

USE OF BIOFUEL AS AN ALTERNATIVE TO EXHAUST FUEL IN UKRAINE

The theme is actualized by the current conditions of the full-scale war that leads to devastating consequences for the whole Ukrainian area. This work aims at analysing information about biofuel and perspectives of its use in Ukraine.

Biofuel refers to a type of fuel that is obtained from renewable biological resources, such as plants, algae. These materials are processed and converted into liquid, gaseous or solid fuels that can be used to generate heat, electricity or drive vehicles. Biofuels are considered renewable because the organic matter used to produce them can be continuously replenished by growing and processing the biomass.

There are several types of biofuel, including bioethanol and biodiesel. bioethanol is a type of alcohol fuel that is mainly made from crops such as corn, sugar cane, wheat, or other raw materials rich in starch or sugar. It is usually mixed with gasoline and used as a transportation fuel in vehicles with internal combustion engines [2; 4]. Biodiesel is a renewable diesel fuel that is usually made from vegetable oil, animal fats, or recycled cooking oil. It can be used as a separate fuel or blended with petroleum diesel to reduce greenhouse gas emissions and dependence on fossil fuels [4].

There are numerous advantages of biofuels. Firstly, they are obtained from organic materials. Unlike fossil fuels, which are a finite resource, biofuels can be continuously replenished by growing and processing biomass. Secondly, biofuel can be used in existing engines with minimal modifications. Besides, it has positive impact on the environment. According to some experts, biofuel adapts well to old cars and emits fewer harmful substances [4]. It should also be noted, that biofuel provides an opportunity to gain economic independence, as it causes provision of stable and profitable jobs for population because of the constant renewal of resources which requires processing [3]. Finally, growing biomass for biofuel production can contribute to sustainable agricultural practices, improved soil and water quality and the preservation of biodiversity.

However, there are also challenges and limitations associated with biofuels. For example, although biofuels can play a significant role in reducing greenhouse gas emissions, they are unlikely to fully replace fossil fuels due to limitations in scalability and the availability of suitable biomass resources [1]. In terms of non-GHG environmental impacts, some studies show that the production of biofuel feedstocks, particularly food crops such as corn and soybeans, can increase water pollution from nutrients, pesticides, and runoff (NRC 2011). Increases in irrigation and ethanol processing may deplete aquifers (NRC 2011).

Air quality may also deteriorate in some regions if the impact of biofuels

on tailpipe emissions plus additional emissions from biorefineries increase net traditional air pollution [4]. In addition, some biofuel production processes, such as biomass burning and biofuel processing, can release pollutants and emissions that adversely affect air quality and human health. In general, biomass has a lower thermal conductivity than coal or natural gas. As a result of combustion, a large amount of ash is formed, which requires frequent removal and cleaning of heating installations. A significant problem is also the rise in prices for energy carriers and raw materials. If biofuel production is not managed sustainably, it can lead to deforestation.

Finally, the fact that not every area is suitable for growing agricultural crops can become a problem. For example, places with an arid and cold climate are not suitable for such activities, and certain types of crops can destroy the local flora, thereby disrupting the balance and threatening the livelihood of certain species of animals [4].

The analysis of the literature allowed to conclude, that before the war, Ukraine had the necessary conditions for the production of liquid biofuels both in terms of land resources and plant potential, and in terms of the availability of its own production facilities. According to the State Energy Efficiency Agency of Ukraine, the production of bioethanol in 2016 was 38.4 thousand tons, and in 2017 it was 47.01 thousand tons.

In Ukraine, there were nearly 20 producers of bioethanol with a total capacity of over 300,000 t/year, but only 8 of them operated with a total capacity of 128,000 t/year. As for biodiesel, 14 biodiesel plants with a total capacity of 300,000 t/year were built in Ukraine. In addition, there were nearly 50 smaller enterprises capable of producing up to 25,000 tons of biodiesel per year.

Besides, before the war the market potential for obtaining liquid motor biofuels of the first generation in Ukraine was estimated at 310,000 t/year of biodiesel and 590,000 t/year of bioethanol (according to 2017 data). According to the National Renewable Energy Action Plan for the period until 2020, the share of renewable energy in the transport sector should have reach 10% in 2020. Bioenergy Association predicted then Ukraine's potential for biomethane production in amount of about ten billion cubic meters per year [6]. It was estimated, that as of 2020, 5.2 billion cubic meters of gas were replaced by bioenergy with a total consumption of three dozen billion cubic meters of gas [7]. This fact might contribute to positive perspectives for Ukraine in the field of biofuels.

However, there is no reliable information about the current activity of biodiesel plants and smaller enterprises in conditions of war [6]. The energy balance of Ukraine for 2021 and 2022 has not been published due to the full-scale war due to the secrecy of the strategically important energy sector.

To sum up, biofuels offer several benefits, including reduced greenhouse gas emissions, energy security, and support for rural economies. However, they also have drawbacks such as land-use competition, water consumption and

potential environmental impacts that need to be carefully managed to ensure their sustainability and effectiveness as a renewable energy source. Thus, although biofuels can be a worthy alternative to traditional exhaust emissions in certain contexts, their potential as a sustainable energy source depends on factors such as the choice of raw materials, production methods and environmental conditions. Efforts to improve biofuel production technologies and increase their sustainability in Ukraine will be critical to realizing their full potential as a renewable energy source.

References

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Ірина Тягай

ОСОБЛИВОСТІ ФОРМУВАННЯ ДОСЛІДНИЦЬКОЇ КОМПЕТЕНТНОСТІ МАЙБУТНЬОГО ВЧИТЕЛЯ МАТЕМАТИКИ

Однією з провідних тенденцій у розвитку вітчизняної освіти є зосередження уваги на підвищенні якості підготовки вчителів до проведення дослідницької роботи. Концепція «Нова українська школа» (2016) орієнтована на розвиток компетентностей у випускників загальної середньої освіти, які є ключовими для їх успішної самореалізації в