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E-Vehicles the Future of Transportation: Comparative Analysis with Hybrid Vehicles

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ABSTRACT

The current state of air pollution in India is a major worry. Numerous Indian towns are among the most polluted in the world, according to a recent survey. The industrial and transportation sectors are the two main sources of air pollution. Among these, the industrial sector is responsible for 51% of air pollution, and the transportation sector for 27%. Every year, 2 million Indians die before their time due to air pollution. Electric Vehicles (EV) can help to reduce GHG emissions and hence help to reduce air pollution. Numerous benefits, including a drop in pollution and lower costs for oil imports, are provided by electric vehicles. Even Nevertheless, there are many risks involved with introducing electric vehicles in India.

In addition to EVs, hybrid cars have a lot of potential in the Indian market. A hybrid vehicle is one that draws its power from two or more different sources, such as submarines that operate on batteries when submerged and diesel when they are surfaced. To enhance both fuel and energy economy, hybrid powertrains are made to switch between different power sources. For instance, in hybrid electric vehicles, the combustion engine is better at maintaining high speed while the electric motor is more effective at providing torque, or turning power. The three main advantages of hybridization are increased efficiency, lower emissions, and cheaper operating costs when compared to non-hybrid vehicles.

This article provides a quick review of the research on electric vehicles and lists the benefits and drawbacks of marketing EVs in India while comparing them to hybrid cars.

Keywords: *electric vehicles, hybrid vehicles, advantages, threats, comparative analysis.*

I. INTRODUCTION

A vehicle that uses one or more electric motors for transportation is referred to as an electric vehicle (EV). It can be operated fully by a battery, a collector system, or electricity from extravehicular sources(occasionally charged by solar panels, or by converting energy to electricity using energy cells or a creator). Road and rail vehicles, face and aquatic boat, electric planes, and electric spacecraft are all exemplifications of EVs. For road buses , EVs form a unborn mobility conception known as Connected, Autonomous, Shared and Electric(CASE)

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Mobility along with other forthcoming automotive technologies including independent driving, connected vehicles, and participated mobility.

Electric vehicles (EVs) originally appeared in the late 19th century when electricity was one of the preferred forms of motor vehicle power, offering a level of comfort and ease of use that gasoline cars of the day were unable to match. For almost 100 years, internal combustion engines predominated as the primary means of transportation for cars and trucks, but electric power remained prevalent in other vehicle types, such as trains and smaller vehicles of all kinds. A growing interest in an electric transport system emerged in the latter half of the 20th and the beginning of the 21st centuries as a result of the negative environmental effects of the petroleum-based transportation systems and the concern of peak oil. Electric vehicles (EVs) differ from conventional cars in that the electricity they use can be produced using a variety of fuels, including nuclear power, renewable energy sources like solar and wind power, or any combination of those. Electric vehicle emissions and their carbon impact vary depending on the technology and fuel utilised to generate the power. Depending on the vehicle, a battery, flywheel, or supercapacitors may be used to store the electricity. Internal combustion engine vehicles often only get their energy from one or two sources, which are typically non-renewable fossil fuels. Regenerative braking, which converts kinetic energy—often wasted during friction braking as heat—into electricity reinvested in the on-board battery, is a significant benefit of electric vehicles.

On the other hand, The system of a hybrid vehicle uses a gasoline engine and at least one electric motor to operate the vehicle, and it uses regenerative braking to recover energy. Sometimes the gas engine and sometimes the electric motor operate in tandem to complete the task. As a result, less gasoline is consumed, improving fuel efficiency. In some circumstances, adding electric power can even improve performance. With all of them, electricity is provided by a high-voltage battery pack different from the vehicle's standard 12-volt battery that is refilled by preserving kinetic energy during deceleration that is generally wasted to heat produced by the brakes in traditional vehicles. The regenerative braking technology makes this possible. In hybrid vehicles, the battery is maintained and charged by the gas engine. Different hybrid designs are used by automakers for a variety of purposes, from maximising fuel efficiency to minimising vehicle costs.

