
**EUROPEAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY
RESEARCH AND MANAGEMENT STUDIES****VOLUME03 ISSUE05**DOI: <https://doi.org/10.55640/eijmrms-03-05-07>

Pages: 38-43



**HYBRIDIZATION OF EXISTING CARS: A REVIEW OF CURRENT TECHNOLOGIES AND
FUTURE PROSPECTS*****Olimjon Tuychiev****Director Of Agency For Innovative Development Republic Of Uzbekistan*

ABOUT ARTICLE

Key words: Electric vehicles (PHEVs), hybridization, technologies, hybrid cars.**Received:** 04.05.2023**Accepted:** 09.05.2023**Published:** 14.05.2023**Abstract:** Hybridization of existing cars has become an increasingly popular option for reducing the carbon footprint of transportation. This paper provides an overview of current hybridization technologies, including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and mild hybrid electric vehicles (MHEVs). We also examine the benefits and challenges of hybridization, including fuel economy, emissions reductions, and cost-effectiveness. Finally, we explore future prospects for hybridization, including the potential for new technologies and the impact of government policies and regulations.

INTRODUCTION

The transportation sector is a major contributor to greenhouse gas emissions, which are a leading cause of climate change. As a result, there is a growing need to reduce the carbon footprint of transportation. One approach to achieving this goal is the hybridization of existing cars. Hybrid cars combine a traditional internal combustion engine with an electric motor and battery, which allows for improved fuel efficiency and reduced emissions. This paper provides a comprehensive review of current hybridization technologies, their benefits and challenges, and future prospects.

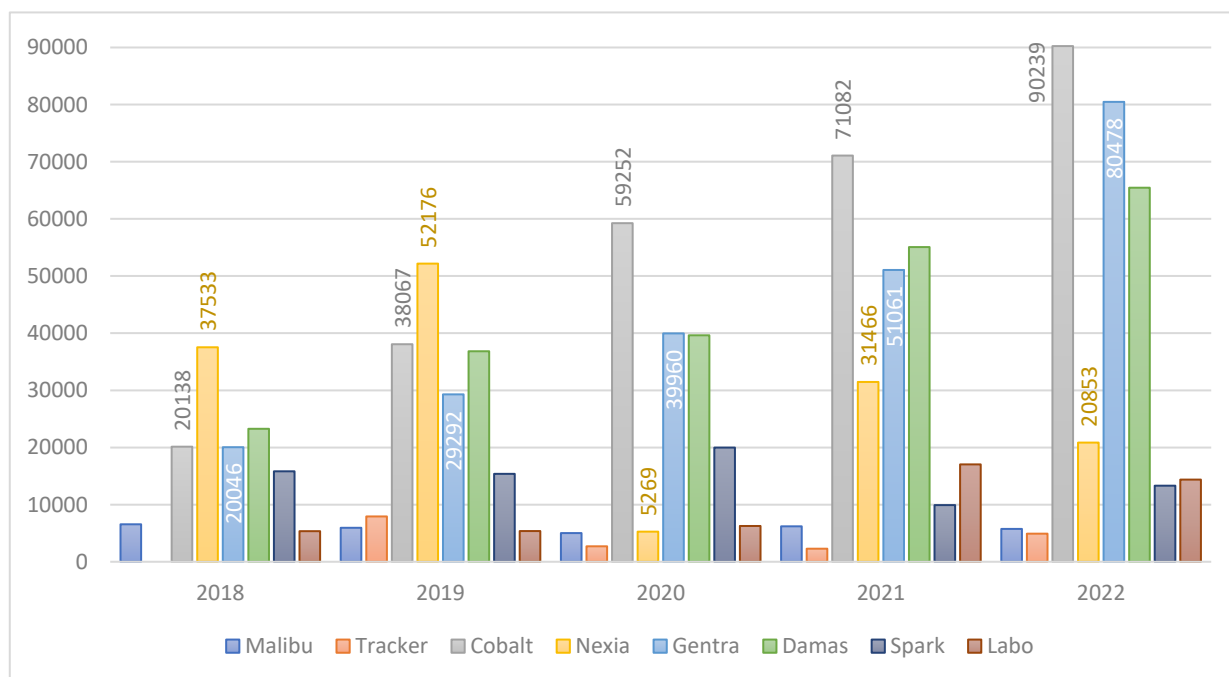


Fig.1. Statistics of automobile production in Uzbekistan (2018 - 2022)

Currently, more than 3.6 million vehicles are registered in Uzbekistan, 93% of which are passenger cars. The domestic car market is estimated at 2.6 billion US dollars, which is about 5% of the gross domestic product of Uzbekistan.

