

## Powering the Electric Cars with Dynamos

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**Abstract:** Our main objective in this paper is to power up the electric cars with dynamos. The major disadvantage we are facing in the electric car is that the charge in the battery which gives the supply for motor gets discharge and hence it should be stopped or parked in the area where the current should be easily taken. But the biggest problem is that when the car get loses its full charge while driving in an area where the current could not be taken easily or there is no sort of current in that area then you can't able to reach your palace .Hence to change this problem the dynamos are used to solve it. Dynamo is a device which is capable of changing mechanical energy into electrical energy .Hence by using this character of the dynamo the problem can be solved. The description of this technique is that by placing one dynamo in each wheel so that each dynamo will produce a charge through the rotatory motion given by the wheels of the car and these charges is stored in a separate battery and that can be used for the emergency purpose and this process is cyclic. When car losses its charge while running on the charge produced by the dynamo, the dynamo will not stops its work, it again produce a charge so that you can go for a longer distance.

**Keywords** – Dynamos, Emergency purpose, Electric charge, Battery, Gear system

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### I. Introduction

An electric car is an automobile that is propelled by one or more electric motors, using electrical energy stored in batteries or another energy storage device. Electric cars were popular in the late 19th century and early 20th century, until advances in internal combustion engine technology and mass production of cheaper gasoline vehicles led to a decline in the use of electric drive vehicle. The energy crises of the 1970s and 80s brought a short-lived interest in electric cars, but in the mid-2000s a renewed interest in the production of electric cars took place, due mainly to concerns about rapidly increasing oil prices and the need to reduce greenhouse gas emissions. As of July 2012, series production highway-capable models available in some countries include the Tesla Roadster, REVAi, Buddy, Mitsubishi i MiEV, Nissan Leaf, Smart ED, Wheego Whip LiFe, Mia electric, BYD e6, Bolloré Bluecar, Renault Fluence Z.E., Ford Focus Electric, BMW ActiveE, Coda, Tesla Model S, and Honda Fit EV. As of June 2012, the world's top-selling highway-capable all-electric cars are the Nissan Leaf, with more than 30,000 units sold worldwide, and the Mitsubishi i-MiEV, with global deliveries of 20,000 vehicles, including units rebadged as Peugeot iOn and Citroën C-Zero for the European market. Electric cars have several benefits compared to conventional internal combustion engine automobiles, including a significant reduction of local air pollution, as they have no tailpipe, and therefore do not emit harmful tailpipe pollutants from the onboard source of power at the point of operation; reduced greenhouse gas emissions from the onboard source of power, depending on the fuel and technology used for electricity generation to charge the batteries; and less dependence on foreign oil, which for the United States and other developed or emerging countries is cause for concern about vulnerability to oil price volatility and supply disruption.

### II. Advantages Of Owning An Electric Car

The greatest advantage of an electric car is obviously the complete lack of emissions (when running on battery power—some vehicles like the Chevy Volt, only run on batter power for the first 40 or so miles of driving then go gasoline-powered). A full electric vehicle, like the all-new 2011 Nissan Leaf, or Tesla Roadster however, will not even have an exhaust system, muffler or fuel tank. They do not use any fossil fuels internally. They are fueled completely by a rechargeable battery that does not have to be charged via a gas engine. With many hybrid cars, there is a gas engine to go along with the electric component. Which leads to another good point: people like electric-only cars are because they provide a very quiet ride. There are no engine noises or roar even when you have to floor the gas, just an eerie (but cool) whirling sound increasing in pitch. When electric cars are run at very low speeds they are essentially silent.

