

The Development of the Electric Cars from Past to Present

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ABSTRACT

Approximately %25 percent of CO₂ emission comes from transportation today. In internal combustion engine vehicles, about %60 of the energy is spreading to the environment which is heating up the atmosphere and adversely affecting all of the living beings. The gas emissions are disturbing the balance of the nature. Global Warming is the biggest outcome of these gas emissions. To leave a clean environment for future generations, the use of fossil fuels must be highly shortened in transportation. To find a solution to this situation, most of the governments started producing electric cars which is not harming the nature by gases. From the beginning of the 19th century, inventors, scientists and engineering have been working on vehicles, but enough importance have not given to electric cars until today. The number electric cars is increased a lot in the last 10 years. Today about 7.5 million electric cars are in use which is a good sign for future.

Keywords: *Electric Cars, Energy, Range, Speed*

1. Introduction

For the last 10 years, the interest against electric cars is rapidly increasing. Most of the automotive companies, notably Tesla, were producing electric cars because of the depletion of the fossil fuels. Contrary to general belief, electric cars have been found about 150 years ago. From the beginning of the 19th century United States, Hungary, United Kingdom and Netherlands started producing electric motors for short ranged electric car concept. In a short time period, many inventors from all around the world created many concepts. The first model car working with an electric motor has been created by Hungarian inventor Ányos Jedlik in 1828 (Guarnieri, 2011). The motor built by Jedlik contains the three main pieces of a DC motor; stator, rotator and commutator. After a while, in 1832 Robert Anderson a Scottish inventor created the first known electric vehicle. This car was made with non rechargeable batteries (primary cells). 7 years later, another Scottish inventor Robert Davidson invented the first electric locomotive. He made a better version of it in 1842. It's top speed was 4 mph (Doppelbauer, 2021). It could not be used because its battery can not be charged. It was a big problem that the batteries were unable to charge.

2. The Emergence of Electric Cars

Later on physicist Gaston Plante invented the first rechargeable battery (accumulator) in 1859 (Britannica, 2021). The invention of the accumulator has made a great contribution to the progress of the industry. Gustave Trouve invented the first electric vehicle powered by accumulator (secondary battery) (Morimoto, 2015). In 1881, he displayed it in an exposition, in Paris (Guarnieri,

2011). It was a tricycle. Thomas Parker claimed that he invented the first electric vehicle in 1884 (Morimoto, 2015). What drives him to electric vehicles might be his emphasis on fuel efficiency. Also he might be worried about the harmful effects of smoke and pollutions. The first successful electric car in the United States was created by William Morrison in 1890. This car's top speed was 14 mph (Matulka, 2014). From the beginning of 1890's the interest in electric cars has grown a lot. Electric taxis have been used from the end of 19th century. In 1897 London Electrical Cab Company started operating taxis (known as Bersey's cab) (Morimoto, 2015). Also Samuel's Electric Carriage and Wagon Company started operating electric taxis in New York. Electric vehicles were more practical than its rivals. They were far ahead from their rivals in gasoline smell problem and the time to run the car. Because of that, it was preferred by wealthy people at first. They also had disadvantages sadly. The most important disadvantage was the range issue. Till the early 1910's electric car sales progressed very well, but a solution had to be found to this issue. Battery replacing service has been proposed as a solution to overcome with the charging issue. However a permanent solution to this problem has not been found. The presence of oil reserves pushed people to fuel cars because gasoline was cheaper and also longer distances could be gain around. Therefore, internal combustion engine vehicles started to become more popular. Also the production cost of internal combustion engine cars was cheaper than electric cars. The production of "Ford Model T" which is still the third best selling automobile in the world today, has greatly reduced the sales rates of electric cars. Many manufacturers withdrew from the electric car market. From 1930's most of the electric cars disappeared.

3. Dark Period and Renaissance

Between 1930-1960, electric cars were about to be forgotten. They were no longer being produced. Unfortunately, there has been no development in electric cars in these years. In 1967, AMC (America Motors Corporation) and Gulton Industries announced a collaboration to develop an electric car (Foster, 2013). In 1960's many concept models such as "Electrovair" appeared but none of them were sold in the market. In 1971 during the Apollo 15 mission, an electric car "The Rover" was used for transportation on the moon (Mohon, 2019). This Moon Buggy was developed by Boeing and Delco Electronics (Costes et al., 1972). This vehicle assumed the title of the first manned vehicle on the moon. Because of the oil crisis in 1973, the United States started to find domestic oil resources, and they started to work on electric vehicles. In 1976 the Electric and Hybrid vehicle Research Development and Demonstration Act was passed in the United States. Many companies such as Mazda, Renault, Ford, Dodge, AMC have started to produce electric cars by converting their own car models (AMC Pacer/Change of Pace, Chevrolet Chevette/Electrovette etc.) Although it has been worked on, electric cars could not approach gasoline powered vehicles in speed and range. In 1985 Sinclair Vehicles company released the "C5" model (Brittanica, 2017). Actually this was not exactly a car, it was a one-seater velomobile. It was not being approved by most people because of its low range and speed. 14.000 of this vehicle were produced but only 5.000 of them were sold (Brittanica, 2017). The vehicle completely disappeared in the fourth month of its launch. In the 1990's a clean air and energy policy law was enacted by the California Air Resources Board (CARB). The aim was to minimize emissions. This increased the interest in electric cars again. Companies such as Ford, Toyota, Honda started to develop electric cars again (Toyota RAV4 EV, Ford Ranger EV, Honda EV+ etc.). These vehicles were closer to gasoline powered vehicles in range and speed than the previous ones but people still preferred gasoline powered vehicles to electric vehicles. Engineers, scientists paid more attention to electric vehicles