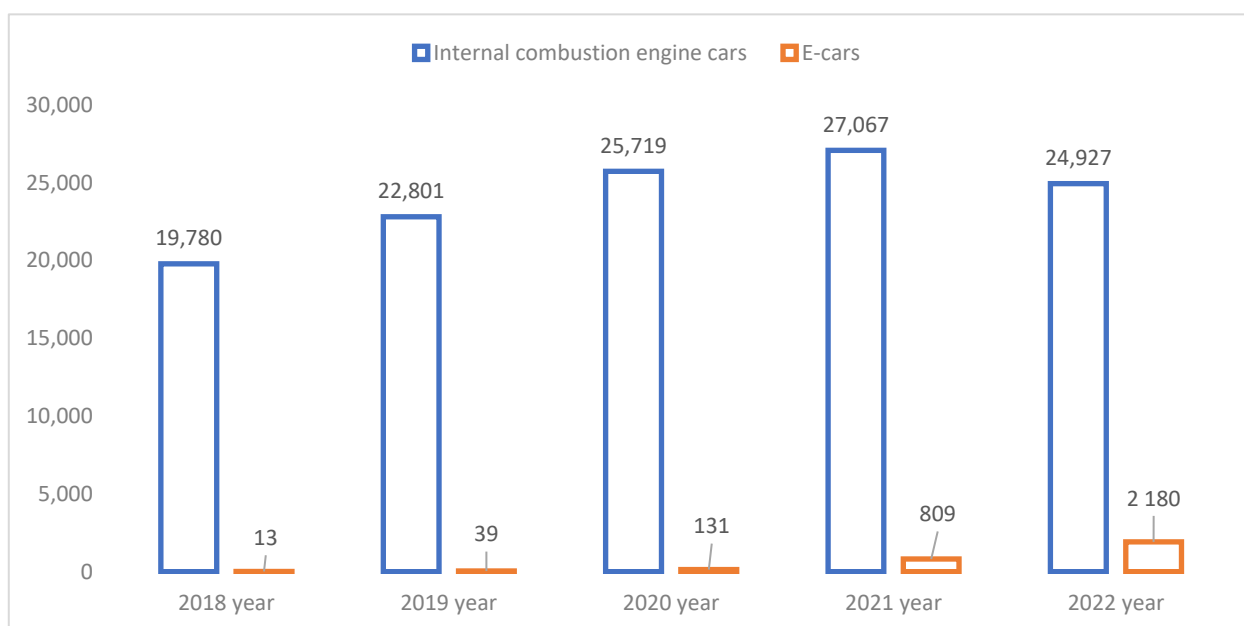


Fig.2. Car import statistics (2018-2022)

In the last 5-10 years, the number of cars has been growing significantly. For example, the number of cars per capita is 90 cars per 1000 people. For comparison, in Kazakhstan this indicator is 202 units, in Russia - 300 units, in Germany - 567 units, in the USA - 800 units and so on. Uzbekistan has a great potential for the growth of the automobile market. The increase in the purchasing power of the population should take into account the costs of using a car.

