in order not to consume all the energy stored in the batteries.

2. Theoretical Framework

An electric car is a car powered by one or more electric motors, using electrical energy stored in rechargeable batteries. Electric motors provide electric cars with instant torque, creating a strong and continuous acceleration. They are also up to three times more efficient than an internal combustion engine.

The first practical electric cars emerged in the 1880s. Electric cars were popular in the late nineteenth and early twentieth century, until advances in internal combustion engines, especially with the introduction of the automatic starting device, and the mass production of cheaper gasoline cars that led to a decline in the use of electric cars.

After several decades of neglect, the 1973 oil crisis produced a brief revival of interest in electric vehicles during the 1970s and 1980s, although they did not reach mass marketing, due to advances in batteries and energy management, the global concern about the increase in oil prices, and the need to reduce greenhouse gas emissions. Several national and local governments have established incentives for plug-in electric or hybrid vehicles, tax exemptions and other aids to promote the introduction and market adoption of such vehicles. Electric vehicles are significantly quieter than internal combustion vehicles. They also provide energy independence from oil imports, which in some countries, is a cause of concern due to their vulnerability and due to the volatility of the price of oil and its possible effect on the disruption of supply.

In 2016, there are more than 10,000 models of electric cars and vans for sale to the public, mainly in the United States, China, Japan and European countries. Cumulative global sales of electric vehicles exceeded one million units in September 2016.

The improvement of the electric battery, by the French Gaston Planté in 1865 and Camille Faure in 1881, paved the way for electric vehicles. At the 1867 World Exposition in Paris, Austrian inventor Franz Kravogl showed a 3-wheeled electric-powered tricycle. France and Great Britain were the first nations that supported the widespread development of electric vehicles.

Electric cars made remarkable speed and distance records, among which the breaking of the barrier of 100 km / h, Camille Jenatzy on April 29, 1899, which reached a top speed of 105.88 km / h.

3. What is an electric car?

An electric car is one that is driven with the force that produces an engine powered by electricity. An electric motor transforms electrical energy into mechanical energy by means of electromagnetic interactions. The conductive element they have in their interior tends to move when it is inside a magnetic field and receives electric current. There are electric motors of all sizes, which range from a radio control car to a locomotive. Electric motors offer many benefits over combustion, starting with a smaller size and weight, in addition to greater technical simplicity. Its use presents advantages from the environmental point of view, since it allows people to reduce the level of emissions of CO 2 to the atmosphere.

4. History of the Electric Car

The electric car was one of the first cars to be developed. In fact, there were electric vehicles prior to the four-stroke engine on which Diesel (diesel engine) and Benz (gasoline) based on the combustion car. Between 1832 and 1839, the Scottish businessman Robert Anderson invented the first pure electric car. Professor SibrandusStratingh of Groningen, in the Netherlands, designed and built with the help of his assistant Christopher Becker small-scale electric vehicles in 1835.

In 1897 the first electric taxi was used in New York, with more than 100 copies.

Just before 1900, electric cars made remarkable speed and distance records, including the breakdown of the 100 km / h barrier by Camille Jenatzy on April 29, 1899 (105.88 km / h), in 1906 the Swiss brand Tribelhornlanza launched tourism buses with autonomy of 60 to 100 km and a speed of 25 km / h.

The introduction of the Cadillac electric starter in 1913 simplified the task of starting the internal combustion engine, which before this improvement was difficult and sometimes dangerous. This innovation, coupled with the relatively massive and relatively inexpensive assembly line production system implemented by Ford since 1908, contributed to the fall of the electric vehicle. In addition, the improvements followed faster in internal combustion vehicles than in electric vehicles.

In the 1920s the electric car industry disappeared completely, being relegated to some very specific industrial applications, such as forklifts (introduced in 1923 by Yale), electric battery-powered bulls, or electric golf carts, with the first Lektra models in 1954.

In 1996, the electric car was reemerged again, starting a continuous launching of new electric cars by major car brands such as TESLA MOTORS.

5. Advantages of Electric Motor in Cars

1) It practically makes no noise at work and its vibrations are imperceptible.
2) It works at full capacity without having to change its temperature.
3) As it does not have oscillating elements, it does not require inertial flywheels or space attachments to isolate it from the rest of the car.
4) An electric motor does not need to change gear, except for a mechanism to distinguish forward or reverse, which may well be the reversal of the motor's own polarity.
5) Theoretically an electric motor can develop a maximum torque from 0 rpm, making it possible to start from zero with a maximum speed.
6) The efficiency of an electric motor is about 90%.

6. Disadvantages of Electric Motor in Cars

1) The main disadvantage and the most important is the autonomy of the electric car without connecting it to the network. The fact that every 100 to 120 kilometers of travel it has to be recharged, the batteries are very limited to users.
2) Electric batteries have an expiration date, as they degenerate with use and begin to have a lower carrying capacity.