development than before. The “EV1” model produced by General Motors has an important place in the electric car industry. It has 80 miles of range which was great. However this vehicle could not be used. 1.117 of this vehicle is produced but most of them dismantled (Jamieson, 2021). Only 40 of them is left, the only fully intact one is staying in National Museum of American History (Edwards, 2006). At the beginning of the 21st century, hybrid cars emerged. The Toyota “Prius” has manufactured in 1997 by 2000, about 40.000 cars had been sold (Clifford, 2015). The emergence of hybrid vehicles helped not to forget electric vehicles. In 2003, “Tesla” company was established. They made their voice heard all over the World by introducing the “Roadster” model in 2006. Tesla Roadster had a range of 394km and it has a top speed of 200km. It went on sale in 2008 (Eric et. al, 2018). After Tesla in 2010, Nissan launched the “Leaf” model. The Leaf received the title of the first 5 door family car in the market. At first, users suffered from not being able to charge their vehicles on the road, but American Department of Energy solved this problem by building over 20.000 charging stations (Anonymous, 2021). Within a few years, many well-known automobile companies put their cars on the market.

3.1 A Brief History of Hybrid Cars

In general, hybrid car (HEV) means that a car using more than one source. Ferdinand Porsche is the pioneer of hybrid cars. In 1900, he developed the Lohner-Porsche Electromobile was introduced in Paris World Fair. In the same year, Porsche designed a hybrid car called “Semper Vivus”. He did not use the battery as the only energy source, he used it for supplying the wheel hub and increasing range of the car. In 1917, Woods Motor Company introduced their hybrid car. It had a four cylinder internal combustion engine and an electric motor. This project did not have a success. Hybrid cars have not produced for a long time. In 1969, General Motors introduced “GM 512”. It was an experimental car. In 1989, Audi “Duo” concept car introduced. It was actually based on Audi A4 Avant. It has a 1.9 lt. TDI 90 PS engine and 9 kW electric engine. . In 1999 Honda “Insight” released. In 1997, Toyota Prius was introduced and in 2000, it released worldwide. In 2002 Honda released “Civic Hybrid”. In 2004 Ford released their first hybrid car “Escape”. It’s the first American hybrid car. Most of the car manufacturers are producing hybrid models today. Also, plug in hybrid (PHEV) models are available on the market. In addition to hybrid cars, It’s battery can be charged by plugging a charging cable. In 2006 GM and Toyota announced plug in hybrid concepts. In 2007, Ford released “Escape” plug in hybrid model. In the later years, other car manufacturers were also announced their plug in hybrid models. Hybrid cars are widely in use today.

3.2 A Short Story of Tesla

Tesla Motors, was founded by a group of people in 2003. At the beginning of 2004, Elon Musk has been contributed about 30 million dollars and he has was chosen as a chairman of the company. They released their first car “Tesla Roadster” in 2008. The Roadster could accelerate from 0 to 60 mph (about 100km) in less than 4 seconds and it has a top speed of 200km/h. Also in 2008, Musk took over as a CEO of the company because of financial problems. In 2012 production of Roadster was stopped and Tesla Model S was launched. It’s range up to 300 miles (about 480km) which makes it the longest range electric car ever at that time. It could accelerate from 0 to 60mph in

about 4 seconds (Erik et, al, 2018). It's still produced today. Tesla Motors, built the Superchargers (charging stations) in the U.S also in Europe without any extra cost for Tesla customers. In 2014 Tesla launched Autopilot drive option. Actually it is not a fully Autopilot technology it was a semiautonomous drive technology. In 2015, "Model X" was released to the market. It is a seven seater car, and it has a battery range of 475km. In 2016 "Model 3" was introduced as a low priced vehicle and they began producing it in 2017 (Erik et, al, 2018). In the second half of the same year, Elon Musk announced that they sold 200.000 vehicles. In 2019 Tesla Motors introduced its new model "Model Y" It is a four seated mid size SUV. They introduced their last model "Cybertruck" concept vehicle in 2019. Later, Elon Musk claimed that Tesla has received about 250.000 orders for Cybertruck. On March 2020, Elon Musk announced that Tesla produced their 1 millionth car. Today, Tesla Motors is one of the biggest car manufacturers in the world.

4. Conclusion

Many automobile manufacturers have begun to develop batteries besides producing internal combustion engines. Nowadays, it is said that many countries will ban the usage of diesel cars in the near future, they will only produce electric cars when sufficient infrastructure is established because cars internal combustion engine cars are harming the environment by CO2 emission. Shifting from fossil fuels to electricity as thinking, the vision of a brighter and more optimistic world is approaching. Not just in daily use, electric cars are also used in motor sports today. Formula E races have been held since 2014. These kind of races have a lot of viewer community. These race are also promoting electric cars usage. With the help of electric car racing series, adoption of electric cars is increasing worldwide. Most of the companies have already decided not to produce diesel vehicles in the near future. If we consider that energy resources will decrease and the atmosphere is adversely affected by harmful gas emissions, it seems that electric cars will have a great importance in the future.

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