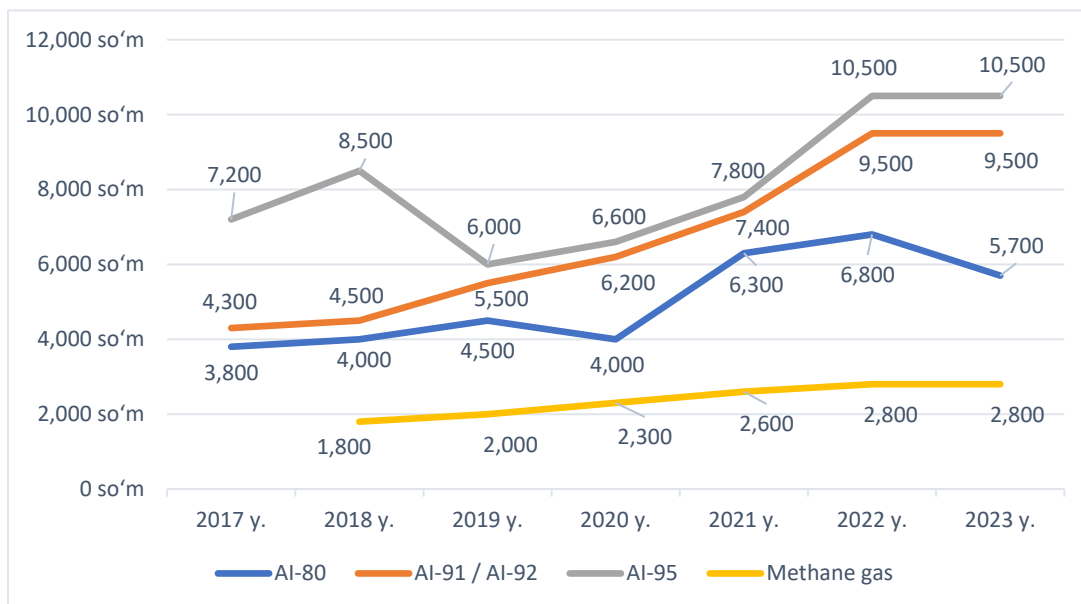


Fig.3. Dynamics of gasoline and methane gas fuel prices

Until the end of the 1st quarter of 2023, AI-80 gasoline fuel was exempted from VAT, so the price of AI-80 gasoline temporarily decreased.

Current technologies. There are three main types of hybridization technologies: HEVs, PHEVs, and MHEVs. HEVs rely on both an internal combustion engine and an electric motor to power the vehicle. The battery is charged through regenerative braking, and the engine can also charge the battery directly. PHEVs are similar to HEVs, but they have a larger battery that can be charged by plugging into an external power source. MHEVs use a smaller electric motor and battery to assist the internal combustion engine, which can result in improved fuel efficiency.

Elaphe technology dates back to the late 1980s and is the result of the founder's research into high-specification high-torque electric motors. The first high-torque engine suitable for direct-drive vehicles was developed. Elaphe Propulsion Technologies was founded in 2006 with the mission of offering in-wheel motor solutions to the mass automotive market.



Fig.4. Current solution concepts

Nowadays, Elaphe Propulsion Technologies is a designer and manufacturer of high-tech propulsion vehicles with a holistic approach to multi-engine propulsion. A key cornerstone of Elaphe's technology portfolio is world-class powertrain engine technology, representing cutting-edge technologies for a new era of automotive innovation.

Benefits and challenges. Hybridization offers several benefits, including improved fuel economy, reduced emissions, and lower operating costs. However, there are also several challenges to hybridization, such as higher upfront costs and the need for specialized maintenance. Additionally, the environmental benefits of hybridization can be offset by the production and disposal of batteries, which can have a significant environmental impact.

Future Prospects. The future of hybridization is promising, with advancements in battery technology and the potential for new hybridization technologies. For example, solid-state batteries may offer improved performance and safety compared to traditional lithium-ion batteries. Additionally, there is potential for new types of hybridization, such as hydrogen fuel cell hybrid electric vehicles, which use a fuel cell to generate electricity from hydrogen. Government policies and regulations will also play a significant role in the future of hybridization, with many countries implementing policies to incentivize the adoption of hybrid and electric vehicles, such as tax credits and subsidies.

CONCLUSION

Hybridization of existing cars offers many benefits, including improved fuel efficiency and reduced emissions. However, there are also challenges to hybridization, such as higher upfront costs and the environmental impact of battery production and disposal. Advances in battery technology and the

potential for new types of hybridization offer promising prospects for the future of hybrid cars. In addition, government policies and regulations will play a significant role in the adoption of hybrid and electric vehicles. As the transportation sector continues to evolve, hybridization is likely to become an increasingly important part of the solution to reducing the carbon footprint of transportation.

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