7. Building Process

We started the construction process with the change of the wheels to 10 ", since they had a diameter of 3 ", and with this it is difficult for us to place the pulleys on the transmission shaft, because it would not be the correct height. Figure 1[A and B]

Figure 1 [A and B]

Subsequently, the traction axis was made. Which we had to plot in the lathe to reduce its diameter to reach a diameter of 5/8, coupled with this, it was done threaded on each end to place nuts and fasten the wheels to the shaft.Figure 2 [A and B]

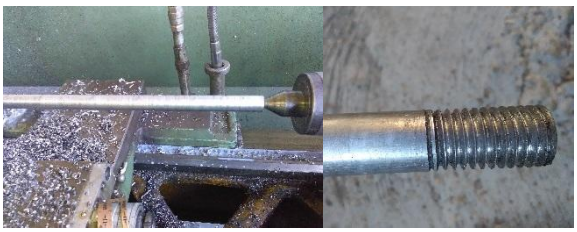

Figure 2: [A and B]

2 bearings were used with a measure of 5/8 " so that the traction shaft could rotate.Figure 3

Figure 3

A 6 "inch pulley was placed on the drive shaft to reduce the engine speed and its start, it does not carry much speed.Figure 4

Figure 4

At first the car had a measurement between ends of 110 centimeters. For which we had lengthen it by 30 centimeters to be able to place the batteries and electric motor.Figure 5[A and B]

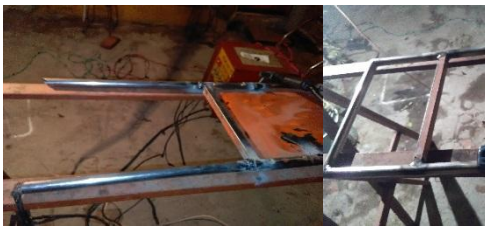

Figure 5: [A and B]

To make the steering of the car, a piece of metallic C was placed to work as support for each of the front wheels. Which internally will carry a circle ring with bearings so that the wheels can be moved easily when driving.Figure 6 [A and B]

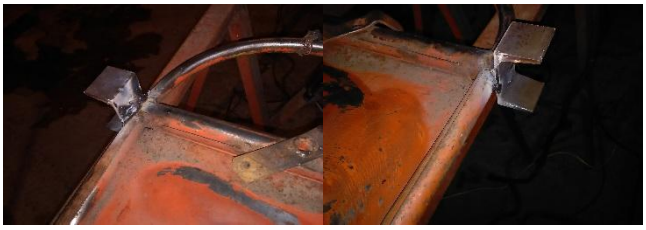

Figure 6: [A and B]

The electric motor that matters in this project was a 24 volt direct current motor which has a consumption of 17 amperes and a power 408 Watts.Figure 7

Figure 7

For the motor, a 1 ½ "pulley for the motor shaft is machined. This pulley will help us to transmit the mechanical energy of the motor to the shaft by means of a toothed belt. Figure 8

Figure 8

For the consumption of energy we used a car battery, which provide us with a wide amperage for the consumption of the motor. The battery has an amperage of 525 amperes at 0 ° C and 420 amperes at -18 ° C.Figure 9

.

Figure 9

To do the auto charge, we took a car alternator, which will convert the mechanical energy of the shaft into direct electric energy. This voltage will be used to recharge the battery we use to power the motor. Figure 10

Figure 10

In the final part we assemble and tighten all the screws of the trolley, as well as the assembly of the motor, alternator and the respective power battery. Figure 11

Figure 11

8. Conclusions

The project was finally concluded with the assembly of all machined and non-machined parts for the car to be able to do tests.

At the time of performing the operation tests it could be noted that the option of transmission by band was not the

best option, because when the car had an obstacle like a slight slope, the band skated on the pulley causing the band to heat up due to friction.

The result was that the electric car works perfectly only on flat surfaces. We note that the alternator generates an optimum recharge for the battery when the car descends from a slope to a straight, reaching approximately 800 RPMS. Because the alternator has a minimum 700 RPMS to generate a regular load, giving us as a conclusion that if we exceed the minimum of RPMS we will have an optimal recharge for our battery.

References

[1] Fórmulas y datos prácticos para electricistas.**Editorial:** Paraninfo **Autor:** JOSÉ ROLDÁN VILORIA
[2] Control of induction motors **Editor** J. David Irwin Auburn University
[3] Control of electric motors. **Author:** ENRÍQUEZ HARPER, GILBERTO.**Editorial:**LIMUSA
[4] The ABC of renewable energies in electrical systems. **Author:** ENRÍQUEZ HARPER, GILBERTO. **Editorial**: LIMUSA

Author Profile

Omar RomanoVazquez received the T.S.U.senior university technician. In the technological university of Tlaxcala in 2014 - 2016 respectively. During 2014 and 2016 I remained studying the industrial area maintenance career and obtaining knowledge for different areas of the industry, such as electricity, mechanics, hydraulics, pneumatics, and electronics among others.

José Luis Hernández Corona Candidate for a PhD from the Autonomous University of Tlaxcala, Research Professor in the area of Industrial Maintenance, Desirable Profile before the PROMEP, responsible for the CA of Industrial Maintenance at the Technological University of Tlaxcala

Ernesto Mendoza Vazquez teacher researcher of time complete in the Technological University of Tlaxcala as well as academic corps in industry maintenance