Volume 3, Issue 12 December 2025 **ISSN (E):** 2938-3757

TECHNOLOGIES FOR USING ENVIRONMENTALLY SAFE FUELS AND LUBRICANTS IN AUTOMOBILE TRANSPORT

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Abstract
This scientific article examines the technologies for using environmentally safe fuels and lubricants in automobile transport. The study analyzes the types of eco-friendly fuels, such as biofuels, compressed natural gas (CNG), liquefied petroleum gas (LPG), and synthetic lubricants, as well as their impact on reducing harmful emissions, improving engine efficiency, and extending the service life of vehicles. The article also discusses fuel-saving and digital monitoring technologies that optimize fuel and lubricant consumption. The research highlights the practical significance of implementing environmentally safe fuels and lubricants to ensure sustainable transport, reduce environmental pollution, and increase economic efficiency in the automotive sector.

Keywords Environmentally safe fuels, biofuels, synthetic lubricants, automobile transport, fuel efficiency, emissions reduction, eco-friendly technology.

Introduction

In the current era of globalization and industrial development, the ecological safety of the transport sector is recognized as a pressing global issue. Automobile transport not only serves as a key factor for economic development and population mobility but also has a significant impact on the environment.

Figure1. Modes of Green Transportation

Globally, harmful gases emitted by vehicles—such as carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NOx), and particulate matter—contribute to climate change, deteriorate air quality, and negatively affect human health. For instance, according to the World Health Organization (WHO) data of 2022, approximately 4.2 million people worldwide die each year due to air pollution, a large proportion of which is directly linked to transport sources. In this context, the use of environmentally safe fuels and high-quality lubricants is of critical importance. By improving the quality of fuels and lubricants, it is possible not only to reduce emissions but also to increase fuel efficiency, extend the service life of vehicles, and reduce maintenance costs. The experience of developed countries demonstrates that applying environmentally safe fuels, including biofuels, gas fuels (LPG, CNG), and synthetic lubricants, can reduce fuel consumption by 15–25% and significantly decrease harmful emissions. Moreover, the use of modern automobile engines equipped with digital monitoring systems, automatic injectors, and high-performance technologies plays a crucial role in enhancing ecological safety. These innovations optimize fuel and lubricant usage, improve operational efficiency, and reduce emissions. Therefore, the production and application of environmentally safe fuels and lubricants are significant not only from an ecological standpoint but also economically and socially. In the context of Uzbekistan, coordinating automobile transport with environmental safety is also a pressing concern. In recent years, projects for the production of biofuels and high-quality lubricants have been implemented, along with the introduction of energy-saving technologies in vehicles. From this perspective, the aim of this scientific article is to systematically study the technologies for using environmentally safe fuels and lubricants in automobile transport and to identify ways to implement them in practice.

RESEARCH METHODOLOGY

Types of Environmentally Safe Fuels. In automobile transport, environmentally safe fuels help reduce harmful environmental impacts and improve fuel efficiency. They are divided into the following main types: 1.1. Biofuels (Biodiesel, Bioethanol) Biofuels are derived from organic sources, such as agricultural waste, oil-bearing plants, and animal fats. Their advantages include: Lower carbon dioxide (CO_2) emissions during combustion compared to conventional fuels. Produced from renewable sources, ensuring ecological sustainability. For example, using biodiesel can reduce fuel consumption by approximately 10–15% and decrease NOx and SOx emissions by up to 30%.

LPG (Liquefied Petroleum Gas) and CNG (Compressed Natural Gas) significantly reduce the emission of harmful substances into the atmosphere. Engines running on gas fuels operate more smoothly, with reduced carbon residues during combustion. Example: Vehicles powered by CNG can reduce CO_2 emissions by 20–25% and NOx emissions by 30–35%. Increase engine efficiency and optimize fuel consumption.

