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PROSPECTS FOR APPLICATION OF CEMENT CONCRETE COVERING OF ROADS IN UKRAINE

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Abstract

After analyzing the world and domestic experience in the construction and maintenance of cement-concrete pavements, we can conclude that cement concrete can be an effective material that will solve the problems of today in the road industry of Ukraine. It can be successfully used for the construction of concrete pavements on roads with heavy traffic and high traffic to ensure the passage of modern vehicles without restrictions in the warm season, as well as high quality and durability of roads.

Keywords: *highways, cement-concrete covering, building materials.*

Introduction

The road network is one of the main components of the transport system of Ukraine, which largely meets the needs of society in passenger and freight transport by road. Gradual integration of Ukraine into the European and world economy, expansion of trade and economic ties with countries near and far abroad, further development of economic sectors, improving living standards against the background of unsatisfactory transport and operational condition of most roads encourages the development of domestic road transport networks.

Main part

Ukraine is one of the last European countries in terms of road supply per 1,000 km2 of territory and per 1,000 inhabitants. The existing network of public roads with a length of 169.4 thousand km today meets only the basic national needs of the economy and the needs of the population in transportation. At the same time, the existing low level of security of public roads in Ukraine has not changed for a long time, due to the very small volume of construction of new roads. Thus, in the last ten years, only 1460 km of public roads have been built [1-2]. To ensure the economic and social development of Ukraine in the coming years, it is necessary to ensure and bring the transport and operational condition of Ukraine's roads in line with European standards and requirements

Insufficient operational quality of road surface causes lower operating speeds of vehicles, increased fuel and lubricants and increased share of the transport component in the cost of production. The fact that the cost of transportation is 1.5 times, and fuel costs are 30% higher than in developed European countries, there is a significant impact of the road component [3-4]. All this, together with the insufficient development of infrastructure, does not attract foreign carriers, hinders the growth of domestic transport and leads to the fact that transit traffic on Ukrainian roads is increasing very slowly. Non-rigid roads do not withstand sufficiently reduced service life. According to the analysis of the State Agency of Motor Roads of Ukraine, as of today about 80% of the total road network needs urgent repairs, and over 60% of road bridges need major repairs and reconstruction, the level of wear of artificial structures on roads is 43.7% [5-6] . Today in Ukraine up to 40 thousand km are in need of major repairs. roads. Ukraine annually loses about UAH 20 billion from the unsatisfactory technical and economic condition of roads, which is a logical result of the lack of new technologies, optimal methods of calculation and implementation of modern road construction materials appearing on the construction market of Ukraine in road construction in the XXI century.

A large area of Ukraine is located on soils with low bearing capacity. Soils, mostly of clay nature. According to the road classification, they are classified as removable and very removable [7-8]. These are soils that are removed in the winter, in a moist state, and in the spring sag under the influence of solar radiation. Removal is also facilitated by: high groundwater levels, prolonged autumn and spring rains, mild winters with slow freezing of the soil and frequent thaws alternating with frosts, sharp fluctuations in spring temperatures, precipitation during thawing of road and urban roads. streets. Such unfavorable climatic conditions do not contribute to the regulatory status of roads for a long time. In the conditions of urban highways, the problem of unfavorable soils is complicated by the presence of a wide network of utilities,

which cause a negative impact on water-thermal processes in the base soils of road pavements of roads [9-10].

The construction of modern roads requires the use of expensive materials. As the demands for durability and safety of highways increase, road professionals around the world are studying and implementing new technologies that create the conditions for improving the quality characteristics and the process of saving money and material resources.

In recent years in Ukraine and around the world there has been a dynamic increase in the intensity of traffic and loading of trucks. Modern grain trucks can carry from 60 tons to 100 tons of cargo. The construction of existing roads and bridges is not designed for such a load, in addition, the climate of Ukraine in recent years is characterized by the presence of a long period in summer, when air temperatures exceed +30 - 35° C. At such air temperature, even in the northern zone of Ukraine asphalt concrete is heated to a temperature above + 60° C, despite the fact that the design temperature of asphalt concrete layers according to the norms for pavement design should not exceed +40° C. At this temperature, the strength of asphalt concrete is less than 1.0 MPa. As a result, asphalt pavements, which make up more than 95% of the pavements in Ukraine, operate in extreme operating conditions. To preserve highways, traffic restrictions are introduced during the day, which is a forced measure and does not solve the problem.

The authors in their work [11-12] cited the main advantages of cement-concrete coatings compared to asphalt-concrete: greater strength and durability; the absence of the phenomenon of track; ensuring greater traffic safety; less surface heating; the ability to provide a lower noise level when paving.

The economic aspects of concrete pavement construction are important. To date, road experts believe that structures with cement-concrete coating are more expensive than asphalt-concrete. But current realities refute this thesis. The cost of bitumen has increased 10 times over the last decade and continues to grow rapidly. The cost of cement has increased 4.7 times and has remained virtually unchanged over the past three years. The cost of asphalt concrete increased 6-8 times, and cast asphalt 11 times. The cost of cement concrete has increased only 3.5 times over the decades.

It should be noted that in recent years in Ukraine there has been a shortage of its own raw materials and insufficient production of road bitumen to meet construction needs, so there is a need for imports. Cement production in Ukraine is virtually unlimited in terms of raw materials and resources

In [12-13], the authors found that the structure with a cement-concrete coating is 1.6-1.7 times cheaper than asphalt concrete. The service life before major repairs for the road of the II category with asphalt concrete covering does not exceed 11 - 12 years, and with cement concrete 25 and more years. That is, the service life of cement-concrete coating is 2.27 times longer than asphalt-concrete. In addition, asphalt pavements require higher annual costs for current and emergency repairs. The total annual maintenance costs for asphalt concrete pavement are - 36.45 UA / m^2, for cement - 15.14 UA / m^2 [13].

Most cement-concrete pavements in Ukraine were built in the 50s - 70s of the last century. Almost all of them need repair or have already been repaired using asphalt concrete layers. Of the approximately 170,000 km of public roads, only 2,400 km have cement-concrete pavement, which is only 1.4%. The share of cement-concrete roads is constantly growing in European countries. For example, in Germany, Austria and the United Kingdom, the share of concrete roads is more than 62%.

Conclusions

From the above it can be concluded that the construction of paved roads with cement concrete, given all its obvious advantages over asphalt concrete in the world will only grow.

The main advantages of roads with cement-concrete pavement are:

- high strength, low surface wear, long service life, low maintenance cost;
- sufficient roughness of the surface of the coating, which allows you to develop a high speed of cars;
- cement-concrete coverings do not change bearing capacity at sharp seasonal fluctuations of temperature and humidity. Moreover, over time, their strength increases. The coefficient of drag in cement-concrete coverings is lower than in other types of coverings, which reduces fuel consumption and tire wear.

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