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**Ecological Aspects** of String Transport Organization of Routes for Urban Passenger Transport Efficient Gse of Gas Turbine Locomotives in the Middle Urals УДК 625.5 + 625.41



Анатолий Эдуардович Юницкий Anatoli E. Unitsky



Михаил Иосифович Цырлин Mikhail I. Tsyrlin

### Экологические аспекты струнного транспорта

## **Ecological aspects of string transport**

#### Аннотация

В статье рассматривается негативное воздействие транспорта на окружающую среду. Описаны основные источники загрязнения на транспорте. Представлен струнный транспорт как наиболее экологичный. Даны его преимущества.

Ключевые слова: транспорт, экология, струнный транспорт, экологическая безопасность струнного транспорта.

#### 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.

**Keywords:** transport, ecology, string transport, environmental safety of string transport

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#### **Авторы** Authors

Анатолий Эдуардович Юницкий, генеральный конструктор 3A0 «Струнные технологии», Минск; e-mail: a@unitsky.com | Михаил Иосифович Цырлин, канд. техн. наук, доцент кафедры «Транспортно-технологические машины и оборудование» Белорусского государственного университета транспорта (БелГУТ), Гомель; e-mail: tsirlin1962@gmail.com

Anatoli E. Unitsky, General designer, Unitsky String Technologies Co., Minsk; e-mail: a@unitsky.com | Michael I. Tsyrlin, candidate of technical science, associate Professor, "Transport-technology machine and equipment" Department, Belarusian State University of Transport (BelSUT), Gomel; e-mail: tsirlin1962@gmail.com

## Transport-technological systems of the country, its regions and cities, organization of production in transport industry

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, pollution of the natural environment is currently carried out at a rate significantly higher than the rate of its natural recovery. In these conditions, the environmental problems of transport are of particular importance.

The negative impact of transport on the environment is evident:

- in the pollution of the atmosphere, water bodies and land, changes in the chemical composition of soils and microflora, the formation of industrial waste, including toxic and radioactive one;
- in the consumption of natural resources atmospheric air, petroleum 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;
- in the irreversible removal from the atmosphere of the most important component necessary for life on the planet — oxygen, more than 10 billion tons annually;
- in the release of heat to the environment;
- in creating high levels of noise and vibration;
- in the possible activation of adverse natural processes (water erosion, waterlogging of the area, formation of mudflows, etc.);
- in injuries and deaths of people and animals;
- in the destruction of the soil and vegetation cover under the roads and its degradation in the adjacent areas, in reducing the yield of agricultural crops and decreasing the quality of agricultural products.

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

The main sources of atmospheric air pollution are: in railway transport — diesel locomotives and diesel trains; in road transport — cars and trucks, buses [3]. Along with exhaust gases, the operation of such transport is accompanied by emissions of hydrocarbons, nitrogen oxide and dioxide, sulfur dioxide, carbon monoxide, soot particles and other substances into the atmospheric air.

The unsatisfactory state of the atmospheric air leads to an increase in respiratory diseases, cancer and other diseases. This circumstance, as well as the prospect of global complications in the environment (acid rains, climate change), lead to the need to limit

emissions of pollutants, the creation and development of new modes of transport that are promising from the view point of environmental friendliness.

One of these types of transport can be SkyWay string transport (Unitsky string transport) [4]. In it, unmanned mounted or suspended vehicles with steel wheels move using electric energy along a continuous pre-stressed string-rail overpass 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 transport, as well as cargo transport (Fig. 1– 3). Five test tracks with flexible, semi-rigid and rigid rails have been built. Many vehicles have already received certification. In 2017, string transport of the flyover type was recognized as innovative by the Ministry of Transport of Russia.

String transport is highly environmentally friendly for a number of reasons:

- the energy used is electricity, not diesel or gasoline fuel with high sources of environmental pollution;
- low level of energy consumption by SkyWay vehicles due to steel wheels and high aerodynamic qualities, including the absence of a screen effect (the absence of a solid roadbed and a rail-sleeper grid), which is especially significant at speeds above 250 km/h, since the power of the aerodynamic drag is proportional to the speed in the third degree;
- low consumption of construction materials for the transport overpass due to pre-tensioning of string rails and the continuous length of the track structure (no deformation temperature joints);
- low consumption of structural materials for rolling stock due to the simplicity of the design of vehicles — electric rail vehicles; the absence of massive undercarriages, powerful frames, heavy running bogies and wheel pairs does not require large costs for their production;
- minimum amount of earthworks and land allocation for the construction of a track structure;
- the land under the tracks can be used for the arrangement of parks, farming, as the track structure is located at a height that does not interfere with the movement of domestic animals, as well as agricultural and other equipment (Fig. 4);

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



*Fig. 2. SkyWay intercity passenger vehicle — high-speed (up to 500 km/h) 6-seat family-type unibus* 



*Fig. 3. SkyWay cargo vehicle — unitruck* 

- the hydrology of soil (movement of surface and ground water) is not disturbed, as it happens during the construction of roads and railways;
- the migration routes of wild animals are preserved due to the absence of earth mounds. transportation.



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

Thus, the string transport of flyover type, which provides high environmental safety, can be successfully used for cargo and passenger transportation.

Photos: https://vk.com/skyway\_official.

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