INVESTIGATION OF FILTRATION MATERIALS USED IN DRAINAGE SYSTEMS UNDER LABORATORY CONDITIONS

Vilda Grybauskienė, Gitana Vyčienė, Vilimantas Vaičiukynas,

Kaunas Forestry and Environmental Engineering University of Applied Sciences.
Faculty of Environmental Engineering, Department of Hydrotechnical Engineering, Lithuania

One of the factors determining the optimal regime of groundwater levels in drained areas is properly selected filtering materials to protect drains from siltation. In the Netherlands in 1845. the first fired clay drains were installed. After 15 years, it has been observed that the performance of these clay drains is impaired due to sediments entering and settling in them. In Lithuania, for clay drainage, natural filter materials have been used to protect drainage joints from siltation: plant soil, moss and low-decomposed peat. Usually, such drains were silted up when they were laid in a soil composed of fine and loose particles. Lithuania has the largest number of such soils. Currently, the situation has changed, as plastic drainage pipes with filtering fabrics from different manufacturers start to be used for the reconstruction of drainage systems.

The aim of this work is to investigate the filtration materials used for agricultural drainage in Lithuania according to a unified methodology (without assessing whether the material has the European CE marking or is recognized and successfully used only in Lithuania). The object of the research is filtration fabrics used in agricultural drainage systems. Different drainage materials in the same soils were studied in separate sections. 6 filtration materials supplied directly from the manufacturers were tested. Fabrics 6K27-170 and 6K05-170J provided by UAB Neaustima; manufacturer's Diupoint material WD-27; SF27; SF32, VAVIN Baltik fabric-Fibertex F27 and control system without filter.

The experimental stand, which simulates the processes taking place in natural conditions in the drainage trench and allows to evaluate, predict and determine the influence of filtration tissues on the removal of soil particles due to the properties of the material, were constructed. Methods of statistical data analysis are applied in the work. When choosing statistical methods, the amount of data, their dispersion, their normality, measurement limits were taken into account. Based on the data collected during the experiment, the possible impact of individual factors (touch intensity, soil, filter cloth) on groundwater runoff was determined. Evaluating the results of statistical data processing, it was found that such material properties as tensile thickness $r = 0.59$, resistance to static puncture $r = 0.40$ and water conductivity perpendicular to the plane $r = 0.21$ ie weak or not at all correlate with the amount of effluent. It can be stated that the properties of this material do not significantly affect the operation of the drainage system. These properties are more important for the transportation or other properties of the material not considered. When evaluating the weight and thickness of the material with the amount of effluent, strong correlations $r = 0.806$ between the weight of the material and water permeability and weak correlations between the thickness and water permeability of the material $r = 0.349$. Thus, the weight of the material is one of the factors that can ensure optimal conditions for water flow to the drains. When measuring the permeability of fine soil particles of individual materials, it was found that damage to the filtration protection material and the absence of any filtration protection material above the drainage pipe have a greater influence on their removal rate. Studies show that after a year, the removal of fine particles is minimal, regardless of the properties of the material and even more so the manufacturer of the material. In order to obtain more accurate data on the amount of fine soil particles released by an individual substance, it is necessary to recover already installed drainage systems, which were installed earlier than in the laboratory.