In the year 1899, Ferdinand Porsche, a mechanical engineer, created the first hybrid vehicle. It was known as the System Lohner-Porsche Mixte, and it used a gas engine to fuel an electric motor that propelled the vehicle's front wheels. Over 300 of the Mixte were created since it was warmly appreciated. The introduction of the first vehicle production line by Henry Ford in 1904,

however, caused the market for hybrids to decline. The market for hybrid vehicles was significantly reduced by Ford's ability to manufacture gasoline-powered cars and sell them for affordable prices. While the Mixte's technology was used to make hybrids far into the 1910s, most of them did not sell well since they were more expensive and had less power than their gasoline-powered counterparts. Hybrids quickly disappeared, starting a nearly 50-year period during which they were only an afterthought.

In the year 1999, the Honda Insight was the country's first HEV to be released in substantial quantities. Although the Toyota Prius sedan, which was introduced in the United States in 2000, provided hybrid technology the foothold it needed, the two-door, two-seat Insight may have been the first. Since its debut in the United States, the Prius has come to represent the word "hybrid." It is the most well-liked HEV ever created, and countless more automobiles have been built using its technology by automakers all over the world. More automakers are now providing hybrid and plug-in hybrid variants of their models. For instance, the Toyota RAV4 Prime is a plug-in hybrid vehicle with a combined range of 600 miles and an electric driving range of 42 miles. It's one of Toyota's fastest cars and even has a 94 MPG rating with more than 300 horsepower.

II. ADVANTAGES AND DISADVANTAGES OF PROMOTING ELECTRIC VEHICLES IN INDIA

Advantages

There are number of advantages of promoting EVs in India. Few of them are as follows:-

1. **Cost-effective:** Compared to fuels like petrol and diesel, which frequently experience price spikes, electricity is significantly less expensive. Battery recharge is affordable when renewable electricity is consumed at home.
2. **Environmentally friendly:** As electric vehicles don't burn fuel, there are no pollutants or gas exhaust. Using an electric car can make a contribution to a clean and healthy environment because fossil fuel-powered vehicles considerably contribute to the buildup of dangerous gases in the atmosphere.
3. **Government support:** As part of a green initiative, governments all over the world have provided tax cuts to encourage more people to use electric vehicles
4. **Electric vehicles are powered by renewable energy,** as opposed to traditional cars, which use fossil fuels, depleting the world's reserves of such resources.

5. **Reduced maintenance:** Because electric vehicles have fewer moving parts, wear and tear are decreased compared to standard auto parts. Repairs are also less difficult and less expensive than with combustion engines.
6. **Smoother motion and less noise:** Driving an electric automobile is much more comfortable. They are quiet and make less noise because they don't contain any fast-moving components.

Disadvantages

Even though there are some great reasons for opting electric vehicles, in a country like India there are disadvantages too. Some of them are as follows:-

1. **Recharging takes time:** Unlike traditional vehicles, which require only a few minutes to refill their petrol tanks, charging an electric vehicle can take many hours.
2. **Relatively high cost:** Electric vehicles remain relatively expensive, and many purchasers think they are not as affordable as regular vehicles.
3. **Evs have a lesser driving range as compared to traditional cars.** Electric vehicles are useful for short-distance transport but cumbersome for long-distance travel.
4. **Options are limited:** There aren't many electric car models to choose from right now in terms of design, style, or customizable modifications.
5. **Limitations of charging stations:** Individuals who must journey over long distances are worried about finding appropriate charging stations in the midst of their trip, which are not always available.

III. COMPARATIVE ANALYSIS WITH HYBIRD VEHICLES

Apart from electric vehicles, hybrid vehicles are also making their way in the market. The major difference between both the vehicles is that electric vehicles use only electricity to work while hybrid vehicles use 2 or more than 2 types of powers to work. According to many big companies like Toyota and Maruti Suzuki, hybrid vehicles would be more appropriate and work better for a country like India. Regardless of what other manufacturers say or intend, the company believes EVs will not be a significant element of vehicle sales. According to Bhargava - "The capacity to acquire green transportation is going to take time in India because of the nature of our electrical generating. Talking about electric automobiles without considering the greenness of the country's electrical generation is an insufficient approach to this challenge. Till the time we have a cleaner grid electricity, it's vital to employ all the current technologies like compressed natural gas, ethanol, hybrid and biogas, which will assist minimise the carbon footprint and not promote any one technology."

