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INVESTIGATION OF PROPERTIES OF SOIL AND WASTE MIXTURES OF OIL AND GAS INDUSTRY

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The article analyzes the behavior of clay soil during compaction.It is confirmed that in the mixture of clay soil and drilling mud during dynamic compaction a structure different from the natural one is formed and the aggregates are destroyed. The article determines the increase of the average modulus of deformation of the mixture of soil with drilling mud at the ratio of soil and drilling mud 90:10 by an amount close to 4%. It is determined that the addition of 10% drilling mud to clay soil during the construction of foundations increases the strength characteristics of the soil.

The purpose of the article is to study the compaction and strength characteristics of a mixture of loess loam with drilling mud in a ratio of 90:10 for the use of this material in the national economy.

Currently in Ukraine there are environmental problems in the oil and gas regions. When drilling wells, a significant amount of waste is generated, which must be disposed of. For the collection and accumulation of this type of waste, sludge barns of considerable size are created. Drilling mud contains heavy metals, a small amount of petroleum products, synthetic surfactants, carboxymethylcellulose, synthetic organic substances and more.

"Solidification" is an effective technology for utilization of drilling rigs. According to this method, the purified drilling mud is mixed with special sorbents and cement. The sorbent binds compounds that, after the addition of cement, turn into a form that is insoluble in all weather conditions. Therefore, the thus neutralized product is used in the manufacture of building materials [1]. There is a chemical method of disposal using phosphogypsum. [2].

For the experiment took loess loam. Made the soil with the required humidity (from 12% to 20% in increments of 2%). Left for even distribution of moisture. The soil was pre-crushed and sieved through a sieve with holes of 1.0 mm. Samples were prepared weighing 3 kg for further experiments to determine the optimal soil moisture for its maximum compaction [4]. The dimensions of the metal cup are h = 127 mm, d = 100 mm. The weight of an empty metal cup is 4800 gr.

For the experiment, loam loess with natural moisture of soil samples W = 0.16 was used. Its humidity at the yield strength $W_L = 0.28$, humidity at the rolling limit $W_p = 0.19$.

Determination of optimal humidity was performed with drilling mud of the West Kharkiv oil and gas condensate field of well № 529. It was determined that this drilling mud belongs to the liquid loam. Humidity of drilling mud was 65%. The study was conducted according to standard laboratory methods of soil research according to DSTU B B.2.1-17: 2009 [3].

According to the results of the experiment, it was found that the optimal humidity of the loam is 17.5%. The calculated value of the optimal soil moisture can be taken for preliminary assessment as the moisture on the verge of unrolling. In this case, the discrepancy between these values is 2%. A study was carried out with the addition of drilling mud to the soil in a ratio of 90:10. The optimum humidity of the mixture should be 17.5%, so at a moisture content of drilling mud of 65%, the humidity of the loam should be 13.85%. The loam has a natural moisture slightly

Figure 1. Photo of the MDU-1 device

higher than the specified value, so the soil was pre-dried and brought to a given humidity in the laboratory.

Next, the procedure of compaction of the mixture of soil and drilling mud was performed using the device MDU-1 (Fig.1).

Based on the results of the analysis, it can be concluded that in the process of compaction of clay soil with the help of dynamic soil compaction in the device MDU-1, the soil forms a structure different from the natural and destroyed components. Therefore, the mixture of clay soil with drilling mud 90:10 at optimum humidity can be characterized by a dispersion structure.

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