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TEXTBOOK FOR THE COURSE
Engineering for natural resources and environment

Edited by
Janusz Szpytko

Engineering for natural resources and environment

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ENVIRONMENTAL ASPECTS OF THE PRODUCTION AND USE OF BIOFUELS IN TRANSPORT

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This lecture presented is a part continuation of the previous topic, which dealt with aspects of green logistics. As noted, modern transport, despite the fact that its use is inevitable and that its number will continue to increase, is one of the main sources of harmful emissions and a general threat to the environment. Currently, there is an active search for alternative energy sources for vehicle engines. These include batteries for electric cars and hydrogen fuel engines. Obviously, these opportunities are very promising, although we should not forget that for the production of electricity or hydrogen, energy sources must still be sought. It would be great if only renewable environmental sources were used everywhere, for example, solar, wind energy, hydroelectric power plants or tidal power plants. The use of nuclear energy is being questioned by a number of countries. For example, neighbouring countries France and Germany have a diametrically opposed approach to this issue, and if France opens new reactors, then Germany closes existing ones. A promising area of energy is the production of electricity based on thermonuclear fusion. But, despite certain advances in science in this area, this type of energy seems to be a very distant prospect.

Thus, the most promising direction in the development of transport energy is the production of various types of fuel from renewable sources. This area of science and production is very broad and, obviously, it is not possible to consider all aspects within the framework of one lecture, so readers and listeners are advised to study the cited literature [1-132]. Let us clarify those aspects that were considered in the proposed lecture. For example, the volume of emissions from different modes of transport was considered. Technological measures to reduce fuel consumption were analysed. At the same time, it was noted that there are several ways to reduce fuel consumption and, accordingly, reduce emissions. These include improvements in vehicle engine and transmission design, vehicle energy efficiency and engine hybridisation, overall vehicle design improvements and the use of new materials.

Technological processes for the production of four generations of biofuels were considered. The raw material base for this product is indicated, as well as the types of products. The energy efficiency of the various types of biofuels which can be used in car engines has been analysed. The economic aspect of the production of this type of fuel is very significant. For example, if the cost of producing corn ethanol is less than that of gasoline or diesel fuel, then the cost of automotive fuel from algae is significantly higher which, despite the prospects of such production, does not yet allow for its wide distribution.

The impact of the production and use of biofuels on the mitigation of the effects of global climate change, as well as the compliance of this criterion with the sustainable development of society, was considered. Unfortunately, the use of various types of biofuels for modern vehicles in their pure form is problematic. It is usually used in the form of various mixtures. Such mixtures are indicated that are used in various European countries. The problems that arise during the implementation of the described technologies are also considered. An analysis is made of the average emissions from the use of some biodiesel blends compared to the use of standard diesel fuel. The comparative performance characteristics of engines running on biofuel and diesel fuel are also considered.

The issue of total emissions for vehicles using battery charge as energy is considered separately. It is quite obvious that, despite the small number of emissions directly related to the car, there is a significant number of emissions due to the production and transmission of electricity, the production, and disposal, of the batteries themselves, etc. It is noted that the use of battery electric vehicles is more preferable in terms of greenhouse gas emissions than most biofuels. But nevertheless, the use of some types of biofuels is several times less dangerous for the environment due to harmful emissions, compared with the use of vehicles using electricity. Electric vehicle batteries do not emit exhaust fumes, but greenhouse gas emissions occur in power plants where electricity is generated. That is, in this case, emissions depend on the conditions of electricity production, and if most of the electricity was produced in ecological power plants, this could be a radical solution to the problem of global warming.

In conclusion, the use of carbon-neutral synthetic biofuels is a promising way to achieve a complete decarbonisation of the transport sector.

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