ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 12 , December 2020

Mining and Pilot Filtration Studies for Assessment of Meliorative State of Soils in Syrdarya Region

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ABSTRACT: The article considers the procedure for describing soils in the following sequence: a) petrographic name; b) mineralogical composition of rock; c) rock color; d) impurities and cement of rocks; e) density; f) structure and texture; g) layering and various features associated with rock formation conditions; h) inclusions; and) rock fracture; k) fauna and flora; l) estimated age of rocks. First of all, when describing, the preliminary name of the soils is given: clay, loam, soup, sand, pebble, sandstone, limestone, etc. The detailed characteristics of the composition of the rocks are then given, for example, sawn sand with an admixture of clay shale particles, etc. Experimental filtration work is considered to study the filtration coefficient of various genetic types (in our case $aQ_{IV}sd$ and $apQ_{III}gl$ of quaternary age) of saline sandy soils and sandy soils showed that the filtration coefficient is determined by a natural combination of the characteristics of their composition, state and nature of structural bonds.

KEYWORDS: mineralogical composition, rock formation conditions, density, structure, texture, filtration coefficient, structural bonds.

I. INTRODUCTION

In Uzbekistan, more than half of the population lives in rural areas, and their well-being depends on the quality of land and the availability of water resources. Land quality is determined by reclamation indicators: groundwater level, groundwater mineralization and soil salinization. These factors do not appear on their own. They are the result of economic activity, so careful treatment of irrigation water has always been the main condition for the farmer.

At the moment, research on the reclamation state of water facilities was carried out using methods that do not fully meet today's requirements.

According to methodological manuals for hydrogeological and engineering-geological research (E.M. Sergeev, N.N. Maslov, V.D. Lomtadze, M.Z. Nazarov, A.A. Adylov), the lithological composition of rocks lying in outcrops and their stratigraphic position is described with little detail [1,3,4].

II.RELETED WORK

The order of description of soils was kept in the following sequence: a) petrographic name; b) mineralogical composition of rock; c) rock color; d) impurities and cement of rocks; e) density; f) structure and texture; g) layering and various features associated with rock formation conditions; h) inclusions; and) rock fracture; k) fauna and flora; l) estimated age of rocks.

First of all, when describing, the preliminary name of the soils is given: clay, loam, soup, sand, pebble, sandstone, limestone, etc. Next, a detailed characteristic of the composition of the rocks is given, for example, wood-spar sand with an admixture of clay shale particles, and the like.

To determine the minerals, it is recommended to use the book prof. N.S. Smolyaninova "How to determine minerals by external signs," 1951

The color of the breed can be varied; it depends both on the minerals that make up the rock, and on the nature and degree of weathering. Often, the color of the rock also depends on impurities of any coloring material. For example, a limestone consisting of white calcareous spar may have a dark color from an impurity of carbonaceous or ferruginous matter. The color of the breed can often indicate the origin of the breed and its properties. For example, bright red shades due to the presence of anhydrous iron oxide (Fe2O3) or hydroxides (2Fe2O3·H2O) indicate continental formation conditions, hot and arid climates.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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When describing, the base color of the rock is marked: green, yellow, gray, etc., then the hue is indicated: brownish, yellowish, etc. It should be borne in mind that the rock often has a color or shade in the fresh fracture, which differs from the color of the rock from the surface.
In terms of cement composition and impurities inclusions, rock can be called clay, glandular, siliceous, mica, lime and glauconite. Depending on the amount of cementitious substance and the amount of impurities, the rock can be called strongly or weakly luminous, calcareous, mica and salty.
Many features of the rock are determined by eye and touch: for example, sandstone and clay of the rock are determined by touch by rubbing or rolling the rock on the palm or between fingers; ironicity is recognized due to the rusty color of the rock; mica is determined due to the sparkles of mica plates; the presence of glauconite is determined by the presence of glauconite grains, giving the rock a characteristic green tint, etc.
The density of the rock is described as follows: sands and sandy loams are divided into loose, compacted (caked), dense; limestones, dolomites, marls, sandstones and conglomerates-on loose, dense and strong; clays, clay marls and clay shales - on strong, dense, viscous, ductile and loose.
When describing the structure and texture of the rock, the shape, location and size of the minerals that make up the rock are noted. Debris rocks are divided by the size of the debris into coarse, large, medium, fine and fine-grained sands and gravel into - small, medium and large. In the presence of different grains in size, the rock is described as diffuse. Grain sizes are determined using a pie chart, and with a known skill can be determined by eye.
Determination of soil filtration coefficient by experimental pouring into pits. To determine the filtration coefficient of non-water-saturated soils, that is, soils lying in the aeration zone, the method of pouring water into the sump is used. The essence of the method is to create a vertical filtration flow leaking through dry soil down from the bottom of the sump, the flow area, water flow rate and hydraulic pressure are measured, that is, all the parameters of Darcy's law except K_f.
The conditions of water movement in the aeration zone differ significantly from the conditions of its movement in water-saturated soil. Water entering the pit is absorbed into the dry soil and moves in it not only under the influence of gravity directed downward, but also capillary forces acting in all directions. Due to the action of these forces, water leaks from the sump into the dry soil, and spreads, forming a humidified zone, the shape of which changes over time, stretching down. As the wetting depth increases, the rate of change in the wetting pattern slows, and the water flow rate for infiltration from the sump stabilizes, however, even with a constant flow rate, the lines of currents of the infiltration flow are not parallel to each other, that is, the area of the horizontal flow section, and therefore its speed changes with depth.

