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Proceedings

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Caroline MUKOMBERO*, Bartłomiej DŁUGOSZ, Aleksander ŚLADKOWSKI

Silesian University of Technology

Krasińskiego 8, 40-019 Katowice, Poland

* *Corresponding authors.* Email: cm304573@polsl.pl

ANALYSIS AND COMPARISON OF GASOLINE AND ELECTRICAL VEHICLES

Summary. In this paper, we are looking at the advantages and disadvantages of the different types of vehicles. We also consider the buyer's perspective when considering which car to buy considering the mileage and the cost of maintenance, also looking at the manufacturer's perspective when they consider the cost of manufacturing the parts of the vehicle e.g. the interlocking parts and the gas filters, and the engine types. We also consider the future trends of purchasing the electric vehicle over the gasoline car as there will be new laws that will promote the buying of the electric vehicle over the gasoline car.

ANALIZA I PORÓWNANIE POJAZDÓW BENZYNOWYCH I ELEKTRYCZNYCH

Streszczenie. W tym artykule przyglądamy się zaletom i wadom różnych typów pojazdów. Rozważamy również perspektywę kupujących, rozważając zakup samochodu, biorąc pod uwagę przebieg i koszty utrzymania, a także patrząc na perspektywę producentów, gdy biorą pod uwagę koszt produkcji części pojazdu, np. części blokujące i filtry gazowe oraz typy silników. Rozważamy również przyszłe trendy zakupu pojazdu elektrycznego nad samochodem benzynowym, ponieważ pojawiają się nowe przepisy, które będą promować zakup pojazdu elektrycznego nad samochodem benzynowym.

1. INTRODUCTION

1.1. A Comparison between gasoline and electric vehicles

Along with the conventional dominance of gasoline-powered cars, the recent rise in popularity of electric vehicles (EVs) has caused a seismic upheaval in the automobile industry. The argument over whether electric vehicles are better than gasoline-powered vehicles has gained more significance as the globe struggles with environmental issues and the pressing need to cut greenhouse gas emissions. In-depth comparisons of the performance, environmental impact, cost-effectiveness, and general acceptability of these two automobile technologies for the transportation of the future are provided in this article, which also studies and evaluates their essential characteristics.

An innovative and environmentally friendly replacement for internal combustion engines, electric cars promise lower carbon footprints and a move away from fossil fuels. These cars rely on electric motors that operate with no tailpipe emissions and are fueled by rechargeable batteries. The internal combustion engines of gasoline automobiles, on the other hand, burn fossil fuels, which release carbon dioxide and other pollutants into the environment. Understanding the distinctions between these two vehicle types is essential to choosing sustainable transportation options as the pressure to address climate change increases.

There will be a thorough analysis of both gasoline and electric cars, taking into account many factors. The capabilities of each vehicle type will be determined by an evaluation of performance, which takes into account elements like acceleration, peak speed, and driving range. Additionally, the availability of gas stations for gasoline vehicles and the infrastructure for charging electric vehicles will be covered because they have a big influence on convenience and usability.

This topic aims to shed light on the benefits and constraints of each technology, enabling people, policymakers, and industry stakeholders to make informed decisions about the future of sustainable transportation. This is accomplished by conducting a thorough analysis and comparison of electric and gasoline vehicles. In the end, this investigation will help us better grasp how to go about reducing environmental effects and forming the automobile industry of the future.

1.2. General comparison of the electric and gasoline vehicles

The table below gives the general comparison of the gasoline vehicle parts and the electric vehicle parts and functions with the electric car containing more.

Functional parts than the gasoline vehicle hence it may contribute largely to the weight of the vehicle.

The general comparison of the different vehicle parts

Fuel Vehicle Parts	Electric Vehicle Parts	Functions
Fuel tank	Battery	Stores energy to make the vehicle run
Fuel Pump	Charger	Puts energy/fuel into the vehicle to make it run
Fuel Engine	Electric Motor	Makes the vehicle move
Carburetor	Controller	Controls starts, stops, speed, acceleration
Alternator	DC / DC Converter	Provides power to accessories such as radio, lights, air conditioner
	DC / AC Converter	Converts DC to AC Power to make the motor run

Fig. 1. Tabulated differences of the electric and gasoline car parts [1]

2. THE COST OF MAINTAINING THE DIFFERENT TYPES OF VEHICLES

Looking at the above table one can conclude for themselves that it would be more affordable to own an electric vehicle as it is much cheaper to fuel, as one considers the daily distance traveled to and from their workplaces, traffic jams, or detours.

