THE EMERGENCE OF HYBRID CARS AND THEIR DEVELOPMENT PROSPECTS

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Annotation. *Recently, there has been a growing trend in the world towards electric and hybrid vehicles over internal combustion engine vehicles. One of the main reasons for this is their environmental advantages.*

The article describes the emergence and development of hybrid vehicles, which are considered a transitional system between electric vehicles and internal combustion engine vehicles, and their advantages.

Key words: *electric car, hybrid car, internal combustion engine cars, recuperation, environmental pollution.*

INTRODUCTION

Road transport has become the most widespread means of transport in the world today. In terms of passenger and freight transport, road transport occupies a leading position compared to other types of transport. At the same time, the scale of the damage caused by road transport to the atmosphere, human health and the environment is also increasing. In terms of causing environmental damage to the environment, road transport is the leader in all types of negative impacts: air pollution - 95%, noise - 49.5%, climate impact - 68%. One car “absorbs” an average of more than 4 tons of oxygen from the atmosphere per year, and at the same time emits about 800 kg of carbon monoxide, 40 kg of nitrogen oxide and almost 200 kg of various hydrocarbons with exhaust gases [1].

Every year, vehicles emit a huge amount of carcinogenic substances into the atmosphere: 27 thousand tons of benzene, 17.5 thousand tons of formaldehyde, 1.5 tons of benzopyrene. In general, the total amount of harmful substances emitted by cars annually exceeds 20 million tons. In times of ecological crisis, significant changes are occurring in the environment due to irresponsible human behavior towards nature [2].

This global environmental problem can be solved by accelerating the production of electric vehicles. Studies have shown that electric vehicles are environmentally friendly, producing fewer greenhouse gases and air pollutants than gasoline or diesel vehicles [3].

A major advantage of electric cars is their potential contribution to improving air quality in cities. Electric cars do not emit carbon dioxide gas during movement. Another advantage is that electric cars can significantly reduce the noise level, which is important for cities.

Studies show that electric cars are better for the environment than cars that run on conventional gasoline or diesel fuel. If an electric car is powered by renewable energy sources, this electric car is 100 percent environmentally friendly.

In order to encourage the development of electric vehicles in the world, a number of countries, France, Great Britain, Germany, India, the Netherlands, Spain, Greece, and Norway, have officially announced that they will reduce the emissions of gases released into the atmosphere from motor vehicles to zero by 2040 [4].

The development of technologies makes it possible to relatively reduce the amount of harmful substances emitted from gasoline and diesel engines, but does not provide an absolute solution to the problem.

All the world's major car manufacturers are actively introducing "green" cars without internal combustion engines into their model lines.

Nowadays, the environmental requirements for cars in the USA, Europe and other countries of the world are constantly being strengthened, and it is becoming more and more difficult for internal combustion engine cars to meet these requirements. Electric cars can fundamentally solve the problem, but they are still expensive and do not have enough autonomy.

Despite the rapid development of electric vehicles at present, they also have some disadvantages. The most important of these are: having a relatively short autonomous movement time (walking reserve); long battery recharging time; the height of the price of batteries; insufficient number of charging stations. However, there is a compromise, that is, an optimal solution, which is a hybrid: a car that uses both gasoline and electricity.

In this regard, hybrid technology aimed at extending the time of autonomous driving, which is one of the main disadvantages of electric cars, already exists, and it can be widely used in many mass-produced car models and in the near future it may become the age of electric vehicles.

A hybrid car (hybrid) is a car that uses more than one source of energy to drive the leading wheels. The most common hybrid transmission combines gasoline and electric motors. Such type of vehicles are called hybrid electric cars.

Although it may seem unbelievable, hybrid electric cars appeared in the early years of the automotive industry. The hybrid car is already a concept that requires

public recognition, not a development, it is a technological product with wide practical application.

The first examples of hybrid cars appeared at the beginning of the 20th century, but their mass production began only in the late 1990s.

The first car with a hybrid drive was the "Lohner-Porsche" (full name System Lohner-Porsche Mixtewagen Semper Vivus), developed in 1900 by designer Ferdinand Porsche in collaboration with the Austrian company Hofwagenfabrik Ludwig Lohner & Co. At first it was an electric car. A year later, it also introduced a hybrid modification [5].

Called the Lohner-Porsche Mixte, the system used a gasoline engine to power electric motors that drove the car's front wheels.

The main advantage of hybrid cars is its economy. To achieve this, it is necessary to find a balance, that is, to balance all the technical indicators of the car, while maintaining all the useful features of a normal car: power, speed, ability to accelerate quickly and many other important indicators that are present in modern cars. In addition, the ability to accumulate energy and charge the battery batteries without wasting the kinetic energy of the movement during braking, in addition to the main advantages, also provided drivers with some additional advantages, for example, less bending of the brake pads.

