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Umereshova S.G., Master of Technical Sciences, **the main author,** https://orcid.org/0000-0001-9382-9317
«West Kazakhstan University of Engineering and Technology», Uralsk, Dostyk Avenue, 208, Kazakhstan, oral.1977@mail.ru
Shinguzhieva A. B., PhD Doctor, senior lecturer, https://orcid.org/0000-0002-8164-2907
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir khan», Uralsk, st. Zhangir khan 51, 090009, Kazakhstan, shing.a@mail.ru
Tukhbatullin K. R., Master's student of 2 course, https://orcid.org/0000-0003-1014-6700
NJSC «West Kazakhstan Agrarian and Technical University named after Zhangir khan», Uralsk, st. Zhangir khan 51, 090009, Kazakhstan, kazybek000@mail.ru

ANALYSIS OF THE PROPERTIES OF GROUND CONCRETES USING OIL SLUDGES

ANNOTATION

This article discusses a literary review on the construction of the roadway, where industrial waste is increasingly used, such as ash and slag, waste of chrysotile cement production, waste of asbestos-cement production, ash and slag from thermal power plants and boiler houses, overburden and many others. The use of this waste significantly improves the ecology of the environment by utilizing it in the construction of roads. For experimental studies, the following were selected: local raw materials - Chagan loam, oil sludge from Zhaiyk Diesel Sauda LLP, Shymkent cement. From raw materials, cubes with dimensions of 10x10x10 cm of two compositions were prepared: loam-oil sludge in a ratio of 3: 1 and cement 10%; loam-oil sludge in a ratio of 3: 1 and cement 20%. It was found that the use of oil sludge in soil concrete significantly changes the characteristics of the studied soils, such as viscosity, swelling capacity. The use of 20% cement in the composition of soil concrete based on loam with the addition of oil sludge improves the forming, strength properties, increases crack resistance.

Key words: *soils, oil sludge, waste, loam, ground concrete, auto road.*

Introduction. To date, the problem of construction and operation of roads is acute in all countries. In the Republic of Kazakhstan, all issues related to the construction, operation and development of roads are regulated by the Law of the Republic of Kazakhstan dated July 17, 2001 № 245. On highways.

Many scientists of the world are engaged in the issues of improving the quality of roads, methods of constructing a roadbed using various materials, including waste from various industries. Roads for various purposes are considered, such as railways [1], roads and structures [2-5].

The paper explored the possibility of using local raw materials - soil, ash and slag waste and waste from chrysotile cement production in order to improve the quality of rural roads. The works of scientists from different countries are considered, which, when using soil concrete at the base of the roadway, received positive results. The authors show the effectiveness, availability and rationality of the proposed technologies that provide high strength and durability of roads, especially for agricultural purposes. To ensure the safety of equipment and transport accessibility, various options for improving the quality of roads have been proposed [6].

Authors Belgorod State Technological University. V.G. Shukhov, having studied soil concretes with micro-reinforcing mineral and organic additives in order to obtain reliable structures for the foundations of roads and structures of agricultural facilities. Thus, the problems of reducing the cost and accelerating the pace of construction in the countryside are solved, which positively affects the development of rural areas [7].

At present, many works are devoted to the topics of recycling of crushed stone waste, asphalt concrete, etc. Initial and final materials, their physical and mechanical characteristics are studied in laboratory conditions, their strength properties are checked. Such studies are relevant both in the construction of the foundations of railways and roads [8].

It has been proven that the construction of a roadbed with a solid base can be achieved by strengthening the soil by including industrial and thermal power industry wastes, including wastes from asbestos-cement production and ashes and slags from thermal power plants and boiler houses [9, 10]. The research results showed that the obtained technical and economic characteristics of the studied materials turned out to be much lower compared to the crushed stone base, while the quality of the roadway is much higher.

Scientists of the Pavlodar State University named after. S. Toraigyrov conducted studies of overburden materials of the Ekibastuz coal basin. Soil concretes based on them have been developed for the purpose of their use in the subgrade during the construction of roads [11].