III. OBJECTS AND METHODS OF RESEARCH

A.K. Boldyrev. In the tested rock to the specified depth pit is digged with a section of 1x1.5 m, in the bottom of which there arranged is a sumpf of a round section with a diameter of 0.5 and a depth of 0.15-0.20 m. In sandy rocks, the sumpf walls are fixed with a ring, which is pressed into the sumpf bottom for 5-6 cm. Water is supplied to the sumpf from a measuring vessel through a flexible tube. The intensity of water supply should be such that the height of the water column in the sump is maintained equal to 10 cm. The height of the column is controlled by a rack (deviations of not more than 1 cm are permissible). Water flow rate is fixed by water measuring tube of measuring vessel every 10-15 minutes (Fig. 1).

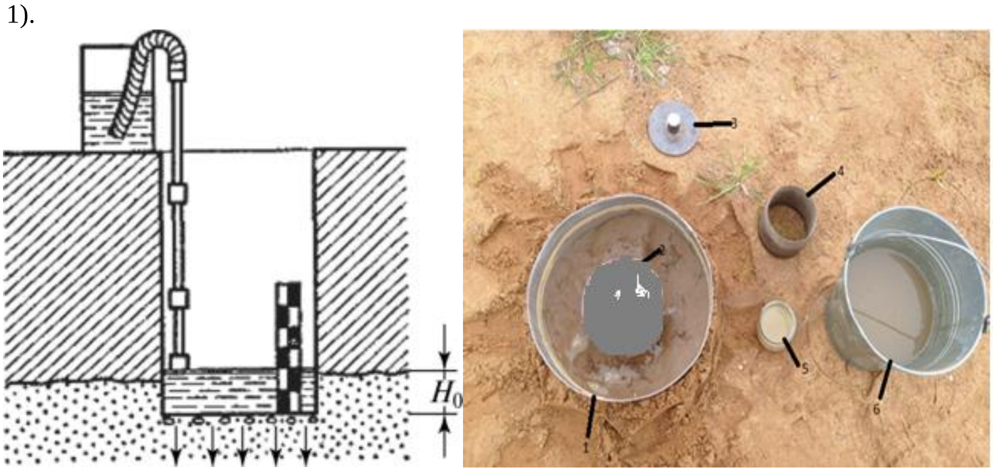

Fig. 1. Installation diagram for determination of filtration coefficient by A.K. Boldyrev method

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 12 , December 2020

During the test, the flow rate versus time is plotted (Figure 2), the test is continued until the water flow is stabilized.