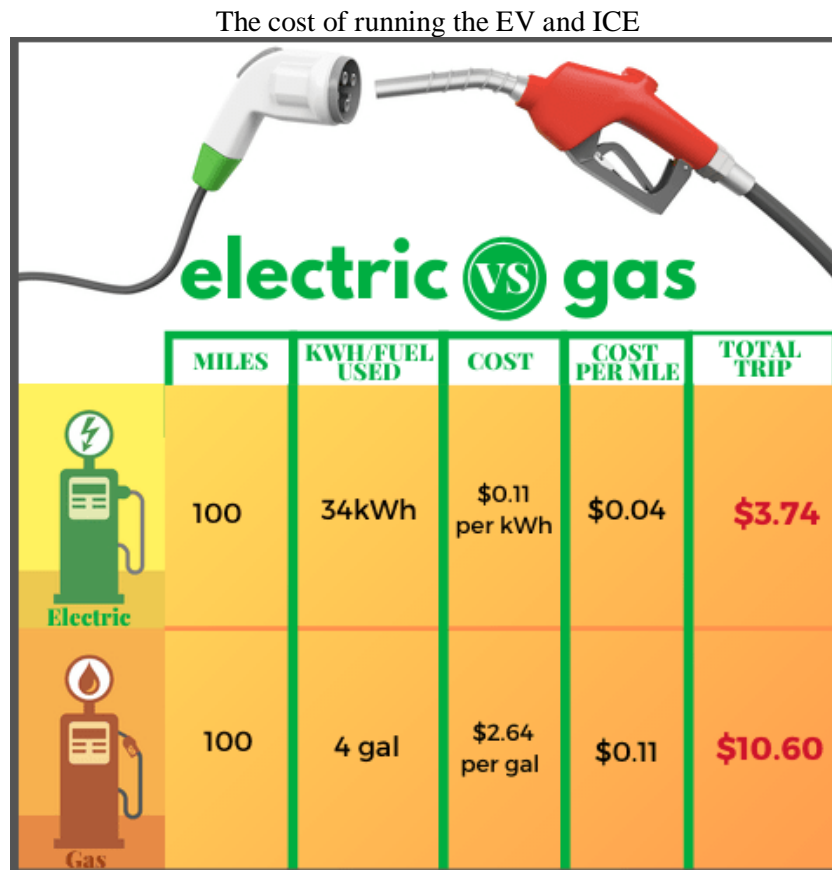


Fig. 2. Table showing the comparison of fueling both the vehicles [2]

Looking at table below one can make note that owning an EV would be an advantage as it has lower maintenance cost due to the following reasons:

1. Electric vehicles (EVs) have a simpler powertrain than cars with internal combustion engines (ICEs). Since they do not need things like the transmission, exhaust system, or fuel system, they have fewer moving parts. By keeping things simple, there are fewer mechanical failures and fewer maintenance and repair costs.
2. Reduced Wear and strain: Since EVs lack an internal combustion engine, they have fewer components like pistons, valves, and spark plugs that are susceptible to wear and strain. As a consequence, routine maintenance procedures like oil changes, air filter replacements, and coolant flushes become less necessary.
3. Efficiency of the braking system: Regenerative braking, which utilizes the electric motor to slow down the car while simultaneously gathering energy and storing it back in the battery, is a common technique used by EVs. The standard brake pads are put under less strain and last longer thanks to this regenerative braking technology. Consequently, replacing brake pads may be less frequent on EVs.
4. No Need for Fluid Changes: EVs don't have an engine that needs oil lubrication, in contrast to gasoline cars that do. Consequently, oil changes are not necessary for EV owners, saving them money and effort.
5. Less Fluids and Filters: Compared to ICE cars, EVs lack parts like coolant systems, transmission fluids, and fuel filters. As a result, EV owners save money on maintenance by not having to replace or maintain these extra fluids and filters.
6. Electric motor lifetime: Electric motors used in EVs are renowned for their toughness and endurance. Over their lifespan, they usually require little maintenance, lowering the likelihood of motor-related problems and corresponding repair expenses.