The maintenance of electric cars is also much easier to handle. Simply put, there are less moving parts and fewer things that can go wrong. With traditional engines, there is constant movement under the hood. With an electric vehicle much more is stationary, only the main motor's drive shaft and the car's transmission spin. Much less will wear down from overuse. For example, in a conventional car, eventually all the belts in the engine will wear out and need to be replaced lest they snap on you and leave you stranded. No such things in electric cars, want to go electric? Another advantage of battery-power is that the technology in these vehicles has come a long way. Although you cannot drive hundreds and hundreds of miles on these batteries, you can

travel fairly long distances—upwards of 100-miles or so (perfect for commuting). Once you have maxed out your battery for the day it must be recharged before you can get back on the road however. Many forward-thinking workplaces now offer electric car charging stations. Charging the battery back to full strength is quick and easy, especially if you have several hours to let it sit. You simply plug the car in just as you would any other electronic device.

### **III. Problems Faced By Electric Cars**

The electric car industry is poised to launch a number of new products over the next two years -- everything from compact cars, like the Mitsubishi i-MiEV, to work vans, like the Ford Transit Connect Electric. But, the success of electric cars is far from assured. The electric car industry, like any new industry, is facing a number of challenges. Unfortunately, those challenges are tangled in a giant ball -- a ball that'll be tough to unravel.

The major challenge is that the electric car makers are finding that people are worried about how far they can travel in electric cars before their batteries peter out. In a gasoline-powered car, running low on gas is really no big deal; just pull into a gas station, fill up and in about five minutes you're back on the road. Charging and electric car isn't quite so simple. Most production electric cars about to hit the market can only go about 100 miles (160.9 kilometers) on a single charge. And, unless you have access to a specialized charging station (which are currently in short supply), getting a full charge takes around eight hours. While most people drive less than 40 miles (64.4 kilometers) a day and could easily charge their electric cars overnight, electric cars still aren't useful for road trips. And, let's say you drive 80 miles (128.7 kilometers) in a day, come home and find out that there's an unexpected emergency and you need to drive another 30 miles (48.3 kilometers)? Consumers thinking of situations like that make for a big hurdle that electric cars still have to clear.

Those charging stations are another challenge -- they can alleviate a number of concerns consumers have about electric cars. Electric cars represent a vast change to the country's infrastructure. While some charging stations are out in trial phases (Best Buy is trying some out at their stores so consumers can recharge while they shop), most charging still needs to be at home, in a garage. That means that people who live in shared housing or use street parking will likely have the hardest time charging. Of course, if infrastructure was improved and more charging stations were available, more people would buy electric cars. But, of course, changes to infrastructure won't be made until more people buy electric cars and call for it. See? It's the chicken-and-the-egg thing again.

### **IV. Solution**

As we seen above, the major disadvantage in electrical cars is that the electricity in the car gets discharge, when it is on the running condition. After it finishes it work, it should be stopped or parked in the place where the current should be easily taken, because the car should be charged for further running and also when the car taken for emergency purpose during that time the charge is not full, the car does not knows the emergency, Automatically the battery gets discharge and when the battery is fully dry the car get stopped before you reaches your place. So in this place our solution is going to play an important role. The solution is dynamo. Dynamo plays an important role in this situation. . It is a device which converts mechanical energy in to electrical energy .the basic role of the dynamo in cars is that it takes the mechanical energy form the car as input and gives the output as electrical energy and that electrical energy is stored in a battery and that is used for emergency purpose. Dynamos are have already done their jobs in the olden days for the braking purpose and also in the train and even now in some fuel cars they are used to recharge the battery which is kept for the purpose to power the light, air conditioner etc.But here the dynamo purpose is entirely different. It gives us some new application that dynamos produce a charge from which the car is going to run. Let us see the detailed information about dynamo.

### **V. Dynamo**

A **dynamo** (from the Greek word *dynamis*; meaning power), originally another name for an electrical generator, generally means a generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator. Also, converting alternating to direct current using power rectification devices (vacuum tube or more recently solid state) is effective and usually economic. The word still has some regional usage as a replacement for the word generator. A small electrical generator built into the hub of a bicycle wheel to power lights is called a Hub dynamo, although these are invariably AC devices. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law of induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. The motion of the wire within the magnetic field causes the field

to push on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils. The commutator was needed to produce direct current. When a loop of wire rotates in a magnetic field, the potential induced in it reverses with each half turn, generating an alternating current. However, in the early days of electric experimentation, alternating current generally had no known use. The few uses for electricity, such as electroplating, used direct current provided by messy liquid batteries. Dynamos were invented as a replacement for batteries. The commutator is essentially a rotary switch. It consists of a set of contacts mounted on the machine's shaft, combined with graphite-block stationary contacts, called "brushes", because the earliest such fixed contacts were metal brushes. The commutator reverses the connection of the windings to the external circuit when the potential reverses, so instead of alternating current, a pulsing direct current is produced.