An extensive patent search was carried out on the device for the foundation of road pavements of highways, where soils were included with the addition of waste from a crushing and screening plant and loose overburden, as well as a mineral binder in the form of lime-containing waste from sugar factories [12].

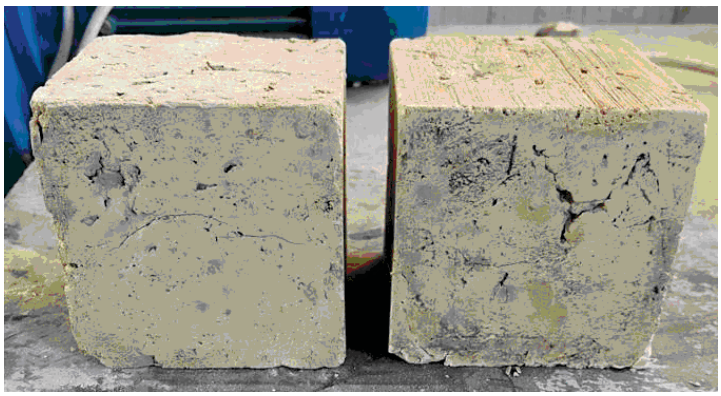
Scientists are considering the possibility of applying soil stabilization technology. To reduce the cost of road construction, it is proposed to use local soil with the addition of a binder as a base for roads [13, 20].

Purpose of the study: development of soil-concrete compositions with the addition of oil sludge.

Materials and research methods. For experimental work, the following materials were taken as raw materials: cement - Shymkent, grade M500, loam - Chaganskoye field, oil sludge – "Zhaiyk Diesel Sauda" LLP.

At the beginning, loam and oil sludge were dosed and weighed in a ratio of 3:1, then thoroughly mixed until a uniformly homogeneous mass was obtained. Further, cement was added in a certain ratio of 10% (Figure 1) and 20% (Figure 2). Water was added to the prepared mixed mass, then placed in a mold measuring 10x10x10cm.

Picture 1 – Ground concrete with the addition of 10% cement



Picture 2 – Ground concrete with the addition of 20% cement

Results and its discussion. According to the results of field studies, the resulting soil concrete based on a conglomerate mixture consisting of loam and oil sludge, with the addition of cement in an amount of 20%, has fewer cracks. The structure is even, fewer chips and voids.

For activation and strengthening with organic and mineral binders, the studied dispersed soils - loams were taken. This type was chosen due to the fact that oxygen compounds in the asphalt-resinous part of oil sludge, namely naphthenic and asphaltogenic acids, significantly increase their surface activity, cohesive strength and adhesion to the surface of soil particles. It has been established that aromatic nitrogen-containing compounds are surfactants and, therefore, improve properties such as wettability and adhesion. This is achieved due to nitrogen, which has an unshared pair of electrons, with hydroxide groups that are on the surface of the particles [14]. Scientists have found that soils have high water resistance, they are adsorbed on negatively charged clay surfaces, while their hydrocarbon groups do not allow water to move in the pores of the soil [15-19].

Treatment with oil sludge has a positive effect on reducing the energy between dust particles on the surface of the interface between the organic and aqueous phases.

Conclusions. Scientific developments have revealed that the additive in the form of oil sludge, depending on the origin, significantly changes the characteristics of the studied soils: viscosity, swelling ability, etc. Activation of loams with oil sludge in an amount of 10-12% improves properties such as workability, swelling.

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SUMMARY

Research has shown that additives in the form of oil sludge, depending on their origin, significantly change the characteristics of the studied soil: viscosity, swelling, etc. Activation of clays with 10-12% of oil sludge improves properties such as hardness, swelling.

Evidence of the use of soil-concrete bases, their main disadvantages. The current perspective directions, which allow to prevent all the disadvantages that hinder the widespread use of oil sludge, are described.

Analysis of the obtained data allows us to conclude that the development of the soil-concrete base of the road using oil sludge is very relevant in Kazakhstan. Oil sludges contain complex physicochemical impurities, including petroleum products and mechanical impurities. In this regard, we offer a technology for combining soil-concrete with petroleum sludge. In addition, it is economically viable if we use waste oil for construction.