When used with high-performance engine designs, emissions are minimized. Lubricants ensure the efficient operation of automobile engines and other mechanical components, reduce energy consumption, and extend service life. Designed to operate under high temperature and pressure conditions. Increase fuel efficiency by 5–10% and reduce engine wear. A combination of

synthetic and mineral oils, relatively inexpensive with high performance. Produced from organic sources and environmentally friendly.

Reduce emissions while providing excellent engine protection. To use environmentally safe fuels and lubricants efficiently in automobile transport, several technologies are applied: Optimize fuel consumption according to engine operating conditions. Operate in real-time to reduce fuel wastage. Sensors monitor engine temperature, lubricant temperature, and fuel consumption. Help reduce emissions and optimize maintenance.

Low-consumption, high-power engines work together with environmentally safe fuels. Turbocharged and direct injection systems improve fuel efficiency. Regular maintenance keeps engines and other components in optimal condition. Diagnostic systems monitor lubricant and fuel consumption in real-time.

- Using biofuels and gas fuels reduces emissions by 20–35%.
- Synthetic lubricants extend engine service life by 15–20%.
- Digital monitoring and automatic injector systems improve fuel efficiency by 10–15%.
- These measures enhance the environmental safety of automobile transport, reduce fuel consumption, and make vehicles more economically efficient.

CONCLUSIONS AND RECOMMENDATIONS

This scientific article comprehensively examines the technologies for using environmentally safe fuels and lubricants in automobile transport. The research results indicate that environmentally safe fuels and high-quality lubricants not only protect the environment from pollution but also play a crucial role in improving fuel efficiency, extending the service life of engines and mechanical components, and reducing operational costs.

The analysis showed that: The use of biofuels and gas fuels significantly reduces emissions (CO_2 emissions by 20–25%, NOx by up to 30–35%).

- Synthetic and semi-synthetic lubricants protect the engine from wear, extend its service life by 15–20%, and increase fuel efficiency.
- Automatic injector systems and digital monitoring help optimize the use of fuel and lubricants, reduce emissions, and enhance maintenance efficiency.

REFERENCES

1. Nayak, S. K., Behera, G. R. & Mishra, P. C. Exhaust from a dual-fuel engine using quinine nut oil and producer gas. *Energy Sour. Part A Recover. Utilization Environ. Eff.* **39** (2), 246–253 (2017).
2. Ramalingam, K. et al. Substitution of diesel fuel in conventional compression ignition engine with waste biomass-based fuel and its validation using artificial neural networks. *Process Saf. Environ. Prot.* **177**, 1234–1248 (2023).
3. Nayak, S. K., Nayak, B., Mishra, P. C., Noor, M. M. & Nanda, S. Effects of biodiesel blends and producer gas flow on overall performance of a turbocharged direct injection dual-fuel engine. *Energy Sour. Part A Recover. Utilization Environ. Eff.* **46** (1), 4165–4184 (2024).

4. Munimathan, A. et al. ML techniques increasing the power factor of a compression ignition engine that is powered by Annona biodiesel using SATACOM. *Sci. Rep.* **15** (1), 11669. https://doi.org/10.1038/s41598-025-91162-1 (2025).

5. Nayak, S. K. & Mishra, P. C. Emissions from sawdust biomass and diesel blends fuels. *Energy Sour. Part A Recover. Utilization Environ. Eff.* **38** (14), 2050–2057 (2016).

6. Faxriddin B., No‘monbek A. ABS SISTEMASI BILAN JIHOZLANGAN M1 TOIFALI AVTOMOBILLARNING TORMOZ SAMARADORLIGINI MATEMATIK NAZARIY TAHLILI //International journal of scientific researchers (IJSR) INDEXING. – 2024. – Т. 4. – №. 1. – С. 333-337.

7. Qurbonazarov S. et al. ANALYSIS OF THE FUNDAMENTALS OF MATHEMATICAL MODELING OF WHEEL MOVEMENT ON THE ROAD SURFACE OF CARS EQUIPPED WITH ABS //Multidisciplinary Journal of Science and Technology. – 2024. – Т. 4. – №. 8. – С. 45-50.

