

## Section 02. Geotechnical Systems Stability

Dmytro Shcherbyna  
V. E. Volkova, research supervisor  
I. I. Zuyenok, language adviser  
National Mining University, Dnipro, Ukraine

### **Composite materials and rubber for highway construction**

Roads are the veins of any country that contribute to its economy sustainability. To date, over 97% of roads of common usage in Ukraine need to be repaired. The quality of almost all the 170 thousand kilometers of Ukrainian roads does not comply with the regulatory documents of the country. According to the World Economic Forum, Ukraine takes the 132 place as to its roads among 140 countries.

To develop a method of preventing road surface defects, it is appropriate to start with examining the process which takes place on the roads while a vehicle running. During operation of highways their covering is exposed to the movement of the variety of vehicles as well as to different climate and seasonal factors that causes various deformation: longitudinal, transverse, oblique and secondary cracks, grid of cracks, chipping, potholes, pits, etc.

As a consequence of seasonal temperature fluctuation and the impact of the transport burden on asphalt coating of roads, there is a tensile stress which often exceeds the ultimate strength of the structure, resulted in occurrence of such coating defects as cracks of different depth, length and profile, where fragmentation is a base covered with violated integrity and its water resistance.

This phenomenon is open for access of atmosphere moisture below lying layers that reduces the load bearing capacity of the whole construction. As a result of numerous freeze thawing cycles and exposure to vehicle load, edge of the cracks begin to crumble. The edge cuts are formed in small potholes. During further operations subsequent defects arise, which lead to the emergence of potholes and cause further destruction of the coating. This is resulted in insufficient plasticity and density structure of asphalt road surfaces that could be explained by low quality of the road construction materials as well as tires of the vehicles run.

Although, these problems could be easily solved by adding a mixture of the plasticizer, but this could lead to higher prices for road construction. The experiments show that at low temperature rubber provides asphalt ductility and high elasticity of the samples that lead to the road coating of material obtained becoming a waterproof, freeze-proof and resistant to cracks, and as a result, a durable, economical and environment-friendly material.

Addition of rubber or a composite material to the road asphalt could be seen as one of the ways out to the problems described. Moreover, the experiments carried out in Poland, Israel and other countries prove their efficiency.