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SMART PAVEMENT SOLUTIONS

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Abstract
The organization of sidewalks with optimal coverings ensures not only its durability and service life, but also an aesthetic appearance specific to the environment. The article highlights the advantages of using environmentally sustainable (recycled, environmentally friendly) and innovative energy-saving materials on sidewalks, and analyzes the latest technological solutions of pavements.

Keywords: pavement, sustainable, recycled materials, smart pavement, energy-generating material, asphalt, rubber, walkways.

Introduction

As global concern about climate change grows, people and organizations are looking for ways to reduce the damage they are doing to the environment. In order to reduce the pressure of waste and pollution on the environment, measures for conscious consumption and recycling of waste are being implemented in various fields. In the field of construction and design, there is a trend of using environmentally friendly technologies and environmentally friendly materials. Many experiments and researches are being carried out on the use of recycled sustainable materials in road construction.

In recent years, innovative solutions of raw materials and technologies used in the field of road construction have been put into practice, and their advantages have also been observed in foreign experience. Environmentally friendly and energy-saving road pavement products are analyzed below.

Environmentally Clean Road Surface Solutions

Permeable pavement is a type of pavement that allows water to soak into the surface and flow through the pavement layer to the subsoil. This type of pavement is designed to prevent flooding, erosion and flooding. A permeable pavement has a porous surface layer that allows water to pass through, while an underlying layer of gravel or rock acts as a reservoir to store water.

Recycled asphalt is another environmentally friendly road surface that has become popular in recent years. This type of resurfacing is done by reusing old asphalt pavement, which is crushed and mixed with new asphalt and other materials to form a new surface layer. Asphalt pavement recycling reduces the amount of waste generated and conserves natural resources such as aggregates and asphalt binder. Recycled asphalt has been found to have comparable performance to conventional asphalt pavement and, in some cases, to be more cost-effective.

Rubber asphalt is a material that provides bright solutions among modern eco-coatings. This type of coating is made by adding shredded rubber from recycled tires to an asphalt binder.

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Rubber asphalt has proven noise reduction, anti-slip and pavement durability. In addition, the use of crushed rubber in road construction reduces waste and saves resources.

Implementation of sustainable road infrastructure can vary depending on the specific type and location of the road surface. For example, permeable pavement is often used in parking lots, sidewalks, and other low-traffic areas. Recycled asphalt and rubberized asphalt can be used on a variety of surfaces including roads, highways, and airport runways [1].

Energy-generating and cost-effective paving solutions

In the foreign experience, it can be observed that the use of materials that collect energy from movement or sunlight and transmit it to the surrounding lighting and other equipment as pavements has yielded positive results.

Laboratory experiments on the use of solar panels as pavements show that among the most promising renewable energy technologies are photovoltaics (PV), an excellent method of generating electricity from the sun, and its latest alternative BIPV offers a wide range of possibilities.

"Platio Solar" is one of the companies that can offer an environmentally friendly and aesthetic solution for BIPV in the domestic and international market. Platio is an eco-friendly product not only through the use of renewable energy in tile coatings, but also because the PV tiles are surrounded by 100% recycled plastic frames. The product works like solar panels, but because of its location on the ground, it has an additional protective shell against external shocks and an anti-slip coating.

Picture 1. PLatio Solar. Solar pavement for walkways

BIPV coating may play an important role for the further development of e-mobility in the future (Figure 1). Charging stations for various electric vehicles (e-cars, e-scooters, e-bikes) are provided with local power through the BIPV cover on the parking itself or next to it. It can be a real green transportation solution [2].

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Many experiments are conducted on innovative corridors, some of them are put into practice. For example, in 2017, the software company Umbrellium presented an interactive crosswalk for Toronto. Called Starling Crossing, this technological crossing uses cameras, LED lights and neural networks to react dynamically to different road conditions in real time. If a person does not notice a car that is distracted by a mobile phone or something else, a warning line appears around it and tries to prevent an accident (picture 2). Among the technological approaches, it is worth mentioning the pavement that generates electricity from steps or WiFi distribution corridor in Britain [3].

In the local practice of Uzbekistan, the use of energy-saving or recycled products can be seen in various aspects. Solar panels are mainly installed on roofs, street lights and art objects. Rubber coverings are widely used in avenues, children's and sports grounds.

In recent years, state decisions support measures to create beautiful and comfortable areas for pedestrians. This can be seen from the modern appearance of many streets.

As the "green" approach to construction and production enters our way of life, it requires the use of the most advanced and latest technologies in the organization of the environment. An example of this is given in the Tourism Strategy for Central Asian countries until 2030 (CARES):

Picture 2. Innovative walkway solutions

With a population expected to reach 4.9 billion by 2033, the growth of the middle-income population – this group's propensity to travel and increasing disposable income – could have a positive impact on the tourism sector. In addition, tech-savvy and tech-oriented age groups such as Millennials (also known as Generation Y) and Generation Z have special needs for communication, consumption and travel experiences. By 2028, these age groups are expected to make up 50% of all consumers [4].

Conclusion

In conclusion, the growing generation is inclined to live in modern cities with "green" and smarter technology, and it is important to create a conscious consumption and ecological environment for a better future.

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