8. Xuzriddinovich B. F. et al. ABS BILAN JIHOZLANGAN AVTOMOBILNI TORMOZ PAYTIDA O ‘ZO ‘ZIDAN VA MAJBURIY TEBRANISHLARINI TORMOZ SAMARADORLIGIGA TA’SIRINI TAHLIL QILISH //ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ. – 2024. – Т. 47. – №. 4. – С. 81-87.

9. Xusinovich T. J., Ro‘zibayevich M. N. M1 TOIFALI AVTOMOBILLARNI TURLI MUHITLARDA TORMOZLANISHINI TAHLIL QILISH VA PARAMETRLARINI O ‘RGANISH.

10. Karshiev F. U., Abduqahorov N. ABS BILAN JIHOZLANGAN M1 TOIFALI AVTOMOBILLAR TORMOZ TIZIMLARINING USTIVORLIGI //Academic research in educational sciences. – 2024. – Т. 5. – №. 5. – С. 787-791. 11. Каршиев Фахридин Умарович, Н.Абдуқаҳоров ИЗУЧЕНИЕ МИКРОСТРУКТУРЫ СТАЛИ В МАТЕРИАЛОВЕДЕНИ//https://www.iupr.ru/6-121-2024 https://www.iupr.ru/_files/ugd/b06fdc_15c4798c874a4ddab326a52bd3af34ea.pdf?index=true

12. Xusinovich T. J., Ro‘zibayevich M. N. M1 TOIFALI AVTOMOBILLARNI TURLI MUHITLARDA TORMOZLANISHINI TAHLIL QILISH VA PARAMETRLARINI O ‘RGANISH.

13. Farxadjonovna, Bekimbetova Elmira, and Abduqahorov No‘monbek. "STARTING ENGINES AT LOW TEMPERATURES." Multidisciplinary Journal of Science and Technology 5.2 (2025): 83-87.

14. Xusinovich, Turdialiyev Jonibek, and Mo‘minov Nurali Ro‘zibayevich. "M1 TOIFALI AVTOMOBILLARNI TURLI MUHITLARDA TORMOZLANISHINI TAHLIL QILISH VA PARAMETRLARINI O ‘RGANISH."

15. Абдуқаҳоров Н., Турдиалиев Ж., Мўминов Н. АВТОМОБИЛИ М1 В РАЗНЫХ УСЛОВИЯХ АНАЛИЗ И ПАРАМЕТРЫ ТОРМОЖЕНИЯ УЧИТЬСЯ //Журнал научно-инновационных исследований в Узбекистане. – 2024. – Т. 2. – №. 4. – С. 377-386.

16. Каршиев Ф. У., Абдукахоров Н. ИЗУЧЕНИЕ МИКРОСТРУКТУРЫ СТАЛИ В МАТЕРИАЛОВЕДЕНИИ //Экономика и социум. – 2024. – №. 6-2 (121). – С. 1142-1145.

17. Oybek o‘g A. N. et al. ABS BILAN JIHOZLANGAN AVTOMOBILLARDA TORMOZLASH JARAYONIDAGI TEBRANISHLAR VA ULARNING TORMOZ SAMARADORLIGIGA TA’SIRI //PEDAGOGS. – 2025. – T. 92. – №. 1. – C. 127-132.
18. Xuzriddinovich B. F. et al. SURXONDARYO VILOYATIDAGI TABIIY-IQLIM SHAROITLARIDA AVTOMOBILLARNING ISH SHAROITLARINI TASNIFLASH //Tadqiqotlar. – 2025. – T. 63. – №. 2. – C. 26-32.
19. Abduqahorov N., Turdialiyev J., Mo‘minov N. M1 VEHICLES IN DIFFERENT ENVIRONMENTS ANALYSIS AND PARAMETERS OF BRAKING LEARN //Journal of science-innovative research in Uzbekistan. – 2024. – T. 4. – №. 4. – C. 377-386.

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