Numerous firms, notably Maruti Suzuki India and Toyota, have frequently stated that hybrids make more sense in regions where infrastructure is not ready for electric cars (EVs) and that a range of options are required. Businesses frequently claim that because much of the energy in India and other developing nations is produced by combustion of coal or other fossil fuels, EVs are more polluting than hybrids in those markets. Even Honda, which recently debuted its hybrid car e:HEV in India, feels hybrid cars make more sense in the nation and believes that decreasing taxes on hybrid vehicles will lead to quicker EV adoption. In that regard, EVs are a superior alternative, although hybrid vehicles are more feasible for Indian roadways, given the limited backing for full-fledged EVs. Moreover, EV fire accidents were initially restricted to e-scooters, but lately, a Tata Nexon EV caught fire in Mumbai, which may sway prospective consumers' opinions of EVs. Hence, hybrid vehicles might bridge the confidence gap for individuals in the country who are currently not prepared for a pure EV.

Kunal Behl, Vice President (Marketing and Sales) of Honda Vehicles India, has stated that hybrid vehicles might aid in the transition to completely electric vehicles while also reducing emissions from vehicles and fossil fuel use. India wants carmakers to produce more electric vehicles, but demand for such vehicles has been weak, with just Tata Motors producing them domestically. Suzuki pledged to investing \$1.4 billion in the nation in March to manufacture BEVs and batteries, but its local affiliate, Maruti Suzuki, has stated that it will not deliver a completely electric car before 2025. Likewise, Ferrari, the Italian luxury sportscar manufacturer, has announced an electrification strategy that aims for 40% full-electric vehicles and 40% hybrid models by 2030.

The overall tax burden on hybrid cars in the country is 43%, including GST, whereas battery electric vehicles are taxed at around 5%. This raises the price of hybrid vehicles while making EVs much more affordable in India's price-sensitive market. In a country like India, carmakers struggle to sell hybrid vehicles. MG Hector and Honda's City eHEV are two hybrid vehicles in the nation that start under Rs 20 lakh. Pure EVs, on the contrary, start around Rs 12 lakh in India, and there are various alternatives to choose from. Peculiarly, 68 percent of Indians favour internal combustion engine-powered automobiles as their next purchase, according to a global poll done by Deloitte. Just 4% want a pure EV as their future car, while 24% prefer a hybrid. A legislative group suggested placing HEVs on par with EVs for tax benefits in December last year in order to meet India's carbon emission reduction objectives, but nothing has been done so far. Unfortunately, the charging station for EVs is still in its infancy, which is a deal killer for numerous people across the nation. This is where hybrid automobiles come into play, but due to their high cost, not everyone can afford one. This leaves many people with the traditional

petrol and diesel vehicles that are affordable and reliable.

IV. CONCLUSION AND MY OPINION

After analysing all the data and information about electric as well as hybrid vehicles, we can conclude by saying that, India as a country has a long way to become a market capable of EVs and hybrid vehicles. Recently the growth of EVs in india has increased by 3000% and the around 168% for hybrid vehicles. India will not have a popular hybrid product until the government intervenes. Because the technology is sophisticated and hence costly. As a result, the government must support the tax structure for hybrids and EVs during the early incubation period.

In my opinion, we cannot directly move to pure electric vehicles as a lot of people won't be comfortable with using it. But we can start by adopting hybrid vehicles. One of the biggest reason for promoting electric or hybrid vehicles is the increasing air pollution in the country. But in a country like India where most of the electricity is generated through coal combustion, electric vehicle will lead to more pollution. Apart from that infrastructure required for electric vehicles to work properly in india has a long way to go as we still don't have minimum charging stations for electric vehicles but hybrid vehicles can work as they can even use other fuels to work. So in order to create a perfect market for electric vehicles, we need to work on the technology and infrastructure. By the time other electricity generation technology like solar, wind or thermal is not developed fully and the infrastructure develops, we can adopt for hybrid vehicle.
