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RECONSTRUCTION OF SOIL DAMS WITH THE USE OF SOIL MIXTURE

Protection of the most valuable areas and settlements by means of embankment with protective dams has found wide use in Ukraine.

In particular, when creating the Dnieper cascade of reservoirs, 300,6 km of dams were built for the protection of 197 thous. ha with 131 settlements and 600 thous. residents [1]. These dams operate in the conditions of constant water head making their utilization more difficult as compared to the flood protective dams. Most dams have been used for about 50 years and are in the near-destruction state. Reconstruction of these dams is necessary not only to avoid potentially catastrophic flooding of large areas, but also to reduce annual losses from crop shortfall due to the flooding of farmland accounting for about 1 570 mln.hrn., as well as to reduce the operating costs of pumping stations exploitation at Dnieper basin management of water resources, which annually pump 2…3 km^3 of water [1].

Another object is the reconstruction of the sludge pit dams of Bortnytska aeration station planned in 2016, which was recognized to be dangerous as far back as in 1989. During the year 2015 the hydraulic fill of the territory in the 5^{th} start-up complex of BAS is being performed as well as the topping of cascade № 5 on the sludge pits №2 [2].

The majority of soil dams in Ukraine were built 20 years ago and nowadays they demand reconstruction (restoration of the project line and repairs of varying difficulty). About 40% of soil dams are in poor condition, and nearly 30% are in dangerous condition. In the process of their operation the dams are being deformed and their crest levels are being reduced. Slopes restoration and dam crest level filling up are often carried out with the soil of the same composition which was used for their construction. Softened soil from the slopes and the dam crest is removed, the loosening and subsequent contracting of its surface are performed as well as dumping, leveling, humidifying and compaction of the soil delivered from the quarry up to projected overflow section. When finding cracks or filtration holes, the trench exceeding the crack or hole depth is dug and filled up with the soil of the composition similar to that of the dam framework and is compacted by layers [3].

However, due to the low strength, water and frost durability of soils, the dam lines restoration must be performed on a regular basis, because the line's elements (slopes, crest) restored with the soil will not be able to effectively and extendedly resist the action of showers, seepage, abrasion, frost and other factors .

The scientists of our University suggest the application of embankment dams equipped with drainage-screen module (DSM) to reduce the seepage when protecting the territories. [4], [5]. DSM is to be located on the side of the dam bottom slope. The module drain is placed on the side of the slope, while the screen is located behind the drain and reaches the soil surface. With this structure, when being reconstructed the

embankment dam traps the surface and underground filtration water flows, and it results in the increase of the structure seepage resistance and prevention of suffusion processes from the dam downstream [6].

The technologies of defects liquidating by means of clay loam, clay, liquid solutions of clay and manure with the subsequent compaction are worth attention [7]. They are applied when filling up voids, filtration holes, cracks formed under the freezing of the dam top and subsiding of the lower soil layers which do not freeze.

There is also a technology of soil dams restoration by means of their dumping (topping) up to the necessary level not with soil but with soil mixture of optimal humidity (soil + screening dust + ash + cement), which is produced with the help of soil mixing installation [8]. When hardened, it becomes high strength (compressive strength is at least 10…15 MPa), water and frost resistant soil concrete which reliably protects the structure framework from the influence of aggressive factors. To prepare the soil mixture, the following components are necessary: Portland cement 400; soil – light slightly water permeable clay loam; screening dust – limestone crushing tailings with the fraction of 0…5 mm.

In conclusion, in terms of the existing and innovative technologies of restoration, there is a possibility to create modern, reliable and efficient protective soil dams to protect the territories from the harmful effects of water.

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