**Quick Details**

**Rated Voltage:** 24V

**Rated Current:** 30A

**Model Number:** EX200-2

**Brand Name:** 6BG1 dynamo

**OEM:** 1-81200-440-2

**VI. Working Of Dynamo In Electric Car**

As from the introduction about the dynamo it is a device which converts mechanical energy in to electrical energy this is the basic principle used here and its is used for low power applications. Each dynamo is capable of producing 24v that can be used for low power application. So here in electrical cars the dynamo role is that the car has four wheels so in each wheel we can place one dynamo so from each dynamo we can get 24v when these dynamos are connected in series we can get the output of 96v.

But the biggest problem is, placing the dynamo in a car is an inefficiency process, that it completely decreases the efficiency of the car. Hence on taking account of this, the working process of the dynamo in a car is completely changed here i.e. every car has to travel in a slope and also it will travel smoothly during when you take off your legs from the acceleration pedal while running. Hence on seeing this situation the dynamos are used to fill up or produce a charge at this time hence you will not loss your efficiency of the car.



Fig.1 Gear systems in a car wheel.

The description of this technique is that as you see in the figure 1 we are going to make a gear like system in the wheel and going to fix another small gear in to that so that when a wheel rotates the small gear rotates.



Fig 2 Larger gear connected to smaller gear

As you see in the figure 2 when a smaller gear is connected to a larger gear then you will get larger rpm from the smaller gear by giving even smaller rpm to the larger wheel. Hence by seeing this even when the wheel rotates at smaller rpm you will get more rpm from the smaller gear. Now let us go into our technique, the smaller gear is fixed in the wheel and is connected to a rod and the other end of the rod is connected to another second small gear-like system and that gear system is going to engage and disengage the dynamo's head from it. Now how could we go to replace the problem faced by the dynamo by its inefficiency process? Here is the solution. The solution is that when you press the acceleration pedal of your car the second small gear will be disconnected from the dynamo's head so no power is taken by the dynamo from the car during running conditions hence the car's efficiency is not decreased. And when you take off your legs from the pedal during when you are travelling on the slope or at the time of braking when you go to stop your car or during the time of speed brakes in the road or you will slow up your car when the signals on the road are on red and hence in this situation the energies are getting wasted. Thus these wasted energies are taken by the dynamo by when you take off your leg from the acceleration pedal the dynamo's head and the second small gear are engaged or connected and due to this the dynamo's head is rotated and it produces the charge and this charge is stored in a separate battery and that could be used for emergency purposes and also at the time of production of charge by dynamo the car's efficiency is not going to be decreased at all hence it is an efficiency process too.



Dynamo's capacity	Dc motor capacities over dynamo's
 6BG1 dynamo	 FB1-4001 Motor
One dynamo's maximum capacity is 24v. Hence from four dynamo's we can get $24+24+24+24=96v$	At 96 Volts: Continuous rating: 15.0 kw (20.0 hp) Peak output: 52.5 kw (70.0 hp)
But in general no process is 100% there is some loss of energy. Hence due to the various power losses we can't be able to get full 96v and then by considering these losses we lose somewhat of about 10 or 15v but we have still 81v remaining.	At 72 Volts Continuous rating: 12.8 kw (17.0 hp) Peak output: 31.5 kw (42.0 hp)

