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UTILIZATION OF LIME AND BIOPOLYMERS TO INCREASE THE STABILITY OF THE SUBGRADES ROADS

ЗАСТОСУВАННЯ ВАПНА І БІОПОЛІМЕРІВ ДЛЯ ПІДВИЩЕННЯ СТІЙКОСТІ ЗЕМЛЯНОГО ПОЛОТНА ДОРІГ

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The war and military operations in Ukraine have caused direct and serious damage to the roads. Since the beginning of the full-scale invasion in Ukraine, about 25 thousand kilometers of roads have been destroyed. The state of maintenance of the road network has become extremely difficult. A large number of district and city roads in the country have already served their service life, and during the war, the load from military convoys was added. Therefore, the main task is to ensure uninterrupted and unhindered traffic, as

well as continuous delivery of humanitarian and military aid to cities and villages. Thus, Ukraine now needs to restore, reconstruct, overhaul and strengthen road pavements and aerodrome pavements; increase the bearing capacity of road and railroad subgrade foundations and slopes, particularly in difficult engineering and geological conditions; and increase the stability of subgrade slopes under dynamic and wave loads. Given that 70% of Ukraine's land area is covered by clay soils, research into improving the bearing capacity of soft clay soils is relevant today.

For the smooth operation of infrastructure facilities, such as roads, bridges, aerodromes and airports, as well as civil and industrial facilities, it is necessary to increase the bearing capacity and stability of the bases on which construction, reconstruction, restoration or overhaul of these facilities is planned. Increasing the bearing capacity and stability of soils can be achieved through the use of geosynthetic materials [1], as well as the addition of lime [2] or biopolymers [3]. The search for the most effective and environmentally friendly materials for strengthening soft clay soils, which cannot be used as a foundation in their natural state, is ongoing worldwide.

During the construction of buildings and structures on soft natural soils, such as peat, silt, clay soils in a soft-plastic or fluid-plastic state, a set of measures must be taken to improve their natural properties. The process of improving the natural properties of soils involves changing their natural properties by introducing binding materials to increase soil strength, reduce compressibility and water permeability [4]. The process of soil stabilization depends on many factors, the main ones being: soil type, binder and activator type, and mixing technology [5].

We have researched methods for improving waterlogged clay soils for their further strengthening with binding materials, in particular lime or biopolymers, which can change physical, chemical and mechanical properties along with dehydration. Ground quicklime and the biopolymer xanthan gum are the most suitable for this purpose.

We conducted research on the use of xanthan gum and lime to increase the stability of soft water-saturated clay soils. Experimental studies were conducted in a compression device with clay soils with varying degrees of moisture. The results of deformation studies of clay soil with liquidity index LI=0,5-0,7 with the addition of lime 2% and xanthan gum 2% are shown in Fig. 1.

The experiments investigated the effect of applying a stabilizing additive to clay soil. Depending on the consistency of the soil mixture, the effectiveness of adding xanthan gum 2% compared to lime 2% is 1,5–2 times higher.

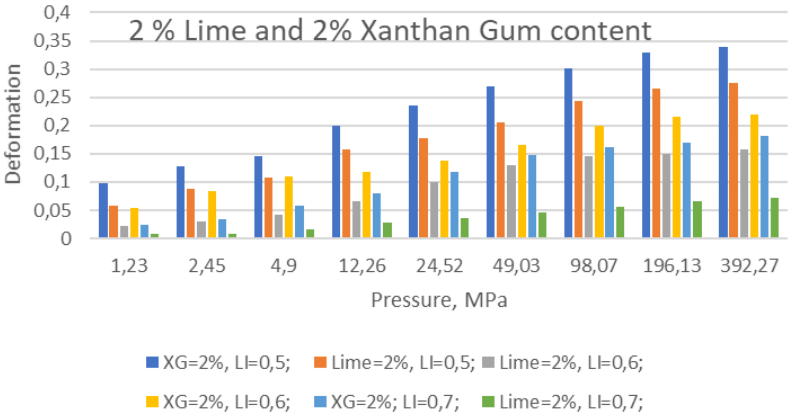

Fig. 1. Results of clay deformation tests with an addition of 2% lime and 2% xanthan gum

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EXERGOECONOMIC ANALYSIS OF THE CENTRAL AIR CONDITIONING SYSTEM OF PREMISES FOR STORAGE OF PUMPKIN FAMILY SEEDS

ЕКСЕРГОЕКОНОМІЧНИЙ АНАЛІЗ ЦЕНТРАЛЬНОЇ СИСТЕМИ КОНДИЦІОНУВАННЯ ПОВІТРЯ ПРИМІЩЕНЬ ДЛЯ ЗБЕРІГАННЯ НАСІННЯ РОДИНИ ГАРБУЗОВИХ

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Центральні системи кондиціонування повітря (ЦСКП) вкрай неефективно споживають теплову та електричну види енергії. За різними оцінками ефективність енергоспоживання ними, визначена через ексергетичний коефіцієнт корисної дії (ЕККД), коливається в межах 5% впродовж цілорічного періоду експлуатації [1]. Але самого значення ЕККД для повної оцінки енергоощадності ЦСКП недостатньо. Ексергетичний аналіз енергоперетворюючих систем передбачає економічну оцінку з урахуванням вартості енергоносіїв. Цей показник є ексергетична вартість цільового продукта [2]. В ЦСКП цільовим