

THE USE OF “GREEN” TECHNOLOGIES IN AIR TRANSPORT IN ORDER TO REDUCE THE ECOLOGICAL BURDEN ON THE ENVIRONMENT

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Abstract. *The problem of environmental pollution is one of the most important problems of humanity. Transport is one of the biggest air polluters. Many technological developments aim to make transport more ecological, including air transport. The biggest area of research is the modernization of aviation fuel.*

The entire history of human evolution shows that humanity has had a significant impact on the environment. However, with the advent of the industrial revolution, humanity began to pollute the soil, atmosphere and water bodies in a geometric progression, thus leading to significant ecological changes of the entire planet. It must be said that there were several stages of the industrial revolution and, accordingly, different types of pollution. American economist and sociologist Jeremy Rifkin proposed the concept of three industrial revolutions. [1] The first revolution was the use of coal and steam energy and industrial typography as the main communication tool.

The second revolution is oil energy and the emergence of the internal combustion engine, and electrification, the emergence of telephone networks, radio and television as the main communication tools.

According to Rifkin, the third industrial revolution is based on five factors:

1. Transition to renewable energy sources.
2. Converting all buildings into a mini power station.
3. Use of hydrogen technology to accumulate generated energy.
4. Using Internet technologies to transform the energy system into an intelligent network.
5. Mass transition to electric cars and cars with hydrogen cells.

Today, there is already a concept of the fourth industrial revolution. Swiss economist Klaus Martin Schwab proposes to call the fourth industrial revolution digital, because its special characteristic is the blurring of differences between the physical, digital and biological spheres. [2]

Transport has a large share in environmental pollution. In particular, civil aviation is not the last link that poses a real threat to the atmosphere from the point of view of pollution by exhaust gases and the formation of "holes" in the ozone layer of our planet.

The specificity of the impact of air transport on the environment is revealed in the significant noise effect and significant emissions of various pollutants. Emissions from aircraft engines and stationary sources are an important aspect of the impact of air transport on the environmental situation. In addition, aviation has a number of differences compared to other types of transport: the use of mostly gas turbine engines leads to a different nature of processes and the structure of exhaust gas emissions; the use of kerosene as a fuel leads to a change in the components of pollutants; flights of airplanes at high altitude cause the dispersion of combustion products in the upper layers of the atmosphere and over large areas, which reduces the degree of their impact on living organisms.

Airships pollute the lower atmosphere with exhaust gases from aircraft engines near airports and the upper atmosphere at cruising altitudes. Gases make up 87% of all civil aviation emissions, which also include atmospheric emissions from special vehicles and stationary sources.

As you know, the main components that pollute the environment are: carbon monoxide, unburned hydrocarbons, nitrogen oxides and soot. At idling modes and while driving on taxiways, during landing, the content of carbon monoxide and carbohydrates in the exhaust gases increases significantly, but the amount of nitrogen oxide decreases at the same time.

In steady flight mode, when the engines work without overloading at 35-50% of their power with optimal parameters, the content of carbon monoxide and carbohydrates decreases, but the emissions of nitrogen oxides increase. The largest emissions of soot and smoke occur during take-off and climb, when the engines work with an overload of 1.1-1.2 times relative to their nominal power and, as a rule, on an enriched fuel mixture.

The greatest pollution of the environment occurs in the area of airports during the landing and take-off of planes, as well as during the warm-up of their engines. It is estimated that with 300 takeoffs and landings of transcontinental airliners per day, 3.7 tons of carbon monoxide, 2 tons of hydrocarbon compounds, and 1.7 tons of nitrogen oxides are released into the atmosphere. [3]

The aviation sector accounts for 13.9% of transport emissions in the EU, making it the second largest source of greenhouse gas emissions in the sector after road transport. The European climate law makes reaching the EU's climate goal of reducing EU emissions by at least 55% by 2030 a legal

obligation. EU countries are working on new legislation to achieve this goal and make the EU climate-neutral by 2050.

The Fit for 55 package is a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are into line with the climate goals agreed by the Council and the European Parliament. According to the European Parliament, sustainable aviation fuel is synthetic fuels, as well as some biofuels, which are made from agricultural or forestry waste, algae, bio-waste or used cooking oil. Also, until 2034, biofuels made from animal fats or distillates may be included in the composition of aviation fuel.

One of the best examples of Sustainable Aviation Fuel (SAF) is product by Finnish Neste Company. Neste SAF is a renewable aviation fuel, made from sustainably sourced, 100% renewable waste and residue raw materials, like used cooking oil and animal fat waste. Over its life cycle, SAF reduces greenhouse gas (GHG) emissions by up to 80%* compared to fossil jet fuel. SAF can be used as a direct replacement (drop-in) for fossil jet fuel as it is chemically similar. It is fully compatible with existing jet engines and fueling infrastructure, requiring zero additional investment into them. [4] Replacing crude oil with renewable raw materials in the production of fuels helps combat climate change through preventing significant amounts of fossil-based greenhouse gas emissions from entering the atmosphere.

Conclusion

It can be confirmed that today more and more efforts are being focused on measures to protect the environment. In the aviation industry, many developments are aimed at reducing harmful emissions into the atmosphere. These are already existing biofuels, and the development of fuels with hydrogen components. Electric airplanes are also one of the promising developments.

References

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