How to achieve such savings:

– reduce the size and power of the engine;

– engine operation in optimal and uniform mode, less dependent on driving conditions;

– if necessary, stop the engine completely;

– the ability to move only on an electric motor;

– regenerative braking with battery charging.

This entire system is so complex that it has become fully possible only in modern conditions, using very complex algorithms for the operation of the on-board computer. Even the correct and effective (in terms of safety) braking is controlled by the on-board computer.

Environmental cleanliness. Reducing carbon fuel consumption has an immediate impact on environmental cleanliness. It is important to completely stop the engine operation in the areas of accumulation of cars on city roads and especially in traffic jams. The use of batteries with a much smaller capacity than in electric cars has reduced the problem of disposal of used batteries. The development of hybrid technology for public transport and trucks will further improve the environmental status of cities.

Good walking characteristics. Now there is no need to install the engine taking into account the highest operating loads. When it is necessary to increase the traction load, both an electric and a regular engine (and in some models an additional electric engine) are connected to the work at the same time. This allows you to install a less powerful internal combustion engine that works in the most convenient mode for the main time.

Such uniform redistribution and accumulation of power, and its subsequent quick use, allow hybrid devices to be used in sports cars and SUVs.

Despite the fact that electric motors have a sufficiently strong torque in relation to the mass and dimensions of the engine compared to other engines, manufacturers reduce their dimensions in a number of models and install less powerful electric motors. Such a scheme is called “hybrid-combination” [6].

Energy storage and reuse. The main disadvantage of the engine on carbon fuel is that there is no possibility to return the energy to the carbon fuel. Transportation engineers have long sought to conserve and reuse kinetic energy during braking. For example, special constructions with large valves were used. However, only electricity can be saved with minimal losses and maximally cheaply. Accumulators and special capacitors are used as accumulators to store excess electrical energy generated during driving and braking in a certain mode.

For example, special constructions with large valves were used. However, only electricity can be saved with minimal losses and maximally cheaply. Accumulators and special capacitors are used as accumulators to store excess electrical energy generated during driving and braking in a certain mode. This shortcoming is eliminated in the hybrid car. Refueling, when necessary, is carried out according to the usual scheme, with the usual carbon fuel, and the movement can be resumed immediately.

In the urban operating cycle, the hybrid vehicle operates in electric mode for 80% of the time. In February 2006, American car enthusiasts managed to hack the electronic control system of the Toyota Prius and learned how to forcefully switch the car to electric mode. The French company PSA Peugeot Citroen will begin serial production of hybrid versions of the Peugeot 307 and Citroen C4 by 2010. Cars have an electric mode at a speed of less than 50 km/h. The driver can turn on the electric car mode at will.

In recent years, extensive work has been carried out in the Republic of Uzbekistan to organize and develop the production of electric and hybrid vehicles, which are “green” vehicles.

For example, in accordance with the Resolution of the President of the Republic of Uzbekistan № PP-132 dated March 18, 2024 "On approval of the investment agreement on the implementation of the investment project "Organization of the production of electric and hybrid vehicles and their components in the Republic of Uzbekistan", it was determined to organize the production of BYD electric and hybrid vehicles in the republic and further expand the range of domestic automotive products [7].

CONCLUSION

Thus, production hybrids can be seen as a "bridge" for the transition of future vehicle production to electric vehicles and the widely dispersed internal combustion engine market. The health benefits of mobile energy will be huge, and the widespread development of electric vehicles will help to create the problems of restoring renewable energy sources in general energy in the future. Electric transport and renewable energy – these sources allow to drastically reduce the level of anthropogenic impact, and also have a positive impact on the environment from the transport sector.

References:

1. Gibridnyj avtomobil. – URL: https://ru.wikipedia.org/wiki/ (date of access: 02.02.2025).
2. Shukurov N.R., Sarimsakov M.F. Road transport main pollutant environment // International scientific review, 2021. № LXXXI, – P. 5-7.
3. Shukurov N.R. Motor transport is the main source of air pollution in Uzbekistan // Conference on the role and importance of science in the modern world, 2024. – Vol. 1. –№1, P.118-123.
4. Nizkouglerodnaja transformacija global'noj jekonomiki. – URL: https: //cenef-xxi.ru/categories/6# dinamika-globalnyx-vybrosov-parnikovyh-gazov-posle-1990-g. (date of access: 22.01.2025).
5. Gibridnyy avtomobil. – URL: https://ru.wikipedia.org/wiki/ (date of access: 02.02.2025).
6. Kak rabotayet gibridnoye avto. – URL: https://tokidoki.su/blog/kak-rabotaet-gibridnoe-avto/#blog-1 (date of access: 02.02.2025).
7. Prezident jelektromobil va gibrid avtomobillarga oid jangi qaror chiqardi. – URL: https://xabar.uz/avtomobil/prezident-elektromobil-va-gibrid (date of access: 02.02.2025).