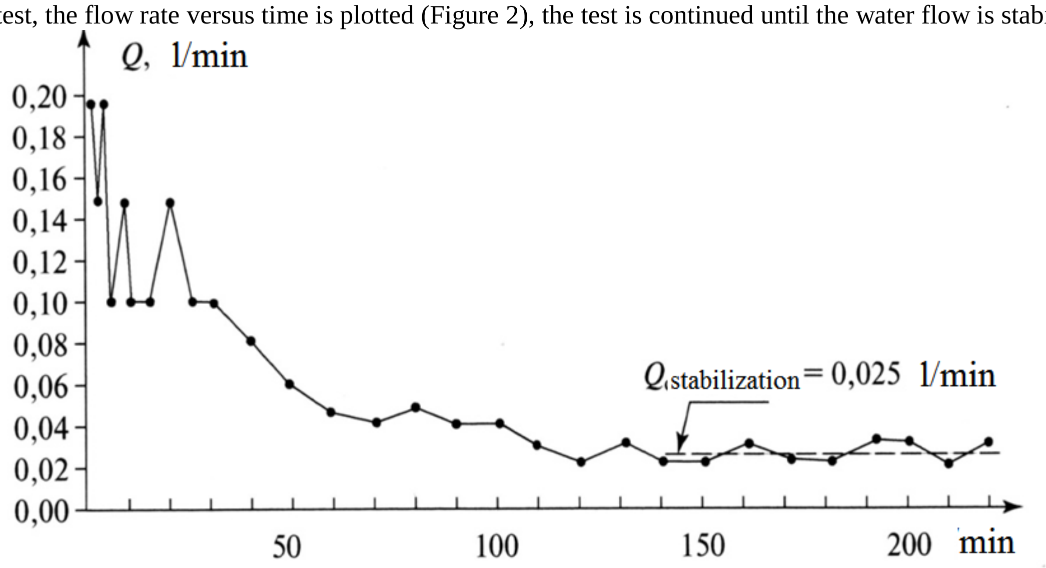

Fig. 2. An example of a graph of the dependence of water flow by ring on time according to the A.K. Boldyrev method

IV. RESULTS OF THE RESEARCH

Filtration coefficient K_f is determined by formula: $K_f = \frac{Q_y}{F \cdot J}$
area of the large ring $F = \pi r^2 = 3.14 \cdot 232 = 1661.1$ см^2
The value of the filtration coefficient K_f is defined as the steady-state infiltration rate V at a pressure gradient equal to one (under test conditions J = 1),

$$K_f = V = \frac{Q_y}{F}$$

where$F$ is the cross-sectional area of the ring in the sump,
Q_y - water flow rate, infiltration from the sump.
This method of determining the filtration coefficient does not take into account the action of capillary forces and lateral flow. Therefore, pouring into pits according to the Boldyrev method is useful to use when testing permeable rocks, such as sandy loam, grained sands, gravel-pebble deposits, tre squash rocks, etc.
The experimental filtration work conducted to study the filtration coefficient of various genetic types (in our case aQ_{IV}sd and apQ_{III}gl of quaternary age) of saline sandy soils and sandy sandy soils showed that the filtration coefficient is determined by a natural combination of the characteristics of their composition, state and nature of structural bonds.

V.CONCLUSION

A numerous study of saline soils in the territory of the Syrdarya region made it possible to identify their different sensitivity to water, depending on the texture, structure and content and composition of secondary salts (amorphous silica - SiO_2, gypsum - $CaSO_4$*$2H_2O$, etc.). Similar ratios of soils with water of the studied territory lead to leaching of salts, non-water-resistant coagulation-crystallization structural bonds are weakened and disturbed in sandy soils, which leads to a sharp decrease in strength and possible change in deformation parameters of soils [2,3,4].
In our case, according to the schedule of changes in water consumption from time, the sandstones, being quite strong in a saline state, are additionally hydrated, decompressed and sharply softened during the leaching process to varying degrees, moving from the initial to the improvement of the reclamation state.
Thus, the studied 2.0-2.5 m thickness of the study area sandy sand can be considered as a zone of hypergenic changes associated with climate aridity. After obtaining the results of laboratory definitions, it will be possible to judge the degree of susceptibility to hypergenic changes, and determine the reclamation state of the studied area.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 12 , December 2020

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