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Экологические аспекты струнного транспорта Ecological aspects of string transport

<p>Аннотация В статье указано негативное воздействие транспорта на окружающую среду. Описаны основные источники загрязнения на транспорте. Представлен струнный транспорт как наиболее экологичный. Даны его преимущества.</p>	<p>Abstract Negative impact of transport on environment is given consideration in the article. The main sources of pollution on transport are described. String transport is presented as the most environmentally friendly and its advantages are offered.</p>
<p>Ключевые слова: транспорт, экология, струнный транспорт, экологическая безопасность струнного транспорта</p>	<p>Key words: transport, ecology, string transport, environmental safety of string transport</p>

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Transport is one of the main pollutants of atmospheric air, its share in the total volume of emissions of pollutants into the atmosphere is about 40% [1]. At the same time, the level of environmental pollution is currently at a rate significantly higher than the rate of its natural recovery. Under these conditions, the problems of transport ecology become of particular importance.

The negative impact of transport on the environment is evident in the following:

- pollution of atmosphere, water bodies and land, changes in the chemical composition of soil and microflora, creation of industrial waste, including toxic and radioactive ones;

- consumption of natural resources – atmospheric air, oil products and natural gas, water for industrial and household needs, land resources alienated for the construction of roads and railways, airports, pipelines, sea and river ports and other transport infrastructure facilities;

- irreversible withdrawal of the most important component necessary for life on the planet from the atmosphere – oxygen, above 10 billion tons annually;

- release of heat to the environment;

- creation of high levels of noise and vibration;

- possible activation of adverse natural processes (water erosion, waterlogging of terrain, formation of mudflows, etc.);

- traumatism and deaths of people and animals;

- destruction of soil and vegetation cover under roads and their degradation in adjacent territories, reduction of crop yields and quality of agricultural products.

The largest transport emissions are from road and railway. In general, road transport accounts for 91.3% of atmospheric pollution, railway – 3.7 %, maritime – 2.7 %, river transport – 0.9% and air transport – 1.4 % [2].

The main sources of atmospheric air pollution are: in railway transport – oil locomotives and diesel trains; in road transport – cars and trucks, buses [3].

Operation of such transport goes along with emissions of hydrocarbons, nitrogen

oxide and dioxide, sulfur dioxide, carbon monoxide, soot particles and other substances along with exhaust gases into the atmosphere.

Unsatisfactory state of atmospheric air leads to an increase in respiratory illness, cancer and other diseases. This circumstance, as well as the prospect of global complications in the environment (“acid rain”, climate change) lead to the need to limit emissions of pollutants, create and develop new modes of transport that are promising from the viewpoint of ecology.

One of these types of transport can be SkyWay string transport (Unitsky String Transport) [4]. It implies unmanned mounted or suspended vehicles with steel wheels driven with electric energy along a continuous string-rail overpass pre-stressed with tension at a height of 5 m. This technology is implemented by Unitsky String Technologies Co. at EcoTechnoPark (Maryina Gorka, Republic of Belarus). To date, 11 types of rolling stock have been developed for urban, intercity high-speed passenger and freight transport (Fig. 1–3). Five test tracks with flexible, semi-rigid and rigid rails have been built. Many vehicles have already been certified. In 2017, SkyWay transport of the trestle type was acknowledged as innovative by the Transport Ministry of Russia.



Fig. 1 – Urban passenger SkyWay vehicle – a suspended quad-rail 48-passenger unibus, Maryina Gorka, 2019



Fig. 2 – Intercity passenger SkyWay vehicle – a high-speed (up to 500 km/h) 6-seat family-type unibus



Fig. 3 – SkyWay cargo vehicle – unitruck

String transport is highly eco-friendly for a number of reasons:

- as a source of energy, it uses electricity, but not diesel or gasoline fuel with high sources of environmental pollution;

– low energy consumption by SkyWay vehicles due to steel wheels and high aerodynamic features, including the absence of an airfoil effect (absence of a solid roadbed and a rail-sleeper grid), which is especially significant at speeds above 250 km/h, since the force of aerodynamic drag is proportional to the speed cubed;

– low consumption of construction materials for the transport overpass due to pre-tensioning of string rails and continuous length of the track structure (the absence of expansion joints);

– low consumption of structural materials for rolling stock due to the simplicity of the vehicle design – electric rail vehicles; the absence of massive drives, hefty frames, heavy running bogies and wheel pairs does not require great expenses for their production;

– minimal volume of earthworks and land acquisition for the construction of a track structure;

– the land under the tracks can be used for parks and agriculture, because the track structure is located at an altitude that does not prevent the movement of domestic animals, as well as agricultural and other vehicles (Fig. 4);

– soil hydrology (flow of surface and ground water) is not disturbed, as it occurs during the construction of roads and railways;

– migration routes of wild animals are preserved due to the absence of earth embankments.



Fig. 4 – SkyWay track structure of rigid type (rail-string truss for movement of both suspended and mounted rolling stock) – Maryina Goroka, 2019

Thus, SkyWay transport of overpass type, which provides high environmental safety, can be successfully applied for cargo and passenger transportation.

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