The cost of maintaining the EV and the ICE






	ELECTRIC BMW i3 £29,570	PETROL BMW 318i £29,600
 Fuel	3.7p per mile + £354 home charger	14.2p per mile
 Tax	£0	£445
 Loss of value	£16,707	£15,066
 Insurance	£1,089	£824
 Servicing + tyres	£322 + £243	£528 + £87
TOTAL	67p per mile	74p per mile

Fig. 3. Tabulated cost of maintenance of an EV and a gasoline vehicle [3]

3. THE MANUFACTURER'S POINT OF VIEW AND THE BUYER'S POINT OF VIEW

3.1. Manufacturer's point of view

From a manufacturer's point of view, several factors come into play when considering which type of vehicle to produce, whether it's electric vehicles (EVs) or gasoline vehicles:

1. **Market Demand and Consumer Preferences:** Manufacturers carefully analyze market trends, consumer preferences, and forecasts to understand the demand for different vehicle types. They assess factors such as customer demographics, regional variations, and shifts in consumer preferences. By evaluating market demand, manufacturers can align their production strategy with the types of vehicles that are likely to sell well and meet customer expectations.
2. **Regulatory Environment and Emission Standards:** The regulatory landscape significantly influences a manufacturer's decision-making process. Government policies and emission standards play a crucial role in shaping the automotive industry. Manufacturers evaluate current and anticipated emission regulations, fuel efficiency requirements, and potential penalties or incentives associated with different vehicle types. They align their production plans to comply with regulations and optimize their product portfolio to meet evolving environmental standards.
3. **Technological Advancements and Innovation:** Manufacturers invest in research and development to stay at the forefront of automotive technology. They closely monitor advancements in electric propulsion systems, battery technology, and sustainable materials to assess the feasibility of producing electric vehicles. Manufacturers also consider the potential for technological breakthroughs, cost reductions, and improvements in infrastructure to support the production and adoption of EVs.
4. **Cost Analysis and Profitability:** Manufacturers evaluate the cost implications of producing different vehicle types. They consider factors such as production costs, supply chain logistics, economies of scale, and anticipated pricing strategies. Manufacturers weigh the initial investment required for EV production, including battery technology, against the potential profitability of entering or expanding their presence in the EV market.
5. **Infrastructure Development and Support:** Manufacturers assess the availability and development of infrastructure to support the production and usage of different vehicle types. This includes considerations such as charging infrastructure for EVs, fueling infrastructure for gasoline vehicles, and the support of government initiatives or private sector partnerships to enhance the overall ecosystem. Manufacturers may collaborate with stakeholders such as

charging network providers, energy companies, and government agencies to ensure the necessary infrastructure is in place to support their chosen vehicle type.

6. **Brand Strategy and Image:** Manufacturers consider their brand strategy and image when deciding which type of vehicle to produce. They evaluate how different vehicle types align with their brand identity, target market, and customer perception. Manufacturers may prioritize certain brand attributes, such as sustainability, innovation, or performance, and choose a vehicle type that reinforces their brand values and resonates with their customer base.
7. **Production Capacity and Flexibility:** Manufacturers assess their production capacity and flexibility to meet the demand for different vehicle types. They consider the adaptability of their manufacturing facilities, production lines, and workforce to accommodate the unique requirements of EV production. Manufacturers evaluate the potential need for retooling, training, and resource allocation to produce electric vehicles effectively.
8. **Competitive Analysis:** Manufacturers analyze the competitive landscape to understand the positioning of other companies in the market. They assess competitors' product offerings, market share, and strategic moves related to EVs and gasoline vehicles. Manufacturers aim to differentiate themselves from competitors and identify opportunities to gain a competitive edge in terms of technology, pricing, performance, or market presence.
9. **Long-Term Sustainability and Industry Trends:** Manufacturers consider long-term sustainability and the evolving dynamics of the automotive industry. They evaluate global trends related to sustainability, electrification, autonomous driving, and mobility services. By assessing future market scenarios and potential disruptions, manufacturers can make strategic decisions that position them for success in a rapidly changing automotive landscape.

3.2. Buyer's point of view

Before one considers buying a vehicle, one would take into consideration a number of factors. These factors will influence the buyer's choice of the car be it an EV owner or an ICE owner these different buyers may put into consideration the same factors. The status of one may influence the choice of vehicle, income, comfortability, and reliability just to mention a few factors.



Fig. 4. Top factors to consider when buying your next car [4]

4. ENVIRONMENTAL FRIENDLINESS OF THE VEHICLES

The graph below shows the comparison of the environmental friendliness of the EV over the ICE. The table below shows that the EV has less greenhouse gas emission as compared to the conventional gasoline vehicle, which makes it more friendly to use.