Fig: 3 the specification of dynamo's over dc motor in cars

Hence as we shown in the fig 3 about the dynamo's specification over dc electric car motor, the dynamo gives the output of about 96v for which the motor's capacity is: at 96v (Continuous rating: 12.8 kw (17.0 hp) ; (Peak output: 52.5 kW (70.0 hp)). This voltage can be able to run a car at least 1.5 or 1 km for dc motor and also when there is a power loss then there will be a loss in voltage so that we will not be able to get full 96v we will be missing of 10 or 15v but we have still 81v remaining for which the motor's capacity is: at 72v (continuous rating: 12.8kw)(17.0hp); (peak output : 31.5kw(42.0hp)) and the advantage is while running a car through the charge which is produced from the dynamo will discharge but the dynamo does not stop its work that is while running automatically dynamo starts it works and produce a charge so hence by this we can be able to run a car until we reach our destination or to a plug in bunk. Hence the amount of charge discharged is equal to the amount of recharging. So it is a cyclic process. But no process is 100% cyclic in practical so there may be a negligible amount of power loss.

## VII. Economical Aspects

A cost of an individual dynamo costs around 5,000 according to the present market price. So, the sum of total 4 dynamos may cost around 20,000. While considering the cost of an all new electrical car in the market it costs around for Nissan: 12 lakhs, TATA Indica : 6 lakhs, Chevrolet: 9 lakhs. The price of an electrical car is very huge while considering the dynamo's rate. So fixing of a dynamo which is a cost-efficient process. And also it does not affect the customer who is going to buy this car because comparing the cost of car to the dynamo's cost it is not a huge amount.

## VIII. Advantages Of Owing An Electric Car With Dynamo

To move forward, a vehicle's drivetrain must provide enough energy to overcome the vehicle's inertia, which is directly related to its weight. The less a vehicle weighs the less energy it takes to move it. Weight can be reduced by using lightweight materials and lighter weight technologies.

Hence by considering this the size and weight of a dynamo it ranges from 4-5kgs. Let us see the specifications of FB1-4001 electric car dc Motor: It gives stunning acceleration in a car 1200 to 1500kg. Drives a 2000kg vehicle very well. High torque means you get superb pulling power from a standstill or accelerating from low speed. The total weight of car is about 1200 (without any passengers). Let us consider 5 passengers of weight 100kgs each. Totally 500kgs added to the car. So the weight of car raises to 1700. The maximum weight of four dynamos equals 20kgs. So the overall weight of car becomes 1720kgs. Still we have 280 kgs left free. So even after fixing 4 dynamos the pulling capacity is not decreased. So it is very compact in fixing into the cars. And also it produces dc supply and hence there is no need of using any alternator if the car has the dc motor.

### I. Disadvantages

It is complicated to fix the dynamo in the wheels of the cars because the front wheel is connected to steering and when the steering is turned then the wheel gets turned hence the dynamo should be fixed in the way that it should be moved where the wheel moves.

By considering the cost of electric cars the dynamo's cost is low but if the cost of the car is low then by comparison the cost of the four dynamos will be slightly greater. Moreover by considering all its advantages and its working and efficiency, the disadvantages are lesser. Hence this technology could be possible in future electric cars.

### II. Conclusion and future aspects

As from the introduction, the main content of this paper is to solve the main problem faced by the electric cars and thus these main problems are cleared by the dynamos hence a small device which solves the big problem we hope this solution could be useful and possible in the future and also the future aspects for this solution is that.



We have recently learned, from a source close to Mercedes Benz and its Research Center in Stuttgart, that the Daimler AG is working on a vehicle "which will revolutionize the luxury auto market," as they put it. The "revolutionary" vehicle will be an all electric mid-size to large luxury vehicle, and will feature lithium ion battery that can be recharged two ways. The first option will be with a direct plug-in, and the other option will be a small dynamo like device that will charge the battery while the car is driving. In current tests, the battery was able to get 170 km (approx 105 miles) before it had to be charged again. Hence their research says that the discharge of the battery can be filled up by the dynamos and thus by seeing this the dynamo is solving two problems which are discharge problem and emergency problem in the electric cars and this shows the efficiency of the dynamo or the importance of the dynamo in cars.

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