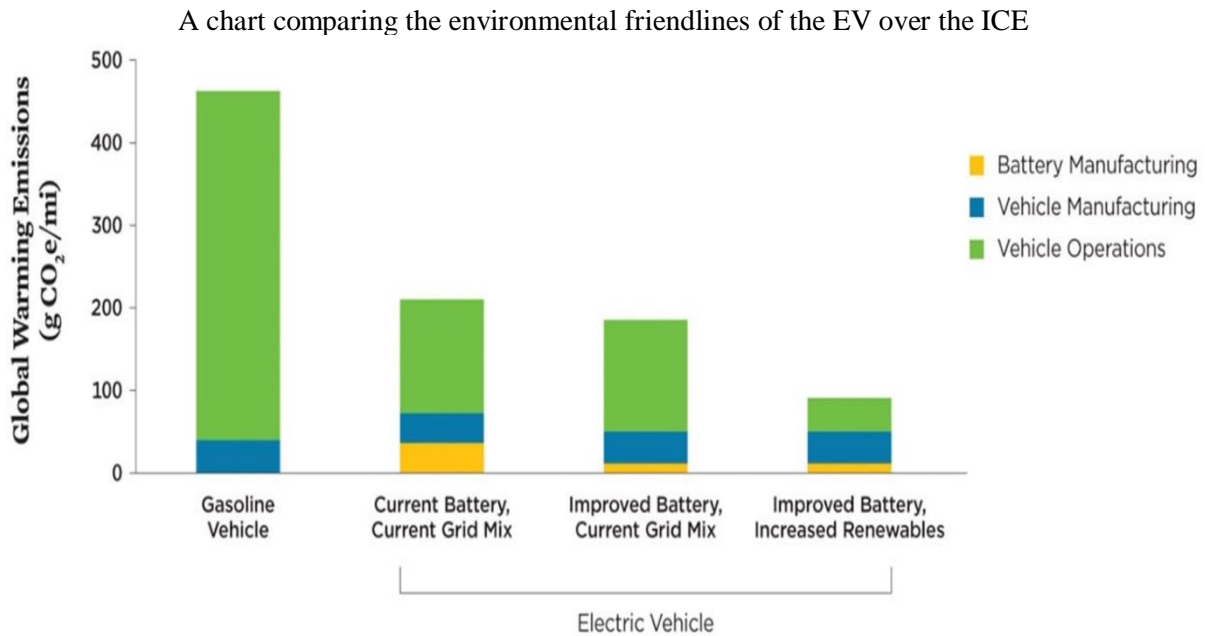
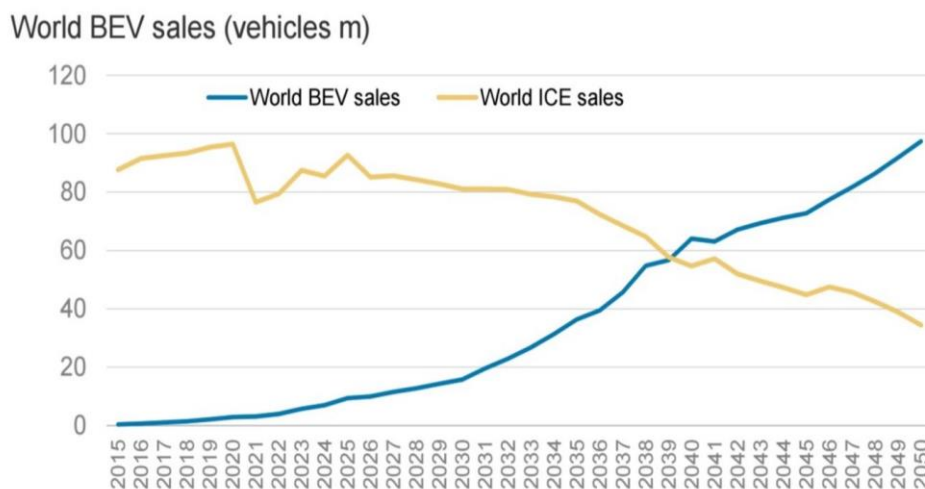


Fig. 5. Comparison of the environmental friendliness of the gasoline and electric vehicles [5]

5. FUTURE OF THE EV AND GASOLINE VEHICLE PURCHASING

The image on the following page gives the future trend in the pricing of the EV and the gasoline vehicles. As the EV will soon be a highly purchased vehicle over the regular ICE due to introduction of new policies and advancements in technology to allow for easier use of the EV.



Source: Ward's, ACEA, CAAM, Morgan Stanley Research estimates (from 2017 onwards)

Fig. 6. Graph of expected car sales in the upcoming years [6]

6. CONCLUSIONS

It is safe to conclude that the future of the automotive industry will be well dominated by the EVs as they seem to have a greater advantage over the conventional internal combustion vehicles. As it has lower Carbon emission and lower greenhouse gas emission.

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